



**Impacts and Determinants of Clinical Knowledge Transfer
to Patients: The Case of KOA**

HUANG Ximou

Thesis submitted as a partial requirement for the conferral of the degree of

Doctor of Management

Supervisor:

Prof. Alexandra Fernandes, Assistant Professor,
ISCTE – University Institute of Lisbon

Co-Supervisor:

Prof. XIA Weidong, Tenured Professor,
Florida International University

April, 2017



Instituto Universitário de Lisboa

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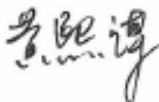
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I declare that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university and that to the best of my knowledge it does not contain any material previously published or written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

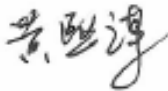
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Abstract

Surveys show that China is gradually stepping into an aged society in the 21st century, with middle-aged and elderly people increasing with years. Most elderly people are living with more than one chronic disease, which requires long-term and large amount of healthcare budget to cover their medical expenses. In order to meet the growing need for elderly healthcare spending, the Chinese government has increased investment year by year, putting a huge strain on the social security funds. Therefore, how to effectively use the elderly medical expenditure has become a key to relieve the government's financial burden, which demands joint efforts and close collaborations of the whole society, including all departments of the government, especially the health and family planning commissions, hospitals, community health service centers, and nursing homes.

Among the common elderly chronic diseases, Knee Osteoarthritis (KOA) occurs in high frequencies. The pain, causing the loss of ability to walk and sleep normally, has greatly affected the patients' qualities of life. Patients living with the KOA always suffer from long treatment cycles, recurrent symptoms and high treatment expenses. If left untreated, the worsening disease is very likely to cause physical disability, and often needs surgical treatments. However, the medical expenses for surgery and rehabilitation treatment are astoundingly high. Therefore, how to effectively prevent the disease from further worsening through early prevention, diagnosis and treatment has attracted growing attentions from medical community. Meanwhile, as the breadth and the depth of people's medical knowledge increases across China, people become increasingly concerned about their own health. However, as things stand, most elderly people know little or nothing about their diseases, let alone to know about preventive measures like early self-massage skills. The failure to pay attention to the early symptoms always costs them to miss the best timing of treatments. In severe cases, when joints become severely deformed, joint replacement is the only effective therapeutic means. Generally, early KOA patients should get basic and effective

treatments in community health service centers. In China's case, however, patients often have no confidence in the medical expertise and capabilities of community health service centers and therefore they would go directly to the large hospitals for treatments. The hierarchical medical system advocated by the government fails to play an effective role as expected. The GPs in community health service centers indeed lack of knowledge about KOA and experience and therefore their treatment effects are often unsatisfactory. In order to solve this problem, it is necessary for specialist physicians to train and transfer professional knowledge to the GPs.

Knowledge transfer is a concept in knowledge management science, which will be applied to the medical field in this study. Specifically, it refers to the process in which the specialists transfer KOA diagnosis method and standard techniques of early self-massage to GPs in community health service centers through theoretical training, step by step demonstrations, group practices and video reviews. Meanwhile, it also includes knowledge transfer from GPs to patients in the process of KOA treatment in the community health service centers. This study will address the following questions: what effects will knowledge transfer from GPs to patients have on patients' treatment results and satisfaction level as well as the improvement of doctor-patient relations? (2) What effects will the knowledge transfer from specialists to GPs have on GPs' satisfaction level and the improvement of doctor-patient relations? (3) To what extent do the patients have the intension to apply what they learned from GP? (4) To what extent do the GPs have the intension to apply what they learned from the specialists? (5) Whether the new treatment model proposed in this study applies to the current medical environment and whether it can, if applicable, further improve the patients' satisfaction and doctor-patient relationship?

A combination of qualitative and quantitative research methods was used in this study, including reviewing on the extent literatures, reviewing theory of planned behavior (TPB) and its applications, soliciting opinions from experts, physicians and patients, and developing questionnaires for data collection. The research data obtained from questionnaire surveys and patient pain measuring rulers and joint range of motion measurement were analyzed using statistical analysis software SPSS20.0 for

descriptive analyses, measurement validations and model testing.

The study concludes that through knowledge transfer, the satisfaction levels of patients and GPs have been significantly improved; the KOA treatment has achieved satisfactory therapeutic effect; and the doctor-patient relationship has been noticeably improved. Therefore, in the current healthcare context, the government should energetically promote the medical reform and vigorously encourage the knowledge transfer between specialists and GPs, and between GPs and patients, which can, to a certain extent, enhance curative effect, improve the satisfaction of physicians and patients, and effectively improve doctor-patient relationships. It is a useful and effective innovative method that deserves to be further explored and popularized.

Key words: Knowledge transfer, Knee Osteoarthritis (KOA), Theory of Planned Behavior (TPB), general practitioner, satisfaction, doctor-patient relationship

JEL Classification: I11, I18, M53, D83

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Resumo

Investigações desenvolvidas na China demonstram que no século 21 a China se está a deparar gradualmente com um aumento do número de pessoas de meia idade e idosas. Observa-se que a maioria das pessoas idosas vivem com pelo menos uma doença crónica, o que leva a que o orçamento governamental no domínio da saúde seja cada vez mais elevado. Desta forma, existe uma necessidade por parte do governo chinês de reduzir estas despesas, o que passa pela colaboração de toda a sociedade, incluindo as comissões de planeamento familiar, os hospitais e os centros de saúde.

Uma das doenças idosas crónicas é a osteoartrite do joelho (OJ). A OJ tem como sintomas uma forte dor que leva a dificuldades ou mesmo incapacidades de andar associada a problema a dormir. Tal faz com que a vida dos doentes se torne bastante limitada. Estes pacientes sofrem períodos de longos tratamentos, o que passa inevitavelmente por grandes despesas nos seus tratamentos. Sucede mesmo que quando a doença não é tratada, os sintomas vão piorando e como último recurso existe a necessidade de uma intervenção cirúrgica. Obviamente, que os custos associados à cirurgia e ao período pós-operatório são extremamente elevados. Desta forma, a possibilidade de prevenir, diagnosticar e tratar a doença OJ tem suscitado extrema atenção e interesse por parte da comunidade médica.

Sucede que na China as pessoas idosas têm pouca consciência da OJ, o que não lhes permite prevenir as doenças com as terapias de auto massagens. Esta falta de consciência por parte das pessoas faz com que se desperdice o tempo mais adequado para se fazerem os tratamentos e resolver o problema. De facto, nos casos muito severos a única solução é mesma efetuar cirurgias para a substituição das articulações. Em contrapartida, caso se comece o tratamento logo no aparecimento dos primeiros sintomas, os doentes de OJ vão os centros de saúde da sua zona e poderiam ser efetuados tratamentos muito básicos e extremamente eficazes. Na China, sucede que as pessoas não confiam no profissionalismo e capacidade dos médicos dos centros de

saúde e, portanto, recorrem aos grandes hospitais. Assim, parece que o sistema governamental a nível médico não consegue ser tão efetivo como seria desejável. Verifica-se que os médicos de família que estão nos centros de saúde não têm grandes conhecimentos sobre o OJ, o que leva a que os tratamentos não tenham os resultados possíveis. Para resolver este problema é necessário que médicos especialistas neste domínio deem formação, de modo a transferirem os seus conhecimentos para os médicos de família.

Esta dissertação irá debruçar-se sobre a gestão do conhecimento em específico sobre a transferência do conhecimento. De facto, a transferência do conhecimento proposta neste estudo incide sobre os especialistas ensinarem métodos de diagnóstico de OJ e técnicas de auto massagem aos médicos de família a partir de demonstrações, de práticas de grupo e vídeos. Posteriormente, os médicos de família transferem esses conhecimentos aos pacientes que acedem aos centros de saúde.

Este estudo tenta responder às seguintes questões: (1) Que efeitos terá a transferência de conhecimento dos médicos de família para os pacientes quer em termos dos resultados do tratamento, quer do nível de satisfação, quer da melhoria das próprias relações médico-paciente? (2) Qual o efeito que a transferência de conhecimento de especialistas para médicos de família terá sobre o nível de satisfação dos médicos de família? (3) Em que medida é que os pacientes irão aplicar o que aprenderam sobre OJ com médicos de família? (4) Em que medida é que os médicos de família irão aplicar o que eles aprenderam dos especialistas? (5) Se este estudo se aplicar pode melhorar a satisfação dos pacientes e a relação médico-paciente?

Na parte empírica deste estudo, será realizada uma investigação qualitativa e outra quantitativa baseando-se numa extensa revisão de literatura, em específico na Teoria do Comportamento Planeado (TCP). Nesta parte, foi pedido a opinião de peritos, médicos e pacientes. Os dados quantitativos foram analisados recorrendo o software de análise estatística SPSS20.0. Tal permitiu efetuar uma análise descritiva, uma validação e teste do modelo desenvolvido ao longo desta tese.

A análise do estudo empírico permite verificar que através da transferência do conhecimento conforme foi proposto neste estudo, existe um maior nível de satisfação

entre os pacientes e os médicos de família. Também se verifica que o tratamento da OJ tem um efeito terapêutico bastante satisfatório e que a relação entre médico e paciente melhora significativamente. Como conclusão, considera-se que o governo chinês deve promover profundamente uma reforma médica que promova a transferência de conhecimento entre os especialistas e os médicos de família, e entre os médicos de família e os pacientes. Tal permite aumentar a eficácia e eficiência dos tratamentos, melhorar a satisfação dos médicos e dos pacientes e melhorar a relação entre os médicos e os pacientes. Assim, esta nova abordagem parece ser muito útil e eficaz o que merece ser mais explorada e divulgada.

Key words: Transferência de conhecimento, Osteoartrite do Joelho, Teoria do Comportamento Planeado, Médico de Família, Satisfação, Relação entre Médico-Paciente

JEL Classification: I11, I18, M53, D83

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List of Acronyms

TPB: Theory of Planned Behavior

GP: General Practitioner

KOA: Knee Osteoarthritis

STD: Standard Deviation

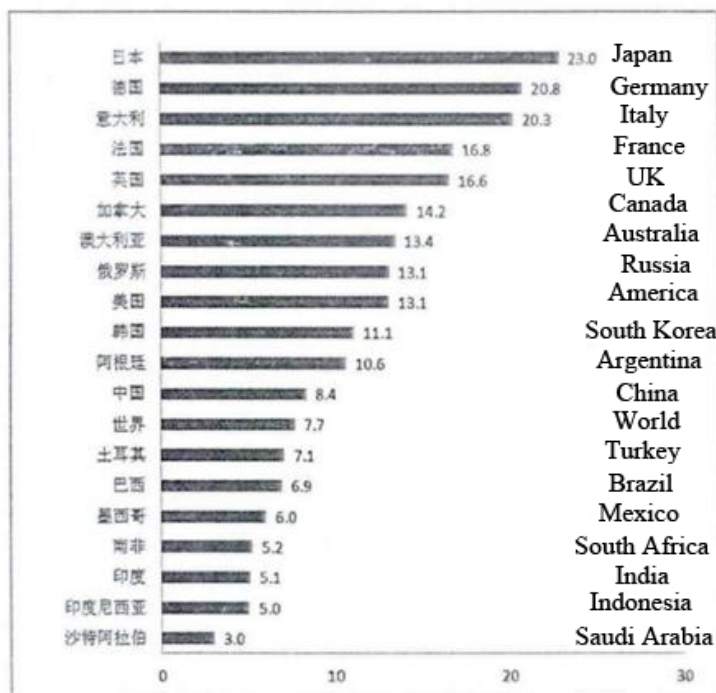
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Chapter 1: Introduction

1.1 Research Background

One of the most prominent problems in the 21st century is population aging. According to Lan (2014), when the number of people aged 65 or over in a country or region accounts for over 7% of the total population or aged 60 or over takes up over 10% of the total population, the country or region is regarded as entering aging society.

Figure 1-1 Percentage of people aged 65 or above in major countries across the world in 2010 (%)



Source: Lan (2014)

Note: China mentioned here only refers to mainland China, excluding Hong Kong, Macau and Taiwan,

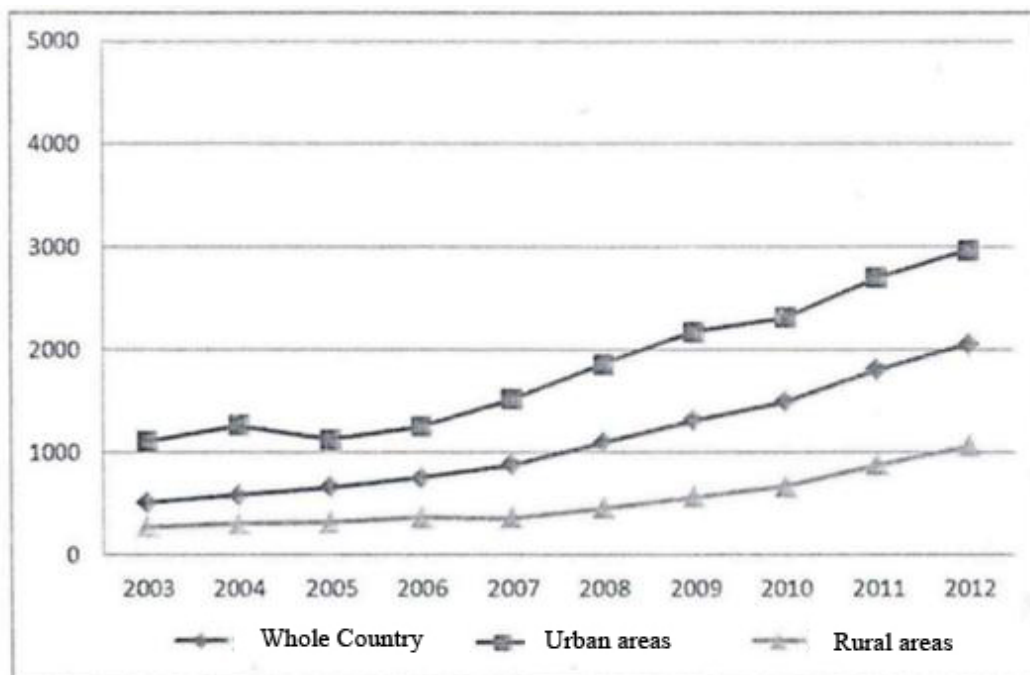
Figure 1-1 shows the percentages of older persons in the population in major countries around the world in 2010 according to the UN standard that a country or

region whose people aged 65 or more exceed 7% of the total population is regarded as entering an aging society (Lan, 2014). As depicted in the figure, people over 65 years old take up 7.7% of the total population in the world, signifying the aging society has become a global problem. According to the figure, the countries mostly plagued by the aging problem are Japan, German and Italy, whose people over 65 years old have all exceeded 20% of the total population. The elderly people aged 65 or more in G8 countries are well over 13% of the total population, showing that the economically-developed industrial countries are experiencing a serious aging problem. With the proportion of elderly people taking up 6.9%, Brazil is poised to become an ageing country in the several years to come. As per the figure, ageing is a common problem faced by the developed industrial countries, while the population age structure in developing countries is relatively reasonable.

According to the UN survey, the older persons in China take up 8.4% of the total population, a level slightly higher than the global average but much higher than most developing countries, showing China is still in the preliminary stage of aging society. China's sixth National Population Census conducted in 2010 showed that China's population had reached 1.37 billion, among which, the percentage of people aged 60 or more takes up 13.26% and the number of aged people above 65 takes up 8.87%. The survey results reflect the share of older persons in the population. The possible reasons behind China's population aging can be summed up as follows. First, the progress of medical technology and improvement of public health services prolongs the average life expectancy of Chinese people, which is an immediate cause of increased share of old people; second, with the improvement of living standard, young people tend to pay more attention to the life quality and marry late and have children late, thus leading to the decline of birth rate among people of reproductive age. The decline of fertility rate in China has reduced the growth rate of the labor force, increasing the proportion of the elderly population. In addition, in order to control the growth of population, the Chinese government has long strictly implemented the family planning policy, directly contributing to the aging of the population. Thus, it can be seen that population aging in China results from combined effects of economic

development, technological progress and family planning policy (Lan, 2014).

Figure 1-2 Changing trend in per capita healthcare expense in China (2003-2012)



Source: Lan (2014)

The changing trend in per capita healthcare expense in China from 2003 to 2012 is shown in Figure 1-2. In 2003, the per capita healthcare expense in China registered only 500 yuan and the per capita healthcare expense in rural areas cost as low as 250 yuan. However, the per capita healthcare expense in China had skyrocketed to over 2000 yuan in 2012 and the per capita healthcare expense in urban areas cost as high as about 3000 yuan. In the 10-year period, the annual growth rate of per capital healthcare expense was as high as 17.4%. Even with the factor of rising price is considered, the adjusted annual growth rate still stands at 13.8%. As per the figure, the medical expenses basically remained unchanged or rose slowly before 2007. After that, however, the medical expenses started to rapidly increase. Coincidentally, the State Council began to implement the urban basic medical insurance system in some pilot areas in 2007 and promoted it across China after 2008. As depicted in figure 1-2, the per capital medical expense in urban areas is significantly higher than that in rural areas in the same year, indicating the rising costs in urban areas played a main role in driving up the medical expenses across China. Meanwhile, it also reflects that medical

resources in the whole society are unevenly distributed. The per capital healthcare expense in urban and rural areas shows an upward trend year after year, with the former higher than the latter and the gap between the two gradually widening over the past ten years.

In China, public hospitals are the major providers of medical services and hence they are heavily dependent on government health investment. Besides, the new rural cooperative medical scheme and urban residents' basic medical insurance built after 2000 also pose even greater challenges to health expenditures. Higher medical costs have brought heavy economic burden to many families especially rural families. Some families are even stricken by poverty because of diseases, which widens the gap between the rich and the poor. Therefore, when policies are introduced and measures are taken to curb the excessively rising medical expenses, financial balance and social equity should be considered as a whole (Lan, 2014).

As can be seen from the facts mentioned above, China has entered an aging society. Although the percentage of elderly people in China is far lower than that in developed countries, China has a population of 1.37 billion, which means there are about 120 million elderly people across China. Most elderly people are living with more than one chronic disease that needs long term drug treatment. The increasing per capita medical expenditure year after year in China has not only increased the economic burden of each family, but put great pressure on the government's financial expenditure in healthcare. As the growing aging population has become an undisputed fact, how to efficiently use the elderly medical expenditure has become a key to relieve the government's financial burden, which demands joint efforts and close collaboration of the whole society, including all departments of the government, especially the health and family planning commissions, hospitals, community health service centers and nursing homes.

Then what is the current medical condition in China? We can get a glimpse at it from the three aspects as described below:

(1) The Chinese medical services are composed by three levels. At the first level are the community health service centers, which are also often referred to as the

grass-root medical organizations. These are mostly located in communities serving as the primary care facilities. At the second level are mid-size hospitals that serve a greater area of residents that are composed of several communities. At the third-level are the highest level of large hospitals that serve a large city or province, which are often referred to as the tie-three class A hospitals. Currently, the tie-three class A hospitals are overcrowded with patients. Statistical data show that the number of beds, number of medical staff, business income, number of visits and inpatients in tertiary hospitals across China account for an increasing share of the whole medical service market. In 2013, the outpatient visits of hospitals and grass-root medical organizations account for 37.5% and 59.1% of the total across China. The proportion of outpatient visits to the grass-root medical organizations was less than 60% and is in declining trend. Take Beijing for example, in 2013, the number of visits to secondary and tertiary hospitals accounted for 67.2% of the total, with tertiary hospitals alone making up as high as 44.8%. In contrast, the number of visits to community health service centers accounted for only 21.7% of the total. In Shanghai, the number of visits to hospitals and community health service centers respectively accounted for 56.8% and 33.6% of the total, showing the service share of grass-root medical organizations is still not high. Although the hierarchical medical system in Dongguan seems to work well, a further analysis of the structure of hospital visits shows that most patients with mild diseases still choose to visit the large hospitals. In 2013, the ratio of hospitals visits to inpatients in Dongguan reached up to 43.2:1, a level far above the national average and provincial average. Thus, when the third third-level grade-A hospitals are still the first choice of most patients, it is not surprising that they are often flooded by patients ([Http://cs.yixueziyuan.com/5878.html](http://cs.yixueziyuan.com/5878.html)).

(2) The grass-root medical organizations are rarely visited by patients. With the improvement of economic development and medical insurance level, people's medical demand has been further unleashed. They begin to care more about their health and have rising demand for high-quality care. Therefore, they are more inclined to visit large hospitals instead of grass-root medical organizations, which can explain why the grass-root medical organizations are rarely visited. Surveys suggest only 62.60%

patients choose the grass-root medical organizations in their first hospital visit (Wang, 2015). There are several reasons for this: (1) For patients, they, on one hand, pay more attention to their health and are eager to get timely treatment when they have health problems. On the other hand, limited by their health knowledge, and not considering their actual needs, they always blindly choose large hospitals for “treatment with immediate effect” and “one-stop service”, without giving any consideration to grass-root hospitals. (2) The medical education mainly focuses on training doctors with special skills instead of GPs that are urgently needed by the grass-root medical organizations. Considering the factors such as working environment, salary, available of government budgeted staff positions and a sense of accomplishment, few medical graduates would like to work in grass-root medical organizations. Therefore, the basic-level hospitals have been trapped in a bad cycle of few patients and backward technical skills. (3) Poor medical infrastructure. The medical facilities in urban and rural areas vary considerably, especially the economically undeveloped countryside where the living conditions and working environment and medical equipment are still very poor. In some places, the inpatient wards in grass-roots hospitals are located in shabby houses with worn beds. It is not surprising that the patients are reluctant to visit hospital like these. (4) Constrained by performance salary system. The individual income is not closely linked with what he has done, resulting in low motivation in work. Even worse, the frequent medical disputes dispirit grass-root doctors so severely that they would reject the medical service as possible as they could. (5) Basic drug system. Only basic drugs are allowed to be prescribed in grass-roots hospitals. At the same time, the medicine doses permitted to be prescribed in grass-roots hospitals and those in large hospitals differ greatly. For this reason, many patients have to go to large hospitals for additional dose of medicines. In addition, the grass-root hospitals remain woefully short of common medicines, chronic medicines and first-aid medicines, even with some of the medicines that are in basic drug catalogues are in short supply.

Given the current medical conditions in China, it is of great significance to promote that patient hospital visits be properly distributed among the whole medical

system. A comprehensive analysis of causes suggests that there are perhaps multi-faceted reasons to explain why the grass-root hospitals are rarely visited and the problem needs to be addressed progressively. Therefore, it is crucial to work out solutions and to establish a “hierarchical medical system, two-way referral of patients” reasonable medical service model to effectively solve the previously mentioned problems. In early 2016, the General Office of the State Council issued a report on key tasks of deepening health care system reform in 2016, which requires stepping up efforts to conduct pilot programs of hierarchical medical system. The number of public hospitals included in the pilot reform will increase to 200 and the hierarchical medical system will be piloted among hospitals in 70% of the cities across China. Since then, the term “hierarchical medical system” has come into people’s view. Then what is “hierarchical medical system”? As its name implies, hierarchical medical system is based on the idea that the initial diagnosis should be in grass-root hospitals, there should be two-way referral of patients, serious and chronic diseases being treated in different hospitals, there should be close cooperation between higher-level and grass-root hospitals (State Council, 2016). To put it simply, the hierarchical medical system aims to form an ideal healthcare pattern in which mild diseases are treated in community health service centers, patients with critical diseases are admitted into large hospitals, and rehabilitation treatment is conducted in community health service centers, which can effectively reduce the medical costs and remarkably relieve the problem of “difficult access to health care services”. It is a good solution to help grass-root medical organizations increase their customers and facilitate residents to see a doctor in the nearby hospitals. However, the challenge that really matters is that the comprehensiveness of service levels offered by grass-root medical organizations is very low. GPs with high levels of experts and experiences are in critical shortage. In addition, outdated and dysfunctional medical equipment also severely hinder the improvement of medical service ability in grass-root hospitals.

(3) A glimpse of physician-patient relationship. Physician-patient relationship refers to the interaction between physicians and patient in the process of medical service, which is an integral part of medical interpersonal relation. In American law,

physician-patient relationship is defined as a relation formed between physicians and patients based on mutual voluntariness. The patient actively visits the physician for disease treatment while the latter is also willing to provide medical service for him (Tao & Qian, 2004). The term has either a broad or a narrow sense when viewed in different contexts. In a broad sense, the term refers to the relationship formed between all medical personnel involved in the treatment and patient (including family members and relatives). In a narrow sense, the term is defined as the relationship established between the physician in charge and his patient. (Chen & Wang, 2002). Conclusively, the physician-patient relationship refers to a special relation formed between individuals or groups in the whole medical activities, which has the following characteristics (Zhang, 2015):

(1) The physician provides patient with professional medical services like diagnosis, treatment and care in order to help him recover from diseases. Therefore, the physician-patient relationship is formed based on professional medical services.

(2) The medical personnel have responsibilities or obligations to cure the sickness and save patients. They should put the health of patients in the first place. And the physician-patient relationship is not only a simply relationship between “Physician” and “patient”, but more of a disease-curing or life-saving relation between the helpful physician and help-wanting patient.

(3) The physician-patient relationship forms on the condition that the physician provides medical services to eliminate diseases at the request of the patient. Therefore, the physician-patient relationship often exists in some special public places like hospitals, where the physician is relatively active and the patient is passive.

(4) The physician-patient relationship is based on the premise that the physician provides medical services to eliminate diseases at the request of patient, which exists through the whole process of treatment till he is discharged from hospitals upon recovery.

(5) Some people select a career as physicians because they want to realize their life value and do their part to improve human health. The patients visit doctors because they want to have their diseases treated, relieve pains and recover their

health.

Different from other ordinary interpersonal communications, the physician-patient relationship is a special social relation that occurs in a special environment. Then what is the current situation of physician-patient relationship in China? In fact, the physician-patient relationship in China has currently become increasingly intense. A survey conducted by the Chinese Medical Doctor Association among 114 hospitals in 2007 shows that the average number of medical disputes in each hospital has doubled to 65 in 2006 from 30 in 2005. The growth rate is stunning. According to courts in different places, the average compensation caused by medical disputes has reached 110,000 yuan. In some cases, the compensation is as high as over 900,000 yuan (Ma & Shi, 2007). In recent years, there were often reports that show doctors were stabbed or even killed by patients. Opening the page links about physician-patient relation and medical disputes, you can find countless violent attacks against doctors across China, some pages even carrying pictures of bloody and appalling crime scenes. A survey conducted by Ding Xiang Yuan (DXY), a large communication platform exclusively for doctors in China, shows that 70% of the medical staff polled said they do not want their children to work as a doctor. If they were given a chance to reselect their professions, they would never work as a physician. With this idea in mind, currently a growing number of medical staff choose to resign and work in other fields. Especially, the Department of Pediatrics and Emergency Department, where the physician-patient conflicts frequently occur, have experienced the largest loss of medical staff. When a patient visits a hospital, there is no escaping of the scene of big crowds of patients because in a country with a population of 1.37 billion, the medical resources provided by the government are always relatively insufficient. If the basic medical needs in China can be met, the global demands for healthcare and physician-doctor relationship can be met and improved accordingly. For a developing country that is still in a primary stage of economic development, the government faces a daunting challenge in providing one fifth of the global population with a package of insurances covering survival, life, healthcare and recreations.

Based on the status quo of the medical environment combined with the clinical practice, the researcher selected the KOA (knee osteoarthritis), one of the elderly chronic diseases, as the research subject in order to get a big picture from small part. By observing the elderly people with KOA as directed by the research design, it is hoped that knowledge transfer can achieve good results in improving the satisfaction of physicians and patients, as well as the physician-patient relationship. Hopefully, the research results can be applied to other elderly chronic diseases.

Studies have shown that there is a greater prevalence of the KOA disease among elderly people. According to statistics, the incidence of KOA comes in the second place out of all diseases affecting people aged over 50 in America; the incidence of the disease among people aged 65 or older has reached 70% (Garstang & Stitik, 2006). The KOA initially outbreaks among some people aged 40, but often without any symptoms. However, the incidence rate of KOA increases as people age. A preliminary survey conducted in China and abroad shows that the total incidence rate of KOA is about 15%. The incidence rate of KOA among people aged 40 is 10% to 17%, people aged 60 or more being 50% and people over 80 years old being 80% (Qiu, 2005). The disease, which may occur in middle aged persons, is most frequently found in people aged 50 or more. Nearly 40 million American people are affected by KOA, 15% of whom have obvious symptoms. The disability rate of this disease is 53%. Statistics suggest that the population over 50 years old in 2020 will be twice that of 1990. The expenditure on KOA will reach about 15.5 billion dollars, putting a lot of strain on the medical resources (Zhong, Li, & Lou, 2002). Among the common elderly chronic diseases, KOA occurs in high incidence. The pain, causing the loss of ability to normally walk and sleep, has greatly affected the life quality of the patients. Patients living with KOA always suffer from long treatment cycles, recurrent symptoms and high treatment expenses. If left untreated, the worsening disease is very likely to cause physical disability, and most often needs surgical treatment. However, the medical expenses for surgery and rehabilitation treatment are astoundingly high. Therefore, how to effectively prevent the disease from further worsening through early prevention, diagnosis and treatment has attracted growing

attentions from medical personnel. Meanwhile, with the popularization of medical knowledge in both breadth and depth across China, people become increasingly concerned about their own health. But, as things stand, most elderly people know little or nothing about their diseases, not to mention the preventive measures such as early self-massage skills. The failure to pay attention to the early symptoms always costs them to miss the best timing for treatment. In severe cases, when joints become severely deformed, joint replacement is the only effective therapeutic means.

1.2 Research Problem

Generally, the early KOA patients can get basic and effective treatment in community health service centers. In China's case, however, patients often have no confidence in the medical expertise level of the community health service centers and therefore they would go directly to the large hospitals for treatment. The hierarchical medical system advocated by the government fails to play an effective role as expected. An analysis of reasons show that the GPs in the community health service centers indeed lack knowledge and experience about KOA, and as a result, their treatment effects are often unsatisfactory. There are perhaps several reasons for this: First, the GPs in community health service centers across China are generally poorly educated. The survey in this study shows that the GPs with lower than bachelor degrees make up the majority, with most holding college degrees or even technical vocational degrees; meanwhile, most old doctors in the grass-root hospitals have rarely received high-level medical educations. Considering factors related to hardware facilities, salary and individual development space in the grass-root medical organizations, the medical graduates with advanced degrees are reluctant to work in these basic level hospitals. Second, when there are not enough GPs, some acupuncture and massage technicians and nurses are also involved in doing what are parts of the GP's work, forming a team with remarkably diverse skills. When there are difficulties in introducing new high-caliber medical staff, the only way to change the situation is to improve the medical skills of the current employees so that they can better serve

the patients and relieve their pains, further reducing the economic burdens of the patients' families and releasing the stress on the national healthcare expenditure. When the specialists provide training for GPs, the professional knowledge is transferred to the latter.

Knowledge transfer is a concept of knowledge management science, which will be applied to the medical field in this study. Specifically, it refers to the process in which the specialists transfer the KOA diagnosis method and standard techniques of early self-massage to GPs through theoretical training, step by step demonstration, group practice and video review. In addition, it includes the professional knowledge transfer from GPs to patients as during KOA treatment.

The study focuses on the following questions:

(1) What effects will knowledge transfer from GPs to patients have on patients' treatment results, satisfaction levels as well as the improvement of doctor-patient relations?

(2) What effects will knowledge transfer from specialists to GPs have on GPs' satisfaction level and the improvement of doctor-patient relations?

(3) To what extent do the patients have the intention to apply what they have learned from GP?

(4) To what extent do the GPs have the intention to apply what they have learned from specialists?

(5) Will the new treatment model proposed in this study apply to the current medical environment, and if applicable, further improve patients' satisfaction and doctor-patient relationship?

1.3 Research Methods

A combination of qualitative and quantitative research methods was used in this study.

First, we reviewed the relevant theories, conducted an overview of the status quo of aging population in China and other parts of the world, forecast the aging trend and

presented the spending on per capita medical expenses in recent 10 years in China, including the increasing medical costs with years afforded by urban and rural residents; we reviewed the Theory of Planned Behavior (TPB) which lays a sound theoretical foundation for many researches due to its exploratory power and predictive power. The TPB theory can be widely used in many research fields, including the medical sector. However, it is still rarely used by Chinese scholars in medical research.

Second, based on the literature review and using KOA that commonly occurs among elderly people as a specific case example, the study proposed the following questions: what effects will the knowledge transfer from GPs to patients have on patients' treatment results and satisfaction level as well as the improvement of doctor-patient relations? (2) What effects will the knowledge transfer from specialists to GPs have on GPs' satisfaction level and the improvement of doctor-patient relations? (3) To what extent do the patients have the intention to apply what they have learned from GP? (4) To what extent do the GPs have the intention to apply what they have learned from specialists? (5) Will the new treatment model proposed in this study apply to the current medical environment, and if applicable, further improve patients' satisfaction and doctor-patient relationship?

Third, based on the TPB theory, the theoretical framework and research model are put forward; the research technique route and research approach are designed; opinions from experts in relevant fields are solicited, physicians and patients participated in training sessions and in the study, questionnaire data were collected over three different time periods from the participating physicians and patients; the survey data were analyzed using SPSS 22.0 to test the validity and reliability of the measures, and to test the research model.

1.4 Research Significance

Currently, most countries in the world have joined the rank of aging society. In some developed industrial countries like Germany and the USA, the increasing

massive medical bills over the years never seem to be enough to cover the medical costs spent on elderly chronic diseases, putting the government under great pressures. When it comes to China, the largest developing country in the world, the situation does not allow us to be optimistic. Although China's economy has remained a rapid growth rate since the reform started and opening-up, we must be fully aware that in the country with a large population of 1.37 billion, a huge number of rural residents still live poor lives. When China has already stepped into the aging society, the Chinese government is facing more pressures in national medical expenditure. The purpose of the study is to explore a specific and clinically feasible therapeutic method for KOA treatment. Through early prevention and effective treatment, it is hoped that the therapeutic method can slow down the disease development, reduce the recurrence of the disease, improve patient's life quality and help more patients avoid expensive surgical treatment, at least defer the surgery until it has to be done. By all these efforts, it is hoped that the medical expenses, patients' family economic burdens and the pressures on national healthcare expenditure can be remarkably reduced.

Undeniably, in the recent five years, the physician-patient relationship in China has become increasingly tense, which is caused by multi-faceted underlying reasons. We hope the good curative effect and full physician-patient communication fostered the process of knowledge transfer can play a positive role in improving patients' and GPs' satisfactions and in improving physician-patient relationship.

Knowledge transfer is a concept of knowledge management science that has been widely used in the foreign medical research for a long time. Some results have been achieved by foreign scholars. But cases of applying the concept in medical research by Chinese scholars are still rare, therefore the study, by applying management knowledge in clinical practice, can be regarded as an innovation and exploration.

Knowledge transfer mentioned in this study refers specifically to: 1) the process in which the specialists transfer the KOA diagnosis method and standard techniques of early self-massage to GPs in community health service centers through training, including the stages of knowledge sharing of specialists and knowledge absorption of

GPs; 2) the process in which the GPs passes the self-massaging skills on to the KOA patients during treatments, including the stages of knowledge sharing of GPs and the knowledge assimilation of the patients. When the management theory is applied in the clinical practice, the treatment method is changed and the knowledge is transferred between specialists and GPs, and between physician and patient, which will play a positive role in the improvement of KOA patient satisfaction and curative effect.

With China entering an aging society, the prevention and treatment of elderly diseases will face challenges. A large number of people who are determined to devote their efforts to this undertaking are needed to accomplish these daunting tasks. As a clinical staff, it is also my unshakable duty. As such, this is why this study was conducted. The researcher contacted a lot of community health service centers and provided trainings to a large number of GPs so that joint efforts are made to work out a simple, effective and cheap self-treatment method and meanwhile use, test and popularize it to benefit more people.

The study concludes that through knowledge transfer, the satisfaction levels of patients and GPs have been significantly improved; the KOA treatment has achieved satisfactory therapeutic effect; and the doctor-patient relationship has been noticeably improved. Therefore, in the current healthcare context, the government should energetically promote the medical reform and vigorously encourage knowledge transfers between specialists and GPs, and between GPs and patients in the community health service centers, which can, to a certain extent, enhance curative effect, improve satisfaction levels of physicians and patients, and effectively relieve the tense doctor-patient relationships. It is a useful and effective innovative method that deserves to be further explored and popularized.

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Chapter 2: Literature Review

2.1 Overview of Knowledge Transfer

2.1.1 Concept of Knowledge Transfer

Knowledge transfer refers to a process in which knowledge transfers from one person's mind to another person's mind or from a certain organization to another organization.

The idea of knowledge transfer was first put forward by Teece, an American technological and innovative management scientist, in 1977. He holds that a large amount of knowledge that is applied across countries can be accumulated through international transfer of technologies (Teece, 1977). In 1992, it was put forward by Kogut and Zander (1992) that the purpose of knowledge transfer is to absorb new knowledge and effectively use new knowledge, and that through knowledge transfer, application of the knowledge that brings benefits to an organization can be accelerated so as to enable the organization to gain competitive advantages. There are two major views on the definition and understanding of knowledge transfer by scholars in China and overseas. First, due to the dominant position of the initiator and the receiver, many scholars tend to define knowledge transfer from the perspectives of the subjects involved in the process. Knowledge transfer refers to the transfer or transmission of knowledge among different organizations or individuals in different ways. In this process, the knowledge, subjects involved in the knowledge transfer (the initiator and the receiver of knowledge), relevant situations and ways of transfer need to be taken into consideration (Xiao & Liu, 2006). Knowledge transfer is a process where knowledge transfers from one subject to another subject. It is a unified process composed of two sub-processes, namely, knowledge transmission and knowledge absorption (Lu, Yue & Liao, 2006). Second, as research in this area advances, more

scholars have gradually realized that although the subject plays a key role in knowledge transfer, its receiver is the most important during the whole transfer process. Only when the knowledge receiver understands, digests and absorbs the transferred knowledge and includes it into his knowledge reserve can the further step of knowledge creation be taken, which is the most significant. Knowledge transfer is the communication between the receiver and the knowledge source, through which the former can learn and apply it (Dong-Gil, Kirsch & King, 2005). Only when the knowledge shared by the knowledge contributor is applied by the knowledge receiver will knowledge transfer occur (Darr & Kurtzberg, 2000). Knowledge transfer is exactly the process where knowledge flows and transfers from the knowledge source to the receiver. It emphasizes the complexity, the composition of several stages and the inevitability of a process of reconstruction. It is more than a simple process of knowledge transmission, but more importantly, a process of knowledge absorption and re-application (Cao & Guo, 2008).

2.1.2 Influencing factors of knowledge transfer

There are four major factors that play important roles in the process of knowledge transfer, namely, the tacitness of knowledge, subjects' ability, choice of media, and situational factors of knowledge transfer (Cao & Guo, 2008). The first is the tacitness of knowledge. The process of knowledge transfer is influenced by the tacitness and explicitness of knowledge, that is, whether or not the knowledge can be written down and taught, as well as the levels of complexity and systematic dependence involved in the knowledge transfer process. In particular, it is difficult to transfer tacit knowledge. The tacitness of knowledge is believed to be a major obstacle to knowledge transfer (Kogut & Zander, 1995). The ambiguity, specificity and complexity of knowledge will determine the difficulty of knowledge transfer by influencing knowledge application, whereas the usefulness of knowledge will influence the efficiency of knowledge transfer via influencing the motivation of knowledge transfer (Xiao & Wen, 2005). The quantity, quality and structure of knowledge are the three factors that affect knowledge transfer. The larger the quantity

of knowledge is, the higher the quality of knowledge is and the more structured the knowledge is, the more successful the knowledge transfer will be. Second, the subjects' ability of performing the knowledge transfer. The subjects of transfer refer to the knowledge initiator and the knowledge receiver. The ability mentioned here includes the motivation, absorption capacity as well as the credibility and communication ability of the knowledge source. The receiver will try to judge whether or not the initiator's expression of knowledge is accurate and whether or not the knowledge source lacks credibility. This will also directly influence the absorption, digestion and re-innovation of knowledge. When the credibility of the knowledge source is low, the receiver will regard the knowledge as less persuasive, depreciate and refuse to accept it; in contrast, when the credibility of the knowledge source is high, it means that the knowledge is highly persuasive and that the knowledge provided by the knowledge source will be considered useful and conducive to reception, absorption and digestion. Differences in the cognitive structure as well as in the ability of the subjects and the cohesion among subjects are the main factors that affect the knowledge transmission (Zuo, 2004). Two main elements are involved in knowledge transfer, namely, the subjects that participate in the transfer process (the knowledge source and the receiver) and the transferred knowledge (Lu, Yue & Liao, 2006). Major factors that affect knowledge transfer include the motivation, credibility and sending capacity (expression ability) of the knowledge source as well as the reception motivation, absorption ability and retention ability of the receiver. A harmonious and cooperative relationship between the two categories of factors is conducive to knowledge transfer. After integrating the acquired knowledge, the receiver combines it with the existing knowledge to produce new knowledge and then send the knowledge back to the knowledge source. In this way, the receiver gives feedback to the knowledge source (Cao & Guo, 2008). Third, the media and situation of the knowledge transfer. Currently the academia both in China and abroad have not conducted many studies on the media of knowledge transfer. Most of the existing studies are focused on the means of transfer. The majority of scholars hold that face-to-face interaction is the most conducive means of knowledge

transfer, and what follow are conferences and reports. Situational factors also occupy an important position among the factors influencing knowledge transfer. Among them, culture is a factor of particular interest to scholars. The degree of compatibility and suitability between the two parties of knowledge transfer in their own respective cultural backgrounds, cognitive structures and technological fields will directly affect the effectiveness of knowledge transfer.

2.1.3 Knowledge Levels

Knowledge exists in three levels, namely, individual level, group level and organizational level. Knowledge transfer happens exactly between individuals and groups, individuals and organizations, groups and organizations, as well as organizations and organizations. Knowledge transfer may happen through a series of ways and channels (Tang & Shi, 2006). Based on the level of knowledge transfer, the research literature in China and abroad can be classified into three categories. First, knowledge transfer within an organization. Knowledge transfer within an organization is defined as an activity where a certain organization or individual diffuses or disseminates its knowledge efficiently and effectively to other departments or individuals and enables them to share and absorb the new knowledge. In order to enhance the effectiveness and value in use of the knowledge for the organization, the internal knowledge of the organization can be widely transferred and shared among different individuals so as to improve the learning ability of all the members in the organization. It will reduce the frequency of occurrence where knowledge is excessively concentrated on a certain individual or organization (Shu, 2006). Second, knowledge transfer among organizations. In order to cope with the increasingly fierce market competition and maintain its own competitive edge, an organization should not just rely on its own knowledge, but also take an initiative to transfer new knowledge from outside (Li & Liu, 2008). In studying the process of knowledge transfer between universities and enterprises, researchers have found that knowledge itself, trust crisis, ownership of intellectual property rights, knowledge transfer subjects and situation of knowledge transfer are obstacles that undermine the

performance of knowledge transfer (Liu, Zhang & Han, 2010). Third, comprehensive knowledge transfer. Knowledge transfer is represented in a comprehensive process model. It comprises of explicit and tacit knowledge during the interactions at four different levels, namely, among individuals, within a group, within an organization and among organizations (Hedlund, 1994; Nonaka & Takeuchi, 1995).

2.2 Overview of Theory of Planned Behavior (TPB)

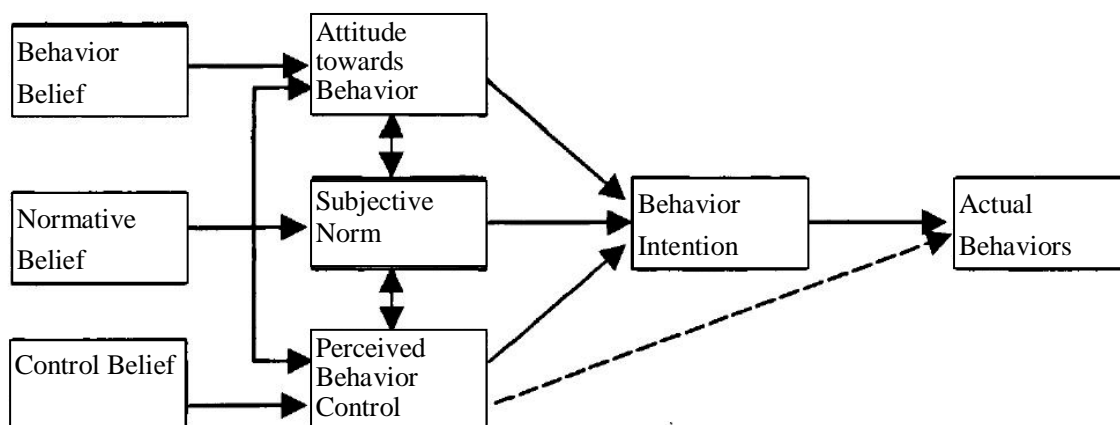
2.2.1 Concept and Connotations of TPB

The Theory of Planned Behavior (TPB), first proposed by Icek Ajzen (1991), is an inheritance and extension of the Theory of Reasoned Action (TRA) which was jointly put forward by Ajzen and Fishbein (1977). Ajzen's (1991) research findings suggest that human behaviors, instead of being fully motivated by his wish, are under control and the TRA theory does not apply to all behaviors. Therefore, by adding a new concept called self "Perceived Behavior Control" into the TRA theory, he developed a new behavior theory model, which is what is known as the TPB. TPB is a three-stage behavioral analysis model: in the first stage, the behavioral intention determines the individual behavior; in the second stage, attitude, subjective norm and perceived behavior control determine behavioral intention; in the third stage, the beliefs determine attitude, subjective norm and perceived behavior control (Xu, Li & Jiang, 2012).

The concept of belief in the Psychology literature refers to the extent to which an individual believes a prospect to be true. An individual holds a large number of behavior-related beliefs but only a few of them, known as the salient beliefs, can be acquired in specific time and environment (Duan & Jiang, 2008). Three types of beliefs are considered in the TPB: behavior belief, normative belief and control belief. According to the Attitude-Expectancy Value Theory developed by Ajzen and Fishbein (1977), a host of beliefs related to the possible results of behaviors held by an individual are referred to as behavior belief.

TPB is interpreted in several ways: (1) the behaviors not fully motivated by one's wish are not only affected by the behavioral intention, but also constrained by the actual control conditions such as personal ability to implement behaviors, opportunities and resources. When the actual control conditions are sufficient, the behavioral intention directly determines behaviors; (2) the accurate perceived behavior control reflects the situation of the actual control conditions, therefore it can be used as indicators alternative to the actual control conditions to predict how likely the behavior can occur (as shown by the dotted line in Figure 2-1); the accuracy of the behavioral prediction depends on the true level of perceived behavior control; (3) attitude toward the behavior, subjective norm and perceived behavior control are the three main variables that determine behavioral intention. The more active the attitude is, the more support others give and the stronger the perceived behavior control is, the higher the behavior intention is. Otherwise, the behavior intention would be lower; (4) an individual holds a large number of behavior-related beliefs but only a few of them, known as the salient beliefs, can be acquired in specific time and environment. These salient beliefs are the cognitive and emotional basis of attitude toward the behavior, subjective norm and perceived behavior control; (5) the factors such as personal profile and social culture (for example, personality, intelligence, experience, age, gender, cultural background) can indirectly affect the attitude towards the behavior, subjective norm and perceived behavior control through behavioral beliefs and ultimately affect behavioral intention and behaviors; (6) the attitude towards the behavior, subjective norm and perceived behavior control can be conceptually differentiated. However, they could sometimes share common belief basis, therefore they are mutually exclusive and at the same time pair-wisely correlated. The structure model of TPB is presented in figure 2-1 (for convenience, only the main parts of the structure model are presented).

Figure 2-1 Structure Diagram of Theory of Planned Behavior



Source: Yan (2014)

Ajzen’s TPB includes five constructs, namely attitude, subjective norm, perceived behavioral control, behavior intention and behavior.

(1) Attitude refers to an individual’s positive or negative feeling towards a specific behavior, and therefore it is often regarded as a function of an individual’s salient beliefs about the behavioral results.

(2) Subjective norm is the perceived social pressure to engage or not to engage in a behavior or the degree to which a salient individual or groups can affect an individual’s intentional behavior.

(3) Perceived behavioral control refers to an individual's perceived ease or difficulty of performing a particular behavior based on his past experience and expectation. The more resources and opportunities an individual controls, the higher expectation he has, the stronger the perceived behavioral control over a behavior is. Perceived behavioral control affects behavior in two ways: first, through implications on the motive of intentional behavior; second, directly predicts behaviors.

(4) Behavior intention is an indication of an individual's judgment of subjective probability before performing a given behavior. It is assumed to be an immediate antecedent of a particular behavior.

(5) Behavior refers to the action which an individual has actually taken.

Ajzen (1985) asserts that all the factors that may influence the actual behavior can only have an indirect effect on it through behavior intention. Generally speaking,

the more favorable the attitude toward behavior, the stronger the person's intention to perform the behavior of interest should be. Similarly, the more favorable the subjective norm, the stronger the person's intention to perform the behavior of interest should be. As a general rule, the more favorable the attitude toward behavior and subjective norm, and the greater the perceived behavioral control, the stronger the person's intention to perform the behavior of interest should be. In contrast, in his basic hypothesis of TRA, Ajzen (1985) maintains that an individual's mind control over his behavior should be seen as a continuum. At one end, the behavior is fully controlled by the mind; at the other end, the behavior is totally out of the control of the mind. Most human's behaviors fall at a point between these two extremes. Therefore, in order to predict a behavior not fully motivated by an individual's wish, it is necessary to add a determinant called "perceived behavior control". However, in extreme cases, when an individual has the most control over a particular behavior or the control factor is not in the list of an individual's considerations, the TPB and TRA have equal performance in behavior prediction.

2.2.2 Evaluation items of TPB and measurement methods

The above review has focused on the conceptual definitions and evolution of TPB. For empirical studies, there is a need to operationalize and measure the different components of TPB. As such, the review below discusses the evolution items of the TPB in terms of the operational definitions of the various components of TPB. In addition, this section reviews the measurement methods and important criteria for developing measures of the different components of the TPB. Based on these literature reviews, in this study, we develop specific evaluation items based on the measurement methods and criteria for our study of knowledge transfer from specialists to GPs and from GPs to patients.

1. Evaluation Items of Theory of Planned Behavior

a. Behavior Intention. It refers to an indication of an individual's readiness to perform a given behavior, or the extent to which the individual can perform a particular behavior after weighing up various factors. It is assumed to be an

immediate antecedent of behavior.

b. Attitude towards the behavior - the first determinant of behavior intention. According to the Expectancy-Value Theory (Ajzen & Fishbein, 1977), attitude refers to a mental position of persistently liking or disliking a particular thing, or positive or negative feeling towards a specific behavior. They argue that attitude is developed as a result of the strength of salient beliefs concerning an outcome and the evaluation of the outcome, which can be expressed as the following mathematical function:

$$Ab = \sum_{i=1}^i BBiOEi \quad (2.1)$$

Ab=Attitude towards the Behavior

BBi=Behavior Beliefs

OEi=Outcome Evaluations

i= Number of salient beliefs

c. Subjective norm - the second determinant of behavior intention. Subjective norm is the perceived social pressure to engage or not to engage in a behavior, which is influenced by the judgment of salient individuals or groups. Therefore, the subjective norm is the sum of products of the strength of each normative belief of each referent and the motivation to comply with the referent, which can be expressed as the following mathematical function:

$$SN = \sum_{j=1}^j NBjMCj \quad (2.2)$$

SN=Subjective Norm

NBj=Normative Belief

MCj=Motivation to Comply

j= Number of Normative Beliefs

d. Perceived Behavioral Control - the third determinant of behavior intention. It refers to an individual's perceived ease or difficulty of performing the particular behavior. Therefore, it is the sum of products of the strength of each control belief and the perceived facilitation, which can be expressed as the following mathematical function:

$$\mathbf{PBC} = \sum_{k=1}^k \mathbf{CB}_k \mathbf{CF}_k \quad (2.3)$$

PBC=Perceived Behavioral Control

CB_k=Control Belief

CF_k=Perceived Facilitation

k=Number of Control Beliefs

Perceived Behavioral Control often reflects an individual's past experience or second-hand information or beliefs about the presence of factors that may facilitate or impede performance of the behavior. Basically, PBC includes internal control factors such as an individual's weaknesses, skills, ability or emotion, and external control factors, such as information, opportunities, dependence on others or obstacles.

2. Measurement Methods of TPB

When using TPB in research, most researchers adopt the measurement method recommended by Ajzen (1985), which is known as the principle of compatibility. The preparatory work in research takes two steps: first, elicit salient beliefs; second, develop formal measurement questionnaire.

(1) The Principle of Compatibility

The principle of compatibility means that all measured research variables such as intention, attitude, subjective norm and perceived behavior control must be pointed towards a particular behavior. Meanwhile, the measured behavior should be in consistent with the actual behavior. Ajzen (1991) asserts that non-compliance of the principle of compatibility will lead to inconsistency of evaluation and easily confuse or underestimate the correlations between variables.

Given the importance of the principle of compatibility to research results, the TPB requires the researchers to strictly define the behavior to be studied before measurement. According to the TPB, behavior refers to an individual's observable response in a given time and situation with respect to a given target. Therefore, the operational definition of the behavior should include target, action, context and time, or simply referred to as TACT. The TACT is often subjectively defined and therefore the researchers can define each element according to the purpose of research or

assemble one or multiple elements to enhance the generality of behavior. Whether it is specifically or broadly defined, the researchers must ensure the behavior intention, attitude, subjective norm and perceive behavior control are pointed towards the same behavior and the behavior to be studied is consistent with the actual one.

(2) Eliciting Salient Beliefs

Because of the important role of salient beliefs in TPB, eliciting salient beliefs is the most important part in the whole research. According to TPB, the salient beliefs are the cognitive and emotional foundation of attitude towards behavior, subjective norm and perceived behavior control. The salient beliefs can not only explain why different persons have different attitude, subjective norms and perceived behavior control, but provide valuable information for the development of behavior intervention measures.

When applying the theory in research, many researchers subjectively select or choose questionnaire items from previous research. Although the practice can achieve some interesting results, the validity and reliability of measurement is relatively low and the correlation between variables is often underestimated, reducing the explanatory power of the theory. Therefore, it is necessary to elicit salient beliefs in order to acquire accurate and reliable research results. The method of eliciting salient beliefs is to select representative research samples and ask them to answer three types of open-ended questions: (1) What are the benefits and harms of target behaviors? (2) Which individuals or groups can affect the occurrence of target behaviors? (3) Which factors can facilitate or impede the occurrence of target behaviors? Collect the beliefs related to behavior results, norm and control from the answers; encode and analyze these beliefs; select the beliefs with high occurrence rate to form salient beliefs modal. The salient beliefs modal is the information source of formal research questionnaire.

(3) Develop formal questionnaire

In order to help researchers better apply TPB, Ajzen (1991) designed a set of general questionnaires for reference, which includes holistic direct measurement and beliefs-based measurement. The Likert-type scale is used to measure all variables but semantic differential method is separately used for the direct measurement of attitude.

When designing the direct measurement items, the accumulated research results over the years should be considered. The items for attitude should include instrumental attitude and affective attitude; the items for subject norm should include injunctive norm and descriptive norm; the items for perceived behavior control should include self-efficacy and controllability.

When designing beliefs-based questionnaires, there is the problem of optimal scaling - the choice between unipolar rating and bipolar rating. Adding or subtracting a constant value can achieve the conversion between unipolar rating and bipolar rating model, which does not change the characteristics of questionnaire (Dawes, 1972).

However, the typical value of variables in beliefs-based measurement is sum of products, and therefore the linear conversion between unipolar rating model and bipolar rating one will lead to the non-linear transformation of typical value of variables and ultimately affect the research results. Presently, there is still no widely accepted standard as to which model should be selected. In order to solve this problem, Holbrook (1977) offered a relatively easy method, as illustrated in the following example with regard to attitude towards behavior. The method can be applied to subjective norm and perceived behavior control. Adding constant values B and E to b and e respectively, we get formula

$$Ab \propto \sum (b_i + B)(e_i + E) \quad (2.4)$$

then expand this formula and ignore the BE item, we get

$$Ab \propto \sum b_i e_i + B \sum e_i + E \sum b_i \quad (2.5)$$

In order to obtain the adjusting parameter B of b and E of e, we simply have a regression of the holistic attitude measurement value using $\sum b_i e_i$, $\sum b_i$ and $\sum e_i$, then divide the regression equation by the coefficient of $\sum b_i e_i$.

Because the algorithm adopted in this method is somewhat complicated, Ajzen (1985) proposed a relatively simple method. He advised the researchers to tentatively acquire the measurement data using both unipolar and bipolar rating models, then compare the two sets of data with regard to beliefs-based measurement data and correlation coefficients of direct measurement data. After data comparison, the rating model producing stronger correlation coefficients will be used in the formal research.

2.2.3 The application scope of TPB and its application in medical knowledge transfer

(1) Application scope of TPB

TPB is not a universally applicable theory; instead it can be only used in limited instances. First, TPB only applies to individual rational behavior, excluding the individual's behavior in groups like rally, protest and group debate, and the emotion-driven behaviors such as sadness, anger and excitement, and the individual behaviors enacted for groups (decision-making) (Bagozzi, Dholakia & Mokerjee, 2006); second, only the individual's particular behavior in specific time and context, instead of the general behavior (for example, go to the cinema), is studied (for example, see a movie at weekend) (Ajzen & Fishbein, 1977); third, the principle of compatibility is followed. All the measured variables must target the same behavior at the same level, or specifically, only the influence of a particular attitude, subject norm and perceived behavior control on the particular behavior to which they are directly related can be studied. Some studies violating the principle of compatibility failed because the researchers predict a general behavior (for example, go to cinema) using a particular attitude (for example, whether or not he likes this film), or predict particular behavior using general attitude (Armitage & Christian, 2003); fourth, TPB is generally used to predict new behaviors, excluding repetitive behaviors and habitual behaviors in stable context (Ouellette & Wood, 1998). Admittedly, some later studies use repetitive behaviors and habitual behaviors as new variable to expand the application scope of the theory, but this is not the original intention of the theory.

(2) TPB's application in medical knowledge transfer

TPB has good explanatory power and predictive power, hence lay good foundation for many studies. Although TPB is rarely used in China, it has been widely used in European and American countries, and has been applied in many behavior fields, including dietary behaviors such as dietary fiber and no caffeine consumption; drug addictive behaviors such as abstinence from smoke and drink, medicine and appetite; exercise behaviors such as jogging, hiking, bicycle riding and leisure

activities; social and learning behaviors such as vote, blood donation, learning achievement and illegal behaviors; clinical and screening behaviors such as health examination, cancer screening and breast self-examination (Wang, Yang, Fu & Gu, 2011).

TPB has also been used in studying behaviors in the medical fields. Gavaza, Brown, Lawson, Rascati, Wilson and Steinhardt (2011) discussed the role of TPB model in predicting Texas pharmacist's intention to report serious adverse drug events to FDA. The result revealed the pharmacist had a favorable attitude towards ADE reporting. Using TPB to predict pharmacist's reporting ADE behavior lead to important practical implications.

Kuo and Young (2008) conducted a longitudinal, two-stage research to evaluate whether or not TRA and TPB (including its two variants decomposed TPB and revised TPB) can fully predict the knowledge sharing behavior.

The first TRA-based research shows that the TRA has severe limitations in predicting the ability of collecting actual knowledge sharing from knowledge management platform. The latest research based on three TPBs models shows that although the independent variables, namely attitude, subject norm and perceived behavior control (decomposed into self-efficacy and controllability), produce satisfactory results in explaining intention difference ($R^2 > 42\%$), behavior difference still exists in the three models. Only self-efficacy in the revised TPB can directly predict knowledge sharing behavior. The gap highlights the importance of knowledge sharing. From the intention to its realization, the fundamental social activity can be interrupted by blameless culture or intended misinterpretation and in turn leads to unexpected negative consequences. The research shows that when applying TPB to the research of knowledge sharing, researchers must focus on people's control beliefs that capture their ability to overcome possible environmental challenges in their intention to share knowledge.

Ryu, Ho and Han (2003) investigate the factors that determine the physician's individual knowledge sharing behavior in his/her department. They examine empirically the physicians' knowledge sharing behavior. The research models under

investigation are the TRA model and the TPB model. These models are empirically examined and compared, using survey data on physicians' knowledge sharing behavior collected from 286 physicians practicing in 28 departments in 13 tertiary hospitals in Korea. TPB model exhibited a good fit with the data and appeared to be superior to TRA in explaining physicians' intentions to share knowledge. In an amended TPB model, subjective norms were found to have the strongest total effects on behavioral intentions to share knowledge of physicians through direct and indirect path mediated by attitude. Attitude was found to be the second most important factor influencing physicians' intentions. Perceived behavioral control was also found to have effect on the intentions to share knowledge although it was weaker than that of subjective norms or attitude.

Gavaza, Fleming and Barner (2014) studied TPB model and found that constructs (that is, attitude, subjective norm [SN], perceived behavioral control [PBC]), past utilization behavior (PUB) and perceived moral obligation (PMO) were significant predictors of Virginia community pharmacists' intention to utilize a PDMP.

Rashidian and Russell (2011) developed the questionnaire via conducting qualitative interviews and pilot study. A random sample of 155 GPs in England participated in the study. The data were analyzed using regression methods. The results showed that TPB explained 48% of variation in the reported intentions to follow guidelines' prescribing recommendations. Attitude and perceived controls, but not subjective norms, were predictors of variations in intentions. TPB belief variables significantly explained variations in effective and efficient prescribing indicators (14% and 12% respectively). There was no significant relationship between intention and prescribing.

Suppiah and Sandhu (2011) investigated the influence of organizational culture types on tacit knowledge sharing behavior in Malaysian organizations. Survey data was collected from 362 participants from seven organizations in Malaysian. Multiple regressions were used to test the research model. The research findings indicate that organizational culture types influence tacit knowledge sharing behavior and that such influences may be positive or negative depending on the culture type.

A case study method was used by Cruz, Perez and Cantero (2009) to analyze a Spanish non-profit organization (Asprona). In this context, a qualitative and quantitative analysis with a sample of 76 people was performed using the partial least squares approach (PLS), in order to test the research hypotheses. The research findings show that, in Asprona, knowledge transfer improves through intrinsic motivation, however extrinsic motivation does not have significant effect on knowledge transfer. This result is interesting that people are involved in a nonprofit organization due to intrinsic reasons rather than for financial rewards.

According to Radaelli, Lettieri and Masella (2015), Physicians' willingness to share knowledge is a central antecedent of effective knowledge sharing within hospitals. The identification of antecedents and their classification was based on the review of the major contributions published in top tier and specialist journals. These factors were classified according to the TPB framework, which identified three behavioral antecedents: attitude, subjective norm and perceived behavior control. The organization of the factors allowed appreciating the diffusion of knowledge-sharing behaviors as the result of three concurring perspectives: raising attention to the benefits of knowledge sharing, building up social pressures from relevant actors and designing appropriate organizational contingencies.

2.3 Overview of KOA

The above two literature review sections are related to concepts and theories regarding knowledge transfer and the TPB. While these reviews are important in setting the foundation for understanding the knowledge transfer process and the general theoretical framework that this research is built on. It is also important to understand the clinical context and the specific disease on top of which the knowledge transfer process occurs in this research. The sections below reviews basic concepts and research literatures related to the specific disease that this research focuses on.

2.3.1 Concept of KOA

Knee osteoarthritis (KOA) is a chronic joint disease. The main results it leads to include retrogression of articular cartilage surface and secondary hyperosteoecy. KOA is resulted from the absence of balance of the normal synthesis and degradation of the articular chondrocytes, extracellular matrix and subchondral bone due to interactions between accumulative mechanical damage of the knee joint and factors causing retrogressive changes of the knee joint. KOA can be caused by a variety of factors, including heredity, development, metabolism and trauma. The ultimate manifestation of KOA is that changes in the knee cartilage cells, matrix morphology, molecular biology and biomechanics result in the tenderness, fibrosis, anabrosis and decrease of the knee cartilage, subchondral bone sclerosis and eburnation, formation of osteophytes and hydatoncus of the subchondral bone. The main KOA clinical manifestations are joint pain, swelling, stiffness, and decreased ability to move and, in serious cases, the loss of joint function, muscular dystrophy and even the joint deformity, disability. X-ray films show narrow joint space, lip hyperplasia, cystic changes, and subchondral bone sclerosis, and in later stage of the disease, the articular cartilage spalls and the crushed bones drop into joints, existing in the form of loose bodies.

One of the most prominent problems in the 21st century is population aging. The most common cause of osteoarthritis of the knee is age. According to statistics, the incidence of KOA comes in the second place out of all diseases affecting people aged over 50 in America; the incidence of the disease among people aged 65 or older has reached 70% (Garstang & Stitik, 2006). China's Fifth National Population Census conducted in 2000 showed that China's population had reached 1.296 billion, among which, the percentage of aged people took up 6.96% and the number of aged people above 65 had reached 90 million. This meant that China had basically entered into an aging society. The incidence time of KOA is at around 20 years old. The majority of people show no symptoms. Yet with the increase of age, the incidence rate also increases. This disease occurs frequently after people have reached middle age. The

initial investigations conducted in China and overseas show that the overall morbidity rate of KOA is about 15%, that of people in their 40s is between 10% and 17%, and that of people above 60 has reached 50%. Among people who are older than 70, more than 80% are afflicted with KOA (Qiu, 2005). Initial investigations in China show that the incidence rate of KOA among people who are above 50 is around 5%, that among females above 60 is 25%, and that among males above 60 is 5%. The number of KOA patients in the United States has reached 40 million, of whom 15% have obvious symptoms (Zhong, Li & Lou, 2002). The disability rate is 53%. KOA is posing a greater threat to human beings. Thus, effective treatment, prevention and healthcare have become major issues of public health. According to statistics, it is anticipated that by 2020, the number of people above 50 in the world will have been twice as many as that in 1990 and the money used for KOA treatment will have reached around 15.5 billion dollars, causing a heavy burden to medical resources.

2.3.2 Knowledge of TCM about KOA and treatment methods

The ancient books of TCM (Traditional Chinese Medicine) have no record of knee osteoarthritis. According to the KOA clinical manifestations, the disease is something like the arthralgia syndrome or bone rheumatism described in the TCM books. Some diseases recorded in the TCM ancient books show the symptoms similar to KOA. For example, among these ancient books, “Neijing”, a canon of traditional Chinese medicine, is the earliest ancient book to give a detailed account of the physiological function of knee joint and pathological changes of pain. The doctors in Ming and Qing dynasties had further understanding of the etiology and pathogenesis of bone rheumatism and proposed many innovative theories about the disease.

TCM holds that KOA is mainly caused by internal problems (for example, inherited abnormalities, infirmity with age, liver and kidney deficiency) and external causes (for example, blood stagnation and meridian blockage caused by cold invasion, dampness attack and repetitive stress injuries).

Based on the causes of KOA, the TCM is very suitable to treat KOA by focusing on invigorating the liver and kidney, activating blood to resolve stasis and dispersing

cold by warming the meridians. The specific methods include treatment with Chinese herbs, acupuncture and manipulation therapy and combined therapy (Zhang & Liu, 2014). In a recent study, thirty-five patients were treated with TCM medicine that can replenish kidney and activate blood circulation and the overall response rate has reached 97.14%, showing the medicine treatment has better performance than Celebrex in relieving symptoms and improving joint function (Han, 2014). Sixty patients with KOA caused by splenic asthenia and phlegm-blood stasis were divided into two groups with 30 in treatment group and another 30 in the control group. The patients in the treatment group were treated by taking TCM medicine helping replenish spleen and promote blood circulation and remove obstruction in channels plus external application. In contrast, the patients in control group take the Meloxicam tablets. The results suggest therapeutic effect of TCM medicine is better than the western medicine in terms of easing joint pain and ameliorate disease condition ($P < 0.05$). Thus, TCM medicine is believed to be an effective method to treat KOA.

There are many external therapies with Chinese herbs, including external application, fumigation, external herb soaking and drug iontophoresis (Ren, Zhu & Lu, 2015). Visual Analogue Scale (VAS) is used to evaluate the therapeutic effect of external application of TMC medicine and Celebrex. The results show that the external application of TMC medicine is significantly effective and perform better than Celebrex in easing the joint pains. Meanwhile, it has the advantages of minimal side effects, lasting effect and simple operation (Yang, Wei & Wei, 2016). Under the effect of external application of herbal medicine, the local blood circulation is improved and the local inflammatory substances are absorbed, greatly relieving the patient's pain and improving the curative effect (Cui, Yin & Zhuang, 2015). In addition, the transdermal iontophoresis treatment using self-made herbal medicine has produced good effect when it is used to treat KOA at different stages, greatly improving the patient's symptoms and enhancing their life quality. It has the advantages of small side effects and simple operation.

There are many ways to treat KOA by means of acupuncture and massage, including ordinary acupuncture, moxibustion, acupuncture with warmed needle,

pricking blood with cupping, electropuncture, needle knife, acupoint injection, fire needle and massage (Guo, 2014). In a recent study, 108 KOA patients were treated with acupuncture and another 108 patients were treated by injecting Sodium Hyaluronate into knee joint. The result showed the overall response rate of acupuncture treatment was higher than that of SH injection ($P < 0.01$). The acupuncture can dilate the local blood capillary, eliminate inflammation, increase pain threshold, thus relieving joint pains (Xie, Hong & Wei, 2014). The unsteady joint caused by pathological changes of muscles around joint is a major reason to cause and worsen KOA. By easing pains, acupuncture can make patients actively exercise knee joint to strengthen muscles around knee. Through needling the acupoint around knee joint, acupuncture can release the adhesion of muscles and ligaments around knee joint so as to increase the stability of knee joint (Zhou, Li & Hou, 2014). The research findings suggest that moxibustion therapy has similar curative effect with electroacupuncture and celecoxib in relieving pains and improving functions of knee joint but performs better than celecoxib in improving functions of knee joint (Hui, 2015). In order to test the clinical effect of warming acupuncture, 200 KOA patients in an experiment group were treated with warming acupuncture and another 200 KOA patients in a control group were treated with sodium hyaluronate injection. The result showed that the overall response rate of experiment group is higher than control group ($P < 0.05$). The difference between the two groups is statistically significant ($P < 0.05$). The researcher believes the warming acupuncture therapy can effectively ease KOA patients' pain and improve the function of knee joint thus has effective clinical effect.

Massage therapy can promote the blood circulation in local tissue, improve microcirculation disorder, speed up metabolism, promote tissue repair and inflammation absorption, release adhesion and restore the stress equilibrium in knee joint (Wang, Ding & Bao, 2014). The muscle meridian massage can relieve pains, improve the knee joint range of motion, strengthen the muscle around the knee and stabilize the knee joint, thus help knee joint return to mobility. With small side effects and good curative effect, the therapy is easily accepted by patients (Yang, Chen & Zhang, 2014). In the recent study, 28 KOA patients were treated with the muscle

meridian massage. The result showed the therapy not only helped with pain and stiffness, but also strengthened the extension and flexion muscles and explosive force and restored the functional equilibrium of different types of muscle fibers inside skeletal muscles, thus effectively improving the function of knee muscles and improve the life quality of the KOA patients.

KOA is a complicated disease with a longer treatment cycle. Any single therapy does not ensure satisfactory curative effect and therefore combined therapies are needed to complement each other to significantly improve the curative effect.

2.3.3 Knowledge of modern medicine about KOA and treatment methods

Modern medicine believes Knee Osteoarthritis can be classified into either primary or secondary depending on the cause of disease. The primary KOA is mainly caused by age, chronic strain and heredity, which commonly occurs in elderly people especially overweight person. Weight increases pressure on all the joints and narrows the gap between joints. When the natural cushioning between joints- cartilage - wears away, the bones of the joints rub more closely against one another with less of the shock-absorbing benefits of cartilage. The secondary KOA is mainly caused by joint injuries or joint diseases, such as external injury, congenital malformation, poor stability of knee joint, metabolism abnormality and joint infection. KOA can be caused by a host of risk factors such as age, gender, occupation, obesity, heredity, chronic fatigue, and immune factors. Still not identifying what really causes KOA, modern medicine asserts cell factor, degradation of enzymes, free radical levels, intraosseous hypertension, hormone levels and joint stress imbalance are all great contributors to the occurrence and development of KOA.

In terms of cytokine, the high concentrations of degradable cytokines (IL-1 β and TNF- α) can be detected in the joint liquid and blood serum of KOA patients, which are positively correlated with the severity of joint injury. Injecting IL-1 β receptor antagonist into knee joint can improve the conditions of synovitis and hyperplasia and meanwhile reduce high sensitivity C-reactive protein and promote synthesis of proteoglycans (Singh, 2012). In terms of degradation of enzyme, the research

indicates that the expression intensity of MMP-13 in joint liquid and synovium of KOA patients is remarkably higher than that of non-KOA patients, and increases with the severity of KOA. The increasing expression intensity of MMP-13 shows MMP-13 plays an important role in causing and worsening KOA (Zhu, Zhang, Liu, Jin & Lin, 2015). The study shows that the KOA occurs when content of MMP-2, MMP-3, MMP-9 and MMP-13 in joint liquid and synovium of KOA patients markedly increase; the articular cartilage extracellular matrix is excessively degraded; the balance between matrix metalloproteinases and tissue inhibitors of metalloproteinases is broken; articular cartilage is damaged (Ma & Guo, 2015). In terms of oxygen free radicals, the excessive oxygen free radicals can inhibit the hyperplasia of chondrocyte and impel them to death and meanwhile inhibit synthesis of cartilage matrix and accelerates its degradation, resulting in the injury of joint cartilage (Zhao, Lou & Zhang, 2013). In terms of articular intraosseous pressure, the research shows that when intraosseous pressure increases, synovial membrane is congested and edematous and the blood flow nourishing vessels reduces, leading to the necrosis of bone trabecula. The necrotic bone trabecula can cause the injury of joint cartilage as a result of osteosclerosis during self-repair, ultimately leading to the occurrence of KOA (Zeng, Zhang & Bai, 2011). In terms of hormone level, the research shows the estrogen level in blood serum of elderly KOA women patients is significantly lower than normal people without KOA. With the increase of age, the estrogen level continuously drops. The estrogen can reduce the hyperplasia of chondrocytes through nuclear receptor membrane approach, intensify the expression of RNA in chondrocytes and increase the synthesis of proteoglycan and collagen, thus preventing the knee joint from inflammation and damage when KOA occurs (Qin, Liu & Xue, 2012). In terms of knee joint stress imbalance, the research shows that the normal cartilage can withstand a certain force in a given time. However, if the joint is overloaded in a short time or sustains heavy load for a long time, the joint will be overstressed and cause the disorder of load transmission. When there is problem with load transmission, the fiber structure of cartilage can be destroyed and the cartilage cells can be damaged because of loss of protection; meanwhile, it can cause the

metabolic disorder of cartilage cells and the occurrence of various types of inflammatory mediators and enzymes, thus inducing knee joint inflammation and further causing KOA.

KOA is a degenerative joint disease, which is caused by so many factors that there is no cure for KOA as yet. The primary goals of treating osteoarthritis of the knee are to relieve the pain, eliminate inflammation, improve knee joint function and reduce the chances of arthritis becoming worse. There are a number of treatments including non - drug therapy, drug therapy and surgery depending on the disease condition.

For patients in early stage of KOA, they should be given some knowledge about this disease and be advised to reduce the joint weight-bearing activities like hiking and climbing mountain to avoid joint injury as a result of intense joint exercise. Those who are overweight should lose weight and wear knee brace to protect joint. Meanwhile, they should take moderate exercises to strengthen the muscles around the knee and makes the joint more stable. In addition, the painless and non-invasive physical therapy can be used at the same time, which can be applied in a variety of ways, including electric therapy, light therapy, ultrasonic, magneto-therapy, water therapy and traction therapy (Zhu, 2007).

Patients who suffer great pain can take medicine. The KOA medicine mainly includes acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), opioids and cartilage protectant (Zhao, Lou & Zhang, 2013). The acetaminophen is regarded as the primary KOA medicine due to its antipyretic and analgesic effects. But it has no anti-inflammatory effect and thus is mainly used for treating mild or moderate pain. NSAIDs is currently the main oral drug for the treatment of KOA, which is capable of relieving pain, reducing inflammation and swelling and improving joint function. The drug can achieve the analgesic and anti-inflammatory effect by inhibiting cyclooxygenase (Cyclooxygenase, COX) activity, inhibiting prostaglandin synthesis and reducing the production of inflammatory factors. Clinically, non-selective COX inhibitors and selective inhibitor COX are commonly used for KOA treatment. The non-selective COX inhibitor can inhibit COX-2, but at the same time, it also has an

inhibitory effect on COX-1, which can cause gastrointestinal inflammation, bleeding, perforation and other adverse reactions. The selective COX inhibitor has analgesic and anti-inflammatory effect through selectively inhibiting COX-2, which can reduce gastrointestinal adverse reaction and the occurrence of renal toxicity; but due to the expression of COX-2 in the cardiovascular system, the incidence of adverse reaction of cardiovascular system is also increased. NSAIDs can only alleviate the clinical symptoms of KOA rather than completely cure KOA. When the drug is excreted from the body, the clinical symptoms will appear, and maybe become even worse. Because KOA mainly occurs in elderly persons, their weakening gastrointestinal tract and liver and kidney can poorly tolerate the side effects of these drugs, thus affecting the widespread use of these drugs to some extent. Celecoxib is a selective inhibitor of COX-2 that retains the activity of COX-1, which is currently a safe and effective non-steroidal anti-inflammatory drug for the treatment of KOA (Chinese Medical Association Osteoarthritis Sub-Association, 2010).

There are several drugs used as cartilage protectant: Glucosamine can produce normal physiological proteoglycan through stimulating cartilage cells; promote the repair and reconstruction of cartilage tissue; and inhibit the occurrence of free radicals and activity of enzymes to reduce the damage of free radicals to cartilage and enzymatic degradation of cartilage matrix, thus effectively protecting articular cartilage and delaying the progression of KOA (Qin, Liu & Xue, 2012). Chondroitin sulfate is a type of extracellular matrix glycosaminoglycans capable of protecting articular cartilage by inhibiting the production of enzyme that can degenerate and damage the cartilage matrix. In addition, it can also repair the degrading joint cartilage. Glucosamine and chondroitin sulfate also have anti-inflammatory effect and can reduce inflammation and relieve pain. But it will take time (4-6 weeks) for these two drugs to take effect and once the drugs are stopped, the drug effect can last four to eight weeks. Intra-articular injection is a direct treatment for KOA (Zhao, Lou & Zhang, 2013). Drugs commonly used in intra-articular injection include hormones, vitamins, sodium hyaluronate and lidocaine. Glucocorticoid intra-articular injection can reduce inflammation and achieve instant relief. However, long-term heavy use

can exacerbate articular cartilage injury and make the disease become worse, so it is generally not recommended. Sodium hyaluronate has high viscosity and the intra-articular injection of it can lubricate the joint cavity, reduce the friction of joints, protect articular cartilage, effectively relieve pain and improve joint function. Therefore the SH injection is an important method for KOA treatment (Chinese Medical Association Osteoarthritis Sub-Association, 2010).

When other conventional conservative treatments do not work for patients with joint deformity, severe dysfunction or loss of joint function, surgery is a good option. The appropriate surgical treatment can be selected depending on disease condition. The common surgical treatments include arthroscopic debridement, osteotomy, drilling decompression, cartilage transplantation, arthrodesis and arthroplasty. The arthroscopic debridement, with dual function of diagnosis and treatment, can be used for patients with loose fragments in joint cave and obvious osteophytosis (Chinese Medical Association Osteoarthritis Sub-Association, 2010).

The drilling decompression can reduce the pressure in joint cavity, relieve venous stasis and restore the blood circulation and metabolism to normal level. Osteotomy can correct joint deformity, redistribute the stress of the knee joint, increase the ability of lateral compartment to withstand load, reduce the joint stress in damaged area so as to relieve pain and improve knee function (Chinese Medical Association Osteoarthritis Sub-Association, 2010). The articular cartilage transplantation is reserved for patients with articular cartilage defects, including autologous cartilage transplantation and autologous osteochondral transplantation. When other treatments do not work for patients with extremely serious KOA, artificial joint replacement can be used for KOA treatment (Zhao, Lou & Zhang, 2013).

2.4 Research and application of knowledge transfer in healthcare

As one of the first researchers who have applied the theory of knowledge transfer in the medical environment, Zhu (2007) drawing from the theory of knowledge

transfer, the TPB and the results of research to study doctor-patient communication. Doctor-patient knowledge transfer was referred to as: “the transmission process where knowledge transfers from knowledge subject (doctor) to knowledge receiver (patient) in a medical environment; the knowledge subject - doctor, selectively and purposefully transfers medical knowledge to the patient through doctor-patient communication so as to satisfy the patient’s thirst for knowledge and bridge the knowledge gap between the knowledge owner and the knowledge receiver” (Zhu, 2007, p.5). Subsequently, researchers (for example, Dong, 2009; He, 2011; Sun, 2012) made additions, modifications and improvement to the idea of doctor-patient knowledge transfer, but they emphasize that knowledge flows from doctor to patient. Some scholars hold that the complexity of Medical Science and the information asymmetry between doctors and patients have decided that the knowledge transfer in the doctor-patient relationship will not be a mechanical movement, but will inevitably undergo changes in the process of transfer. Effective knowledge transfer can produce new knowledge during the two-way interaction and enrich the existing knowledge of the two parties. This kind of interaction will produce a value increment effect, thus enabling the doctor and patient to converge in both knowledge and understanding (Hu, Chen, Wang & Yu, 2009). The two-way flow of medical knowledge between doctor and patient is emphasized.

In this research, the researcher designs a cooperative model between special hospitals and community health service centers where specialists from special hospitals provide standard training for GPs in community health service centers on KOA diagnosis and patient self-massage manipulation so as to enable GPs from community health service centers to conduct KOA diagnosis more accurately and carry out more effective self-massage treatment training among patients. This includes not only transfer of medical knowledge (overall situation of KOA incidence and patient self-massage manipulation at the early stage) between doctors and patients, but also transfer of professional knowledge (specialists provide KOA diagnosis training for GPs in community health service centers) among medical workers. The level of transfer belongs to comprehensive knowledge transfer. In order to realize better

knowledge transfer, from the perspective of the factors that influence knowledge transfer, efforts should be made to enhance the motivation, credibility and sending capacity (expression ability) of the knowledge initiators well as the reception motivation, absorption ability and retention ability of the knowledge receiver. And such ways as face-to-face communication, conferences, reports and training should be carried out to enable knowledge transfer to go deeper and be more comprehensive.

The process of medical knowledge transfer between doctors and patients is actually the process where the disease diagnosis and treatment model changes. To be specific, the traditional situation has been changed where patients go to hospitals to get treatment when they are inflicted with diseases and doctors provide treatment while patients have insufficient or even no knowledge of their own diseases. Now patients are making active efforts to understand the knowledge about diseases instead of passively waiting to be treated. Early prevention, early detection and early treatment are ensured. They are also able to actively cooperate and coordinate during hospital treatment, contributing to better treatment effects. Currently, mutual decision-making by doctors and patients, as a model of medical behavior intervention, has been widely recognized in the medical world. Its characteristics are as follows: it is able to enhance the medical level while alleviating patients' financial burden; it will not lead to serious negative consequences; it is proven to be effective after being systematically evaluated by multiple parties; it has not only won recognition from the majority of doctors, but is also widely welcomed by patients. This model is materialized in the form of mutual decision-making by doctors and patients in the process of diagnosis and treatment and also needs doctors to encourage patients to participate in order to complete the process (Yu & Shi, 2013).

2.5 Chapter summary

As suggested above, the knowledge transfer mentioned in this study refers specifically to: 1) the process in which the specialists transfer the KOA diagnosis method and standard techniques of early self-massage to GPs in community health

service centers through training, including the stages of knowledge sharing of specialists and knowledge absorption of GPs; 2) the process in which the GPs passes the self-massaging skills on the KOA patients during treatment, including the stages of knowledge sharing of general practitioner and the knowledge assimilation of patient. When the management theory is applied in the clinical practice, the treatment method is changed and the knowledge is transferred between specialists and general practitioner, and between physician and patient, which will play a positive role in the improvement of KOA patient satisfaction and curative effect and deserves further study. With China entering aging society, the prevention and treatment of elderly diseases will face challenges and a large number of people determined to devote their efforts to this undertaking are needed to accomplish these daunting tasks. As a clinical staff, it is also my unshakable duty. Meanwhile, it is why the studied is conducted. The researcher contacted many community health service centers and provided the training for a large number of GPs so that joint efforts are made to work out a simple, effective and cheap self-treatment method and meanwhile use, test and popularize it to benefit more people.

Chapter 3: Theoretical Framework and Research Model

3.1 Research problems and research questions

Knowledge transfer is an idea in Knowledge Management Science. Scholars in China and abroad have tried to understand it from different perspectives, and also defined it by emphasizing its knowledge flow as well as ways and effects of transfer. In short, knowledge transfer underlines the process where knowledge transfers from one individual to another individual or from one organization to another organization. In order to address the above questions, the researcher introduces the knowledge transfer theory in management science into clinical practice and meanwhile puts forward the idea of enhancing the KOA diagnosis and treatment level of GPs in community health service centers and transferring the self-massage knowledge from specialists to GPs and ultimately to patients by utilizing the cooperative relationship between special hospitals and community health service centers as well as the knowledge transfer from specialists in special hospitals to GPs in community health service centers. This research has also lighted upon change of medical model. To be specific, the treatment model where KOA patients passively wait to be treated has been replaced by a new model where patients are encouraged to actively participate in disease treatment, thus further reducing the times and time of patients' hospital visits. The research is to find a more reasonable and more effective treatment model and to analyze the effect of knowledge transfer and the change of treatment model on the KOA patients' satisfaction and treatment effects, improvement of patient satisfaction with physicians and improvement of physician-patient relationship. If this research can prove that knowledge transfer and change of the diagnosis and treatment model will raise patient satisfaction, physician satisfaction and physician-patient relationship while ensuring treatment effects, then the credibility of community health service centers can be increased, the cohesion of community health service centers be

strengthened and the overall strength of community health service centers be enhanced. In other words, it is entirely a win-win research as it can not only bring benefits to patients, but also win recognition for community health service centers. Therefore, it is of great strategic significance to encourage common diseases to be treated in community health service centers, implement country-led hierarchical medical system and make full use of limited medical resources.

Then what will this study do? What answers will it seek and what questions will it discuss? The following questions are proposed:

(1) What effects will the knowledge transfer from GPs to patients on patients' treatment results and satisfaction level as well as the improvement of doctor-patient relations?

(2) What effects will the knowledge transfer from specialists to GPs have on GPs' satisfaction level and the improvement of doctor-patient relations?

(3) To what extent do the patients have tendency to apply what they have learned from GP?

(4) To what extent do the GPs have tendency to apply what they have learned from specialists?

(5) Whether the new treatment model proposed in this study applies to the current medical environment and whether it can, if applicable, further improve the patients' satisfaction and doctor-patient relationship?

3.2 Research model and concept model

3.2.1 Proposal of TPB-based research model

As can be seen from previous overview of TPB theory, TPB has good explanatory power and predictive power and lays good theoretical basis for many studies, and thus widely used in various fields of research. According to the knowledge transfer between specialists and GP, and between GP and patients in this study, separate research model is proposed as follows:

Table 3-1 Research Model (Specialist-General Practitioner)

	TPB Constructs	Research Variables
Independent Variable	Attitude subjective norm	Hospital culture, physician pressure, physician attitude, atmosphere influence, physician motivation, knowledge transfer motivation between physicians, physician's ability to absorb knowledge, physician's ability to transfer knowledge
Intermediate Variable	Perceived behavior control, behavior intention	Physician behavior, specific knowledge (self-massage techniques), physician behavior intention
Outcome Variable	Behavior outcome	Physician satisfaction

Source: the author

Table 3-2 Research model (GP-patient)

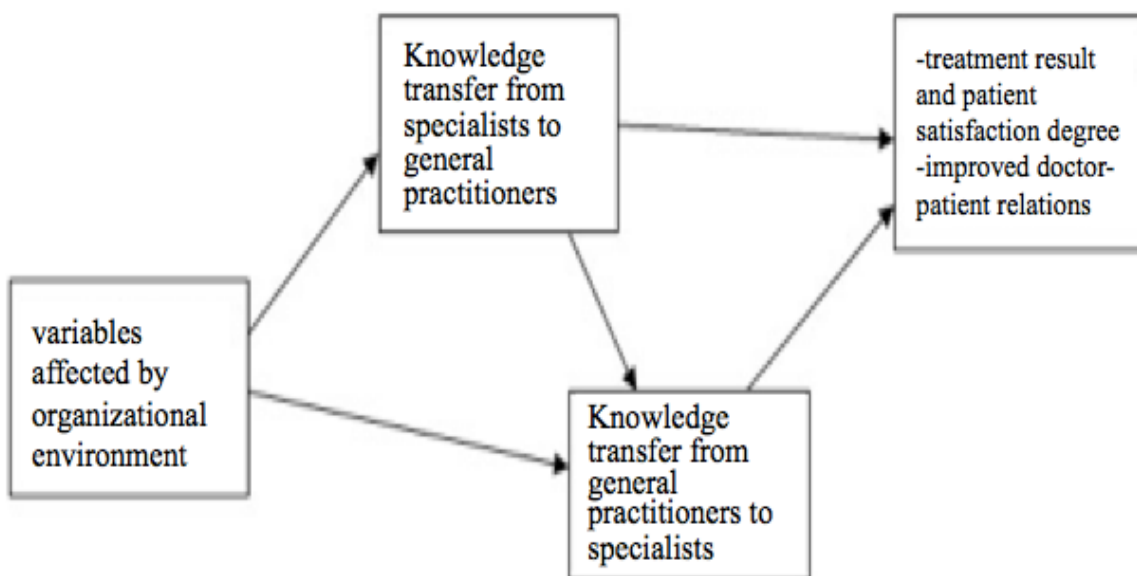
	TPB constructs	Research variables
Independent Variable	Attitude subjective norm	Hospital culture, patient condition, patient pressure, patient attitude, atmosphere influence, patient participation, patient trust, patient's motivation to accept knowledge, knowledge transfer motivation between GP and patients, patient's knowledge absorption ability, knowledge transfer ability between GP and patients
Intermediate Variable	Perceived behavior control, behavior intention	Patient behavior, specific knowledge (self-massage techniques), patient behavior intention
Outcome Variable	Behavior outcome	Patient satisfaction, physician-patient relationship

Source: the author

3.2.2 Concept model construction

Model refers to a solid object or virtual representation developed from people’s thoughts that can illustrate objective things or structure (but not limited to solid object or virtual representation or plane and three-dimension form). Model is classified into solid model (least abstract physical object having volume and weight) and virtual model (more abstract but having some resemblance to what it represents, such as object existing in digital form). If a thing can change with the concept (human’s thoughts), then it is seen as the model of the concept. The concept can change the model in many ways, such as its function, aesthetics, application and time efficiency. By changing the nature and form of the products in the next stage, the human civilization (spiritual and material form) persistently evolves. The model is an expression of human’s thoughts. In this study, we propose the following model according to the relation between specialist and GPs, relation between specialist (GP) and patients, treatment effect of patients, patient’s satisfaction and the improvement of physician-patient relationship:

Figure 3-1 Concept model construction



Source: the author

The conceptual model for this study is shown in Figure 3-1. The figure shows:

Variables influencing organization environment means that in the present medical environment, the medical information asymmetry exists between doctors and patients, doctor-patient relations are becoming increasingly strained, patients' right to know is underlined and the initiative of patients to participate in disease treatment is considered as a priority. In the medical system, medical workers in major hospitals, special hospitals and community health service centers differ from each other in the mastery of medical knowledge and the level of diagnosis and treatment. They are sometimes met with unsmooth medical information exchange and limited channels for mutual communication and learning. The above circumstances indicate that it is necessary and urgent to push forward knowledge transfer from specialists to GPs as well as from GPs to specialists.

The researcher thus holds that in a medical environment, the knowledge transfer is of particular importance as it plays the role of communication, transition, promotion and common progress; besides, the knowledge transfer in a medical environment includes transfer of medical knowledge at two levels: the first is knowledge transfer among doctors, and the second is knowledge transfer between doctors and patients.

Knowledge transfer among doctors refers to the transfer of professional knowledge among medical workers; it is a process where the knowledge initiator (generally doctors in major hospitals and special hospitals) transfers professional knowledge to the knowledge receiver (generally community doctors) through certain ways. This process is not a simple process of knowledge explanation or transmission, but a complicated process where the initiator passes on useful knowledge and the receivers absorbs, internalizes and reconstructs it. The factors that influence this process include the fact that knowledge can be written down and taught, its complexity, ambiguity, quantity, quality and structure of knowledge, credibility of the knowledge source and initiator's communication ability. In addition, whether the receiver trusts the knowledge source and its knowledge absorption ability as well as ways of transfer (face-to-face communication, conferences and reports) also play a role.

Knowledge transfer between doctors and patients refers to the transfer of medical knowledge between doctors and patients in a medical environment. Due to differences in the degree of medical education between doctors and patients, the degree of knowledge transfer between doctors and patients is far lower than that of knowledge transfer among doctors; in medical practices, knowledge transfer between doctors and patients emphasizes the process where the knowledge initiator (doctors) transfers medical knowledge purposefully (for example: to facilitate the patients' coordination in treatment), in a targeted manner (the medical knowledge patients demand to know) and straightaway (explaining medical knowledge straightaway) to the receiver (patients) through some means. In this process, patients do not simply receive knowledge passively, but also understand, absorb and internalize knowledge to some extent. The ultimate purpose is to enable doctors and patients to converge in the understanding of medical knowledge so as to join hands to combat diseases.

It can be seen from the analyses of the above knowledge transfer among medical workers and that between doctors and patients that, in medical activities, if knowledge transfer among doctors proceeds well and the amount of information lost in the process of transfer is small, then theoretically speaking, there should be no obvious difference in the treatment effects patients between the first way of transfer where doctors in major hospitals and special hospitals transfer knowledge to community doctors before community doctors transfer knowledge to patients and the second way of knowledge transfer where doctors in major hospitals and special hospitals directly transfer knowledge to patients. In this way, the professional knowledge of the doctors in major hospitals and special hospitals can be directly disseminated among patients through community doctors to benefit more patients. On the one hand, this can help save medical cost as the prices charged in community health service centers are lower than in major hospitals for the same treatment programs; on the other hand, patients are able to get diagnosis and treatment in nearby community health service centers. Community doctors can even go to each household to provide diagnosis and treatment. Thus, patients no longer have to spend a lot of time traveling to major hospitals to wait in the long queue. Instead, they can save both time and transportation cost.

3.2.3 Research Model Construction

Based on the previous research and literature review, the TPB-based research model is proposed, whose variables include independent variable, intervening variable, and outcome variable. Each type of these variables is further refined to different sub-variables for further measurement and study. For example, the physician (patient) attitude and subjective norm in TPB constructs are divided into research variables like accepting motivation, transfer motivation, absorptive capacity and transfer capacity; while the accepting motivation is further decomposed into two measurement indexes including intrinsic accepting motivation and extrinsic accepting motivation, and so forth. For the knowledge initiators (referring to specialists when knowledge transfers from specialists to GPs; referring to specialists and GPs when knowledge transfers from doctors to patients), the availability of the transfer motivation is the premise and the availability of transfer capacity is the condition. Only these two are combined can the knowledge be transferred from the initiators. But the successful knowledge transfer also needs the cooperation of the receivers, namely, whether the receivers have the absorptive motivation and corresponding accepting capacity. Certainly, the indexes need to be refined during the further measurement.

The intervening variables include specific knowledge (for this research, it refers specifically to the knee joint self-massage of the KOA patients), knowledge transfer process and patients' self-treatment (the successful knowledge transfer). The specific knowledge includes the tacit knowledge and explicit knowledge; the realization of patients' self-treatment depends largely on patients' knowing about their symptoms, the preliminary diagnosis of disease, understanding doctors' introduction about disease and self-massage according to doctor's advice.

While the outcome variables should be evaluated according to whether the knowledge is successfully transferred, the satisfaction degree of the two sides (doctors are initiators and the patients are receivers) and the impact of knowledge transfer on the two sides (treatment improved or unchanged), among which, the satisfaction degree of the receiver, or KOA patients in this research, is the most important, which

can be measured according to the visiting time, cost, treatment effect and the disease-related stress; while doctor satisfaction can be measured from the treatment time, cost, treatment effect, work-related stress, behavior, trust and participation. The improvement of physician-patient relationship can be comprehensively measured using breakdown indicators related to patient satisfaction and physician satisfaction.

As per the research model, it can be seen the independent variables like accepting motivation, transfer motivation, absorptive capacity, transfer capacity have a direct impact on outcome variables like patient satisfaction, physician satisfaction and physician-patient relationship.

A holistic analysis of the research model shows the study takes the priority over patient satisfaction. Sure enough, the physician satisfaction and physician-patient relationship are also key measurement indicators. Different from traditional physician-led medical model, the patient-centered medical service principle upheld in this study improves the role of patient in treatment. Thus the highly-motivated patients can actively cooperate with physicians in medical treatment to achieve a new medical model.

Chapter 4: Research Methods

The overall research was conducted using a combination of multiple approaches including five stages: (1) literature review, conceptual development, and initial measurement item generation; (2) conceptual refinement and item modification; (3) Pain measure ruler and joint range of motion measurement; (4) Training implementation and data collection; and (5) statistical analyses including descriptive data analysis, measurement validation, and model testing. Each of the five stages is discussed in this chapter.

4.1 Literature Review, Conceptual Development, and Initial Measurement Item Generation

By applying the literature review, relevant theories on knee osteoarthritis, knowledge transfer, TPB theory and treatment models were integrated and applied in this research. More specifically, a review was conducted on the treatment standards of knee osteoarthritis, the existing treatment methods for knee osteoarthritis and the future development orientation; the idea of knowledge transfer, the mechanism, barriers, influence factors and results of knowledge transfer among independent enterprises; the concept and connotation of TPB, the TPB measurement items and its measurement methods, the application scope of TPB and its application in medical knowledge transfer and the idea of treatment model as well as the barriers and influence factors to the treatment model. In-depth organization and analysis of relevant ideas, implications and relationships were carried out. The characteristics and specificity of the medical service industry were analyzed. As a result of this literature review, the key variables in the research model were carefully defined, and an initial pool of measurement items were generated. Whenever possible, existing measures in

the literatures were adapted for this study.

4.2 Conceptual Refinement and Measurement Item Modification

After the research model and initial items were defined and created, a sorting procedure and a pilot study were conducted to further refine the concepts and modify the measurement items.

4.2.1 Sorting procedures

In order to qualitatively assess and improve the face validity and the construct validity of the measurement items, a sorting procedure was conducted with doctoral students and faculty members. In total, six rounds of Q-Sorting validation tests were conducted (Xia & Lee, 2003; Straub, Boudreau, Gefen, University & University, 2004). A measure is validated to have face validity if it appears to measure what it is supposed to measure (Goodwin, 1995). Construct validity refers to the extent to which a measure adequately represents the underlying construct that it is supposed to measure (Xia & Lee, 2005). Q-Sorting helped to identify issues that can hinder survey respondent's ability to relate items to the corresponding construct. In each round of the sorting process, a few survey items were modified to reflect the comments made by the sorting experts.

4.2.2 Pilot study

After Q-sorting, a pilot test was conducted through interviews with specialist doctors, GPs and patients who are similar to the final participants of the study. The purpose of the pilot test was to further validate the relevance, coverage, and clarity of the measurement items (Xia & Lee, 2003). The pilot study interviews focused on the relative importance of the measures in assessing the corresponding variables and on the understandability of the measures. The participants first filled out a questionnaire regarding the importance and relevance of each item to the construct. They were asked to identify items that appeared to be inappropriate or irrelevant to the constructs.

Participants also made suggestions for improving the relevance, coverage, understandability, and clarity of the items. The pilot testing will be iterative processes, several tests will be planned, and we will improve the instrument incrementally based on our participants' suggestions. Some additional modifications were made to measure as a result of the pilot test.

The final measures cover the various variables in the research model across two groups of respondents. The first group of respondents are GPs and the second groups of respondents are patients. Specific constructs, their corresponding dimensions and numbers of items used to measure those dimensions are summarized in the different measurement models below.

In the first set of measures, as shown in Figure 4-1, key constructs assessed included the GPs' motivation of accepting knowledge transfer from the specialists and their absorptive capacity of internalizing the knowledge that being transferred to them as trainees. Each type of motivation is composed of two dimensions: intrinsic and extrinsic motivations. In addition, the GPs' motivation to transfer the learned knowledge to their patients and the GPs' capacity to transfer the learned knowledge to their patients. Absorptive capacity was composed of two dimensions: potential and realized capacity.

Figure 4-1 Measurement Model 1

Construct	Measurement
1.1. Accepting motivation	1.1.1. Intrinsic accepting motivation (7)
1.2. Transfer motivation	1.1.2. Extrinsic accepting motivation (10)
1.3. Absorptive capacity	1.2.1. Intrinsic transfer motivation (6)
1.4. Transfer capacity	1.2.2. Extrinsic transfer motivation (14)
	1.3.1. Potential absorptive capacity (7)
	1.3.2. Realized absorptive capacity (7)
	1.4. Transfer capacity (8)

Source: the author

In the second set of measures, as shown by Figure 4-2, key constructs assessed included characteristics of knowledge being transferred from the GPs to the patients, patients' acceptance and use of transferred knowledge from the GPs, and knowledge transfer process that the patient experienced as the trainees. Characteristics of

knowledge include tacit and explicit knowledge. Patients’ acceptance and use of transferred knowledge from the GPs are composed of such dimensions as patient awareness, initial diagnosis/screening, preventive techniques, understanding and following doctor’s instructions, and actual use of transferred knowledge.

Figure 4-2 Measurement Model 2

Construct	Measurement
2.1. Knowledge characteristics	2.1.1. Tacit knowledge (11)
2.2. Patient self-treatment	2.1.2. Explicit knowledge (6)
2.3. Knowledge transfer	2.2.1. Patient awareness (7)
	2.2.2. Initial diagnosis/screening (7)
	2.2.3. Preventive techniques (5)
	2.2.4. Understanding doctor’s instructions (7)
	2.2.5. Following doctor’s instructions (6)
	2.2.6. Patient use of transferred knowledge (14)
	2.3. Knowledge transfer (4)

Source: the author

In the third set of measures, as shown in Figure 4-3, key constructs assessed included patients’ trust of the GPs, GPs’ transfer willingness and patients’ accepting willingness. Trust was further composed of two dimensions: benevolence-based trust and competence-based trust.

Figure 4-3 Measurement Model 3

Construct	Measurement
3.1. Trust	3.1.1. Benevolence-based trust (7)
3.2. Transfer willingness	3.1.2. Competence-based trust (12)
3.3. Accepting willingness	3.2. Transfer willingness (8)
	3.3. Accepting willingness (7)

Source: the author

In the fourth set of measures, key constructs assessed included knowledge transfer outcome as measured from the patients’ points of view, patient satisfaction, doctor satisfaction, and doctor-patient relationship. Patient satisfaction was composed of four dimensions: time, cost, quality of treatment by the GPs, and their disease-related stress. Doctor satisfaction was composed of four dimensions: time, cost, quality of treatment as viewed by the doctor, and work-related stress.

Figure 4-4 Measurement Model 4

Construct	Measurement
4.1. Knowledge transfer outcome	4.1. Knowledge transfer outcome (13)
4.2. Patient satisfaction	4.2.1. Time (8)
4.3. Doctor satisfaction	4.2.2. Cost (8)
4.4. Doctor-patient relationship	4.2.3. Quality of treatment (8)
	4.2.4. Disease-related stress (5)
	4.3.1. Time (8)
	4.3.2. Cost (8)
	4.3.4. Quality of treatment (6)
	4.3.5. Work-related stress (10)
	2.3. Doctor-patient relationship (14)

Source: the author

4.3 Pain measure ruler and joint range of motion measurement

The treatment effects for patients are evaluated in terms of pain exponents (pain scale ruler method), range of joint motion, length of time for walking 30 meters on flat ground and duration of straight leg raise of two legs. The evaluation is completed by professionally trained people and strictly followed the principle of informed consent. Before evaluation, the person in charge explains in detail the purpose, content and notes of the evaluation so as to effectively improve the evaluation accuracy.

4.4 Training implementation and data collection

4.4.1 Respondents of questionnaire

Figure 4-5 Respondents of questionnaire

Hospital Name (Yuexiu District, Guangzhou)	Hospital Level	Number of doctors	Number of patients
Community health service centers on 11 streets	One-A	General practitioners of all the centers 5 (55)	All the streets 50 (550)
Guangzhou Orthopedic Hospital (Yuexiu District)	Two-A	Specialists 10	100

Source: the author

After a careful field investigation on the community health service centers in Yuexiu District of Guangzhou concerning the community medical staff's quality, number, degree, title, patient number and common clinic diseases, 14 community health service centers are selected for training, questionnaire survey and data collection, which include Renmin Street Community Health Service Center, Guangta Street Community Health Service Center, Huanghuagang Street Community Health Service Center, Lurong Street Community Health Service Center, Huale Street Community Health Service Center, Baiyun Street Community Health Service Center, Meihua Village Street Community Health Service Center, Dongshan Street Community Health Service Center, Zhuguang Street Community Health Service Center, Datang Street Community Health Service center, Dongdong Street Community Health Service Center, Yuexiu District Hospital of Traditional Chinese Medicine, Hongqiao Street Community Health Service Center and Lihua Street Community Health Service Center. The survey respondents include GP, rehabilitation doctors, orthopedic doctors and nurses. Their title is physicians, technicians, nurses, nurse practitioners, attending doctor, nurse director and associate senior doctor. It should be noted that the study mainly focuses on the GPs, but some nurses, nurse practitioners, technicians and even the pharmacists who engage in KOA treatment in community health service centers are also included in this study given China's actual conditions.

4.4.2 Self-massage training and questionnaire collection

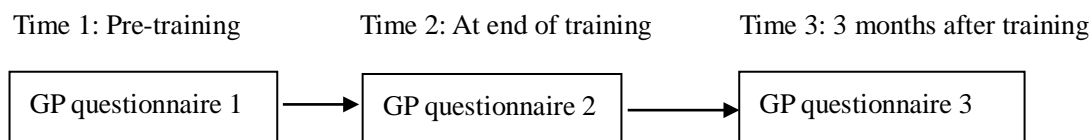
The "step by Step" demonstrations for self-massage techniques and the details of the questionnaires are provided in Appendix I, II and III.

4.4.3 Questionnaire collection and quality control

When the knowledge transfers from the specialists to GPs, the subjects of questionnaire are the specialists and GPs before and after training, but three months after the training, the questionnaire survey will be limited to the GPs for purpose of

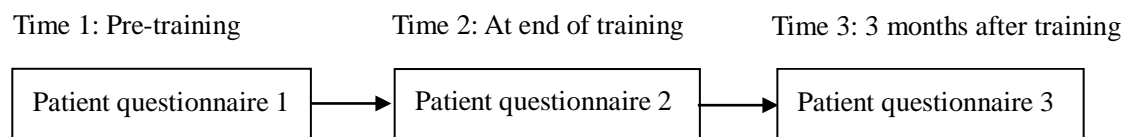
evaluating training results. When the specialists and GPs train the KOA patients for knee joint self-massage, the questionnaire survey will be conducted on the two sides before and after training and three months after the training for purpose of evaluating training results. Figure 4-5 and Figure 4-6 illustrated the questionnaire data collection processes with the GPs and the patients respectively.

Figure 4-6 Questionnaire collecting process 1 (GPs trained by specialists)



Source: the author

Figure 4-7 Questionnaire collecting process 2 (Patients trained by GPs)



Source: the author

Combined with the actual conditions in the region, the subjects of questionnaire in this study are as follows: 55 qualified GPs from first grade-A community health service centers on 11 streets in Yuexiu District, Guangzhou. Each general practitioner is responsible for training 10 patients and the number of patients is 550; 10 qualified specialists from Guangzhou Orthopedic Hospital, a second grade-A specialized hospital. Each specialist is responsible for training 10 patients and the number of patients is 100.

Before the pilot questionnaires are sent out, the data collectors are gathered in the meeting room of Guangzhou YueXiu Health and Planning Commission where the specialists from Guangzhou Orthopedic Hospital (15 years or more working experience with associate senior title) provide training for them with regard to the study's research objectives, research approach, professional quality, massage technical standards, operating instructions of data collection form and some matters needing attention during patient interviews in a bid to improve the reliability and accuracy of collected data. According to the local characteristics in Guangzhou, some elderly persons who cannot speak mandarin should be interviewed in Cantonese to ensure the

accuracy of collected data.

The GPs who receive training are divided into different groups to test whether they really grasp the main points of massage techniques. In addition, a Disc carrying massage techniques especially made by research team is given to each GP for self-study after training.

The quality of collected questionnaires is strictly controlled to ensure the data's validity and truthfulness. For example, the questionnaires that miss more than 20% information or have more unidentified filling-marks will be excluded from the statistical analysis.

4.5 Statistical analysis

4.5.1 Data input

The collected data are manually entered to establish research database. In order to avoid human errors, two team members are responsible for the data input and meanwhile carefully self-check and double check the input data to ensure the accuracy of research data.

4.5.2 Data analysis

The single-factor analysis, multi-factor analysis and regression equation analysis are conducted using statistical analysis software SPSS 20.0 to explore the relationship between variables, especially:

- (1) Outliers
- (2) Deviation
- (3) Data distribution

4.5.3 Validity and Reliability Test

The factor analysis is used to test the reliability and validity of extracted variables from Scales. Factor analysis is a statistical method used to describe a potentially large number of factors or correlations between factors using a low number of factors. In this study, it is used to extract common factors from mutually

correlated variables in order to reduce dimensionality then classify them according to correlations between primitive variables. The confirmatory factory analysis is used to test whether the sub-dimensions can reflect their parent dimensions and meanwhile whether the sub-dimensions can be reflected by their items.

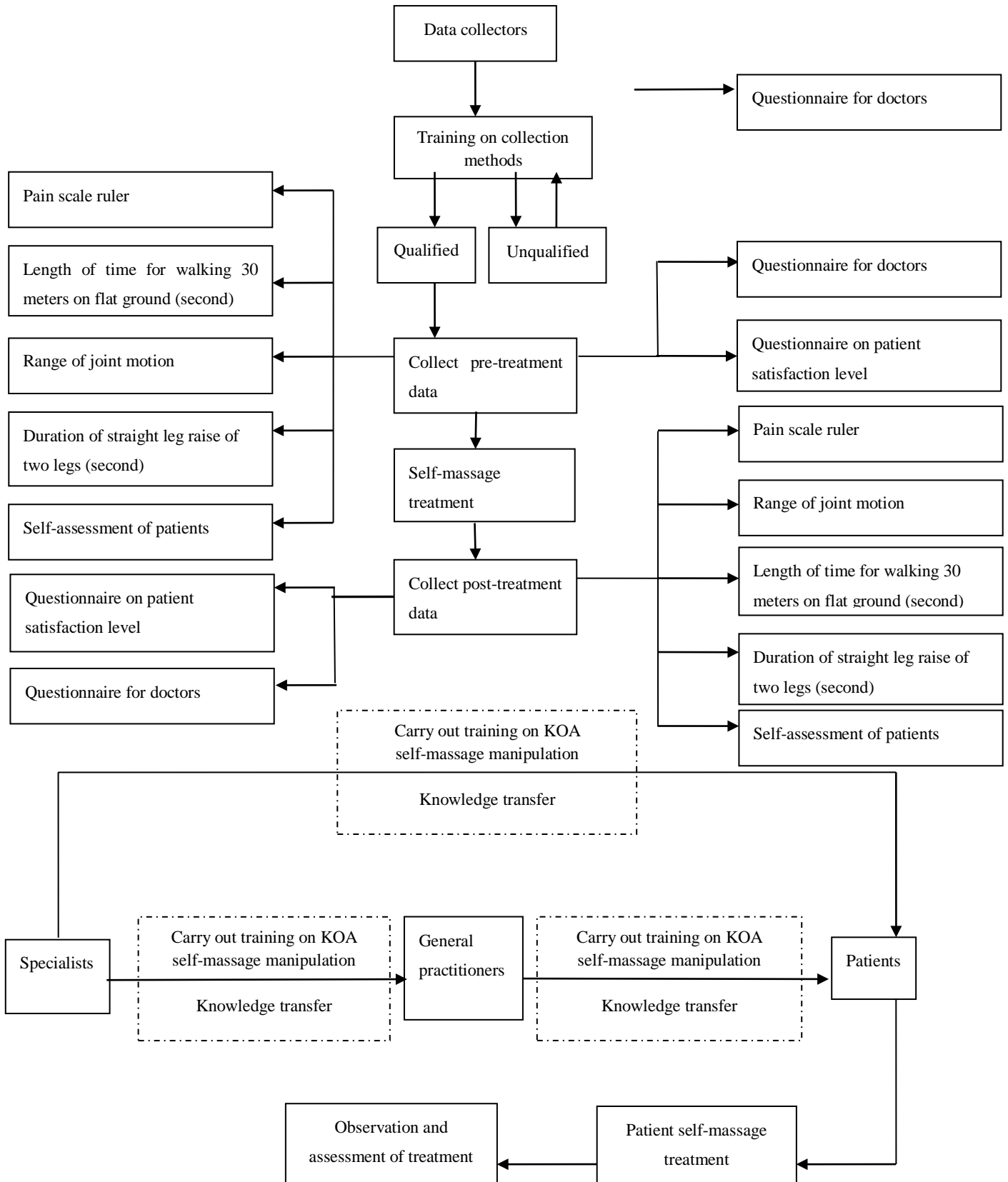
4.5.4 Regression Analysis

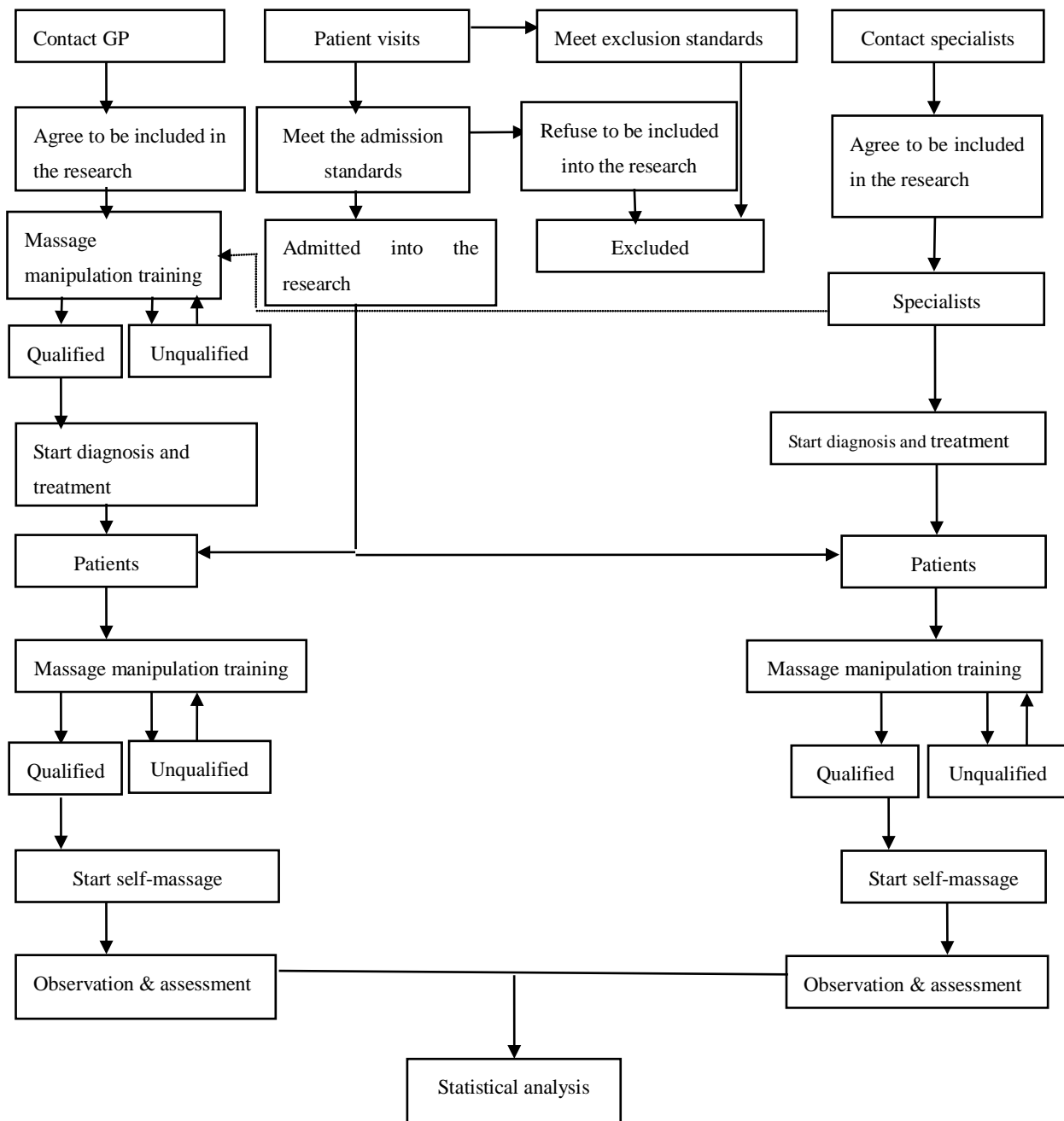
In this study, the following modeling methods are used:

- (1) Descriptive statistical analysis: ratio, percentage, mean and Std of key factors;
- (2) Single factor analysis: Chi-square test, T test, Variance analysis;
- (3) Multivariate statistical model: the linear model is established using multiple stepwise regression analysis.

4.6 Research Technique Route

Figure 4-8 Overall research process workflows



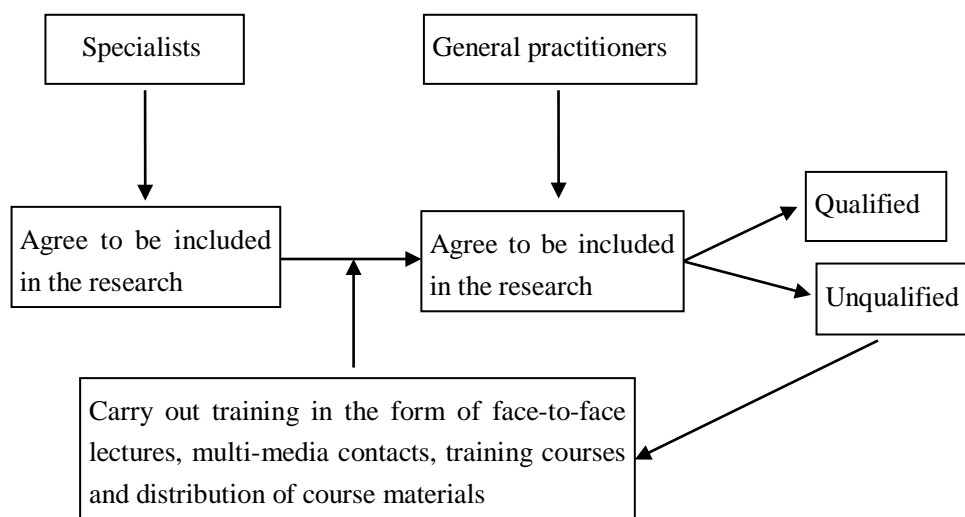


Source: the author

To be specific, it can be divided into three parts characterized by relative independence as well as causal and progressive relationship between them. Elaborations are given as follows:

Part 1: Permit the selected specialists to carry out training among the community health service centers GPs that meet the admission standards on KOA self-massage manipulation. The training can be carried out in such ways as face-to-face lectures, multi-media contacts, training courses and distribution of course materials. The results will be divided into two groups. The first group consists of qualified trainees (those who get more than 80 points in KOA special knowledge examination and assessment) who are directly admitted into the next stage to treat patients; the other group consists of unqualified trainees (those who get less than 80 points in KOA special knowledge examination and assessment) who need to participate in re-training and re-examination, after which the qualified trainees are admitted into the research and the unqualified trainees are excluded.

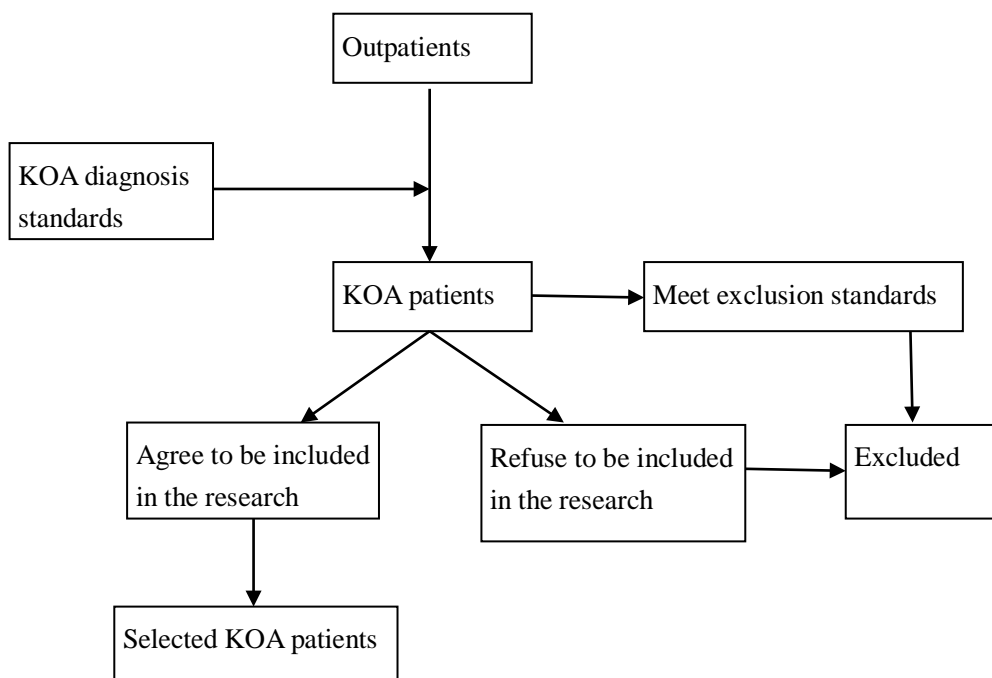
Figure 4-9 Special to GP knowledge transfer participant selection process



Source: the author

Part 2: Select clinical patients in strict accordance with KOA clinical diagnostic standards. Establish exclusion standards for those who meet KOA diagnostic standards and apply the standards to select cases. Sign informed consent form with the selected candidates. Exclude those who refuse to be included in the research and include those who agree to be included into the research as the selected cases.

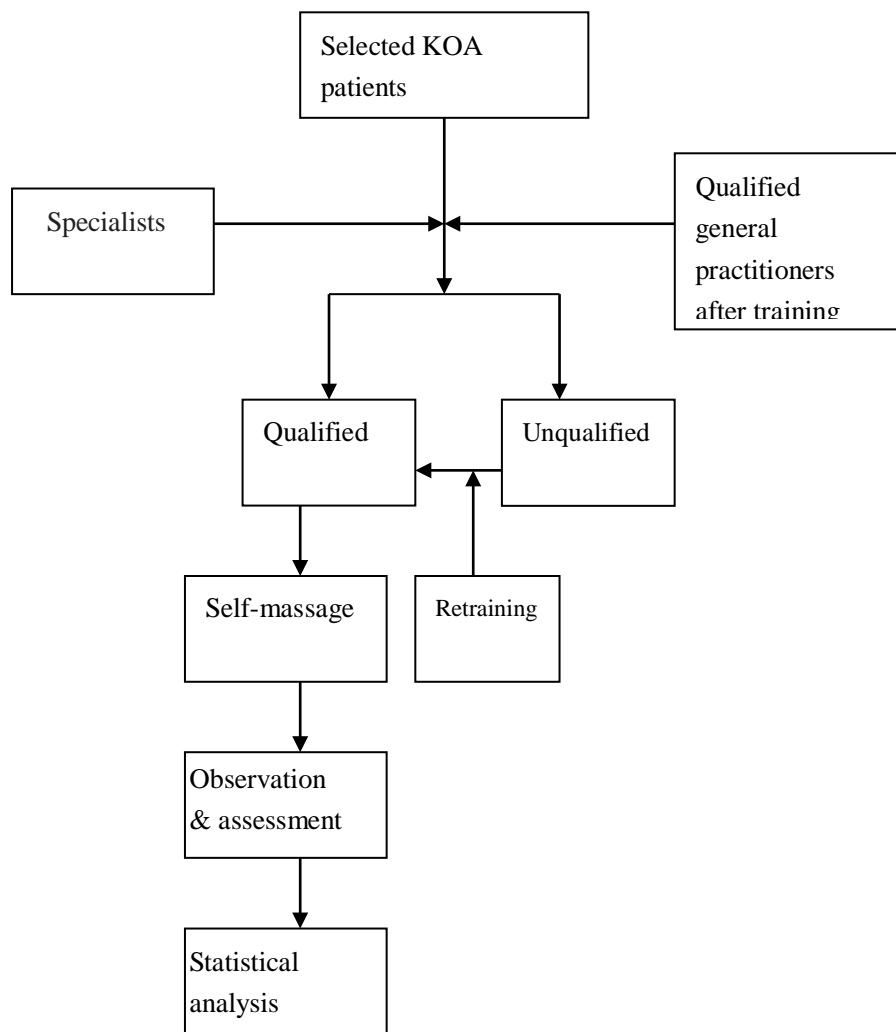
Figure 4-10 GP to patient knowledge transfer participant selection process



Source: the author

Part 3: Specialists and the community GPs who are qualified trainees carry out training among KOA patients on professional massage manipulation in clinical treatment. The results are divided into two groups. The first group consists of qualified trainees (those who get more than 60 points in examination and assessment on KOA massage manipulation), who are directly admitted into the next stage of subject design for observations and questionnaire evaluation; the other group consists of unqualified trainees (those who get less than 60 points in examination and assessment on KOA massage manipulation) who need to participate in re-training and re-examination (considering that most KOA patients are old people with different levels of education background, re-training and re-examination can be carried out many times), after which the qualified trainees are to be observed and required to conduct questionnaire evaluation; at last, data are collected for statistical analysis.

Figure 4-11 GP to patient knowledge transfer data collection process



Source: the author

Chapter 5: Data Results and Analysis

5.1 Sample Description

5.1.1 Encoding of Questionnaire Items

There are six questionnaires in this study, including questionnaires for GPs (before & after training and three months after training) and questionnaires for patients (before & after training and three months after training). For the convenience of follow-up study, these questionnaires are encoded respectively, with codes being labeled as GPQ1, GPQ2, GPQ3, PQ1, PQ2 and PQ3.

Then the items of each questionnaire are encoded. Take GPQ1 for example, the item codes of the questionnaire GPQ1 are GPQ1_a, GPQ1_b, GPQ1_c.....GPQ1_aa; the codes of personal information such as gender, age, job, education background, title and working years are GPQ1_Gender, GPQ1_age, GPQ1_job, GPQ1_degree, GPQ1_Pro_Ranking and GPQ1_W_Year; the items of the other two GP questionnaires are encoded in the same manner. Take PQ1 for example, the item codes of the questionnaire PQ1_a, PQ1_b, PQ1_c.....PQ1_v; the codes of personal information such as gender, age, job, education background, title and working years are PQ1_Gender, PQ1_age, PQ1_job, PQ1_degree, PQ1_Pro_Ranking, PQ1_W_Year; the items of the other two patients questionnaires are encoded in the same manner.

5.1.2 General Information

(1) Questionnaire for GPs before training (GPQ1)

Two hundred and sixty two valid questionnaires are eventually retrieved from physicians in this study, with basic information including 107 male respondents, 155 female respondents; 123 GPs, 57 specialists, 82 nurses; 155 people with primary title, 77 with intermediate title, 18 with vice senior title, one with senior title and 11

ungraded medical staff; 17 people with technical secondary school education, 65 with college degree, 157 with bachelor degree, 12 with master degree, two with doctoral degree and 9 respondents whose educational background is unknown; 77 people have held degree for 0 to 5 years; 79 for 6-10 years; 42 for 11-15 years; 20 for 16-20 years; 15 for 21-25 years; 5 for 26-30 years, 3 for 31-36 years; and 21 respondents whose time of acquiring degree is not clear.

Table 5-1 Basic information of samples based on GPQ1 questionnaire

Attribute variable	Demographic information	Nr of respondents	Percentage (%)
Gender	Male	107	40.8
	Female	155	59.2
Profession	General practitioner	123	46.9
	Specialist	57	21.8
	Nurse	82	31.3
Title	Primary	155	59.2
	Intermediate	77	29.4
	Vice senior	18	6.9
	Senior	1	0.4
	Other	11	4.2
Education background	Technical secondary school	17	6.5
	College degree	65	24.8
	Bachelor	157	59.9
	Master	12	4.6
	Doctor	2	0.8
	Other	9	3.4
Time duration of holding degree	0-5 years	77	29.4
	6-10 years	79	30.2
	11-15 years	42	16
	16-20 years	20	7.63
	21-25 years	15	5.73
	26-30 years	5	1.91
	31-36 years	3	1.14
	Remain uncertain	21	8.02
Time duration of using computer	0-5 years	88	33.6
	6-10 years	78	29.8
	11-15 years	37	14.1
	16-20 years	28	10.7
	21-25 years	3	1.2
	Other	28	10.7

Source: the author

The basic information of GPQ2 and GPQ3 is basically consistent with that of GPQ1.

Table 5-2 Statistical analysis results of samples based on questionnaire GPQ1

	N	Value Field	Min. Value	Max. Value	Mean Value	Std.
Age	250	42.0	20.0	62.0	34.844	8.5534
Working years in medical field	254	40.0	S	40.0	12.451	8.8671
Working years in current hospital	251	41.0	.0	41.0	9.114	8.2727
Diagnosis and treatment time for each patient	187	60.0	.0	60.0	12.270	8.3708
Ratio of your time in actively communicating with patients to your total treatment time	196	88.0	2.0	90.0	34.092	17.5040
Ratio of patient's time in actively communicating with you to your total treatment time	195	88.0	2.0	90.0	27.736	14.4696
Ratio of your time in using computerized order- entry system to your total treatment time	188	90.0	.0	90.0	15.777	12.0228
Ratio of your time in doing other things to your total treatment time	192	90.0	.0	90.0	20.375	20.1370
Number of similar trainings you have participated in over the past two years	234	80.0	.0	80.0	6.021	8.9079
Number of similar training hours you have spent over the past two years	226	400.0	.0	400.0	26.458	48.2558
Valid N (list-wise)	151					

Source: the author

As per table 5-2, GPs polled are widely distributed in different age groups with some just entering workforce while some already having more than 40 years of working experience. During diagnosis and treatment, the physicians always take a more active role than patients do. Although some GPs have ever participated in the similar trainings, an average of 26 training hours in two years is far from enough. Therefore, it is necessary to continue to provide training for them in the future.

(2) Patient questionnaire (PQ1) before training

Five hundred and fifty valid questionnaires are eventually retrieved from patients in this study, with basic information including 168 male respondents, 138 female respondents; 44 government employees, 127 company employees, 27 self-employed, 22 farmers and 281 respondents engaging in other works; 49 are excluded from the study; 87 people with primary title, 92 with intermediate title, 25 with vice senior title, 18 with senior title, 214 ungraded employees and 114 people whose titles are unknown; 175 people with junior college and below degree, 82 with technical school degree, 88 with college degree, 51 with bachelor degree, 3 with master degree, none with doctoral degree, 70 with other education background and 81 respondents whose educational background is unknown; 15 people have held degree for 0 to 10 years; 48 for 11-20 years; 62 for 21-30 years; 50 for 31-40 years; 42 for 41-50 years; 19 for 51-60 years, 6 for more than 60 years; and 308 respondents whose time of acquiring degree is not clear; There are 216 people living with hypertension, with 318 people being hypertension-free and 16 having other accompanying diseases; 475 people have stomach trouble, 59 people are without such disease and 16 have other diseases; there are 529 people suffering from hepatitis, with 5 people without such disease and 16 other people having other diseases; 492 people are affected by diabetes, 42 people are diabetes-free and 16 have other diseases; there are 526 people suffering from kidney disease, 8 people are nephropathy-free and 16 have other diseases. 80 people have ever been taught the self-massage skills by doctors, 422 have no such experience and 48 other people remain unknown.

Table 5-3 Basic information of samples based on questionnaire PQ1

Attribute variable	Demographic information	No. of respondents	Percentage (%)
Gender	Male	168	30.5
	Female	382	69.5
Occupation	Government employee	44	8
	Enterprise employee	127	23.1
	Self-employed	27	4.9
	farmer	22	4
	other	281	51.1
	Excluded from study	49	8.9
	Title	Primary	87
Education background	Intermediate	92	16.7
	Vice senior	25	4.5
	Senior	18	3.4
	Ungraded	214	38.9
	Other	114	20.7
	Junior School	175	31.8
	Technical Secondary School	82	14.9
	College	88	16
	Bachelor	51	9.4
	Master	3	0.5
Time duration of holding degree	Doctor	0	0
	Other	70	12.7
	Unfilled	81	14.7
	0-10 years	15	2.7
	11-20 years	48	8.7
	21-30 years	62	11.3
	31-40 years	50	9.1
	41-50 years	42	7.6
51-60 years	19	3.5	
Hypertension	>60 years	6	1.1
	Other	308	56
	Yes	216	39.3
Stomach trouble	No	318	57.8
	Other diseases	16	2.9
	Yes	475	86.4
Hepatitis	No	59	10.7
	Other diseases	16	2.9
	Yes	529	96.2
Kidney Disease	No	5	0.9
	Other diseases	16	2.9
	Yes	526	95.6
Do you have any experience of being taught the self-massage skills by physicians?	No	8	1.5
	Other diseases	16	2.9
	Yes	80	14.5
Do you have any experience of being taught the self-massage skills by physicians?	No	422	76.7
	Other diseases	48	8.8
	Yes	80	14.5

Source: the author

As per table 5-3, the female patients are far more than male ones, which is consistent with the fact that women are easily affected by KOA according to clinical statistics. Most patients are already in retirement, proving that there is a greater prevalence of the disease among elderly people aged 50 or more and it is also in line with the actual conditions of China where the women are required to retire at 55 and men at 60. In terms of education background, when those elderly patients were young, China's economic development was still at an initial stage after the founding of the country. At that time, most of them still struggled to take food to table and had no extra money to receive more education in school. Therefore, it is no surprise that most of them only have middle school education while those who have high school education or hold college degree can be regarded as highly educated people in relative terms. As far as accompanying diseases are concerned, most of them suffer from other diseases except KOA. 90% of them are affected by stomach trouble or kidney disease, but most are living with mild or moderate degree of these two diseases. Nearly 80% of them have no experience of being taught the self-massage skills by doctors, indicating doctors place little importance on guiding the patients to massage themselves or they also have little knowledge about the main points of self-massage techniques.

Table 5-4 Statistical analysis results of samples based on questionnaire PQ1

	N	Value Field	Min. Value	Max. Value	Mean Value	Std.
Age	495	74.0	24.0	98.0	61.685	12.7837
Average visits to this hospital	419	300	0	300	22.74	32.948
Time of suffering with KOA (years)	471	60	0	60	7.31	8.990
Average hours of visiting this hospital	466	122.000	.000	122.000	2.69159	8.747097
physician's average treatment time (min)	435	120.0	.0	120.0	15.852	12.2281
Valid N (list-wise)	351					

Source: the author

As per table 5-4, the age range of patients sampled is quite considerable from 24 to 98. In general, KOA rarely occurs in young people but several factors increase the risk of developing significant arthritis at an earlier age. Take the 24-year-old patient for example, he is a sports enthusiast with excessive exercise like running, climbing mountain and playing basketball every day. But in recent days, he suffers acute pain in knee joint. An X-ray can show his knee joint has sign of degenerative hyperosteoegeny. Although the 98-year-old patient is still in good spirit, he is chronically afflicted with the keen pain. His visits to a hospital have reached 300, equivalent to one time a day. A physical examine show the patient also suffer high blood pressure, diabetes and coronary heart diseases and basically visits the same community health service centers. The medical benefits granted by government for each patient who visit the community health service center is about 10 yuan, covering drug cost, treatment expenses, consumables and dressings.

5.2 Construct validity and reliability analysis of extracted variables from questionnaire

5.2.1 Construct validity of extracted variables from questionnaire

The factor analysis method is used to test the construct validity of questionnaires reflecting KOA curative effect, physician-patient relationship and patient satisfaction. First, the Bartlett's test of sphericity is used to filter out the variables that are suitable for factor analysis. Then principal component analysis and varimax rotation are used to extract common factors. The common factors should contain much of information of the original variables, but in most factor analyses, the extracted common factors are actually not obviously correlated with the original variables. To make the coefficient of factor loading matrix more significant, the original factor loading matrix needs to be rotated to readjust the relation between factors and original variables and make the coefficient of correlation approach 0 or 1.

The variable communalities, or known as variable variance, which represents the

square load of each original variable on common factors, or the percentage of variance of each original variable that can be explained by common factors. Each variable consists of common factors and unique factors. The communality refers to the percentage of variance of each original variable that can be explained by common factors. The higher the communality is, the more fully the variable can be explained by common factors and the higher percentage of the variable’s variance can be explained by common factors. The communality is meant to indicate the extent to which the information of the original variable can be retained when the original variable is replaced by common factors. According to the table of communalities, the list of Extraction (variance of extracted common factors) indicates to what extent the extracted factors have explained the independent variables. The closer the value is to 1, the better it is (maximum value=1).

Total variable explained as depicted in the table below (Table 5-5)

Table 5-5 Total variable explained of GPQ1

Principal component	Eigen-value	Square load		Eigen-value	Square load after factor rotation	
		Variance contribution rate%	Cumulative contribution rate %		Variance contribution rate%	Cumulative contribution rate %
1	5.525	32.5	32.5	3.609	21.228	21.228
2	3.383	19.901	52.401	3.579	21.052	42.279
3	1.908	11.225	63.626	2.985	17.557	59.836
4	1.387	8.156	71.782	2.031	11.945	71.782

Extraction method: principal component analysis

Source: the author

As per table 5-5, the eigenvalue (λ values) of the first 4 principal components is greater than 1, which means the variance of the 4 principal components is greater than 1. Therefore, the principal components are extracted based on this criterion. As seen from the table, the cumulative λ percentage of the first 4 principal components has reached 71.782%, so there is no need to extract more.

Table 5-6 Load of rotation matrix of 4 components in GPQ1

Item	Component			
	1	2	3	4
GPQ1a		0.807		
GPQ1b		0.874		
GPQ1c		0.809		
GPQ1d		0.799		
GPQ1e		0.769		
GPQ1h			0.758	
GPQ1j			0.806	
GPQ1k			0.813	
GPQ1l			0.787	
GPQ1m	0.847			
GPQ1n	0.888			
GPQ1o	0.914			
GPQ1p	0.861			
GPQ1q	0.684			
GPQ1u				0.885
GPQ1v				0.897
GPQ1w				0.556

Extraction method: principal component analysis

Rotation Method: Varimax with Kaiser Normalization

a. Rotation convergence plus 5 iterations

Source: the author

As per table 5-6, after component extraction using principal component analysis method and factor rotation, the items of GPQ1 are categorized into four types: component 1 (including GPQ1m, GPQ1n, GPQ1o, GPQ1p, GPQ1q) represents physician pressure; by analogy, component 2 (including GPQ1a, GPQ1b, GPQ1c, GPQ1d, GPQ1e) represents organization learning culture; component 3 (including GPQ1h, GPQ1j, GPQ1k, GPQ1l) represents physician-patient relationship; component 4 (including GPQ1u, GPQ1v, GPQ1w) represents physician satisfaction.

Table 5-7 Total variable explained of GPQ2

Principal component	Eigenvalue	Square load		Square load ^a after factor rotation
		Variance contribution rate%	Cumulative contribution rate %	Eigenvalue
1	10.723	42.894	42.894	7.672
2	4.858	19.433	62.327	4.349
3	1.458	5.83	68.157	6.431
4	1.362	5.447	73.604	3.614
5	1	4	77.604	5.584
6	0.73	2.922	80.526	6.508
7	0.673	2.693	83.219	6.179

Extraction method: principal component analysis

a. The square load cannot be added to the total variance when the components are inter-correlated.

Source: the author

As per table 5-7, the eigenvalue (λ values) of the first 7 principal components after rotation is more than 1, and the variance of these 7 principal components is greater than 1. Therefore, the principal components are extracted based on this criterion. As seen from the table, the cumulative λ percentage of the first 7 principal components has reached 83.219%, so there is no need to extract more.

Table 5-8 Load value ^a of rotation matrix corresponding to 7 components in GPQ2

	Component						
	1	2	3	4	5	6	7
GPQ2a					.924		
GPQ2b					.799		
GPQ2c					.537	-.405	
GPQ2e						-.656	
GPQ2f						-.655	
GPQ2g						-.750	
GPQ2l						-.444	.410
GPQ2m							.766
GPQ2n							.691
GPQ2o							.647
GPQ2t	.671						
GPQ2u	.724						
GPQ2v	.821						
GPQ2w	.745						
GPQ2aa				-.957			
GPQ2ab				-.935			
GPQ2ac				-.793			
GPQ2ad			-.904				
GPQ2ae			-.856				
GPQ2af			-.801				
GPQ2ag			-.625				
GPQ2ah		.906					
GPQ2ai		.883					
GPQ2aj		.942					
GPQ2ak		.965					

Extraction method: principal component analysis

Rotation Method: Varimax with Kaiser Normalization

a. Rotation convergence plus 5 iterations

Source: the author

As per table 5-8, after component extraction using principal component analysis method and factor rotation, the items of GPQ2 are categorized into seven types: component 1 (including GPQ2t, GPQ2u, GPQ2v, GPQ2w) represents inner motivation; by analogy, component 2 (including GPQ2ah, GPQ2ai, GPQ2aj, GPQ2ak)

represents explicit Knowledge; component 3 (including GPQ2ad, GPQ2ae, GPQ2af, GPQ2ag) represents tacit knowledge; component 4 (GPQ2aa, GPQ2ab, GPQ2ac) represents external motivation; component 5 (GPQ2a, GPQ2b, GPQ2c) represents physician's absorptive ability; component 6 (GPQ2e, GPQ2f, GPQ2g) represents atmosphere influence; component 7 (GPQ2l, GPQ2m, GPQ2n, GPQ2o) represents physician's willingness to apply knowledge.

Table 5-9 Total variable explained of GPQ3

Principal component	Eigenvalue	Square load		Square load ^a after factor rotation
		Variance contribution rate%	Cumulative contribution rate %	Eigenvalue
1	10.002	35.721	35.721	7.121
2	4.856	17.341	53.062	4.775
3	3.418	12.208	65.270	4.607
4	1.674	5.980	71.250	7.312
5	1.489	5.318	76.568	3.184
6	1.131	4.038	80.606	5.737

Extraction method: principal component analysis

a. The square load cannot be added to the total variance when the components are inter-correlated.

Source: the author

As per table 5-9, the eigenvalue (λ values) of the first 6 principal components is greater than 1, which means the variable of these 6 principal components is greater than 1. Therefore, the principal components are extracted based on this criterion. As seen from the table, the cumulative λ percentage of the first 6 principal components has reached 80.606%, so there is no need to extract more.

Table 5-10 Load value ^a of rotation matrix corresponding to 6 components in GPQ3

	Component					
	1	2	3	4	5	6
GPQ3a				.787		
GPQ3b				.854		
GPQ3c				.899		
GPQ3d				.876		
GPQ3e				.753		
GPQ3g				.639		
GPQ3j			.924			
GPQ3k			.935			
GPQ3l			.870			
GPQ3m			.910			
GPQ3n	.829					
GPQ3o	.941					
GPQ3p	.926					
GPQ3q	.693					
GPQ3r	.618					
GPQ3s	.501					
GPQ3v						.536
GPQ3x						.884
GPQ3y						.795
GPQ3z						.762
GPQ3ad					.742	
GPQ3ae					.664	
GPQ3af					.809	
GPQ3ak		.918				
GPQ3al		.935				
GPQ3am		.954				
GPQ3an		.938				
GPQ3ao		.886				

Extraction method: principal component analysis

Rotation Method: Varimax with Kaiser Normalization

a. Rotation convergence plus 8 iterations

Source: the author

As per table 5-10, after component extraction using principal component analysis method and factor rotation, the items of GPQ3 are categorized into six types: component 1 (including GPQ3n, GPQ3o, GPQ3p, GPQ3q, GPQ3r, GPQ3s) represents hospital culture; by analogy, component 2 (including GPQ3ak, GPQ3al,

GPQ3am, GPQ3an, GPQ3ao) represents physician pressure; component 3 (including GPQ3j, GPQ3k, GPQ3l, GPQ3m) represents patient’s symptom relief; component 4 (including GPQ3a, GPQ3b, GPQ3c, GPQ3d, GPQ3e, GPQ3g) represents patient behavior; component 5 (including GPQ3ad, GPQ3ae, GPQ3af) represents physician’s absorptive ability; component 6 (including GPQ3v, GPQ3x, GPQ3y, GPQ3z) represents physician-patient relationship.

Table 5-11 Total variable explained of PQ1

Principal component	Initial eigenvalue			Square load			Square load after factor rotation		
	Eigenvalue	Variance contribution rate%	Cumulative contribution rate %	Eigenvalue	Variance contribution rate%	Cumulative contribution rate %	Eigenvalue	Variance contribution rate%	Cumulative contribution rate %
1	6.603	30.013	30.013	6.603	30.013	30.013	3.490	15.863	15.863
2	4.807	21.851	51.864	4.807	21.851	51.864	3.438	15.625	31.488
3	2.314	10.519	62.383	2.314	10.519	62.383	3.294	14.975	46.463
4	1.473	6.696	69.079	1.473	6.696	69.079	3.267	14.850	61.312
5	1.252	5.692	74.771	1.252	5.692	74.771	2.961	13.458	74.771
6	.862	3.916	78.687						
7	.558	2.537	81.224						
8	.543	2.466	83.691						
9	.502	2.282	85.973						
10	.433	1.968	87.941						
11	.363	1.648	89.589						
12	.312	1.416	91.006						
13	.296	1.347	92.353						
14	.285	1.295	93.648						
15	.242	1.099	94.747						
16	.219	.994	95.742						
17	.206	.937	96.678						
18	.186	.847	97.525						
19	.160	.726	98.251						
20	.152	.689	98.940						
21	.130	.593	99.533						
22	.103	.467	100.000						

Extraction method: principal component analysis

Source: the author

As per table 5-11, the eigenvalue (λ values) of the first 56 principal components is greater than 1, which means the variable of these 5 principal components is greater than 1. Therefore, the principal components are extracted based on this criterion. As seen from the table, the cumulative λ percentage of the first 5 principal components has reached 74.771%, so there is no need to extract more.

Table 5-12 Loading value ^a of rotation matrix corresponding to 5 components in PQ1

	Component				
	1	2	3	4	5
PQ1a				.839	
PQ1b				.876	
PQ1c				.801	
PQ1d				.727	
PQ1e		.601		.564	
PQ1f		.768			
PQ1g		.860			
PQ1h		.845			
PQ1i		.859			
PQ1j			.792		
PQ1k			.868		
PQ1l			.863		
PQ1m			.848		
PQ1n					.800
PQ1o					.844
PQ1p					.862
PQ1q	.411				.700
PQ1r	.724				
PQ1s	.877				
PQ1t	.893				
PQ1u	.830				
PQ1v	.590				

Extraction method: principal component analysis

Rotation Method: Varimax with Kaiser Normalization

a. Rotation convergence plus 7 iterations

Source: the author

As per table 5-12, after component extraction using principal component analysis method and factor rotation, the items of PQ1 can be categorized into five types:

component 1 (including PQ1q, PQ1r, PQ1s, PQ1t, PQ1u, PQ1v) represents patient benefits; by analogy, component 2 (PQ1e, PQ1f, PQ1g, PQ1h, PQ1i) represents patient pressure; component 3 (including PQ1j, PQ1k, PQ1l, PQ1m) represents patient's knowledge utilization; component 4 (including PQ1a, PQ1b, PQ1c, PQ1d) represents patient disease condition; component 5 (including PQ1n, PQ1o, PQ1p) represents patient participation.

Table 5-13 Total variable explained of PQ2

Principal component	Initial eigenvalue			Square load			Square load ^a after factor rotation
	Eigenvalue	Variance contribution rate%	Cumulative contribution rate%	Eigenvalue	Variance contribution rate%	Cumulative contribution rate%	Eigenvalue
1	14.903	55.196	55.196	14.903	55.196	55.196	9.858
2	2.084	7.718	62.914	2.084	7.718	62.914	10.254
3	1.699	6.291	69.206	1.699	6.291	69.206	7.944
4	.975	3.613	72.818	.975	3.613	72.818	10.400
5	.960	3.557	76.375	.960	3.557	76.375	6.362
6	.736	2.726	79.101				
7	.581	2.151	81.252				
8	.555	2.055	83.307				
9	.475	1.758	85.066				
10	.434	1.609	86.674				
11	.388	1.436	88.110				
12	.359	1.329	89.439				
13	.329	1.220	90.659				
14	.313	1.159	91.818				
15	.283	1.048	92.866				
16	.267	.987	93.853				
17	.246	.913	94.765				

18	.210	.778	95.543
19	.198	.735	96.278
20	.181	.669	96.947
21	.158	.586	97.533
22	.139	.516	98.049
23	.132	.489	98.537
24	.118	.439	98.976
25	.107	.396	99.372
26	.094	.346	99.719
27	.076	.281	100.000

Extraction method: principal component analysis

a. The square load cannot be added to the total variance when the components are inter-correlated

Source: the author

As per table 5-13, the Eigenvalue (λ value) corresponding to the square load of the first 5 principal components after factor rotation is greater than 1, and the variance of the five principal components is greater than 1. Therefore, the principal components are extracted based on this criterion. As seen from the table, the cumulative λ percentage of the first 5 principal components has reached 76.375%, so there is no need to extract more.

Table 5-14 Load value ^a of rotation matrix corresponding to 5 components in PQ2

	Component				
	1	2	3	4	5
PQ2a		.786			
PQ2b		.805			
PQ2c		.747			
PQ2d		.829			
PQ2e		.848			
PQ2f		.818			
PQ2g		.551			
PQ2p					
PQ2r			.409		
PQ2s			.761		
PQ2t			.859		
PQ2u			.841		
PQ2v			.719		
PQ2z	.634				
PQ2aa	.585				
PQ2bb	.838				
PQ2cc	.809				
PQ2dd	.580				
PQ2ee	.660				
PQ2ff	.441				
PQ2ll					.647
PQ2mm					.703
PQ2nn					.772
PQ2ss				.764	
PQ2tt				.694	
PQ2vvvv				.844	
PQ2uu				.853	

Extraction method: principal component analysis

Rotation Method: Varimax with Kaiser Normalization

a. Rotation convergence plus 16 iterations

Source: the author

As per table 5-14, after component extraction using principal component analysis method and factor rotation, the items of PQ2 can be categorized into 5 types: component 1 (including PQ2z, PQ2aa, PQ2bb, PQ2cc, PQ2dd, PQ2ee, PQ2ff,)

represents patient absorptive ability; by analogy, component 2 (including PQ2b, PQ2c, PQ2d, PQ2e, PQ2f, PQ2g) represents physician-patient relationship; component 3 (including PQ2r, PQ2s, PQ2t, PQ2u, PQ2v) represents patient satisfaction; component 4 (PQ2ss, PQ2tt, PQ2uu, PQ2vv) represents patient's willingness to apply knowledge ; component 5 (PQ2ll, PQ2mm, PQ2nn) represents atmosphere influence.

Table 5-15 Total variable explained of PQ3

Principal component	Initial eigenvalue			Square load			Square load after factor rotation ^a
	Eigenvalue	Variance contribution rate%	Cumulative contribution rate%	Eigenvalue	Variance contribution rate%	Cumulative contribution rate%	Eigenvalue
1	13.769	37.213	37.213	13.769	37.213	37.213	9.040
2	6.247	16.884	54.097	6.247	16.884	54.097	5.457
3	3.267	8.830	62.927	3.267	8.830	62.927	9.157
4	1.565	4.229	67.156	1.565	4.229	67.156	6.507
5	1.429	3.862	71.019	1.429	3.862	71.019	5.102
6	1.186	3.205	74.224	1.186	3.205	74.224	8.931
7	1.072	2.897	77.121	1.072	2.897	77.121	7.584
8	.908	2.453	79.574				
9	.752	2.031	81.606				
10	.615	1.662	83.267				
11	.474	1.281	84.548				
12	.465	1.257	85.805				
13	.438	1.183	86.988				
14	.411	1.111	88.099				
15	.382	1.033	89.133				
16	.334	.904	90.037				
17	.310	.838	90.875				

18	.293	.792	91.667
19	.278	.752	92.419
20	.253	.683	93.102
21	.245	.662	93.764
22	.223	.603	94.367
23	.214	.577	94.944
24	.201	.543	95.488
25	.188	.507	95.995
26	.181	.489	96.484
27	.176	.477	96.961
28	.158	.428	97.388
29	.156	.420	97.809
30	.135	.366	98.174
31	.124	.336	98.510
32	.116	.313	98.823
33	.112	.303	99.126
34	.095	.256	99.382
35	.094	.255	99.637
36	.071	.192	99.828
37	.063	.172	100.000

Extraction method: principal component analysis

a. The square load cannot be added to the total variance when the components are inter-correlated

Source: the author

As per Table 5-15, the Eigenvalue (λ value) of the first 7 principal components is greater than 1, which means the variance of the first 7 principal components is greater than 1. Therefore, the principal components are extracted based on this criterion. As seen from the table, the cumulative λ percentage of the first 7 principal components has reached 77.121%, so there is no need to extract more.

Table 5-16 Load value ^a of rotation matrix corresponding to 7 components in PQ3

	Component						
	1	2	3	4	5	6	7
PQ3a					.976		
PQ3b					.938		
PQ3c					.827		
PQ3d					.688		
PQ3e		.541			.438		
PQ3f		.852					
PQ3g		.937					
PQ3h		.921					
PQ3i		.765					
PQ3j			.684				
PQ3k			.762				
PQ3l			.901				
PQ3m			.870				
PQ3n			.735				
PQ3o			.759				
PQ3p			.729				
PQ3q			.763				
PQ3r							.925
PQ3s							.926
PQ3t							.753
PQ3w	.440			.401			
PQ3x				.711			
PQ3y				.970			
PQ3z				.852			
PQ3ae	.488						
PQ3af	.573						
PQ3ag	.840						
PQ3ah	.865						
PQ3ai	.733						
PQ3aj	.627						
PQ3ak	.612						
PQ3al						.509	
PQ3am						.694	
PQ3an						.722	
PQ3ao						.772	
PQ3ap						.953	
PQ3aq						.929	

Extraction method: principal component analysis
 Rotation Method: Varimax with Kaiser Normalization

a. Rotation convergence plus 11 iterations

Source: the author

As per Table 5-16, after component extraction using principal component

analysis method and factor rotation, the items of questionnaire PQ3 can be categorized into 5 types: component 1 (including PQ3ae, PQ3af, PQ3ag, PQ3ah, PQ3ai, PQ3aj, PQ3ak) represents physician-patient relationship; by analogy, component 2 (including PQ3e, PQ3f, PQ3g, PQ3h, PQ3i) represents patient pressure; component 3 (including PQ3j, PQ3k, PQ3l, PQ3m, PQ3n, PQ3o, PQ3p, PQ3q) represents patient behavior; component 4 (including PQ3a, PQ3b, PQ3c, PQ3d) represents patient satisfaction; component 5 (including PQ2ll, PQ2mm, PQ2nn) represents patient's disease condition; component 6 (including PQ3al, PQ3am, PQ3an, PQ3ao, PQ3ap, PQ3aq) represents hospital culture; component 7 (including PQ3r, PQ3s, PQ3t) represents patient's symptom relief.

5.2.2 Construct Reliability Test of Extracted Variables from Questionnaire

Cronbach's alpha, a coefficient of reliability developed by Lee Cronbach in 1951, which addresses the shortcoming of split-half method, is currently widely used in reliability test. The Cronbach's α is not only used in two-point scoring questionnaire but in multiple-point scoring questionnaire. The value of Cronbach's α is from 0 to 1. The higher the Cronbach α value is, the higher the reliability is and the better the internal consistency of questionnaire is. When Cronbach's α is equal to 0.6, the reliability is moderate; when $0.5 < \text{Cronbach's } \alpha < 0.7$, the reliability is acceptable. (Normally, when Cronbach's $\alpha < 0.35$, the reliability is low and rejected; when Cronbach's $\alpha > 0.70$, the reliability is high).

Table 5-17 Reliability test result of extracted variables of GPQ1

Principal component	Organization learning culture	Physician-patient relationship	Physician pressure	Physician satisfaction
Cronbach's α	.908	.854	.895	.740

Source: the author

As per Table 5-17, the Cronbach's alpha of 4 principle components is greater than 0.70, showing the questionnaire GPQ1 has high internal consistency and good construct reliability.

Table 5-18 Reliability test result of extracted variables of GPQ2

Principal component	Absorptive ability	Atmosphere influence	physician's willingness to apply knowledge	Internal motivation	External motivation	Tacit knowledge	Explicit knowledge
Cronbach's α	.881	.886	.916	.947	.894	.818	.945

Source: the author

As per Table 5-18, the Cronbach's alpha of principle components is greater than 0.80, showing the questionnaire GPQ2 has high internal consistency and good construct reliability.

Table 5-19 Reliability test result of extracted variables of GPQ3

Principal component	Physician behavior	Physician behavior	Physician behavior	Physician-patient relationship	Physician satisfaction	Physician pressure
Cronbach's α	.918	.969	.922	.836	.759	.960

Source: the author

As per Table 5-19, the Cronbach's alpha of principle components is greater than 0.70, showing the questionnaire GPQ3 has high internal consistency and good construct reliability.

Table 5-20 Reliability test result of extracted variables of PQ1

Principal component	Patient's disease condition	Patient pressure	Patient participation	Patient's benefits
Cronbach's α	.882	.891	.911	.869

Source: the author

As per Table 5-20, the Cronbach's alpha of principle components is greater than 0.80, showing the questionnaire PQ1 has high internal consistency and good construct reliability.

Table 5-21 Reliability test result of extracted variables of PQ2

Principal component	Physician-patient relationship	Patient satisfaction	Patient's absorptive ability	Patient's atmosphere influence	Patient's willingness to apply knowledge
Cronbach's α	.927	.911	.937	.907	.929

Source: the author

As per Table 5-21, the Cronbach's alpha of principle components is greater than 0.90, showing the questionnaire PQ2 has high internal consistency and good construct reliability.

Table 5-22 Reliability test result of extracted variables of PQ3

Principal component	Patient's disease condition	Patient pressure	Patient behavior	Patient's symptom relief	Patient satisfaction	Physician-patient relationship	Hospital culture
Cronbach's α	.941	.926	.938	.918	.872	.924	.927

Source: the author

As per Table 5-22, the Cronbach's alpha of principle components is greater than 0.80, showing the questionnaire PQ3 has high internal consistency and good construct reliability.

5.2.3 Summary and analysis of items of questionnaires

Each item of questionnaire is corresponding to different measurement dimension, whose analysis is listed as follows:

Table 5-23 GPQ1 measurement dimension and its corresponding items

Measurement dimension	Code	Item	Mean	Std
Organization learning culture	GPQ1a	Our hospital/clinic encourages medical staff to participate in continuing professional training.	6.62	0.8582
	GPQ1b	Our hospital/clinic encourages all employees to learn from each other.	6.412	1.0468
	GPQ1c	In our hospital/clinic, employees like to share knowledge.	6.204	1.1304
	GPQ1d	In our hospital/clinic, we try to use new medical knowledge.	6.396	0.9465
	GPQ1e	In our hospital/clinic, we like to apply new knowledge into our daily medical activities.	6.4	0.9556
Physician -patient relationship	GPQ1h	Every time I am visited by patients, I always encourage patients to ask questions.	5.892	1.0863
	GPQ1j	I'm very familiar with the disease history of my patients	5.78	1.0554
	GPQ1k	I know my patient's medical needs	5.846	1.0151
	GPQ1l	If possible, my patients always want to visit me every time	5.863	1.0964
	GPQ1m	I feel a lot of pressure as a doctor	5.116	1.7639
Physician pressure	GPQ1n	I feel too much pressure because my patients have too many demands	4.678	1.7966
	GPQ1o	I feel too much pressure because I need to treat and diagnose too many patients every day	4.524	1.8005
	GPQ1p	I feel a lot of stress because I do not have time to spend with my family and friends	4.592	1.8963
Physician satisfaction	GPQ1q	The administrative work always puts me under great pressure	3.811	2.0507
	GPQ1u	My treatment time is worth every penny of the patient's registration fee.	4.988	1.9373
	GPQ1v	My professional level and experience is worth every penny of the patient's registration fee.	5.054	1.9793
	GPQ1w	I am satisfied with my salary as general practitioner	4.158	1.8613

Source: the author

Table 5-24 GPQ2 measurement dimension and its corresponding items

Measurement dimension	Code	Item	Mean	Std
Physician absorptive ability	GPQ2a	I now understand all the knowledge about knee arthritis transferred from the specialist.	6.372	0.9417
	GPQ2b	I am now well aware of how the knowledge about knee arthritis transferred from the specialist can reduce patient's symptom.	6.342	0.9956
	GPQ2c	I now clearly know how the patients should apply the self-treatment knowledge to provide KOA relief.	6.143	1.084
Atmosphere influence	GPQ2e	When my colleagues teach patients the self-treatment skills, I also feel obliged to do this.	6.268	1.1442
	GPQ2f	My patients want me to teach them the self-massage techniques for KOA treatment.	6.33	1.0494
	GPQ2g	The occupational skills certification regulations require me to teach patients the self-massage techniques for KOA treatment.	6.071	1.2144
Physician's intention to apply learned knowledge	GPQ2l	I intend to follow the recommendations about the KOA treatment in the future.	6.189	1.0577
	GPQ2m	I intend to apply what I have learned from this training to change my patients' bad living habits and lifestyle such as unhealthy food and lack of exercise.	6.313	0.9379
	GPQ2n	I intend to apply what I have learned from this training to my daily treatment.	6.317	0.9937
	GPQ2o	I am intent on integrating what I have learned from this training with my existing knowledge.	6.361	0.9556
Internal motivation	GPQ2t	I would like to share my knowledge of Knee Osteoarthritis.	6.354	0.9182
	GPQ2u	Sharing my knowledge of Knee Osteoarthritis with patients also gives me an opportunity to enrich my own experience.	6.367	0.9627
	GPQ2v	Sharing my knowledge of arthritis makes me more like what I am doing.	6.358	0.9333

	GPQ2w	I would like to share some knowledge about arthritis because I think it is very important for patients.	6.385	0.9322
External motivation	GPQ2aa	I share my knowledge of arthritis with patients because of economic benefits.	3.815	2.3413
	GPQ2ab	Sharing my knowledge of arthritis with patients is helpful to my promotion.	3.477	2.1894
	GPQ2ac	If I do not share arthritis knowledge with my patients, I will be punished by my supervisor.	3.005	2.1367
	GPQ2ad	The most useful KOA knowledge I have learned is from the demonstration of specialists.	6.068	1.2022
Tacit knowledge	GPQ2ae	The most useful KOA knowledge I have learned is from the specialist's special experience sharing.	6.081	1.1881
	GPQ2af	The most useful KOA knowledge I have learned is from the discussions and ideas exchanges with specialists.	5.851	1.3005
	GPQ2ag	The most useful KOA knowledge I have learned is from the specialist sharing anecdotal stories with me.	5.303	1.7948
	GPQ2ah	I can actually learn similar KOA knowledge and skills through reading KOA-related books and materials, so there is no need to learn from specialist.	3.404	2.2002
Explicit knowledge	GPQ2ai	The most useful KOA knowledge and skills I have learned is from the multimedia materials like photos and videos instead of from specialist.	3.5	2.1456
	GPQ2aj	I can actually learn the same KOA knowledge and skills through reading the training books and materials, so there is no need to learn from specialists.	3.202	2.1494
	GPQ2ak	The most useful KOA knowledge and skills I have learned is from the training books and materials instead of from the interactive-communication based training.	3.342	2.1521

Source: the author

Table 5-25 GPQ3 measurement dimension and its corresponding items

Measurement dimension	Code	Item	Mean	Std
Physician behavior	GPQ3a	I now still remember the KOA knowledge I learnt from the training.	6.37	0.9173
	GPQ3b	I have spent a considerable time teaching my patients more KOA knowledge since the training.	6.17	0.9434
	GPQ3c	I have spent a considerable time demonstrating the self-massage techniques before patients.	6.1	1.02
	GPQ3d	I have persistently discussed with my patients about their condition of KOA disease since the training.	5.99	0.9265
	GPQ3e	I have found a new way to provide KOA relief based on what I have learned since the training.	6.03	1.1499
	GPQ3g	I have effectively taught patients how to incorporate the KOA self-treatment techniques into their daily life since the training.	5.84	0.9505
	Patient's symptom relief	GPQ3j	Compared with the disease condition three months ago, the KOA condition of my patients has been improved.	5.82
GPQ3k		Compared with the disease condition three months ago, the complications caused by arthritis have been alleviated.	5.88	1.2167
GPQ3l		Compared with the disease condition three months ago, my patients become less dependent on drugs	5.62	1.3241
GPQ3m		Compared with the disease condition three months ago, my patient has been relieved of the pain caused by arthritis.	5.82	1.2901

Hospital culture	GPQ3n	Our hospital/clinic creates conditions to make it easier for patients to see a doctor.	5.515	0.9515
	GPQ3o	Our hospital/clinic encourages patients to take control of their own health.	5.869	0.9329
	GPQ3p	Our hospital/clinic encourages patients to take preventive measures against diseases.	6.061	0.8308
	GPQ3q	Our hospital/clinic encourages patients to make joint decisions with doctors	5.828	0.9902
	GPQ3r	Our hospital/clinic encourages doctors to do their best to provide the information patients need	5.869	0.9219
	GPQ3s	Our hospital/clinic encourages doctors to involve patients in a joint decision-making process.	6.081	0.8412
Physician -patient relationship	GPQ3v	Every time I am visited by patients, I always encourage patients to ask questions.	5.5	1.1326
	GPQ3x	I am very familiar with the disease history of my patients	5.98	0.8526
	GPQ3y	I know my patient's medical needs	5.97	0.8221
	GPQ3z	If possible, my patients always want to visit me every time	5.81	0.9067
Physician satisfaction	GPQ3ad	My treatment time is worth every penny of the patient's registration fee.	5.126	1.4384
	GPQ3ae	My professional level and experience is worth every penny of the patient's registration fee.	5.2	1.4557
	GPQ3af	I am satisfied with my salary as general practitioner	4.874	1.6389
Physician pressure	GPQ3ak	I feel a lot of pressure as a doctor	3.634	1.8638
	GPQ3al	I feel too much pressure because my patients have too many demands	3.462	1.833
	GPQ3am	I feel too much pressure because I need to treat and diagnose too many patients every day	3.226	1.7639
	GPQ3an	I feel a lot of stress because I do not have time to spend with my family and friends	3.409	1.9574
	GPQ3ao	The administrative work always puts me under great pressure	3.312	1.7875

Source: the author

Table 5-26 PQ1 measurement dimension and its corresponding items

Measurement dimension	Code	Item	Mean	Std
Patient's disease condition	PQ1a	I suffer joint hurt every day	4.424	2.0054
	PQ1b	I have severe pain in my knee joint	3.985	1.9644
	PQ1c	The pain in my joints makes it hard for me to perform daily activities	3.641	2.0609
	PQ1d	I have to depend on medicine to relieve my joint pain	3.252	2.1264
	PQ1e	I feel a lot of pressure on my health	3.67	2.072
	PQ1f	The current treatment puts me under great psychological pressure.	3.094	1.9878
Patient pressure	PQ1g	The attitude of my physician during the treatment process puts me under great psychological pressure.	2.646	1.8138
	PQ1h	The uncertainty of the treatment result puts a huge pressure on me	3.126	1.9981
	PQ1i	My resident physician does not make it clear what I should do after treatment process, which puts me under great psychological pressure.	2.805	1.973
Patient's knowledge utilization	PQ1j	I always pay close attention to the medical knowledge related to my health	5.659	1.5404
	PQ1k	I often use my new medical knowledge to deepen my understanding of my health	5.465	1.5631
	PQ1l	I always learn new medical knowledge related to my health	5.059	1.7577
	PQ1m	I will quickly use my new medical knowledge to deal with my health	5.196	1.6464

	PQ1n	I would like to learn more about arthritis.	5.882	1.4389
Patient participation	PQ1o	Understanding new knowledge about arthritis helps me to adopt new ways to improve health	5.891	1.3766
	PQ1p	I want to learn about arthritis because I should know about it	5.903	1.3852
	PQ1q	Understanding new knowledge of arthritis can improve the relationship between me and my physician	5.723	1.4948
Patient's benefits	PQ1r	Understanding new knowledge of arthritis can win the attention and recognition from others	5.061	1.8509
	PQ1s	Understanding new knowledge of arthritis can help me save money in medicine	5.492	1.7369
	PQ1t	Understanding new knowledge of arthritis can help me save money in health insurance	5.361	1.7993
	PQ1u	Knowing arthritis knowledge can help me reduce the trouble of seeing a doctor	5.643	1.709
	PQ1v	I have no other choice, because the doctor will tell me about arthritis	4.971	1.9148

Source: the author

Table 5-27 PQ2 measurement dimension and its corresponding items

Measurement dimension	Code	Item	Mean	Std
Physician -patient relationship	PQ2a	I can easily get along well with/communicate with my doctor.	6.35	1.09
	PQ2b	I have maintained a good relationship with my doctor	6.33	1.033
	PQ2c	Every time I see a doctor, the doctor always encourages me to ask questions	6.03	1.229
	PQ2d	Every time I see a doctor, the doctor will answer all my questions	6.23	1.106
	PQ2e	The doctor is very familiar with my disease history	6.09	1.176
	PQ2f	The doctor knows my medical needs	6.07	1.232
	PQ2g	If possible, I always hope to see the same doctor every time	6.25	1.069
Patient satisfaction	PQ2p	I am very satisfied with the treatment time	6.2	1.042
	PQ2r	I am satisfied with the total time spent here for treatment	6.08	1.118
	PQ2s	My registration fee is reasonable	6.1	1.155
	PQ2t	The cost of the medicine I bear is reasonable	6.06	1.154
	PQ2u	The cost spent on my medical insurance is reasonable	5.9	1.277
Patient's absorptive ability	PQ2v	The doctor's treatment is as good as I had expected	6.03	1.09
	PQ2z	I now know all the arthritis knowledge that the doctor taught me	6.13	1.023
	PQ2aa	I am now very clear how to use the knowledge this doctor has taught me to reduce my symptom of arthritis	6.15	1.012
	PQ2ab	I now know how to use the self-treatment method demonstrated by the doctor to treat the arthritis myself.	5.84	1.236

	PQ2ac	I now know how to change my living habit and lifestyle (such as diet and exercise) to improve my illness.	5.95	1.153
	PQ2ad	The KOA knowledge acquired from this hospital visit is very helpful to me.	6.11	1.111
	PQ2ae	The KOA knowledge acquired from this hospital visit inspires me to look at my illness in different ways.	5.98	1.154
	PQ2af	The KOA knowledge acquired from this hospital visit will help improve my disease condition.	6.07	1.146
Atmosphere influence	PQ2al	My family members think I should use self-treatment techniques to reduce my symptom.	6.01	1.221
	PQ2am	My friends think I should use self-treatment techniques to reduce my symptom.	5.99	1.219
	PQ2an	Other patients use self-treatment techniques to provide pain relief, so I think I should do the same.	5.86	1.346
	PQ2as	I am going to follow the doctor's instructions on self- treatment of arthritis.	6.14	0.996
Patient's intention to apply knowledge	PQ2at	I am going to follow my doctor's advice to change my living habit and lifestyle such as diet and exercise.	6.14	1.023
	PQ2au	I intend to use the self-treatment techniques taught by my doctor to treat my KOA every day.	6.15	1.044
	PQ2av	I intend to integrate the KOA knowledge the doctor taught me into my current knowledge.	6.04	1.076

Source: the author

Table 5-28 PQ3 measurement dimension and its corresponding items

Measurement dimension	Code	Item	Mean	Std
Patient's disease condition	PQ3a	I suffer joint hurt every day	3.665	1.9238
	PQ3b	I have severe pain in my knee joint	3.376	1.9079
	PQ3a	The pain in my joints makes it hard for me to perform daily activities	3.042	1.8919
	PQ3d	I have to depend on medicine to relieve my joint pain	3.113	1.9631
Patient pressure	PQ3e	I feel a lot of pressure on my health	3.075	1.8643
	PQ3f	The current treatment puts me under great psychological pressure.	2.845	1.8386
	PQ3g	The attitude of my physician during the treatment process puts me under great psychological pressure.	2.663	1.8094
	PQ3h	The uncertainty of the treatment result puts a huge pressure on me	2.805	1.8634
	PQ3i	My resident physician does not make it clear what I should do after treatment process, which puts me under great psychological pressure.	2.791	1.9238
Patient behavior	PQ3j	From the first time the doctor taught me KOA knowledge, I still remember what I have learned from a doctor	5.525	1.5055
	PQ3k	From the first time the doctor taught me, I have followed the doctor's instructions on self-treatment of arthritis	5.693	1.2853
	PQ3l	From the first time the doctor taught me, I have been using the techniques I learned from the doctor to treat my KOA.	5.649	1.225
	PQ3m	From the first time the doctor taught me, using KOA self-treatment techniques taught by doctors has become part of my daily life	5.527	1.2185
	PQ3n	From the first time the doctor taught me, I have found a new way to treat my disease based on the KOA knowledge I learnt from my doctor.	5.672	1.2866
	PQ3o	From the first time the doctor taught me, I have effectively followed the doctor's advice to change my living habit and lifestyle such as diet and exercise	5.568	1.1555
	PQ3p	From the first time the doctor taught me, I have taken a preventive measure to protect my health with a new	5.718	1.1711

		perspective		
	PQ3q	From the first time the doctor taught me, I have effectively used the KOA knowledge I have learned from the doctor to improve my quality of life	5.77	1.1366
Patient's	PQ3r	Compared to three months ago, the pain caused by arthritis has eased	5.745	1.3008
symptom relief	PQ3s	Compared to three months ago, the complications caused by arthritis has eased	5.76	1.2761
	PQ3t	Compared to three months ago, I have become less dependent on drugs.	5.685	1.4134
Patient	PQ3w	I am satisfied with the total time spent here for treatment	5.916	1.0906
satisfaction	PQ3x	The registration fee I bear is reasonable	5.994	1.1485
	PQ3y	The cost of the medicine I bear is reasonable	5.914	1.2826
	PQ3z	The cost of my medical insurance is reasonable	5.612	1.3463
Physician-patie	PQ3ae	I can easily get along well with/communicate with my doctor.	6.301	0.9043
nt relationship	PQ3af	I have a good relationship with my doctor	6.303	0.8744
	PQ3ag	Every time I see a doctor, the doctor always encourages me to ask questions	5.884	1.1404
	PQ3ah	Every time I see a doctor, the doctor will answer all my questions	5.998	1.1047
	PQ3ai	The doctor is very familiar with my disease history	6.052	1.0375
	PQ3aj	The doctor knows my medical needs	6.05	1.0265
	PQ3ak	If possible, I always hope to see the same doctor every time	6.1	1.0627
Hospital	PQ3al	The hospital/clinic creates conditions to make it easier for patients to see a doctor.	5.904	1.0695
culture	PQ3am	The hospital/clinic encourages patients to take control of their own health.	6.077	0.9509
	PQ3an	The hospital/clinic encourages patients to take preventive measures against diseases.	6.077	0.9616
	PQ3ao	The hospital/clinic encourages patients to make joint decisions with doctors	6.012	1.0281
	PQ3ap	The hospital/clinic encourages doctors to do their best to provide the information patients need	5.98	1.024
	PQ3aq	The hospital/clinic encourages physicians to involve patients in a joint decision-making process.	6.073	0.9724

Source: the author

5.3 T-test

The paired sample T test is used to test whether there is significant difference between two statistical values with normal mean value. As per Table 5-29, the median score of physician-patient relationship, physician pressure and physician satisfaction has changed after training.

Table 5-29 Basic descriptive statistics

		Median	Sample size	Std	Standard error
Pair 1	GP3_physician-patient relationship	5.9596	99	.83769	.08419
	GP1_physician-patient relationship	5.8232	99	.76620	.07701
Pair 2	GP3_physician pressure	3.4641	99	1.69375	.17023
	GP1_physician pressure	3.9556	99	1.65572	.16641
Pair 3	GP3_physician satisfaction	5.0660	96	1.23650	.12620
	GP1_physician satisfaction	4.7882	96	1.56580	.15981

Source: the author

As per Table 5-30, the significance values (sig) of all correlations are smaller than 0.05.

Table 5-30 Correlation between Paired Samples

		Sample size	Correlation	Sig.
Pair 1	GP3_physician-patient relationship & GP1_physician-patient relationship	99	0.221	0.028
Pair 2	GP3_physician pressure & GP1_physician pressure	99	0.342	0.001
Pair 3	GP3_physician satisfaction & GP1_physician satisfaction	96	0.236	0.02

Source: the author

Table 5-31 shows the differences between the compared paired samples, indicating physician pressure has significantly reduced. Physician satisfaction has increased with a p-value of 0.123 and physician-patient relationship has been improved but with a p value of 0.179.

Table 5-31 Paired-sample test

		Paired Differences				t	df	Sig.
		Median	Std	Standard error	95% Confidence interval			
					Value (min)	Value (max)		
Pair 1	GP3_ Physician -patient relationship	0.13636	1.00258	0.10076	-0.33632	0.0636	1.353	0.179
	GP1_physician -patient relationship 1							
Pair 2	GP3_physician pressure	-0.49141	1.92119	0.19309	-0.87459	-0.10824	-2.545	0.012
	GP1_physician pressure							
Pair 3	GP3_physician satisfaction	0.27778	1.75097	0.17871	-0.077	0.63256	1.554	0.123
	GP1_physician satisfaction							

Source: the author

5.4 Regression Analysis

5.4.1 Regression analysis of patient's intention to apply knowledge

The stepwise regression is used to explore the relationship between patient's intention to apply knowledge and other factors.

Table 5-32 Variable input/deleted^a

Model	Input variables	Deleted variables	Result
1	P2_atmosphere influence, P1_patient pressure, P1_patient trust, P1_patient participation, P2_patient satisfaction, P1_patient's disease condition P2_physician-patient relationship, P2_absorptive ability ^b	.	All variables are included into the model

a. Dependent Variable: P2_ patient's intention to apply knowledge

b. All input variables are included into model

Source: the author

As per Table 5-32, after regression fitting process, all input variables including P1(patient pressure, patient trust, patient participation and patient's disease condition) and P2 (atmosphere influence, patient satisfaction, physician-patient relationship, absorptive ability) are introduced into the model, or in other words, no variable has been excluded by this model.

Table 5-33 Model analysis of patient's intention to apply knowledge

Model	R	R ²	Adjusted R ²	Standard error of estimated value
1	.808 ^a	0.653	0.646	0.56233

a. Predictors: (Constant), P2_absorptive ability, P1_patient pressure, P1_patient participation, P1_patient trust, P1_patient's disease condition, P2_patient satisfaction, P2_atmosphere influence, P2_physician-patient relationship

Source: the author

According to Table 5-33, the values of R (multiple correlation coefficient), R² (coefficient of determination) and adjusted R² (adjusted coefficient of determination) are shown, among which, the value of adjusted R² has increased gradually, showing

the model fits well. Therefore, the regression equation we establish is very good.

Table 5-34 Variance analysis of patient’s intention to apply knowledge

Model	Sum of squares	df	Mean	F	Sig.
1 Regression	267.836	8	33.479	105.877	.000 ^b
Residual	142.611	451	0.316		
Total	410.447	459			

a. Dependent Variable: P2_ patient’s intention to apply knowledge

b. Predictors: (Constant), P2_absorptive ability, P1_patient pressure, P1_patient participation, P1_patient trust, P1_patient’s disease condition, P2_patient satisfaction, P2_atmosphere influence, P2_physician-patient relationship

Source: the author

According to Table 5-34, the variance analysis of model 1 is conducted and the variance analysis result in each step during the regression fitting process is given. As we can see from the table, all sig values are smaller than 0.001 and each model has rejected the hypothesis whose regression coefficient is 0. Each regression equation presents significance, that is to say, when a new variable is introduced into the model, the model remains significant. Meanwhile, once a variable is introduced into the model, it is not to be deleted.

Table 5-35 Model coefficients of patient’s intention to apply knowledge

Model	Unstandardized coefficients		Standardized coefficient	t	Sig.
	Partial regression coefficient	Standard error	Beta		
(Constant)	.853	.208		4.099	.000
P2_atmosphere influence	.193	.034	.239	5.695	.000
P1_patient pressure	-.020	.020	-.035	-.993	.321
P1_patient trust	-.024	.022	-.035	-1.074	.283
1 P1_patient participation	.059	.025	.077	2.366	.018
P2_patient satisfaction	.177	.041	.179	4.364	.000
P1_patient’s disease condition	.024	.020	.043	1.216	.225
P2_physician-patient ability	.064	.042	.066	1.543	.124
P2_patient absorptive ability	.398	.045	.407	8.875	.000

a. Dependent Variable: P2_ patient’s intention to apply knowledge

Source: the author

As per Table 5-35, eight independent variables including absorptive ability, patient pressure, patient participation, patient trust, patient’s disease condition, patient satisfaction, atmosphere influence, physician-patient relationship are introduced model 1 and two questionnaires P1 and P2 are involved.

Finally, we get the regression equation:

$$y_1 = 0.853 + 0.193x_1 - 0.020x_2 - 0.024x_3 + 0.059x_4 + 0.177x_5 + 0.024x_6 + 0.064x_7 + 0.398x_8 \quad (5.1)$$

Where, $x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8$ represent atmosphere influence, patient pressure, patient trust, patient participation, patient satisfaction, patient’s disease condition, physician-patient ability and patient absorptive ability; y_1 represents patient’s intention to apply knowledge.

5.4.2 Regression analysis of physician’s intention to apply knowledge

The stepwise regression is used to explore the relationship between physician’s intention to apply knowledge and other factors.

Table 5-36 Model analysis of physician’s intention to apply knowledge

Model	R	R ²	Adjusted R ²	Standard error of estimated value
1	.863 ^a	.744	.732	.46027

a. Predictors: (Constant), GP2_explicit knowledge, GP1_physician-patient relationship, GP1_physician pressure, GP2_atmosphere influence, GP1_physician satisfaction, GP2_external motivation, GP2_tacit knowledge, GP1_organization learning culture, GP2_absorptive ability, GP2_internal motivation

Source: the author

According to Table 5-36, the values of R (multiple correlation coefficient), R² (coefficient of determination) and adjusted R² (adjusted coefficient of determination) are shown, among which, the adjusted R² is fairly large in value, showing the model fits well. Therefore, the regression equation we establish is very good.

Table 5-37 Variance analysis of physician’s intention to apply knowledge

Model		Sum of squares	df	Mean	F	Sig.
1	Regression	131.084	10	13.108	61.877	.000 ^b
	Residual	45.124	213	.212		
	Total	176.208	223			

a. Dependent Variable: GP2_ physician’s intention to apply knowledge

b. Predictors: (Constant), GP2_explicit knowledge, GP1_physician-patient relationship, GP1_physician pressure, GP2_atmosphere influence, GP1_physician satisfaction, GP2_external motivation, GP2_tacit knowledge, GP1_organization learning culture, GP2_absorptive ability, GP2_internal motivation

Source: the author

According to Table 5-37, the variance analysis of model 1 is conducted and the variance analysis result in each step during the regression fitting process is given. As we can see from the table, all sig values are smaller than 0.001 and each model has rejected the hypothesis whose regression coefficient is 0. Each regression equation presents significance, that is to say, when a new variable is introduced into the model, the model remains significant. Meanwhile, once a variable is introduced into the model, it is not to be deleted.

Table 5-38 Model coefficients of physician’s intention to apply knowledge

Model	Unstandardized coefficients		Standardized coefficient	t	Sig.	95% Confidence interval	
	Partial regression coefficient	Standard error	Beta			Value (min)	Value (max)
(Constant)	.334	1.147		.291	.772		
GP3_physician behavior	.063	.167	.043	.377	.707	.627	1.595
GP3_hospital culture	.695	.176	.434	3.948	.000	.685	1.460
GP1_physician pressure	-.101	.068	-.137	-1.480	.142	.971	1.030
GP1_physician-patient relationship	.111	.144	.075	.770	.443	.875	1.143

a. Dependent Variable: GP3_ physician’s intention to apply knowledge

Source: the author

As per Table 5-38, four independent variables including physician behavior, hospital culture, physician pressure, and physician-patient relationship are introduced model 1 and two questionnaires P1 and P3 are involved.

Finally, we get the regression equation:

$$y_2 = 0.334 + 0.063x_1 + 0.695x_2 - 0.101x_3 + 0.111x_4 \quad (5.2)$$

Where, x_1 , x_2 , x_3 , x_4 represent physician behavior, hospital culture, physician pressure, physician-patient relationship; y_2 represents physician’s intention to apply knowledge.

5.4.3 Regression analysis of patient satisfaction

The stepwise regression is used to explore the relationship between patient satisfaction and other factors.

Table 5-39 Variance analysis of patient satisfaction

Model	Sum of squares	df	Mean	F	Sig.
Regression	200.218	6	33.370	49.073	.000 ^b
1 Residual	289.003	425	.680		
Total	489.222	431			

a. Dependent Variable: P3_patient satisfaction

b. Predictors: (Constant), P3_patient behavior, P1_patient pressure, P1_patient participation, P3_hospital culture, P1_patient trust, P1_patient’s disease condition

Source: the author

According to Table 5-39, the variance analysis of model 1 is conducted and the variance analysis result in each step during the regression fitting process is given. As we can see from the table, all sig values are smaller than 0.001 and each model has rejected the hypothesis whose regression coefficient is 0. Each regression equation presents significance, that is to say, when a new variable is introduced into the model, the model remains significant. Meanwhile, once a variable is introduced into the

model, it is not to be deleted.

Table 5-40 Model analysis of patient satisfaction

Model	R	R ²	Adjusted R ²	Standard error of estimated value
1	.640 ^a	.409	.401	.82463

a. Predictors: (Constant), P3_patient behavior, P1_patient pressure, P1_patient participation, P3_hospital culture, P1_patient trust, P1_patient’s disease condition

Source: the author

According to Table 5-40, the values of R (multiple correlation coefficient), R² (coefficient of determination) and adjusted R² (adjusted coefficient of determination) are shown, among which, the value of adjusted R² is fairly large, showing the model fits well. Therefore, the regression equation we establish is very good.

Table 5-41 Model coefficient of patient satisfaction

Model	Unstandardized coefficients		Standardized coefficient	t	Sig.	95% Confidence interval	
	Partial regression coefficient	Standard error	Beta			Value (min)	Value (max)
(Constant)	1.039	.361		2.882	.004		
P3_hospital culture	.693	.050	.562	13.909	.000	.850	1.176
P1_patient’s disease condition	-.037	.030	-.059	-1.232	.218	.601	1.665
1 P1_patient pressure	-.030	.030	-.047	-.992	.322	.606	1.649
P1_patient participation	-.073	.038	-.085	-1.934	.054	.728	1.373
P1_patient trust	.011	.033	.015	.334	.738	.729	1.371

P3_patient behavior	.196	.049	.167	3.989	.000	.790	1.266
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a. Dependent Variable: P3_SAT

Source: the author

As per Table 5-41, six independent variables including hospital culture, patient’s disease condition, patient pressure, patient participation, patient trust and patient behavior are introduced model 1 and two questionnaires P1 and P3 are involved.

Finally, we get the regression equation:

$$y_3 = 1.039 + 0.693x_1 - 0.037x_2 - 0.030x_3 - 0.073x_4 + 0.011x_5 + 0.196x_6 \quad (5.3)$$

Where, $x_1, x_2, x_3, x_4, x_5, x_6$ represent hospital culture, patient’s disease condition, patient pressure, patient participation, patient trust, patient behavior; y_3 represents patient satisfaction.

5.4.4 Regression analysis of physician satisfaction

The stepwise regression is used to explore the relationship between physician satisfaction and other factors.

Table 5-42 Variance analysis of physician satisfaction

Model	Sum of squares	df	Mean	F	Sig.
1 Regression	35.605	4	8.901	7.388	.000 ^b
Residual	109.644	91	1.205		
Total	145.249	95			

a. Dependent Variable: GP3_physician satisfaction

b. Predictors:(Constant), GP1_physician-patient relationship, GP3_hospital culture, GP1_physician pressure, GP3_physician behavior

Source: the author

According to Table 5-42, the variance analysis of model 1 is conducted and the variance analysis result in each step during the regression fitting process is given. As we can see from the table, all sig values are smaller than 0.001 and each model has rejected the hypothesis whose regression coefficient is 0. Each regression equation

presents significance, that is to say, when a new variable is introduced into the model, the model remains significant. Meanwhile, once a variable is introduced into the model, it is not to be deleted.

Table 5-43 Model analysis of physician satisfaction

Model	R	R ²	Adjusted R ²	Standard error of estimated value
1	.495 ^a	.245	.212	1.09767

a. Predictors: (Constant), GP1_physician-patient relationship, GP3_hospital culture, GP1_physician pressure, GP3_physician behavior

Source: the author

According to Table 5-43, the values of R (multiple correlation coefficient), R² (coefficient of determination) and adjusted R² (adjusted coefficient of determination) are shown, among which, the value of adjusted R² is fairly large, showing the model fits well. Therefore, the regression equation we establish is very good.

Table 5-44 Model coefficient of physician satisfaction

Model	Unstandardized coefficients		Standardized coefficient	t	Sig.	95% confidence interval	
	Partial regression coefficient	Standard error	Beta			Value (min)	Value (max)
(Constant)	.334	1.147		.291	.772		
GP3_physician behavior	.063	.167	.043	.377	.707	.627	1.595
GP3_hospital culture	.695	.176	.434	3.948	.000	.685	1.460
GP1_physician pressure	-.101	.068	-.137	-1.480	.142	.971	1.030
GP1_physician-patient relationship	.111	.144	.075	.770	.443	.875	1.143

a. Dependent Variable: GP3_physician satisfaction

Source: the author

As per Table 5-44, four independent variables including physician behavior, hospital culture, physician pressure, physician-patient relationship are introduced model 1 and two questionnaires GP1, GP3 are involved.

Finally, we get the regression equation:

$$y_4 = 0.334 + 0.063x_1 + 0.695x_2 - 0.11x_3 + 0.111x_4 \quad (5.4)$$

Where, x_1, x_2, x_3, x_4 represent physician behavior, hospital culture, physician pressure, physician-patient relationship; y_4 represents physician satisfaction.

5.4.5 Regression analysis of physician-patient relationship

The stepwise regression is used to explore the relationship between physician-patient relationship and other factors. According to questionnaire design and survey results, the physician-patient relationship is examined and analyzed in context of GPQ and PQ, respectively. The results are shown as follows:

Physician-patient relationship presented in GPQ:

Table 5-45 Variance analysis of physician-patient relationship

Model	Sum of squares	df	Mean	F	Sig.
1 Regression	29.133	4	7.283	24.107	.000 ^b
Residual	28.399	94	0.302		
Total	57.532	98			

a. Dependent Variable: GP3_physician-patient relationship

b. Predictors: (Constant), GP1_physician pressure, GP3_physician behavior, GP1_physician satisfaction, GP3_hospital culture

Source: the author

According to Table 5-45, the variance analysis of model 1 is conducted and the variance analysis result in each step during the regression fitting process is given. As we can see from the table, all sig values are smaller than 0.001 and each model has rejected the hypothesis whose regression coefficient is 0. Each regression equation presents significance, that is to say, when a new variable is introduced into the model, the model remains significant. Meanwhile, once a variable is introduced into the

model, it is not to be deleted.

Table 5-46 Model analysis of physician-patient relationship

Model	R	R ²	Adjusted R ²	Standard error of estimated value
1	.712 ^a	0.506	0.485	0.54965

a. Predictors: (Constant), GP1_physician pressure, GP3_physician behavior, GP1_physician satisfaction, GP3_hospital culture

Source: the author

According to Table 5-46, the values of R (multiple correlation coefficient), R² (coefficient of determination) and adjusted R² (adjusted coefficient of determination) are shown, among which, the value of adjusted R² is fairly large, showing the model fits well. Therefore, the regression equation we establish is very good.

Table 5-47 Model coefficient of physician-patient relationship

Model	Unstandardized coefficients		Standardized coefficient	t	Sig.	95% Confidence interval	
	Partial regression coefficient	Standard error	Beta			Value (min)	Value (max)
(Constant)	1.532	0.513		2.989	0.004		
GP3_physician behavior	0.209	0.08	0.229	2.617	0.01	0.685	1.459
GP3_hospital culture	0.555	0.088	0.555	6.337	0	0.686	1.459
GP1_physician satisfaction	0.039	0.036	0.079	1.087	0.28	0.987	1.013
GP1_physician pressure	-0.009	0.034	-0.019	-0.265	0.791	0.988	1.012

Source: the author

As per Table 5-47, four independent variables including physician behavior,

hospital culture, physician satisfaction, physician pressure are introduced model 1 and two questionnaires GP1, GP3 are involved.

Finally, we get the regression equation:

$$y_5 = 1.532 + 0.209x_1 + 0.555x_2 + 0.039x_3 - 0.009x_4 \quad (5.5)$$

Where, x_1, x_2, x_3, x_4 represent physician behavior, hospital culture, physician satisfaction, physician pressure, y_5 represents physician-patient relationship in GPQ.

Table 5-48 Descriptive statistics

	Mean	Std	Sample size
GP2_patient's intention to apply knowledge	6.2906	0.88892	224
GP1_absorptive ability	6.4004	0.85682	224
GP1_physician-patient relationship	5.7976	0.91809	224
GP1_patient pressure	4.4502	1.56942	224
GP1_patient satisfaction	4.7634	1.592	224
GP2_absorptive ability	6.2872	0.91129	224
GP2_atmosphere influence	6.2016	1.05168	224
GP2_internal motivation	6.3735	0.87051	224
GP2_external motivation	3.4085	1.99562	224
GP2_tacit knowledge	5.8307	1.11436	224
GP2_explicit knowledge	3.34	1.98618	224

Source: the author

Physician-patient relationship presented in PQ:

Table 5-49 Variance analysis of physician-patient relationship

Model	Sum of squares	df	Mean	F	Sig.
1 Regression	225.668	9	25.074	93.034	.000 ^b
Residual	113.467	421	.270		
Total	339.135	430			

a. Dependent Variable: P3_physician-patient relationship

b. Predictors: (Constant), P3_patient satisfaction, P1_patient trust, P3_patient pressure, P1_patient's disease condition, P3_patient behavior, P1_patient participation, P3_patient's symptom relief, P1_patient pressure, P3_hospital culture

Source: the author

According to Table 5-49, the variance analysis of model 1 is conducted and the variance analysis result in each step during the regression fitting process is given. As

we can see from the table, all sig values are smaller than 0.001 and each model has rejected the hypothesis whose regression coefficient is 0. Each regression equation presents significance, that is to say, when a new variable is introduced into the model, the model remains significant. Meanwhile, once a variable is introduced into the model, it is not to be deleted.

Table 5-50 Model analysis of physician-patient relationship

Model	R	R ²	Adjusted R ²	Standard error of estimated value
1	.640 ^a	.409	.401	.82463

a. Predictors: (Constant), P3_patient behavior, P1_patient pressure, P1_patient participation, P3_hospital culture, P1_patient trust, P1_patient’s disease condition

Source: the author

According to Table 5-50, the values of R (multiple correlation coefficient), R² (coefficient of determination) and adjusted R² (adjusted coefficient of determination) are shown, among which, the value of adjusted R² is fairly large, showing the model fits well. Therefore, the regression equation we establish is very good.

Table 5-51 Model coefficient of physician-patient relationship

Model	Unstandardized coefficients		Standardized coefficient	t	Sig.	95% Confidence interval	
	Partial regression coefficient	Standard error	Beta			Value (min)	Value (max)
(Constant)	.614	.237		2.591	.010		
P3_hospital culture	.522	.039	.509	13.557	.000	.565	1.771
P1_patient’s disease condition	.019	.019	.036	.978	.329	.593	1.686
P1_patient pressure	-.038	.019	-.071	-1.927	.055	.580	1.723
¹ P1_patient participation	.020	.024	.028	.849	.396	.720	1.389
P1_patient trust	-.010	.021	-.016	-.492	.623	.723	1.383
P3_patient behavior	.072	.032	.074	2.274	.023	.758	1.319
P3_Patient’s symptom relief	.129	.024	.185	5.330	.000	.661	1.512

P3_patient pressure	.022	.017	.040	1.285	.199	.836	1.197
P3_patient satisfaction	.180	.032	.216	5.540	.000	.523	1.912

a. Dependent Variable: P3_physician-patient relationship

Source: the author

As per Table 5-51, nine independent variables including hospital culture, patient's disease condition, P1_patient pressure, patient participation, patient trust, patient behavior, Patient's symptom relief, P3_patient pressure, patient satisfaction are introduced model 1 and two questionnaires P1, P3 are involved.

Finally, we get the regression equation:

$$y_6 = 0.614 + 0.522x_1 + 0.019x_2 - 0.038x_3 + 0.020x_4 - 0.010x_5 + 0.072x_6 + 0.129x_7 + 0.022x_8 + 0.180x_9 \quad (5.6)$$

Where, $x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9$ represent hospital culture, patient's disease condition, P1_patient pressure, patient participation, patient trust, patient behavior, Patient's symptom relief, P3_patient pressure, patient satisfaction, y_6 represents physician-patient relationship in PQ.

Chapter 6: Conclusions and Prospect

6.1 Discussion of research results

After an analysis and summary of patient's intention to apply knowledge after training, we get the first regression model:

$$y_1 = 0.853 + 0.193x_1 - 0.020x_2 - 0.024x_3 + 0.059x_4 + 0.177x_5 + 0.024x_6 + 0.064x_7 + 0.398x_8 \quad (6.1)$$

(where, $x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8$ represent atmosphere influence, patient pressure, patient trust, patient participation, patient satisfaction, patient's disease condition, physician-patient ability and patient absorptive ability; y_1 represents patient's intention to apply knowledge). According to regression model 1, the patient's intention to apply knowledge are positively correlated with atmosphere influence, patient participation, physician-patient relationship, patient absorptive ability and patient trust and negatively correlated with patient's disease condition and patient pressure. There are many reasons for this. First, when the patients are positively influenced by the surrounding atmosphere like doctor, family members, hospital environment and hospital culture, they will have more interest and in the training and enthusiasm for learning and further intend to apply the learned knowledge to practice; second, the interaction with doctors during training can help patient actively participate in the disease treatment thus providing more disease relief and improve physician-patient relationship. If not, the patient's disease condition will become worse. With both physical and psychological pressure, coupled with the lack of trust in the doctor, patient will throw doubt on the effect of training and thus have a faint chance to apply what they have learned in training to practice. Therefore, the medical staff should lay emphasis on the understanding and cooperation of patients.

After an analysis and summary of general practitioner's intention to apply knowledge after training, we get the second regression model:

$$y_2 = 0.334 + 0.063x_1 + 0.695x_2 - 0.101x_3 + 0.111x_4 \quad (6.2)$$

(where, x_1 , x_2 , x_3 , x_4 represent physician behavior, hospital culture, physician pressure, physician-patient relationship; y_2 represents physician's intention to apply knowledge). As per regression model 2, general practitioner's intention to apply knowledge is positively correlated with physician behavior, hospital culture and physician-patient relationship and negatively correlated with physician pressure. The strong interest in learning, good learning atmosphere in hospital, great support from leaders and harmonious physician-patient relationship will make GPs more willing to put energy and time to further study and meanwhile have higher tendency to apply what they have learn from training into clinical practice to improve the treatment effect. Conversely, when the GPs are put under great pressure in work, life and learning, they will have little enthusiasm for learning and are reluctant to apply their newly acquired knowledge into practice even if they have participated in the training.

After an analysis and summary of variable patient satisfaction based on patient questionnaire, we get the third regression model:

$$y_3 = 1.039 + 0.693x_1 - 0.037x_2 - 0.030x_3 - 0.073x_4 + 0.011x_5 + 0.196x_6 \quad (6.3)$$

(Where, x_1 , x_2 , x_3 , x_4 , x_5 , x_6 represent hospital culture, patient's disease condition, patient pressure, patient participation, patient trust, patient behavior; y_3 represents patient satisfaction). According to regression model 3, it is found patient satisfaction is affected by six variables, or specifically, which is positively correlated with hospital culture, patient trust and patient behavior and negatively correlated with patient's disease condition, patient pressure and patient participation. Good hospital culture can provide a favorable medical environment where the patients feel comfortable and ease. When patients place trust in physicians, they can truthfully tell their disease condition, have full confidence in treatment method and fully cooperate with physicians in order to achieve a good curative effect. In addition, the patient's good behavior also plays an important role. The hospital is a public place whose environment is affected and determined by all individuals. When each patient can behave in a civilized way, the good environment they create can make the treatment process more smooth and orderly and bring them a comfortable treatment experience. Conversely, patients suffering serious disease and great pressure are likely to give rise to mood of conflict

or place no trust in physicians during treatment thus reducing their satisfaction. The research results show patient satisfaction is negatively correlated with participation, which seems to be contrary to the conventional thinking. However, a careful analysis shows that is probably true. In the traditional medical model, the physicians always play a predominant role while the patients remain passive. But when the patients become active in treatment, it can actually to some extent weaken the role of physicians and disgruntle some physicians who like to play a commanding role. In this case, the patients can probably get a simple response from these physicians or even be treated with ignorance and indifference. The poor treatment experience will ultimately affect the satisfaction of patients.

After an analysis and summary of physician satisfaction based on general practitioner questionnaire, we get the fourth regression model:

$$y_4 = 0.334 + 0.063x_1 + 0.695x_2 - 0.11x_3 + 0.111x_4 \quad (6.4)$$

(Where, x_1 , x_2 , x_3 , x_4 represent physician behavior, hospital culture, physician pressure, physician-patient relationship; y_4 represents physician satisfaction). It is shown from the regression model 4 that physician satisfaction is affected by four variables. Specifically, it is positively correlated with physician behavior, hospital culture and physician-patient relationship and negatively correlated with physician pressure. That is to say, good physician behaviors, good organizational learning atmosphere and harmonious physician-patient relationship can boost the physician's satisfaction. Conversely, the great pressure in work, life and study will directly affect physician's satisfaction.

After an analysis and summary of physician-patient relationship based on general practitioner questionnaire, we get the fifth regression model:

$$y_5 = 1.532 + 0.209x_1 + 0.555x_2 + 0.039x_3 - 0.009x_4 \quad (6.5)$$

(where, x_1 , x_2 , x_3 , x_4 represent physician behavior, hospital culture, physician satisfaction, physician pressure, y_5 represents physician-patient relationship in GPQ). It is shown from regression model 5 that the physician-patient relationship from the perspective of physicians is positively correlated with physician behavior, hospital culture and physician satisfaction and negatively correlated with physician pressure.

To be specifically, the good physician behavior, favorable hospital culture and high physician satisfaction can harmonize the physician-patient satisfaction. In contrast, the great pressure from hospital, disease treatment, colleagues and salary can affect physician's emotion during treatment and further worsen the physician-patient relationship.

After an analysis and summary of physician-patient relationship based on patient questionnaire, we get the sixth regression model:

$$y_6 = 0.614 + 0.522x_1 + 0.019x_2 - 0.038x_3 + 0.020x_4 - 0.010x_5 + 0.072x_6 + 0.129x_7 + 0.022x_8 + 0.180x_9 \quad (6.6)$$

(Where, $x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9$ represent hospital culture, patient's disease condition, patient pressure, patient participation, patient trust, patient behavior, patient's symptom relief, patient pressure, patient satisfaction, y_6 represents physician-patient relationship in PQ). As per the model 6, the physician-patient relationship from the perspective of patient is correlated with 9 variables. The good hospital culture, good curative effect and high patient participation can promote the physician-patient relationship. Conversely, severe disease condition, great physical and psychological pressure and even no trust in physician can increase tension between physician and patient and further compromise therapeutic effect.

Physician-patient relationship constitutes an integral part of social relationship. With the progress of human civilization and medical technology, people are paying increasing attention to the physician-patient relationship based on social trust. We can say the patient's trust in physician reflects their respect for doctor's professional ethics and recognition of their medical skills. Trust plays a key role in maintaining harmonious physician-patient relationship, which is formed through effective exchange and communication between physician and patient. Most importantly, modern physician-patient relationship is not a simple relation between physician and patient, but more of a social interpersonal relation between social groups associated with patient and medical practitioners in a vast social network. The harmonious physician-patient relationship is significantly helpful to the social stability and development and establishment of harmonious society. With the social progress,

deepening reform of healthcare system and improvement of patients in education degree, knowledge level and legal consciousness, the traditional medical model characterized by “doctor playing active role and patient remaining passive” under the planned economy will be transformed into a new one (Zhang, 2015).

In his book *New Vision on Introduction to Sociology*, Zheng (2003) points out that social role is a set of connected behaviors, rights, obligations, beliefs, and norms as conceptualized by people in a social situation, defining a set of behaviors that are expected of someone who holds a particular status and meanwhile serving as the foundation for the social groups or organizations. When a sick person goes to the hospital to seek help from a doctor, and the doctor accepts his request, the physician-patient relationship is established. The medical staff and patients not only have their own rights but also undertake their respective obligations. All members of the society including medical personnel and patients have different expectations for doctors and patients. The medical staff can relieve patients from disease pain and restore their health, so people have high expectation on them. If they fail to meet the expectation, the patients will feel dissatisfied and various types of medical disputes may be caused, leading to tense physician-patient relationship. By contrast, people have no strict expectation of patients because they are generally regarded as a vulnerable group and hence their behaviors cannot be measured by the conventional standard. Plagued by the pains physically and psychologically, patients can always earn a great deal of public sympathy. But patients vary considerably. Some patients choose to place trust in doctors and actively cooperate with the treatment and maintain a harmonious physician-patient relationship; while the other patients do not trust doctors and always take a hostile attitude towards doctors and even launch a violent attack against them. The establishment of harmonious physician-patient relationship calls for the joint efforts of physicians and patients. Any problem in one side will undermine the physician-patient relationship.

Therefore, the harmonious physician-patient relationship is based on the mutual trust between the two parties. The physician-patient relationship is formed in a specific time and environment. In narrow sense, it refers specifically to the

relationship between a doctor and his patients; but in a broad sense, it is defined as an interactive social relationship between certain social group and medical group in a vast social system, which is affected by social politics, economy, culture, and history and system transformation. From the perspective of different levels of society, the physician-patient relationship can be defined from culture, law, morality, service and trusteeship, fully presenting how complex and diversified the relationship is. With the rapid development of medical technology, medical service has become more perfect, human-oriented and diversified, but the autonomy of medical staff has been increasingly constrained by the medical policies and medical institutions. When medical organization is operated in a commercial way, the physician-patient relationship has been affected and constrained by more factors, becoming a more complex social and interpersonal relationship than ever before (Zhang, 2015).

According to the previous analysis, it is shown that trust is acquired instead of coming naturally. In medical activities, the factors that affect the trust between physicians and patients include ability, communication and attitude. First, whether the medical organizations can provide professional medical service for patients largely depend on the skills, knowledge level and education degree of medical staff and medical equipment, which can directly determine the patient's satisfaction. Second, the information asymmetry during treatment can directly affect the mutual trust between doctors and patients. For doctors, the amount of truthful information they can provide for patients based on their understanding of patient's personal information and the knowledge about their disease condition also affect the patient's trust in them. Similarly, the openness of medical system, the availability of regulatory system and the efficacy of regulating mechanism in the event of medical disputes are the factors influencing the patient's trust in doctors. Third, whether the medical staff and medical organizations can put the patient's interest in the first place and preserve professional ethics can radically affect the mutual trust between the two parties, which is also the most direct and effect standard as to whether the high trust between physicians and patients can be established (Zhang, 2015).

6.2 Research theoretical significance

Through the discussion and analysis of the research results, we believe that this study has the following theoretical contribution and practical significance:

First, the application of TPB in management science in medical practice can be considered to be an innovation and exploration.

According to the previous literature review, it is found the clinical treatment of KOA has been massively discussed. The TCM and modern science have studied in depth the causes of KOA based on their own theory. TCM holds that KOA is mainly caused by the internal causes (for example, inherited abnormalities, infirmity with age, liver and kidney deficiency) and external causes (for example, blood stagnation and meridian blockage caused by cold invasion, dampness attack and repetitive stress injuries). While modern medicine asserts that Knee Osteoarthritis can be classified into either primary or secondary depending on the cause of disease. The primary KOA is mainly caused by age, chronic strain and heredity, which commonly occurs in elderly people especially overweight person; weight increases pressure on all the joints and narrows the gap between joints. When the natural cushioning between joints- cartilage - wears away, the bones of the joints rub more closely against one another with less of the shock-absorbing benefits of cartilage. The secondary KOA is mainly caused by joint injuries or joint diseases, such as external injury, congenital malformation, poor stability of knee joint, metabolism abnormality and joint infection. According to the causes of KOA, the TCM suits the remedy to the cases focusing on invigorating the liver and kidney, activating blood to resolve stasis and dispersing cold by warming the meridians. The specific methods include treatment with Chinese herbs, acupuncture and manipulation therapy and combined therapy. The primary goals of modern medicine in treating osteoarthritis of the knee are to relieve the pain, eliminate inflammation, improve knee joint function and reduce the chances of arthritis becoming worse. There are a number of treatments including non - drug therapy, drug therapy and surgery depending on the disease condition. In a word,

there is a variety of treatment methods from western oral medicine, application of advanced medical equipment, joint injection and various surgical treatments to external application of TCM herbs and widely used acupuncture and massage treatment.

Knowledge transfer refers to a process where knowledge transfers from one person to another one or from a certain organization to another one (Ren, 2005). The knowledge transfer can take place within organization in the form of individual to individual, individual to group or group to group; it can occur among enterprise alliance or different enterprises. Based on the literature review on knowledge transfer among enterprises and according to number of citations, research areas and importance, it is found that the research on enterprise knowledge transfer can be categorized into four types: intra-firm knowledge transfer, knowledge transfer between enterprise alliance and multinational companies, knowledge transfer between different independent enterprises as well as international M&A and internet-based knowledge transfer (Li & Liu, 2007). The application of management science in medical research can be seen as an innovation. Literature search shows transfer knowledge had been applied to medical research by foreign scholars quite early and some research results have been achieved, but it is still rarely used in China.

Due to its exploratory power and predictive power, the TPB theory has been widely used in many research fields including medical activities, including dietary behaviors such as dietary fiber and no caffeine consumption; drug addictive behaviors such as abstinence from smoke and drink, medicine and appetite; exercise behaviors such as jogging, hiking, bicycle riding and leisure activities; social and learning behaviors such as vote, blood donation, learning achievement and illegal behaviors; clinical and screening behaviors such as health examination, cancer screening and breast self-examination (Wang, Yang, Fu & Gu, 2011). However, TPB is rarely used in China but widely used in European and American countries,

Further, studying a problem based on the three aspects combined should be an original and innovative idea of the study.

Second, aside from the treatment of diseases, the medical staff should also show

humanistic care for patients. By following the treatment principles, the physicians should use effective combined therapy to provide KOA relief and relieve patient's pains and improve their life quality. Traditionally, physician always focus their efforts on the disease itself while ignoring other needs of patients like psychological feeling and satisfaction. The results of this study suggest that improvement of patient satisfaction and physician satisfaction can harmonize physician-patient relationship and accelerate the discovery from disease. By doing these, the spirit of harmonious society featuring human-oriented and humanistic care can be well presented.

Third, transform the traditional medical model and encourage the joint efforts by patient and physician in disease treatment. In traditional medical model, because the patient know little knowledge about his disease, the physician often exerts authoritarian control over the patient's treatment and pushes the patient to accept the treatment plan with which they are presented. In some cases, however, patients may throw doubt on physician's treatment plan and refuse to cooperate with physician, always leading to unsatisfactory curative effect. In this study, the GPs need to transfer the self-massage techniques to patients and use various training methods to ensure the patients to have a good command the skills. Therefore the knowledge transfer process requires a good physician-patient communication. When patients take initiatives to understand disease knowledge and follow the principles of early prevention, early detection and early treatment and meanwhile actively cooperate with the physician, the treatment can achieve best results. Currently, the shared decision making has been widely recognized as a new medical model by medical field, which has the following characteristics: able to improve medical level and meanwhile reduce the economic burden of patients; cause no serious problems; be considered to be very effective after multi-system evaluation; widely accepted by most physicians and broadly welcomed by patients. The shared decision-making is an approach in which physicians and patients communicate together choosing the best available treatment when faced with the task of making decisions (Yu & Shi, 2013).

Fourth, expand the application scope of TPB. The literature review shows although TPB has been widely used in various fields, there is still no TPB-based study

as to KOA treatment. Therefore, it is hoped that the original idea of applying TPB in the study of a specific disease in this paper may shed light on any further research!

6.3 Research practical significance

The purpose of theoretical research is to better guide the practice and the application of good research results will be greatly beneficial to the clinical practice. The practical significance of this study can be expounded from several points as follows:

On hospital management, it will better promote the sound development of the hospital. The development of hospital depends largely on the joint efforts of all medical staff. The good organizational learning atmosphere, employees' enthusiasm for continuing study, hospital leaders' great support in attitude and funds for further study, the improvement of hospital culture will produce more positive effect on the physician-patient relationship, patient satisfaction, physician satisfaction, hospital management and rapid development of hospital.

On physician management, it will promote the medical skills of physicians. In clinical practice, the physician should persistently increase the knowledge of a disease and pay close attention to the latest trends in medical diagnosis and treatment in order to provide better medical service and relieve patients from pains.

The knowledge transfer mentioned in this study refers specifically to: 1) the process in which the specialists transfer the KOA diagnosis method and self-massage techniques to GPs in community health service centers through knowledge sharing of specialists and knowledge absorption of GPs; 2) the process in which the GPs passes the self-massaging skills on the KOA patients during treatment, including knowledge sharing of general practitioner and the knowledge assimilation of patient. When the management theory is applied in the clinical practice, the medical model is changed and the knowledge is transferred between specialists and general practitioner, and between physician and patient, which will produce positive effect on KOA patient satisfaction and curative effect and therefore deserves further study. With China

entering aging society, the prevention and treatment of elderly diseases will face challenges and a large number of people determined to devote their efforts to this undertaking are needed to accomplish these daunting tasks. As a clinical staff, it is also my unshakable duty. The researcher contacted a lot of community health service centers and provided the training for a large number of GPs so that joint efforts are made to work out a simple, effective and cheap self-treatment method and meanwhile use, test and popularize it to benefit more people. This is why the studied is conducted.

On patient management, it can effectively improve the curative effect and patient satisfaction. We first try to analyze why most patients like to flock to the large third-level grade-A hospitals. First, medical resources are unevenly distributed. China is a country with a large population and vast territory. Before the founding of new China, the incessant wars such as fighting between warlords, Japanese war of aggression and the Civil War nearly destroyed all infrastructures across China and turned large swaths of cities to rubble. In the early days of the founding of new China, Chinese people worked hard with one heart and one mind and eventually achieved major breakthroughs in all fields, ushering China into the preliminary stages of economic development. Since the reform and opening up, China has made rapid development, maintained rapid economic growth every year and gradually accumulated enormous social wealth. Admittedly, China has achieved remarkable accomplishments. However, there is no denying the fact that the gap between the poor and rich in China continue to widen, which is reflected not just in individuals, but different regions across China or even different cities in one region. Just as historical materialism states, economic basis determine superstructure. The medical expenditure in a region is determined by the local economic development level. The hospitals in economically developed areas and undeveloped ones always vary considerably in hardware facilities such as infrastructure, medical equipment, supporting facilities and software facilities like talent recruitment, reserve of talents and continuing education. Therefore, it is not surprising that patients prefer to visiting medical experts or professors in large hospitals for good treatment effect. Most third-level grade-A

hospitals are public hospitals financed by government. However, with the healthcare system reform, these public hospitals have to take full responsibility for their own profits and losses. In order to maintain the normal operation and pay salary for large number of employees in medical, nursing, pharmacy, inspection and logistics departments, the hospitals have to receive more outpatient visits and treat more patients. Meanwhile, the outpatient treatment fee charged by experts or professors in large third-level grade-A hospital is relatively low. Except several national famous doctors or experts with State Council special allowance can charge more than 100 yuan for outpatient treatment, the registration fee for chief physician, vice-chief physician and attending physician (physician) is 9 yuan, 7 yuan and 4 yuan respectively. Therefore, most patients can afford such small expenses and even there are patients who visit several chief physicians in one day for treatment and diagnosis of the same disease. Although it often takes a patient several hours to wait for the treatment after registration, the treatment can be quickly completed on the same day. Therefore, the convenient and quick outpatient treatment procedure can explain why most patients have preference for large hospitals. Third, the hierarchical medical system fails to play an effective role as expected. As previously stated, although large hospitals are often flooded by patients, the grass-root community health service centers are rarely visited by patients. The possible causes may include: first, the professional level of GPs in grass-root hospitals is low and meanwhile their medical skills vary considerably; second; medical equipment is backward and obsolete; third, the treatment effect is far from satisfactory.

If this research can prove that knowledge transfer and transformation of the diagnosis and treatment model will improve patient satisfaction, physician satisfaction and physician-patient relationship while ensuring treatment effects, then the credibility of community health service centers can be increased, the cohesion of community health service centers be strengthened and the overall strength of community health service centers be enhanced. In other words, it is entirely a win-win research as it can not only bring benefits to patients, but also win recognition for community health service centers.

The research significance of this study can be further extended:

Currently, most countries in the world have joined the rank of aging society. In some developed industrial countries like Germany and America, the increasing massive medical bills with years never seem to be enough to cover the medical costs spent on elderly chronic diseases, putting the government under great pressure. When it comes to China, the largest developing country in the world, the situation does not allow us to be optimistic. Although China's economy has remained a rapid growth rate since the reform and opening-up, we must be fully aware that in the country with a large population of 1.37 billion, a huge number of rural residents still live a poor life. When China has already stepped into the aging society, Chinese government is facing more pressure in national medical expenditure. The purpose of the study is to explore a clinically specific and feasible therapeutic method for KOA treatment. Through early prevention and effective treatment, it is hoped that the therapeutic method can slow down the disease development, reduce the recurrence of the disease, improve patient's life quality and help more patients avoid expensive surgical treatment, at least defer the surgery until it has to be done. By all these efforts, it is hoped that the medical expenses, patient's family economic burden and the pressure on national healthcare expenditure can be remarkably reduced. Meanwhile, it is of great strategic significance to encourage common diseases to be treated in community health service centers, implement country-led hierarchical medical system and make full use of limited medical resources. Undeniably, in recent 5 years, the physician-patient relationship in China has become increasingly tense, which is caused by multi-faceted underlying reasons. We hope the good curative effect and full physician-patient communication in the process of knowledge transfer can play a positive role in improving the patient satisfaction, physician satisfaction and the physician-patient relationship.

6.4 Research limitations and research prospect

Although the findings in this study may have theoretical and practical

significance, the study is still greatly limited as a result of a variety of conditions, which are summarized as below:

1. The research data was collected from a limited sample. Constrained by the resources of research team, the questionnaire survey was only conducted among GPs in Yuexiu community health service centers and patients in Yuexiu District of Guangzhou, so it is not a random sampling of grass-root hospitals in many districts of a city or regions across China. Therefore, the research data is not highly representative.

2. Because of time limit and the screening of questionnaire survey results, many indicators have been excluded from this study. In the further research, these excluded indicators can be included in analysis in order to comprehensively and deeply explore the current situation of physician-patient relationship in China.

3. The purpose of the study is to explore the influence of knowledge transfer on the curative effect and patient satisfaction. But the physician satisfaction, patient satisfaction and physician-patient relationship in this study is separately analyzed and no comparative analysis is conducted.

4. In regression analysis, only factors with greater influence are deeply studied while factors with small influence are excluded from this study.

According to the analysis results of GPQ and PQ, it is found that the application of TPB in clinical practice has significantly improved the physician satisfaction, patient satisfaction and treatment effect. Based on the research conclusions and limitations, future studies may be conducted in the following several directions:

1. Research survey will be conducted among more community health service centers and patients in different districts in a city or regions across China to examine the scientificity and broad applicability of the research conclusions. Meanwhile, those that have not yet been studied can be further discussed in the future to make the study more comprehensive, objective, scientific and accurate

2. In this study, a lot of questionnaire items are not accepted by the statistical test, and therefore the doctor and patient questionnaire items can be further improved in order to make the study more scientific and accurate and reliable.

3. A comparative study of physician satisfaction, patient satisfaction and doctor-patient relationship can be conducted in the future research.

4. In this study, only the factors with greater influence are selected for analysis but factors with minor influence are excluded and meanwhile the reason for this does not be discussed. In the future, the factors with small influenced can be included in the analysis to improve the theoretical level of this study.

6.5 Conclusion

The study concludes that through knowledge transfer, the satisfaction of patients and GPs has been significantly improved; the KOA treatment has achieved satisfactory therapeutic effect; and the doctor-patient relationship has been noticeably improved. Therefore, in the current healthcare context, the government should energetically promote the medical reform and vigorously encourage the knowledge transfer between specialist and general practitioner, and between doctor and patient, which can, to a certain extent, enhance curative effect, improve the satisfaction of physicians and patients, and effectively relieve the tense doctor-patient relationship. It is a useful and effective innovative method that deserves to be further explored and popularized.

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Appendix I: Diagrams of step-by-step demonstration of self-massage techniques

Lesson 1: starting position



Use the base of your palm to lightly push your quadriceps for one minute



Lesson 2: massage around your kneecap



Step 2: massage back and forth 10 times around the edge of kneecap



Step3: push the tendon of quadriceps



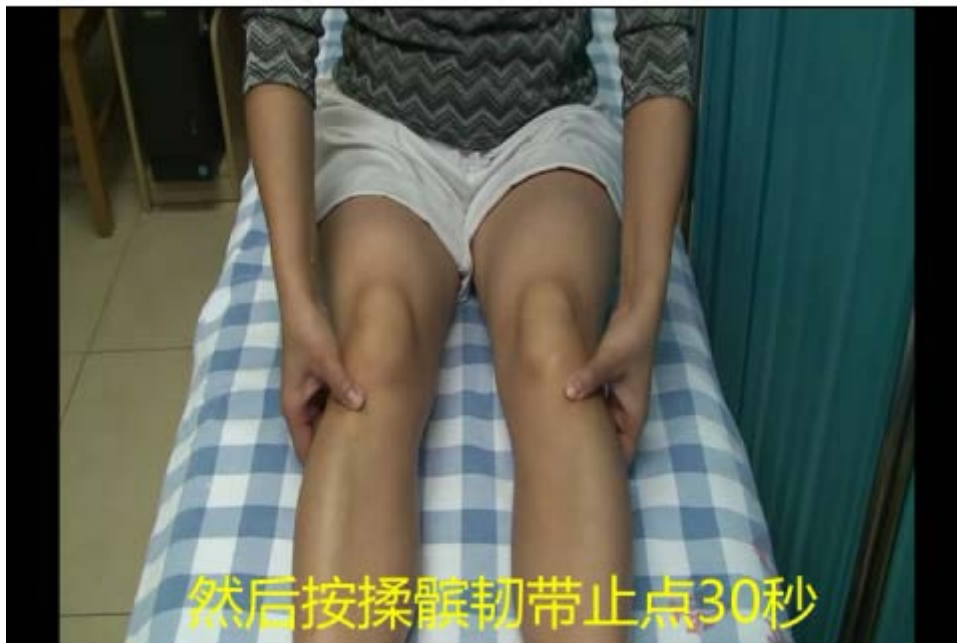
Step 3: Press and rub Liangqiu and Xuehai acupoints for 30 seconds



Step 4: push ligament of kneecap 10 times



Press and rub the insertion of kneecap's ligament for 30 seconds



Step 5: push the two sides of knee cap 10 times



Lesson 3: Massage the inside of knees



Knead the top and bottom insertions of medial accessory ligament for 30s



Press along the medial accessory ligament and push medial accessory ligament 10 times



Push knees 10 times along the inside of joint space



Lesson 4- massage the bottom part of the knee



Push bladder meridian at rear of knee joint (right side)



Press Weizhong acupoint for 30 seconds



Bend and stretch knee joints 10 times



Straight two legs and stretch your body



Bend your knees with your arms clasped around your knees for 30 seconds



Appendix II:

KOA knowledge training of general practitioner and results research

Questionnaire for GPs (before training)

Thank you very much for your participation in the KOA knowledge training of GPs and for your support for our important research. The data collected will be used for the purpose of research only. The data analysis is based on the overall results of all questionnaires and any individual or hospital's data will not be analyzed or evaluated. Please rest reassured to answer all questions according to your experience and true feelings.

Hospital/Clinic Name: _____

Doctor Name: _____

Telephone: _____

Please score the following statements using the scale of 1 to 7 to express your approval degree, with "1" representing "Extremely disagree", and "7" representing "Extremely agree" according to your own situation. There are no standard answers to all the questions in this questionnaire. Please answer all questions.

Extremely disagree<--> *Extremely agree*

a.	Our hospital/clinic encourages medical staff to participate in continuing professional training.	1	2	3	4	5	6	7
b.	Our hospital/clinic encourages all employees to learn from each other.	1	2	3	4	5	6	7
c.	In our hospital/clinic, employees like to share knowledge.	1	2	3	4	5	6	7
d.	In our hospital/clinic, we try to use new medical knowledge.	1	2	3	4	5	6	7
e.	In our hospital/clinic, we like to apply new knowledge into our daily medical activities.	1	2	3	4	5	6	7
f.	I can easily communicate with/get along with my patients	1	2	3	4	5	6	7
g.	I have remained a good relationship with my patients	1	2	3	4	5	6	7
h.	Every time I am visited by patients, I always encourage patients to ask questions.	1	2	3	4	5	6	7
i.	Every time I treat my patients, I always answer all of their questions.	1	2	3	4	5	6	7
j.	I am very familiar with the disease history of my patients	1	2	3	4	5	6	7
k.	I know my patient's medical needs	1	2	3	4	5	6	7
l.	If possible, my patients always want to visit me every time	1	2	3	4	5	6	7
m.	I feel a lot of pressure working as a doctor	1	2	3	4	5	6	7
n.	I feel too much pressure because my patients have too many demands	1	2	3	4	5	6	7
o.	I feel too much pressure because I need to treat and diagnose too many patients every day	1	2	3	4	5	6	7
p.	I feel a lot of stress because I do not have time to spend with my family and friends	1	2	3	4	5	6	7
q.	The administrative work always puts me under great pressure	1	2	3	4	5	6	7
r.	I am very satisfied with my time spent on treatment.	1	2	3	4	5	6	7
s.	I feel I have spent enough time on self-treatment guidance for patients.	1	2	3	4	5	6	7
t.	I am troubled by my waiting for patients.	1	2	3	4	5	6	7
u.	My treatment time is worth every penny of the patient's registration fee.	1	2	3	4	5	6	7
v.	My professional level and experience is worth every penny of the patient's registration fee.	1	2	3	4	5	6	7
w.	I am satisfied with my salary as a general practitioner	1	2	3	4	5	6	7
x.	I am very satisfied with my treatment quality.	1	2	3	4	5	6	7
y.	I am very satisfied with the disease relief of my patients as a result of my treatment.	1	2	3	4	5	6	7
z.	I am very satisfied with my performance in prescribing medicine according to disease	1	2	3	4	5	6	7
aa.	I am very satisfied with my accurate disease diagnosis.	1	2	3	4	5	6	7

----- Please turn to the opposite side to complete the questionnaire

Please provide your personal information so that we can know your actual situation.

1. Gender (Please tick among the options): ___ Male ___ Female
2. Age: _____ years old
3. Occupation (Please tick among the options):
___General Practitioner ___ Acupuncture /massage technician
___Nurse ___Others (Please specify): _____
4. Technical title (Please tick among the options):
___Primary ___Intermediate ___Vice senior ___Senior ___Ungraded
5. The highest degree and the year of obtaining it (Please tick among the options):
___High school ___Technical secondary school ___College ___Bachelor ___Master
___Doctor ___Others (please specify): _____
6. The year of obtaining the highest degree (for example: 2005): _____
7. Working years in medical field: _____ years
8. Working years in the current hospital: _____ years
9. How many _____ minutes do you spend on each patient
10. How do you use the time spent on the ward round (total 100%):
 - 1) The time of your asking patient questions and actively communicating with patients accounts for _____% of the total treatment time.
 - 2) The time of the patient's asking your questions and actively communicating with you accounts for _____% of the total treatment time.
 - 3) The time of using the computerized physician order entry system accounts for _____% of the total treatment time.
 - 4) The time of your doing other things accounts for _____% of the total treatment time.
11. Your first time of using the computer in work (for example, 2010): _____
12. In the past two years, how many times have you participated in the similar skill training? _____
13. In the past two years, how many hours have you spent on the similar skill training?
_____ hours

Thank you very much for your support and cooperation!

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KOA knowledge training of general practitioner and results research

Questionnaire for GPs (after training)

Thank you very much for your participation in the KOA knowledge training of GPs and for your support for our important research. The data collected will be used for the purpose of research only. The data analysis is based on the overall results of all questionnaires and any individual or hospital's data will not be analyzed or evaluated. Please rest reassured to answer all questions according to your experience and true feelings.

Hospital/Clinic Name: _____

Doctor Name: _____

Telephone: _____

Please score the following statements using the scale of 1 to 7 to express your approval degree, with "1" representing "Extremely disagree", and "7" representing "Extremely agree" according to your own situation. There are no standard answers to all the questions in this questionnaire. Please answer all questions.

Extremely disagree<--> Extremely agree

a.	I now understand all the knowledge about knee arthritis transferred from the specialist	1	2	3	4	5	6	7
b.	I am now well aware of how the knowledge about knee arthritis transferred from the specialist can reduce patient's symptom.	1	2	3	4	5	6	7
c.	I now clearly know how the patients should apply the self-treatment knowledge to provide KOA relief.	1	2	3	4	5	6	7
d.	My leader encourages me to teach the patients KOA self-massage techniques	1	2	3	4	5	6	7
e.	When my colleagues teach patients the self-treatment skills, I also feel obliged to do this.	1	2	3	4	5	6	7
f.	My patients want me to teach them the self-massage techniques.	1	2	3	4	5	6	7
g.	The occupational skills certification regulations require me to teach patients the self-massage techniques for KOA treatment	1	2	3	4	5	6	7
h.	It is feasible to discuss the KOA self-treatment method with patients during treatment.	1	2	3	4	5	6	7
i.	It is not very difficult to teach patients the KOA self-treatment method	1	2	3	4	5	6	7
j.	Patients want to treat themselves and therefore it is easy to teach them.	1	2	3	4	5	6	7
k.	Patients pay great attention to the preventive health management and therefore it is easy to teach them.	1	2	3	4	5	6	7
l.	I intend to follow the recommendations about the KOA treatment.	1	2	3	4	5	6	7
m.	I intend to apply what I have learned from this training to change my patients' living habits and lifestyle such as diet and exercise.	1	2	3	4	5	6	7
n.	I intend to apply what I have learned from this training to my daily medical activities.	1	2	3	4	5	6	7
o.	I am intent on integrating what I have learned from this training with my existing knowledge	1	2	3	4	5	6	7
p.	I can clearly explain all the knowledge of arthritis the patients need to know	1	2	3	4	5	6	7
q.	I have clear idea of how to demonstrate the KOA self-massage techniques.	1	2	3	4	5	6	7
r.	I can clearly explain how to prevent the development of joint disease.	1	2	3	4	5	6	7
s.	I can clearly explain the importance of changing unhealthy habits in diet and exercise.	1	2	3	4	5	6	7
t.	I would like to share my knowledge of Knee Osteoarthritis.	1	2	3	4	5	6	7
u.	Sharing my knowledge of Knee Osteoarthritis with patients also gives me an opportunity to enrich my own experience.	1	2	3	4	5	6	7
v.	Sharing my knowledge of arthritis makes me more like what I am doing.	1	2	3	4	5	6	7
w.	I would like to share some knowledge of arthritis with patients because I think it is very important for them.	1	2	3	4	5	6	7

----- *Please turn to the opposite side to complete the questionnaire*

Please score the following statements using the scale of 1 to 7 to express your approval degree, with “1” representing “Extremely disagree”, and “7” representing “Extremely agree” according to your own situation. There are no standard answers to all the questions in this questionnaire. Please answer all questions.

Extremely disagree <--> Extremely agree

x.	Sharing my knowledge of arthritis with patients can improve our relationship.	1	2	3	4	5	6	7
y.	Sharing my knowledge of arthritis with patients can make me progress in work.	1	2	3	4	5	6	7
z.	Sharing my knowledge of arthritis with patients can win the attention and recognition from others.	1	2	3	4	5	6	7
aa	I share my knowledge of arthritis with patients because of economic benefits	1	2	3	4	5	6	7
bb	Sharing my knowledge of arthritis with patients is helpful to my promotion.	1	2	3	4	5	6	7
cc	If I do not share arthritis knowledge with my patients, I will be punished by my supervisor.	1	2	3	4	5	6	7
dd	The most useful KOA knowledge I have learned is from the demonstration of specialists	1	2	3	4	5	6	7
ee	The most useful KOA knowledge I have learned is from the specialist’s special experience sharing.	1	2	3	4	5	6	7
ff	The most useful KOA knowledge I have learned is from the discussions and ideas exchanges with specialists.	1	2	3	4	5	6	7
gg	The most useful KOA knowledge I have learned is from the specialist sharing anecdotal stories with me.	1	2	3	4	5	6	7
hh	I can actually learn similar KOA knowledge and skills through reading KOA-related books and materials, so there is no need to learn from specialist.	1	2	3	4	5	6	7
ii.	The most useful KOA knowledge and skills I have learned is from the multimedia materials like photos and videos instead of from specialist.	1	2	3	4	5	6	7
jj.	I can actually learn the same KOA knowledge and skills through reading the training books and materials, so there is no need to learn from specialists.	1	2	3	4	5	6	7
kk	The most useful KOA knowledge and skills I have learned is from the training books and materials instead of from the interactive-communication based training.	1	2	3	4	5	6	7

Thank you very much for your support and cooperation!

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KOA knowledge training of general practitioner and results research

Questionnaire for GPs (three months after training)

Thank you very much for your participation in the KOA knowledge training of GPs and for your support for our important research. The data collected will be used for the purpose of research only. The data analysis is based on the overall results of all questionnaires and any individual or hospital's data will not be analyzed or evaluated. Please rest reassured to answer all questions according to your experience and true feelings.

Hospital/Clinic Name: _____

Doctor Name: _____

Telephone _____

Questionnaire filling date: _____

Please score the following statements using the scale of 1 to 7 to express your approval degree, with "1" representing "Extremely disagree", and "7" representing "Extremely agree" according to your own situation. There are no standard answers to all the questions in this questionnaire. Please answer all questions.

Extremely disagree<--> Extremely agree

a.	I now still remember the KOA knowledge I learnt from the training.	1	2	3	4	5	6	7
b.	I have spent a considerable time teaching my patients more KOA knowledge since the training.	1	2	3	4	5	6	7
c.	I have spent a considerable time demonstrating the self-massage techniques before patients.	1	2	3	4	5	6	7
d.	I have persistently discussed with my patients about their condition of KOA disease since the training.	1	2	3	4	5	6	7
e.	I have found a new way to provide KOA relief based on what I have learned since the training.	1	2	3	4	5	6	7
f.	I have effectively taught patients how to change their living habits hand lifestyle since the training.	1	2	3	4	5	6	7
g.	I have effectively taught patients how to incorporate the KOA self-treatment techniques into their daily life since the training.	1	2	3	4	5	6	7
h.	I have taught patients to take preventative measures against diseases since the training.	1	2	3	4	5	6	7
i.	I have effectively taught patients how to use KOA knowledge to provide relief and thus improve their life quality.	1	2	3	4	5	6	7
j.	Compared with the disease condition three months ago, the KOA condition of my patients has been improved.	1	2	3	4	5	6	7
k.	Compared with the disease condition three months ago, the complications caused by arthritis have been alleviated.	1	2	3	4	5	6	7
l.	Compared with the disease condition three months ago, my patients become less dependent on drugs	1	2	3	4	5	6	7
m.	Compared with the disease condition three months ago, my patient has been relieved of the pain caused by arthritis.	1	2	3	4	5	6	7
n.	Our hospital/clinic creates conditions to make it easier for patients to see a doctor.	1	2	3	4	5	6	7
o.	Our hospital/clinic encourages patients to take control of their own health.	1	2	3	4	5	6	7
p.	Our hospital/clinic encourages patients to take preventive measures against diseases.	1	2	3	4	5	6	7
q.	Our hospital/clinic encourages patients to make joint decisions with doctors	1	2	3	4	5	6	7
r.	Our hospital/clinic encourages doctors to do their best to provide the information patients need	1	2	3	4	5	6	7
s.	Our hospital/clinic encourages doctors to involve patients in a joint decision-making process.	1	2	3	4	5	6	7
t.	I can easily get along well with/communicate with my patients.	1	2	3	4	5	6	7
u.	I have maintained a good relationship with my patients.	1	2	3	4	5	6	7

----- *Please turn to the opposite side to complete the questionnaire*

Please score the following statements using the scale of 1 to 7 to express your approval degree, with “1” representing “Extremely disagree”, and “7” representing “Extremely agree” according to your own situation. There are no standard answers to all the questions in this questionnaire. Please answer all questions.

Extremely disagree <--> *Extremely agree*

v.	Every time I am visited by patients, I always encourage patients to ask questions.	1	2	3	4	5	6	7
w.	Every time I am visited by patients, I always answer all questions of my patients.	1	2	3	4	5	6	7
x.	I am very familiar with the disease history of my patients	1	2	3	4	5	6	7
y.	I know my patient's medical needs	1	2	3	4	5	6	7
z.	If possible, my patients always want to visit me every time	1	2	3	4	5	6	7
aa.	I am satisfied my treatment time spent on patients.	1	2	3	4	5	6	7
bb.	I am satisfied with the time spent on discussing KOA self-treatment method with my patients.	1	2	3	4	5	6	7
cc.	I am troubled by my waiting for patients.	1	2	3	4	5	6	7
dd.	My treatment time is worth every penny of the patient’s registration fee.	1	2	3	4	5	6	7
ee.	My professional level and experience is worth every penny of the patient’s registration fee.	1	2	3	4	5	6	7
ff.	I am satisfied with my salary as a general practitioner	1	2	3	4	5	6	7
gg.	I am very satisfied with my treatment quality.	1	2	3	4	5	6	7
hh.	I am very satisfied with the disease relief of my patients as a result of my treatment.	1	2	3	4	5	6	7
ii.	I am very satisfied with my performance in prescribing medicine according to disease	1	2	3	4	5	6	7
jj.	I am very satisfied with my accurate disease diagnosis.	1	2	3	4	5	6	7
kk.	I feel a lot of pressure working as a doctor	1	2	3	4	5	6	7
ll.	I feel too much pressure because my patients have too many demands	1	2	3	4	5	6	7
mm.	I feel too much pressure because I need to treat and diagnose too many patients every day	1	2	3	4	5	6	7
nn.	I feel a lot of stress because I do not have time to spend with my family and friends	1	2	3	4	5	6	7
oo.	The administrative work always puts me under great pressure	1	2	3	4	5	6	7

Thank you very much for your support and cooperation!

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KOA knowledge training of general practitioner and results research

Questionnaire for patients (before training)

Thank you very much for your participation in the KOA knowledge training of GPs and for your support for our important research. The data collected will be used for the purpose of research only. The data analysis is based on the overall results of all questionnaires and any individual or hospital's data will not be analyzed or evaluated. Please rest reassured to answer all questions according to your experience and true feelings.

Hospital/Clinic Name: _____

Name of general practitioner in charge of you: _____

Patient Number: _____ Patient Name: _____

Telephone: _____

Questionnaire filling date: _____

Please score the following statements using the scale of 1 to 7 to express your approval degree, with "1" representing "Extremely disagree", and "7" representing "Extremely agree" according to your own situation. There are no standard answers to all the questions in this questionnaire. Please answer all questions.

Extremely disagree<--> *Extremely agree*

a.	I suffer joint hurt every day	1	2	3	4	5	6	7
b.	I have severe pain in my knee joint	1	2	3	4	5	6	7
c.	The pain in my joints makes it hard for me to perform daily activities	1	2	3	4	5	6	7
d.	I have to depend on medicine to relieve my joint pain	1	2	3	4	5	6	7
e.	I feel a lot of pressure on my health	1	2	3	4	5	6	7
f.	The current treatment puts me under great psychological pressure.	1	2	3	4	5	6	7
g.	The attitude of my physician during the treatment process puts me under great psychological pressure.	1	2	3	4	5	6	7
h.	The uncertainty of the treatment result puts a huge pressure on me	1	2	3	4	5	6	7
i.	My resident physician does not make it clear what I should do after treatment process, which puts me under great psychological pressure.	1	2	3	4	5	6	7
j.	I always pay close attention to the medical knowledge related to my health	1	2	3	4	5	6	7
k.	I often use my new medical knowledge to deepen my understanding of my health	1	2	3	4	5	6	7
l.	I always learn new medical knowledge related to my health	1	2	3	4	5	6	7
m.	I will quickly use my new medical knowledge to deal with my health	1	2	3	4	5	6	7
n.	I would like to learn more about arthritis.	1	2	3	4	5	6	7
o.	Understanding new knowledge about arthritis helps me to adopt new ways to improve health	1	2	3	4	5	6	7
p.	I want to learn about arthritis because I should know about it	1	2	3	4	5	6	7
q.	Understanding new knowledge of arthritis can improve the relationship between me and my physician	1	2	3	4	5	6	7
r.	Understanding new knowledge of arthritis can win the attention and recognition from others	1	2	3	4	5	6	7
s.	Understanding new knowledge of arthritis can help me save money in medicine	1	2	3	4	5	6	7
t.	Understanding new knowledge of arthritis can help me save money in health insurance	1	2	3	4	5	6	7
u.	Knowing arthritis knowledge can help me reduce the trouble of seeing a doctor	1	2	3	4	5	6	7
v.	I have no other choice, because the doctor will tell me about arthritis	1	2	3	4	5	6	7

----- Please turn to the opposite side to complete the questionnaire

Please provide your personal information so that we can know your actual situation.

14. Gender (please tick among the options): Male Female
15. Age: _____ years old
16. Occupation (please tick among the options):
 Government employee Enterprise's employee Self-employed
 Farmer Others (please specify): _____
17. Technical title (Please tick among the options): Primary Intermediate
 Vice senior Senior Ungraded
18. The highest degree and the year of obtaining it(Please tick among the options):
 High school Technical secondary school College
 Bachelor Master Doctor Others (please specify): _____
19. The year of obtaining the highest degree (For example 2005): _____
20. When did you begin to see a doctor in the hospital/clinic (For example 2005)
21. How many times did you visit the hospital/clinic in the past: _____
22. How many years do you have suffered from Osteoarthritis? _____ years,
(please fill 0 if you have no Osteoarthritis)
23. Except Osteoarthritis, do you be affected by other diseases? (please tick the options)
 High blood pressure Stomach trouble Hepatitis Diabetes
 Kidney disease
 Others (please specify): _____
24. Did you ever taught the KOA self-massage techniques by doctors before?
 Yes No
If any, please give the time (for example, June 2013) _____, _____
25. The average hours you spend in this hospital/clinic for each visit _____ hours
The average treatment time spent on you _____ minutes

Thank you very much for your support and cooperation!

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KOA knowledge training of general practitioner and results research

Questionnaire for patients (after training)

Thank you very much for your participation in the KOA knowledge training of GPs and for your support for our important research. The data collected will be used for the purpose of research only. The data analysis is based on the overall results of all questionnaires and any individual or hospital's data will not be analyzed or evaluated. Please rest reassured to answer all questions according to your experience and true feelings.

Hospital/Clinic Name: _____

Name of general practitioner in charge of you: _____

Patient Number: _____ Patient Name: _____

Telephone: _____

Questionnaire filling date: _____

Please score the following statements using the scale of 1 to 7 to express your approval degree, with "1" representing "Extremely disagree", and "7" representing "Extremely agree" according to your own situation. There are no standard answers to all the questions in this questionnaire. Please answer all questions.

Extremely disagree <--> *Extremely agree*

a.	I can easily get along well with/communicate with my doctor.	1	2	3	4	5	6	7
b.	I have maintained a good relationship with my doctor	1	2	3	4	5	6	7
c.	Every time I see a doctor, the doctor always encourages me to ask questions	1	2	3	4	5	6	7
d.	Every time I see a doctor, the doctor will answer all my questions	1	2	3	4	5	6	7
e.	The doctor is very familiar with my disease history	1	2	3	4	5	6	7
f.	The doctor knows my medical needs	1	2	3	4	5	6	7
g.	If possible, I always hope to see the same doctor every time	1	2	3	4	5	6	7
h.	I believe my doctor has the spirit of professionalism and dedication in work.	1	2	3	4	5	6	7
i.	I believe the resident physician has solid medical experience and achievement.	1	2	3	4	5	6	7
j.	I throw no doubt on the doctor's diagnosis due to his/her educational background	1	2	3	4	5	6	7
k.	I am fully confident that the doctor has the ability to treat my disease.	1	2	3	4	5	6	7
l.	I think doctors care about my overall physical and mental health.	1	2	3	4	5	6	7
m.	I believe my doctor will not take advantage of my little knowledge about the disease to pursue her/his personal interests.	1	2	3	4	5	6	7
n.	I can tell the doctor my concerns without any scruple.	1	2	3	4	5	6	7
o.	I believe the doctor will do her/his best to avoid side effects of the treatment.	1	2	3	4	5	6	7
p.	I am very satisfied with the treatment time	1	2	3	4	5	6	7
q.	I am very satisfied with the time the doctor has spent on explaining to me knowledge about arthritis.	1	2	3	4	5	6	7
r.	I am satisfied with the total time spent here for treatment	1	2	3	4	5	6	7
s.	The registration fee I bear is reasonable	1	2	3	4	5	6	7
t.	The cost of the medicine I bear is reasonable	1	2	3	4	5	6	7
u.	The cost spent on my medical insurance is reasonable	1	2	3	4	5	6	7
v.	The doctor's treatment is as good as I had expected	1	2	3	4	5	6	7
w.	I think the doctor's treatment can help improve my disease condition	1	2	3	4	5	6	7
x.	I am satisfied with the doctor's decision	1	2	3	4	5	6	7
y.	If I had to do it all over again, I would choose the same treatment method	1	2	3	4	5	6	7
z.	I now know all the arthritis knowledge that the doctor taught me	1	2	3	4	5	6	7
aa.	I am clearly know how to use the knowledge the doctor has taught me to reduce my symptom of arthritis	1	2	3	4	5	6	7

----- Please turn to the opposite side to complete the questionnaire

Please score the following statements using the scale of 1 to 7 to express your approval degree, with “1” representing “Extremely disagree”, and “7” representing “Extremely agree” according to your own situation. There are no standard answers to all the questions in this questionnaire. Please answer all questions.

Extremely disagree <--> Extremely agree

bb.	I am now well aware of how to apply the KOA self-treatment method demonstrated by the doctor.	1	2	3	4	5	6	7
cc.	I clearly know how to improve my disease condition through changing my living habits and lifestyle such as diet and exercise.	1	2	3	4	5	6	7
dd.	The KOA knowledge acquired from this hospital visit is very helpful to me.	1	2	3	4	5	6	7
ee.	The KOA knowledge acquired from this hospital visit inspires me to look at my illness in different ways	1	2	3	4	5	6	7
ff.	The KOA knowledge acquired from this hospital visit will help improve my disease condition	1	2	3	4	5	6	7
gg.	The doctor can clearly explain the arthritis knowledge I need to know.	1	2	3	4	5	6	7
hh.	The doctor can clearly demonstrate for me the self-treatment method of arthritis.	1	2	3	4	5	6	7
ii.	The doctor can clearly explain how to prevent the joint disease becoming worse.	1	2	3	4	5	6	7
jj.	The doctor can clearly explain the importance of getting rid of bad habits (for example, unhealthy food and lack of exercise).	1	2	3	4	5	6	7
kk.	My doctor encourages me to apply the self-treatment method of arthritis.	1	2	3	4	5	6	7
ll.	My family members think I should use self-treatment techniques to reduce my symptom.	1	2	3	4	5	6	7
mm.	My friends think I should use self-treatment techniques to reduce my symptom.	1	2	3	4	5	6	7
nn.	Other patients use self-treatment techniques to provide pain relief, so I think I should do the same.	1	2	3	4	5	6	7
oo.	Learning self-treatment of arthritis take less time.	1	2	3	4	5	6	7
pp.	Self-treatment method of arthritis is easy to learn.	1	2	3	4	5	6	7
qq.	Self-treatment method of arthritis can be easily used on a daily basis.	1	2	3	4	5	6	7
rr.	The training materials concerning self-treatment method of arthritis offered by my doctor is easy to understand.	1	2	3	4	5	6	7
ss.	I am going to follow the doctor's instructions on self-treatment of arthritis.	1	2	3	4	5	6	7
tt.	I am going to follow my doctor's advice to change my living habit and lifestyle such as diet and exercise.	1	2	3	4	5	6	7
uu.	I intend to use the self-treatment techniques taught by my	1	2	3	4	5	6	7

	doctor to treat my KOA every day.								
vv.	I intend to integrate the KOA knowledge the doctor taught me into my current knowledge	1	2	3	4	5	6	7	
ww.	The most useful KOA knowledge I have learned is from the demonstration of my doctor.	1	2	3	4	5	6	7	
xx.	The most useful KOA knowledge I have learned is from the doctor's special experience sharing.	1	2	3	4	5	6	7	
yy.	The most useful KOA knowledge I have learned is from the discussions and ideas exchanges with my doctor.	1	2	3	4	5	6	7	
zz.	The most useful KOA knowledge I have learned is from the doctor's sharing specific examples with me.	1	2	3	4	5	6	7	
aaa.	I can actually learn similar KOA knowledge and skills through reading KOA-related books and materials, so there is no need to learn from my doctor.	1	2	3	4	5	6	7	
bbb.	The most useful KOA knowledge and skills I have learned is from the multimedia materials like photos and videos instead of from my doctor	1	2	3	4	5	6	7	
ccc.	I can actually learn the same KOA knowledge and skills through reading the training books and materials, so there is no need to learn from my doctor.	1	2	3	4	5	6	7	
ddd.	The most useful KOA knowledge and skills I have learned is from the training books and materials instead of from the interactive-communication with my doctor.	1	2	3	4	5	6	7	

Thank you very much for your support and cooperation!

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KOA knowledge training of general practitioner and results research

Questionnaire for patients (three months after training)

Thank you very much for your participation in the KOA knowledge training of GPs and for your support for our important research. The data collected will be used for the purpose of research only. The data analysis is based on the overall results of all questionnaires and any individual or hospital's data will not be analyzed or evaluated. Please rest reassured to answer all questions according to your experience and true feelings.

Hospital/Clinic Name: _____

Name of general practitioner in charge of you: _____

Patient Number: _____ Patient Name: _____

Telephone: _____

Questionnaire filling date: _____

Please score the following statements using the scale of 1 to 7 to express your approval degree, with "1" representing "Extremely disagree", and "7" representing "Extremely agree" according to your own situation. There are no standard answers to all the questions in this questionnaire. Please answer all questions.

Extremely disagree <--> *Extremely agree*

a.	I suffer joint hurt every day.	1	2	3	4	5	6	7
b.	I have severe pain in my knee joint.	1	2	3	4	5	6	7
c.	The pain in my joints makes it hard for me to perform daily activities.	1	2	3	4	5	6	7
d.	I have to depend on medicine to relieve my joint pain.	1	2	3	4	5	6	7
e.	I feel a lot of pressure on my health.	1	2	3	4	5	6	7
f.	The current treatment puts me under great psychological pressure.	1	2	3	4	5	6	7
g.	The attitude of my physician during the treatment process puts me under great psychological pressure.	1	2	3	4	5	6	7
h.	The uncertainty of the treatment result puts a huge pressure on me.	1	2	3	4	5	6	7
i.	My resident physician does not make it clear what I should do after treatment process, which puts me under great psychological pressure.	1	2	3	4	5	6	7
j.	From the first time the doctor taught me KOA knowledge, I still remember what I have learned from a doctor.	1	2	3	4	5	6	7
k.	From the first time the doctor taught me, I have followed the doctor's instructions on self-treatment of arthritis.	1	2	3	4	5	6	7
l.	From the first time the doctor taught me, I have been using the techniques I learned from the doctor to treat my KOA.	1	2	3	4	5	6	7
m.	From the first time the doctor taught me, using KOA self-treatment techniques taught by doctors has become part of my daily life.	1	2	3	4	5	6	7
n.	From the first time the doctor taught me, I have found a new way to treat my disease based on the KOA knowledge I learnt from my doctor.	1	2	3	4	5	6	7
o.	From the first time the doctor taught me, I have effectively followed the doctor's advice to change my living habit and lifestyle such as diet and exercise.	1	2	3	4	5	6	7
p.	From the first time the doctor taught me, I have taken a preventive measure to protect my health with a new perspective.	1	2	3	4	5	6	7
q.	From the first time the doctor taught me, I have effectively used the KOA knowledge I have learned from the doctor to improve my quality of life.	1	2	3	4	5	6	7

----- Please turn to the opposite side to complete the questionnaire

Please score the following statements using the scale of 1 to 7 to express your approval degree, with “1” representing “Extremely disagree”, and “7” representing “Extremely agree” according to your own situation. There are no standard answers to all the questions in this questionnaire. Please answer all questions.

Extremely disagree <--> *Extremely agree*

r.	Compared to three months ago, the pain caused by arthritis has eased.	1	2	3	4	5	6	7
s.	Compared to three months ago, the complications caused by arthritis have eased.	1	2	3	4	5	6	7
t.	Compared to three months ago, I become less dependent on drugs.	1	2	3	4	5	6	7
u.	I am satisfied with my treatment time.	1	2	3	4	5	6	7
v.	I am satisfied with the time my doctor spent on explaining the arthritis knowledge.	1	2	3	4	5	6	7
w.	I am satisfied with the total time spent here for treatment.	1	2	3	4	5	6	7
x.	The registration fee I bear is reasonable.	1	2	3	4	5	6	7
y.	The cost of the medicine I bear is reasonable.	1	2	3	4	5	6	7
z.	The cost spent on my medical insurance is reasonable.	1	2	3	4	5	6	7
aa.	The doctor's treatment is as good as I had expected.	1	2	3	4	5	6	7
bb.	I think the doctor's treatment can help improve my disease condition.	1	2	3	4	5	6	7
cc.	I am satisfied with the doctor's decision.	1	2	3	4	5	6	7
dd.	If I had to do it all over again, I would choose the same treatment method.	1	2	3	4	5	6	7
ee.	My doctor can easily get along well with/communicate with me.	1	2	3	4	5	6	7
ff.	I have maintained a good relationship with my doctor.	1	2	3	4	5	6	7
gg.	Every time I see a doctor, the doctor always encourages me to ask questions.	1	2	3	4	5	6	7
hh.	Every time I see a doctor, the doctor will answer all my questions.	1	2	3	4	5	6	7
ii.	The doctor is very familiar with my disease history.	1	2	3	4	5	6	7
jj.	The doctor knows my medical needs.	1	2	3	4	5	6	7
kk.	If possible, I always hope to see the same doctor every time.	1	2	3	4	5	6	7
ll.	The hospital/clinic creates conditions to make it easier for patients to see a doctor.	1	2	3	4	5	6	7
mm.	The hospital/clinic encourages patients to take control of their own health.	1	2	3	4	5	6	7
nn.	The hospital/clinic encourages patients to take preventive measures against diseases.	1	2	3	4	5	6	7
oo.	The hospital/clinic encourages patients to make joint decisions with doctors.	1	2	3	4	5	6	7
pp.	The hospital/clinic encourages doctors to do their best to provide the information patients need.	1	2	3	4	5	6	7
qq.	The hospital/clinic encourages physicians to involve patients in a joint decision-making process.	1	2	3	4	5	6	7

Thank you very much for your support and cooperation!

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Appendix III:

Field training and promotion of KOA self-massage techniques

1. Activity time:

From December 1 2015 to April 20 2016

2. Participants:

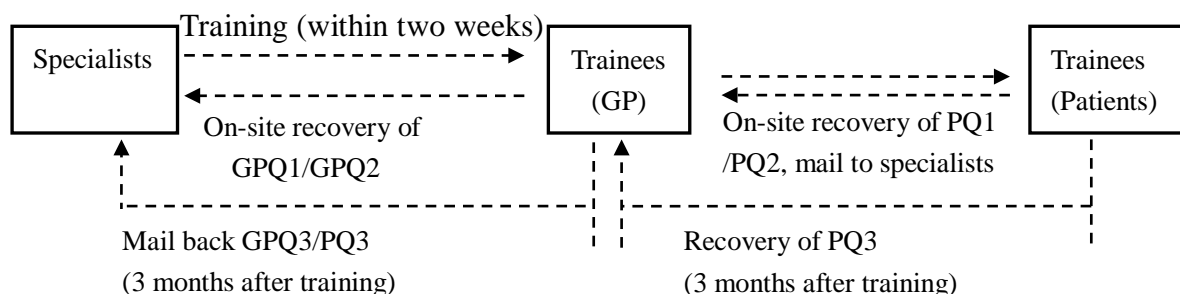
(1) Specialists: Department of Orthopedics of Guangzhou Orthopedic Hospital

(2) Trainees (doctors): GPs or acupuncture and massage doctors, therapists or nurses engaging in promotion of medical education from 14 grass-root hospitals including Yuexiu District Hospital of Traditional Chinese Medicine and community health service centers under the Yuexiu Bureau of Health of Guangzhou. The total number of trainees is 100, with each hospital having 5-10 staff participating in the training.

3. Activity contents:

KOA Specialists from Guangzhou Orthopedic Hospital are sent out to the above-mentioned grass-root hospitals for purpose of transferring the KOA self-massage techniques to the GPs and other medical staff concerned; then the GPs promote the KOA self-treatment method among patients (See Appendix I for specific tutorial).

4. Activity procedure:



5. Specific work:

- (1) Provide a set of training materials for trainees (doctors), which includes:
 - a. DVDs containing demo videos of “KOA self-massage techniques” (11 pieces);
 - b. GPQ1_physician questionnaire, before training (1 piece);
 - c. GPQ2_physician questionnaire, after training (1 piece);
 - d. GPQ3_physician questionnaire, 3 months after training (1 piece);
 - e. PQ1_patient questionnaire, before training (10 piece);
 - f. PQ2_patient questionnaire, after training (10 piece);
 - g. PQ3_patient questionnaire, 3 months after training (10 piece);
 - h. Training fees: 100 yuan;
 - i. Field training and promotion of KOA self-massage techniques (1 piece).
- (2) Before training, the trainees (GPs) are required to complete GPQ1_physician questionnaire then the questionnaire are retrieved by specialists on the spot.
- (3) Specialists transfer the KOA self-massage techniques to GPs through theoretical teaching, step-by-step demonstration and constant practice till the trainees have a good command of the skills.
- (4) After training, the trainees (GPs) are required to complete GPQ2_physician questionnaire then the questionnaire are retrieved by specialists on the spot.
- (5) Within three and half months after training, each GP is required to treat five KOA patients. The specific steps are as follows:
 - a. Within two weeks after training, each GP is required to promote the KOA self-massage techniques among patients (group training or individual coaching); before training, each patient is required to complete PQ1_patient questionnaire and the questionnaires are recovered by GPs on the spot;
 - b. GPs teach patients the KOA self-massage techniques through demonstration and constant practice till the patients have a good command of the skills; each patient will be provided with a DVD with demo video introducing the KOA self-massage techniques;
 - c. After training, the patients are required to complete the PQ2_patient questionnaire and the questionnaires will be retrieved by GPs on the spot;

d. After collecting the PQ1_patient questionnaire and PQ2_patient questionnaire, the GPs could choose to mail these questionnaires to specialists or notify specialists to personally fetch them back;

e. After three months after training, each GP is required to get feedback from five patients whom he/she ever taught KOA self-treatment method; each patient respondent is required to complete PQ3_patient questionnaire (three months after training) and the questionnaires are retrieved by the GP; meanwhile, each GP needs to complete GPQ3_physician questionnaire (three months after training);

f. GPs could choose to mail the collected PQ3_questionnaires and GPQ3 questionnaires to specialists or notify them to fetch them back personally.

6. Note:

Training field and equipment: a meeting room capable of holding 8 to 12 people; one projector; one laser pen; one or two pieces of bed sheets.

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