ISCTE ◈ IUL

Instituto Universitário de Lisboa

Relationship between Patient Safety Culture and Safety Performance in Nursing

HU Shaohua

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

Doctor of Management

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March, 2018

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Declaration

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

Signed: Date: 2018年3月30日

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作者申明

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Abstract

With providing high-quality health care services as the fundamental purpose, medical institutions should regard safeguarding patient safety as the core task. In recent years, the Chinese government has formulated relevant policies to promote patient safety. Medical institutions at all levels have formulated corresponding systems and measures in accordance with the policy requirements and the features of hospitals. However, due to the long-term impact of traditional harsh culture on the medical environment, many of the views and behaviors have not been fundamentally changed, leading to many problems in patient safety performance. As a group who first discover and handle patient safety problems, nurses can identify the causes of safety problems in a relatively accurate way. Therefore, it is necessary to conduct an in-depth study on the relationship between patient safety culture and safety performance in nursing.

This research summarizes the basic connotation and research results of organizational culture, safety culture, patient safety culture and patient safety performance, defines the concepts of patient safety culture, safety behavior and safety performance on this basis, analyzes the relationship between patient safety culture and safety performance, and proposes the theoretical assumption model. The measurement indicators are summarized based on literature review and theories such as the organizational culture structure theory and safety culture pyramid model are adopted to design patient safety culture questionnaire. The formal questionnaire is formed through the focus group meeting method and Experts consultation method. Data are collected through field surveys to evaluate the validity and reliability of the questionnaire. Structural equation model is used to analyze the relationship between patient safety culture and patient safety performance, leading to the conclusion that espoused values directly affect safety performance, and practiced values affect safety performance through safety behavior. That is to say, safety behavior plays a complete intermediary role in practiced values and safety performance. The results of this study suggest that Chinese nursing managers should construct a patient safety culture that is guided and driven by correct values. In the management practice, we should first focus on refining espoused values and then

infiltrate the soul of nurses through penetration of various management strategies. These will then be internalized by nurses and become their practiced values, which will ultimately be externalized to be their daily habits.

Resumo

Tendo como propósito providenciar serviços de saúde de alta qualidade, as instituições médicas devem perspetivar a proteção da segurança do paciente como uma tarefa central. Nos últimos anos, o governo chinês elaborou políticas relevantes para promover a segurança do paciente e as instituições médicas de todos os tipos também têm desenvolvido várias atividades de segurança do paciente. Contudo, dado que o clima médico atual é afetado pela cultura tradicional de culpa-e-acusação, muitas das atitudes e comportamentos não foram mudados na essência, originando vários problemas de desempenho na segurança dos pacientes. Enquanto grupo ocupacional que primeiramente descobriu e lidou com os problemas da segurança dos pacientes, os enfermeiros conseguem identificar as causas dos problemas de segurança de uma forma relativamente precisa. Assim, é necessário realizar um estudo em profundidade sobre a relação entre a cultura de segurança do paciente e o desempenho de segurança na enfermagem.

Esta investigação sumariza os resultados de investigação empírica sobre cultura organizacional, cultura de segurança, cultura de segurança dos pacientes, e desempenho na segurança dos pacientes, define os conceitos de cultura de segurança dos pacientes, comportamento de segurança e desempenho na segurança, analisa as relações entre cultura de segurança dos pacientes e desempenho na segurança, e propõe um modelo de análise. Os indicadores medidos são sumarizados com base na revisão de literatura e em teorias tais como a teoria estrutural da cultura organizacional ou o modelo da pirâmide da cultura de segurança. Estes são adotados para construir um questionário da cultura de segurança dos pacientes metodologicamente suportadfo no método Método de consulta de peritos e em grupos focais. Os dados recolhidos através de um questionário recolhido no terreno permitiram avaliar a validade e fiabilidade deste questionário. Utilizaram-se modelos de equações estruturais para analisar as relações entre a cultura de segurança dos pacientes e o desempenho nesse domínio, sugerindo que os valores declarados afetam diretamente o desempenho na segurança, enquanto que os valores praticados afetam o desempenho através do comportamento de segurança. Ou seja, o comportamento de segurança desempenha o papel de mediador total

entre os valores praticados e o desempenho na segurança. Os resultados deste estudo sugerem que os responsáveis pela enfermagem na China devem construir uma cultura de segurança dos pacientes guiada pelos valores correctos. Na gestão da prática, devemos primeiro focarmo-nos em refinar os valores declarados e posteriormente facilitar a sua assimilação pelos profisisonais de enfermagem utilizando diversas estratégias de gestão. Estes valores, então internalizados pelos enfermeiros, tornar-se-ão valores praticados, que, em última instância, serão expressos nos seus hábitos do quotidiano.

Key words: Cultura de segurança dos pacientes, desempenho na segurança dos pacientes, comportamento de segurança dos pacientes, modelos de equações estruturais, gestão de enfermagem.

JEL: I12; M12; I10

摘 要

医疗卫生机构以提供高质量的卫生保健服务为根本宗旨，保障患者安全是其核心内容。近年来，中国政府制定相关政策促进患者安全，各级医疗卫生机构也根据政策要求，并结合医院特点制定相应的制度、措施，但是由于传统苛责文化对医疗环境的长期影响，许多观念和行为难以发生根本性转变，因此患者安全绩效存在诸多问题。护士作为患者安全问题的最先发现者及执行者，可以相对准确地判断安全问题出现的原因，因此针对护理领域患者安全文化和安全绩效之间关联机制的深入研究非常必要。

本文系统梳理组织文化、安全文化、患者安全文化、患者安全绩效的基本内涵、研究成果，并在此基础上界定患者安全文化、安全行为、安全绩效的概念，分析患者安全文化和安全绩效之间的关系，提出本研究的理论假设模型；基于文献回顾提炼测量指标，借鉴组织文化结构理论、安全文化金字塔模型等相关知识自设患者安全文化问卷，并通过焦点小组会议法、专家德尔菲法等形成正式测量问卷；通过实地调查收集数据，评价测量问卷的信效度；运用结构方程模型对患者安全文化和患者安全绩效关系进行分析，最终得出信奉价值观直接影响安全绩效，践行价值观完全通过安全行为影响安全绩效，即安全行为在践行价值观和安全绩效中发挥完全中介作用。本研究结果提示中国护理管理者应构建基于正确价值观引领和驱动的患者安全文化，在管理实践中首先应注重提炼信奉价值观，然后通过各项管理策略渗透融入护士的灵魂渗出，内化为护士的践行价值观，最后再外化出护士的日常习惯行为。

关键词：患者安全文化；患者安全绩效；患者安全行为；结构方程模型；护理管理

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With a persistent passion for nursing, I have never stopped learning and progressing in this domain, walking all the way from an undergraduate to a master and finally to a doctoral candidate. I still clearly remember the joy of receiving the admission letter four years ago after submitting the application and passing the interview as well as the painstaking hard work over the past four years. For so many times, I have to make hard choices among work, family and study; I travel to and from between Guangzhou and Hefei in the early morning and midnight. It is during the Spring Festival when I write my thesis, but I have to stay alone in my study, giving up the chance of family reunion. However, in this road of exploration and learning, I feel boundless joy and sense of achievement. In retrospect, I feel grateful for all those who have offered me help and support.

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致 谢

怀揣着一颗对护理事业的执着与热爱,我一直未停止学习和前进的脚步,从本科、硕士到博士。我清楚地记得四年前提交申请、通过面试,到收到录取通知那一刻的欣喜,以及四年来欣喜之后的辛苦付出。我已记不清有多少次在工作、家庭和学习之间的艰难抉择;多少次在清晨、在深夜往返与广州与合肥;毕业论文撰写时又正值中国农历新年,放弃与家人团聚,独坐于书斋。但是,在这条探索学习的道路上,我更多体会到的是无限的快乐和成就感。回顾过往,对求学之路上无数帮助、支持过我的人们,内心充满感激。

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Chapter 1: Introduction

1.1 Research Background

In this chapter we intend to introduce the topic of research by stating its importance within the context of Chinese healthcare, the research problem itself, the overall theoretic and practical significance of the research on patient safety culture, a preview of the research methods chosen for the empirical study (both qualitative and quantitative) and finish by mapping the research path. In this way we believe the understanding of the remaining of the thesis is facilitated and a more detailed and honest account of the steps taken is given.

1.1.1 Severe Challenges Confronting Patient Safety

Medical institutions are committed to providing high-quality healthcare service, with ensuring patient safety as the core. However, the current situation of patient safety in the world is still grim (Chen, 2016). In 1999, in its report To Err Is Human: Building a Safer Health System, the U.S. Institute of Medicine (IOM) pointed out that 44,000-98,000 people in America die from preventable medical errors every year, causing a direct economic loss of $17 billion and $29 billion (value for 1999) (Institute of Medicine, 1999). The figure startled the entire medical community, and medical institutions around the world started to devote themselves to improving patient safety (Huang, 2007).

Despite that, evidence shows that the issue of patient safety worldwide is not well addressed (Xia, 2015). In 2008, World Health Organization (WHO) pointed out in its report that every year, tens of millions of patients get injured, disabled and even died because of unsafe medical treatment and nursing, causing additional medical cost, which leads to an economic loss between 6 billion dollars and 29 billion dollars in some countries. The *10 Facts on Patient Safety* by WHO in 2004 indicates that due to poor quality in caring, 20%-40% of health care cost is wasted. Costs like extra hospitalization expenses, litigation fees and productivity losses, amount to 19 billion dollars in some countries (WHO, 2014). In

developing countries, the possibility of medical accidents is much higher than that in developed countries due to management defects, relatively weak medical skills, inadequate medical resources or unequal distribution, and shortage of funds (Li, 2011). In China, about 400,000 people die of unnatural causes every year due to medical malpractice, and a large number of patients are disabled due to medical malpractice (Wang, 2012). According to the investigation statistics by Zhang (2014) on medical disputes in 13 public hospitals, from 2007 to 2013, a total of 974 medical disputes happened, which costed the hospitals 19,845,800 *yuan* to compensate their patients, an annual average of 2,835,000 *yuan*. According to a survey conducted by the China Hospital Management Association, the total amount of claims for medical disputes in China is as high as 60 million yuan (Legal Daily, 2002). It proves that there is huge potential safety hazard in the service process of medical institutions and patient safety is severely threatened. Medical malpractice not only leads to huge economic losses and irreparable suffering of patients, worse still, it undermines the trust between doctors and patients, exacerbating the contradiction between them (Chen, 2016). The most important challenge in patient safety is to identify how to prevent patients from being harmed during medical care, especially the "avoidable harms". All preventable errors can and should be avoided. In order to provide high-quality health services, the safety of each patient should be prioritized (China Healthcare, 2017).

1.1.2 Significance of Building Patient Safety Culture

Institute of Medicine (IOM) states in its report that the biggest challenge to the transformation into a safer medical system is to change hospital culture (Colla, Bracken, Kinney, & Weeks, 2005). Building patient safety culture is an effective way to reduce or avoid safety incidents and it is suggested that medical institutions evaluate patient safety culture on a regular basis so as to improve the current transformation (Kohn, Corrigan, & Donaldson, 2000). Building patient safety culture is the core element to enhance medical quality and improve patient safety. It is also closely related to medical results such as complications and infections (DiCuccio, 2015; Muething et al., 2012). In complicated medical care systems, it is medical staff, especially nurses, who play the most critical role (Groves, Meisenbach, & Scott-Cawiezell, 2011). Since nurses are always the first ones to discover and deal with

patient safety issues, they can determine the cause of these issues rather precisely (Zhou,et al., 2013). Therefore, nurse-based patient safety culture evaluation is the primary step in building patient safety culture. Medical care institutions around the world have conducted many studies on patient safety issues, whereas in China, relevant studies started late. As mentioned in the report *China's Medical Quality and Patient Safety* by Cao Ronggui, president of Chinese Hospital Association, China is yet to build the medical safety culture climate (Cao, 2007).

1.1.3 Problems that May Affect Safety Performance

In recent years, Chinese government has made relevant policies to promote patient safety, and different levels of medical institutions are organizing patient safety activities in various forms. But the current medical environment is heavily influenced by traditional medical culture, and many traditional ideas and practices have not been transformed fundamentally. Thus, there is still a long way to go before realizing an active safety culture climate (Zhang, 2015). There are many factors affecting safety performance within the medical institutions, such as neglecting established procedures, focusing on speed rather than accuracy and in some cases even risk-taking practices being encouraged (Patankar, Brown, Sabin, & Peyton, 2015). Other factors include a lack of efficient communication between executives and staff, poor coordination between departments, high workload and work stress of nurses, postponed report on medical errors due to false thinking and frequent patient safety incidents (Ren, 2011). In 2013, an investigation on nursing staff's awareness of patient safety culture was carried out, which indicated that improvements should be made in terms of frequency of adverse events reporting, non-punitive reaction to errors and nursing staff allocation (Li, et al., 2014).

Further investigation of the existing problems in patient safety management shows that the proportion of problems such as poor comprehensive ability of nurses, imperfect safety management system, under-regulated safety management process, and poor implementation is much higher than that of problems such as medical equipment and facilities. On the other hand, there are many problems in patient safety performance. On the other hand, to improve patient safety management in nursing, it is urgently needed to establish the concept of "patient

safety first" among nurses from a more in-depth cultural level. In addition, strict implementation of patient safety management measures is the only way to establish a long-term mechanism to ensure patient safety.

Therefore, an in-depth study of the correlation between patient safety culture and safety performance in nursing is quite necessary. The findings can better demonstrate to hospital administrators, nursing administrators and clinical nurses that building patient safety culture can effectively improve patient safety performance and offer a theoretical framework to advance knowledge and guide policymaking.

1.2 Research Problem

Patient safety is the core objective of medical care quality management and the biggest challenge to move to a safer medical care system is to change the safety culture. (Liu, Y. E., Zhang, P., & Deng, A. H., 2011) It is found in the investigation of patient safety culture in nursing that although a great deal of work has been done in the building of patient safety culture by hospital administrators and nursing administrators, the expected results of patient safety management remain unrealized. Why? Maybe it is because administrators and nurses at all levels are unaware of the correlation between patient safety culture and safety performance. Also, because western findings about this topic may not directly apply to the specific Chinese context, and as a consequence, there is advantage in empirically testing models in real settings in China. Therefore, we have to identify what are the factors in patient safety culture that affect safety management performance, how they affect and to what extent. As a result, the thesis is designed to study the relationship between patient safety culture and safety performance in nursing.

1.3 Research Significance

This research has important practical significance to carry out patient safety culture building in nursing and improve patient safety performance level as well as important theoretical significance to expand the research scope of patient safety culture and enrich

research results of patient safety culture.

1.3.1 Theoretical Significance

In recent years, there have been a number of studies in the field of patient safety culture, mainly focusing on the understanding of patient safety culture connotation, measurement evaluation, and construction implementation. However, there is still a lack of research on the relationship between patient safety culture and safety performance in nursing, and a complete patient safety culture theory system is yet to be formed. The research on patient safety culture started relatively late in China and is still in the stage of introducing measurement tools. According to evidence-based analysis, 96% of the literature is cross-sectional survey and current situation investigation, the research angle of which is rather narrow (Yang, Jiang, & Chen, 2016). Through theoretical analysis and model construction of the relationship between patient safety culture and safety performance in nursing, this study reveals the intrinsic correlation between the two, which is conducive to a deeper understanding of patient safety culture. It can fill in gaps in patient safety culture management theory and has implications to improve patient safety culture management theory.

1.3.2 Practical Significance

From the perspective of hospital patient safety management practices, an in-depth analysis of the relationship between patient safety culture and safety performance is key to the continuous improvement of patient safety culture. If a hospital starts to build the patient safety culture blindly without a thorough investigation of the reasons that affect the patient safety culture and safety performance in the hospital, its safety culture will often stay only in the superficial level, with no substantive results. In China, the building of patient safety culture has not been valued sufficiently as many efforts are only superficial. The implementation of safety culture measures has been difficult within the hospital, which has doubled the work of safety culture building and even caused discontent and resistance among the medical staff, exerting a negative influence on the hospital safety management and safety production. On the other hand, the building of hospital patient safety culture should be closely integrated with daily safety management. However, in practice, these two are often separated in many

hospitals, leading to the phenomenon of "two skins" of cultural building and safety management, which makes the concept of "patient safety first" difficult to "take root". The purpose of studying the relationship between patient safety culture and safety performance is to identify the key link and understand if patient safety culture building can be used as the breakthrough to achieve more obvious results. Patient safety performance illustrates the cultural challenges faced by medical institutions and further enhances patient safety performance through culture building, thus forming a virtuous circle. The research objects in this thesis include nurses from primary, secondary and tertiary hospitals. We contend that an empirical study is required and should be conducted at the three levels of hospitals in China to be representative and test a model linking patient safety culture with safety performance in nursing. The conclusion has important practical significance in guiding Chinese hospitals to realize patient safety culture building and improving patient safety. It also helps Chinese hospitals to build a complete patient safety culture mode.

1.4 Research Content

This thesis studies the relationship between patient safety culture and safety performance in nursing and establishes a correlation mechanism model of patient safety culture and safety performance. The key links in the building of patient safety culture in Chinese hospitals are identified, making it possible for hospitals to grasp the core of patient safety culture in the building of patient safety culture to let the patient safety culture take root. Specifically the research content includes the following four aspects:

(1) Explain the concept, theory and model of organizational culture, safety culture, patient safety culture and patient safety performance systematically, analyze the relationship between patient safety culture and safety performance, and then put forward the theoretical hypothesis model of this study.

(2) Extract measurement indicators based on literature review, compile the questionnaire about the relationship between patient safety culture and safety performance in nursing through focus group meeting and experts consultation method, and provide a scientific data collection tool to build the correlation model.

(3) Obtain the patient safety culture and safety performance data of hospitals at different levels in China, conduct reliability and validity analysis, descriptive statistics analysis, exploratory factor analysis and confirmatory factor analysis on the sample data, test the theoretical assumption model, and ultimately form the structural equation model of patient safety culture and safety performance in nursing.

(4) Analyze the structural equation model of patient safety culture and safety performance in nursing, and summarize the management implications for the patient safety culture building, so as to provide a scientific basis for Chinese hospitals to better develop patient safety culture and enhance patient safety performance.

1.5 Research Methods

This study adopts both the method of qualitative research and quantitative research. Relevant foreign and domestic literature on the impact of safety culture and safety performance on safety performance is reviewed before the theoretical hypothesis model is proposed based on the literature review. The research contents of the dissertation are further explored through focus group meetings. In quantitative research, the major method is the questionnaire method.

This research mainly uses the Chinese database and the foreign language database of the electronic resource system of the Anhui Medical University Library to retrieve relevant literature. The Chinese databases mainly include China National Knowledge Internet(CNKI),Wanfang Database, VIP Information Resource System and Duxiu Database, and the foreign language databases mainly include the ELSEVIER Science Direct On Site (SDOS) Database, the pubmed database. Also relevant books in the university library are referred to. Based on the summary and analysis of relevant literature, the author puts forward the theoretical hypothesis model of the relationship between patient safety culture and safety performance in nursing.

1.5.1 Qualitative research

The focus group meeting outline was designed based on the results of literature analysis. Professors from School of Nursing of Anhui Medical University, and nursing management experts as well as clinical nurses from the First Affiliated Hospital of Anhui Medical University were invited to attend the focus group meeting to further understand the research contents of the relationship between patient safety culture and safety performance in nursing. Contents of the meeting were recorded in detail.

Experts consultation method was deployed to collect opinion from experts about content and facial validity of the questionnaire's items (if they seemingly represent the construct and if items cover the meaning in a comprehensive way).

1.5.2 Quantitative Research

The main function of quantitative research is to answer what factors of patient safety culture in nursing affect patient safety performance, how they affect and to what extent through empirical research. Quantitative research includes the design of preliminary questionnaire, pre-investigation and modification of questionnaire, questionnaire distribution and recovery, and data analysis.

Questionnaire Design:

(1) **Formation of item pool:** Construct the questionnaire framework guided by the concept of patient safety culture and safety performance. Based on the literature analysis, questionnaires of the patient safety culture and safety performance compiled by domestic and foreign counterparts are referred to form the item pool.

(2) **The first draft of the preliminary questionnaire:** Experts consultation method was adopted. Hospital management experts, medical management experts, nursing management experts and questionnaire compilation experts were invited to evaluate the questionnaire item by item. The preliminary questionnaire was formed after calculating the expert content validity and the item content validity.

(3) **The second draft of the preliminary questionnaire:** Nursing experts with rich

experience in clinical management were invited to discuss the questionnaire item by item through the focus group meeting to check the structure of the questionnaire, the wording of questions and the difficulty of filling out the questionnaire. The second draft of the preliminary questionnaire was formed on this basis.

(4) **The third draft of the preliminary questionnaire:** Medical management experts and nursing management experts were invited to grade the questionnaire and the third draft of the preliminary questionnaire was formed on this basis.

(5) **The Chinese version of questionnaire:** Clinical nurses were selected to conduct the pre-test on the questionnaire. All the pre-test subjects need to answer the difficulty of the questionnaire items, the accuracy of the statements, the rationality of the items and whether there is a better wording. According to the pre-test results, we revised the questionnaire items, and finally form the Chinese version of questionnaire.

1.5.3 Empirical Research

Based on the data obtained from the questionnaire, the AMOS software is used to empirically test the theoretical model, and finally establishing a structural equation model of the relationship between patient safety culture and safety performance in nursing.

(1) Sample size: The sample size of the clinical test is determined according to the amount of items in the scale (3 to 5 times the number of items to reduce the error caused by chance), and expand additional 10% of the sample size to offset shortage of sample caused by low response rate.

(2) Research sites: Primary, secondary and tertiary hospitals in Anhui province.

(3) Statistical analysis: The model was verified by the AMOS 7.0 software. Through the model fitting and correction, the overall fitness, internal validity index and external validity index of the model are analyzed.

(4) Professional analysis: Questions such as "which are the key factors between patient safety culture and safety performance in nursing" and "what are the degrees of influence between key factors, and among the key factors and patient safety culture and safety performance" are answered through empirical research.

1.6 Research Roadmap

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┌─────────────────────────────┐              ╔═══════════════════════════════════════════╗
│     Research Questions       │              ║   ┌─────────────────────────┐              ║
└─────────────────────────────┘              ║   │    Review Literature     │              ║
              │                                ║   └─────────────────────────┘              ║
              ▼                                ║              │                             ║
┌─────────────────────────────┐              ║              ▼                             ║
│ Literature Reading, Review   │              ║   ┌─────────────────────────┐              ║
│        and Analysis          │              ║   │  Preliminary Item Pool   │              ║
└─────────────────────────────┘              ║   └─────────────────────────┘   ┌────────────────────────┐
              │                                ║              │            ◄──── │ Experts consultation    │
              ▼                                ║              ▼                 │ method, Expert Content  │
┌─────────────────────────────┐              ║   ┌─────────────────────────┐   │ Validity Analysis       │
│    Small-scale Interview     │              ║   │ 1st Draft of Questionnaire│  └────────────────────────┘
└─────────────────────────────┘              ║   └─────────────────────────┘              
              │                                ║              │            ◄──── ┌────────────────────────┐
              ▼                                ║              ▼                 │  Focus Group Meeting    │
┌─────────────────────────────┐              ║   ┌─────────────────────────┐   └────────────────────────┘
│ Proposal of Theoretical      │              ║   │ 2nd Draft of Questionnaire│             
│   Hypothesis Model           │              ║   └─────────────────────────┘              
└─────────────────────────────┘              ║              │            ◄──── ┌────────────────────────┐
              │                                ║              ▼                 │   Expert Evaluation     │
              ▼                                ║   ┌─────────────────────────┐   └────────────────────────┘
┌─────────────────────────────┐              ║   │ 3rd Draft of Questionnaire│             
│    Questionnaire Design      │ ⇄           ║   └─────────────────────────┘              
└─────────────────────────────┘              ║              │            ◄──── ┌────────────────────────┐
              │                                ║              ▼                 │       Pre-test          │
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┌─────────────────────────────┐              ║   │ The Chinese version of   │             
│     Empirical Research       │              ║   │    Questionnaire         │             
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│ Data Analysis and            │
│    Organization              │
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│   Conclusion and Outlook     │
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Chapter 2: Literature Review and Theoretical Framework

This chapter begins with a review of relevant literature in China and abroad from five aspects: organizational culture, safety culture, patient safety culture, patient safety performance, and relationship between patient safety culture and safety performance, and then presents the theoretical hypothesis model, based on which the questionnaire was designed.

2.1 Connotation of Organizational Culture

2.1.1 Definition of Culture

The word *culture* is derived from its Latin origin *culture*, which can also be translated as *cult*, referring to a certain religious believers' specific behaviors, which are then developed into a belief-based culture. So far, there is no agreement on the definition of culture. The British anthropologist Tylor, honored as the Father of Anthropology, was the first scholar who had a significant impact on the definition of *culture*. In the chapter of the Science of Culture in his representative work *Primitive Culture*, Tylor（1992） explains that Culture or civilization, in its broad ethnological sense, is a complex whole, including knowledge, belief, art, morality, law, custom and all the other competence and habits that are acquired by a person as a member of society through learning. Since then, the American scholar Kroeber and Kluckhohn (1952), in their book *Culture: A Critical View of Concepts and Definitions*, have listed 166 definitions of culture made by famous anthropologists, sociologists, psychologists, philosopher, and political scholars from different perspectives.

2.1.2 Definition of Organizational Culture

Similar to the definition of culture, the definition of organizational culture varies among scholars. The concept of organizational culture was first proposed by Jaques (1952) from a study conducted by Tavistock Institute for Glacier Metal Co. Elliot Jaques defined culture

then as the traditional way of thinking and acting that is shared, to a certain extent, by all members of an organization and that new members should learn and accept to be integrated in the organization. This was a pioneer work that anticipated in more than 20 years the upsurge of interest on this concept due to the shared notion that the competitiveness from emerging economies was explained by work values rather than any other reasons.

A major proposal to focus on culture in the 1970s came from Andrew W. Pettigrew (1979), a British management scientist, in his article *Organizational Culture Studies* published in the *Administrative Science Quarterly*. Since then, the study of organizational culture has received extensive attention by the academia and the practice circle.

In his paper *On Studying Organizational Cultures*, Pettigrew (1979) points out that organizational culture is the system of sense shared by all the members of an organization under a certain time-and-space background. He regarded it as the sign, language, ideology, belief, rite and myth, marking the official starting point of the school of organizational culture.

After about a decade of research, Denison (1990) offered a conceptual definition of organizational culture in his masterwork *Corporate Culture and Organizational Performance*. Organizational culture is the underlying value, belief and principles; it is the foundation of the entire management system, practice and behavior, which not only manifests but also enhances these underlying basic principles.

Cameron and Quinn (2006) point out in their masterwork *Diagnosing and Changing Organizational Culture* that organizational culture is the consensus of an organization and the understanding, memory, value and attitude that are summarized.

Ouchi (2007) converged by pointing out that organizational culture refers to some common values and behaviors within an organization, which are formed along with the establishment, development and expansion of the organization.

Robbins (2012) corroborated this view stating that organizational culture refers to a set of meaning system shared by organizational members that can distinguish itself from other organizations.
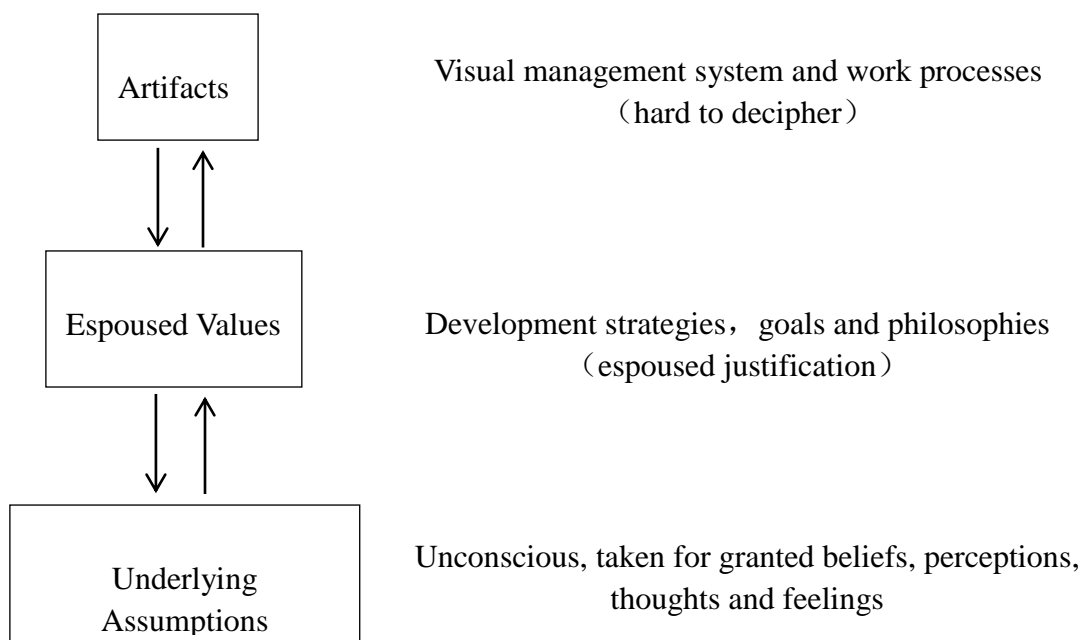
Schein (2017) argues that organizational culture refers to a set of shared deep

assumptions acquired by a group in solving their external adaptation and internal integration issues. Since they are well-functioning and effective in the group, they are imparted to new members in the group as the correct way to perceive, think, and sense when solving similar problems.

To conclude, the definitions of organizational culture by domestic and foreign scholars are diversified, and the most influential one is made by Edgar Schein. In his book Corporate Culture Survival Guide, Schein (2017) gives a profound interpretation of the connotation of organizational culture. According to Schein (2017), a better way to understand the connotation of organizational culture is that we should realize that organizational culture exists at three different levels (artifacts, espoused values, underlying assumptions), see Figure 2-1 for the three Levels of Organizational Culture, and we should better understand and manage the deeper cultural contents, as organizational culture gradually changes from the externally visual level to the invisible level. The essence of organizational culture is the beliefs and values that are acquired by every member and help maintain sound organizational operation. In addition, as the organization continues to succeed, these beliefs and values will gradually become the default assumption shared by all members and will play a greater role. He stresses that all the three levels have strong and extensive influence on organizational behavior. Organizational culture is the most decisive factor among all factors affecting organizational behavior, so inevitably the administrators will use organizational culture, the unique and irreplaceable resources of an organization, to manage staff, carry out planning and implement organizational strategy.

In summary, organizational culture is a set of basic assumptions and values during the process of establishment, development and expansion of the organization. While the organization faces the pressure of competition in the turbulent external environment, enhances and improves the internal manipulation within the organization, organizational culture is developed and gradually accumulated within an organization along with the passage of time.

Figure 2-1 Three Levels of Organizational Culture

| Artifacts | Visual management system and work processes（hard to decipher） |

| Espoused Values | Development strategies，goals and philosophies（espoused justification） |

| Underlying Assumptions | Unconscious, taken for granted beliefs, perceptions, thoughts and feelings |

It is also the value system shared by the members of an organization, which passes on the important assumptions and models, influences organizational members' values, shapes their activities and objectives and provides the codes of conduct and norms in the operation and practice of the organization. All these perspectives tend to approach culture in a functional way, i.e., values are adopted because they facilitate organizations across their challenges. Also, as Schein's model structures the components of culture, we can also accept that once established, culture tends to be inertial, due to its structure, and so organizational culture tends to endure.

2.1.3 Organizational Climate Versus Culture

Organizational climate refers to the organization members' shared perceptions of practices, procedures and behaviors that are expected, supported and awarded in their workplace (Schneider, 1990). Organizational culture refers to basic assumptions, beliefs and values shared by members of an organization, which are obtained through their learning during the process of solving the problems of existence in external environment and the problems of integration in internal environment(Schein,1992; Zohar & Hofmann, 2012).The

differences between organizational climate and organizational culture are: Firstly, from the perspective of the origin of concept, the concept of organizational culture originates from anthropology while the concept of organizational climate originates from psychology. The two different origins then cause the differences in the research tendency and method in later studies(Glick,1985).Secondly, from the perspective of concept in itself, organizational culture is the way staff finish their duties in their workplace and their shared values; while organizational climate is their perception of their organizational environment (Jones & James, 1979). Thirdly, from the perspective of research method, qualitative research method is used more often in the study of organizational culture whereas quantitative research method is preferred in that of organizational climate (Glick, 1985). Fourthly, from the perspective of the conceptual nature, organizational culture is more of an objective organizational nature (James, James, & Ashe, 1990), while the nature organizational climate is somewhat controversial: some scholars think it is a subjective individual nature (James, 1982; Glisson & James, 2002) while some other scholars believe it is an objective organizational nature (Schneider & Bartlett, 1968).

Nevertheless, there is an inalienable relation between organizational climate and organizational culture. Rousseau (1990) believes that organizational culture is a notion with more than one layer. The organization members' shared expectations and norms form the upper layer, which can be felt by these members, while their values and ideas form the deeper layer, which cannot or cannot easily be felt by them. The expectations and norms at the upper layer of organizational culture, as they are obvious in the daily operation of an organization, are the perceptual object of the staff and the fundamental element that forms the organizational climate.

2.2 Safety Culture

The concept of "safety culture" was first proposed by the International Nuclear Safety Group (INSAG) in 1986 after the Chernobyl nuclear accident in the former Soviet Union. It then gave the definition of safety culture in nuclear power plant for the first time in the 1991

Safety Culture pamphlet, namely, "the sum total of the special qualities and attitudes that exist in an organization or individuals, which establishes an overriding notion that the safety issues of a nuclear power plant should be given due attention because of their importance (International Safety Advisory Group, 1991). It was then spread rapidly and became a concept that was repeatedly quoted until a specialized discipline was created to describe and evaluate it (Patankar & Sabin, 2010). The safety culture research can be divided into the following two aspects by the domain of application (as shown in Table 2-1).

A review of the literature on the definitions of safety culture in China and abroad shows that scholars do not have a unified definition of safety culture. The differences are mainly reflected in the following two aspects. First, there is difference as for whether safety culture includes behavior. Lee (1996), Cox and Flin (1998), Carroll (1998), Wang (2007), Li (2009), Yang (2013) , and Zhang (2016) believe that safety culture includes behavior, while Cox and Co(1991), Pidgeon (1991), International Safety Advisory Group (1991), Ostrom, Wilhelmsen, and Kaplan (1993), Geller (1994), and Mearns, Flin, Gordon, and Fleming (1998) believe that safety culture does not include behavior, and safety culture mainly refers to values, belief and attitude. Second, there is difference as for the scope of safety culture. The definitions of safety culture by International Safety Advisory Group (1991) and Ma (2011) focus on spiritual values, beliefs and attitudes, while Geller (1994), Li (2009), and Dong (2014) believe that material aspects are equally important.

Based on the previous literature, it is argued in this study that safety culture does not include safety behavior. The connotation of safety culture includes safety values, safety strategy and safety attitude. In addition, safety culture contains the meaning of safety climate which is linked with the organization's internal safety attitude.

To clarify our conceptual view, we think safety culture is an adjustable dynamic equilibrium resulted from the coordination of values, leadership strategy and attitude, the combination of which can affect individuals, groups, and enterprise-level safety performance.

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Table 2-1 Definitions of Safety Culture

Scholar	Research Field	Definition
Cox and Cox (1991)	Oil and gas	Safety cultures reflect the attitudes, beliefs, perceptions, and values that employees share in relation to safety.
Pidgeon (1991)	Theoretical research	The set of beliefs, norms, attitudes, roles, and social and technical practices that are concerned with minimizing the exposure of employees, managers, customers and members of the public to conditions considered dangerous or injurious.
International Safety Advisory Group (1991)	Nuclear power	Safety culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance.
Ostrom ,Wilhelmsen, and Kaplan (1993)	Nuclear power	The concept that the organization's beliefs and attitudes, manifested in actions, policies, and procedures affect its safety performance.
Geller (1994)	Theoretical research	In a total safety culture (TSC), everyone feels responsible for safety and pursues it on a daily basis.
Lee (1996)	Theoretical research	The safety culture of an organization is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, and organization's health and safety management
Mearns, Flin, Gordon, and Fleming (1998)	Oil and gas	Safety culture is the attitude, values, norm and belief of risk and safety shard by special groups.
Cooper(2000)	Theoretical research	Safety culture is a part of corporate culture, and it includes individuals and work affecting safety and organizational characteristics.
Singer, Gaba, Geppert, Sinaiko, Howard, and Park (2003), Liu (2008)	Health care	It can be personified by the shared values, beliefs, norms, and procedures related to patient safety among members of an organization, unit, or team.
Wang (2007), Haukelid (2008)	Theoretical research	Safety culture is a set of individual or organizational values, concept, perception, attitude, system, ability and behavioral mode.
Zhao (2008)	Transportation	Safety culture is a set of common features of safety presented by an organization and its members. It is manifested by internal belief and values as well as external norm, rite, symbol and behavior.

Li (2009)	Coal mining	Safety culture is the safety values, safety concepts, safety related systems, safety code of conduct and characteristic safety production practices agreed, accepted, and followed by all employees.
Du (2010)	Coal mining	Safety culture is the sum total of corporate safety values and safety codes of conduct, including safety climate, safety management system and employee safety practices.
Patankar and Sabin (2010)	Theoretical research	The safety culture is an adjustable state with dynamic equilibrium generated by values, leadership strategy and attitude. The integration of the three can also affect individual, group and corporate safety performance. In short, safety culture is the reason why we do something.
Ma (2011)	Coal mining	Safety culture is the core idea of safety management.
Yang (2013)	Construction	Safety culture is a set of materials, system, concept and behavior (including participation and observance) of individuals and organizations in the construction industry, it is committed to minimizing the risks posed to employees and the public by unsafe behavior.
Dong (2014)	Construction	Safety culture refers to the sum of spiritual wealth (including safety concept, safety attitude, safety awareness and safety system) and material wealth (safety engineering technology, equipment, facilities and safety publicity carrier) related to safety in an enterprise.
Zhang (2016)	Oil and gas	Safety culture exists in enterprises and employees and is the sum of various attitudes and characteristics. It has certain openness and continuity and covers aspects such as safety values, perception, ability and behavior.

2.2.1 Safety Culture Theoretical Research

According to Pidgeon (1991), safety culture is defined as a set of beliefs, norms, attitudes, roles, and social and technical practices that are concerned with minimizing the exposure of employees, managers, customers and members of the public to conditions considered dangerous or injurious.

Geller (1994) believes that in a total safety culture (TSC), everyone feels responsible for safety and pursues it on a daily basis.

According to Lee (1996), Cox and Flin (1998), safety culture of an organization is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, and organization's health and safety management.

Wang (2007) and Haukelid (2008) believe that safety culture is a set of individual or organizational values, concept, perception, attitude, system, ability and behavior.

Cooper (2000) contends that safety culture is a part of organizational culture that affects member attitude and behavior, and it can affect organizational health and safety performance.

Patankar and Sabin (2010) defined safety culture as "an adjustable state of the dynamic balance resulted from the integration of value, leadership strategy and attitude. Such integration can also influence the safety performance at individual, group and company levels. In a word, safety culture is the reason why someone does something".

From the definitions in the theoretical study of safety culture in China and abroad, it can be seen that there is no consensus on what safety culture is. After the concept of safety culture was proposed in 1986, the difference between safety culture and safety climate has been influenced by the relationship between the organizational culture and organizational climate, and it has become an unavoidable research issue in the academia. This study mainly draws on the definition made by Patankar and Sabin (2010) and defines the patient safety culture as the common values, strategies and attitudes of medical institution employees formed to realize patient safety. The safety culture includes the connotation of safety climate, and safety climate is directly linked with safety attitude within an organization.

2.2.2Safety Culture in Special Subjects

In the nuclear power industry, according to the *Organizational Safety* of International Safety Advisory Group (1991), safety culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance. Ostrom, Wilhelmsen, and Kaplan (1993) believe that the organization's beliefs and attitudes, manifested in actions, policies, and procedures, affect its safety performance.

In the oil and gas industry, Cox and Cox (1991) contends that safety culture reflects the attitudes, beliefs, perceptions, and values that employees share in relation to safety. Mearns et al. (1998) believe that Safety culture is the attitude, values, norm and belief of risk and safety shard by special groups.

In the coal mining industry, Li (2009) believes that safety culture is the safety values, safety concepts, safety related systems, safety code of conduct and characteristic safety production practices agreed, accepted, and followed by all employees. Du (2010) argues that safety culture is the sum total of corporate safety values and safety codes of conduct, including safety climate, safety management system and employee safety practices. Ma (2011) contends that safety culture is the core idea of safety management.

In the transportation industry, Zhao (2008) believes that safety culture is a set of common features of safety presented by an organization and its members. It is manifested by internal belief and values as well as external norm, rite, symbol and behavior.

In the construction industry, Yang (2013) believes that safety culture is a set of materials, system, concept and behavior (including participation and observance) of individuals and organizations in the construction industry. Dong (2014) believes that Safety culture refers to the sum of spiritual wealth (including safety concept, safety attitude, safety awareness and safety system) and material wealth (safety engineering technology, equipment, facilities and safety publicity carrier) related to safety in an enterprise.

In the health care industry, Professor Singer (2003) defines patient safety culture as it can be personified by the shared values, beliefs, norms, and procedures related to patient safety among members of an organization, unit, or team (Singer et al., 2003). .

2.3 Patient Safety Culture

2.3.1 Safety Culture Assessment

2.3.1.1Patient Safety Culture in Foreign Countries

Since the publishing of *To Err Is Human: Building Safer Health System*in 1999 by the U.S. Institute of Medicine (IOM), countries around the world have been paying attention to research on patient safety. Since 2007, the Joint Commission on Accreditation of Healthcare Organization (JCAHO) has been requiring all hospitals applying for accreditation to carry out self-assessment (Pace, 2007). European countries and the US have listed patient safety culture as an important indicator for hospital service quality (Yang, et al., 2016).

Due to the multi-dimensional and multi-layered nature of safety culture, both qualitative and quantitative methods are needed to fully understand it. Figure 2-2 shows the four applicable analytical methods and the corresponding empirical results. The four methods include case analysis, investigation analysis, qualitative analysis, quasi-experimental analysis. A multi-approach method combining the four methods produces a holistic view of the safety culture and its various states.

Questionnaire is a very versatile tool that measures the key factors of the four levels of the safety culture pyramid and identifies the interplay of each factor within each level among different levels. At present, foreign researchers mainly use the following four kinds of questionnaires.

(1) Safety Attitude Questionnaire (SAQ): Sexton et al. (2006) explained their use of safety attitude questionnaire in research of the medical field. The questionnaire consists of six dimensions to measure community collaboration climate, safety climate, management perception, job satisfaction, work environment and stress awareness. The entire questionnaire is composed of 60 items (using the five-point Likert scale), demographic information items and an open comment section. Different versions of the SAQ can be used in surveys of intensive care units, operating theaters, general inpatient areas, and outpatient medical care. The various versions of SAQ have subtle changes in wording according to different medical departments (Patankar et al., 2015). However, the SAQ only assesses the safety attitude

perception of the medical staff, and there are still controversies as to whether safety attitude is equivalent to safety culture (Yang et al., 2016).

Figure 2-2 Assessment Methods of Safety Culture
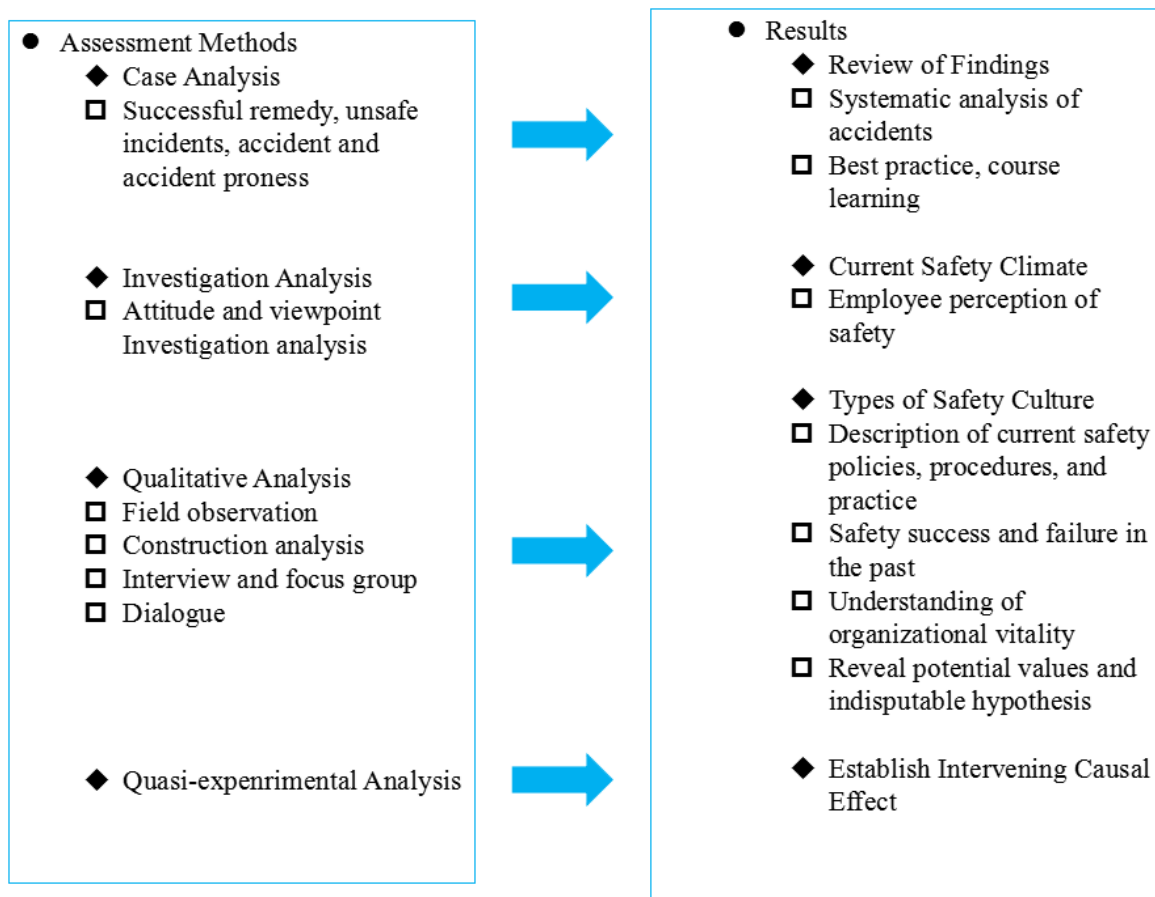
Source: Patankar et al.(2015)

(2) Hospital Survey on Patient Safety Culture (HSOPSC): It is developed by the Agency for Healthcare Research and Quality (AHRQ) (Brborović, Šklebar, Brborović, Brumen, & Mustajbegović, 2014). The questionnaire includes nine safety culture dimensions (activities expected by supervisory/management staff to promote safety, organizational learning, openness to communication, feedback and communication on errors, non-punitive response to errors, personnel allocation, support of patient safety by the hospital management, hospital team assistance, and patient referral), 4 safety result variables (comprehensive understanding of safety, frequency of incident reporting, safety grade, number of reported incidents) and demographic information (Patankar et al., 2015). Since investigation of adverse events in this questionnaire is not comprehensive, so its guiding significance to clinical adverse events is

limited (Xia, 2015).

(3) Patient Safety Climate in Healthcare Organizations Survey (PSCHOS): It is also a widely used survey scale in the United States. It is developed by the California Patient Safety Research Center (Pumar-Mendez, Attree. & Wakefield, 2014). It has eight dimensions (manager participation, organizational resources, overall safety importance, department safety habits, department support, sense of punishment, shame and unsafe behavior perception) and 38 items. The scale studies patient safety culture from the three levels of organization, department and individual. The safety climate scale has the advantage of requiring weighting of all scale data, reflecting the rigor of the scale data processing. However, the arrangement of its items is relatively confusing, resulting in a disorganized evaluation structure which is not conducive to data analysis (Xia, 2015).

(4) Manchester Patient Safety Framework (MaPSaF): It is a safety culture assessment tool developed by Prof. Parker from University of Manchester based on qualitative research(Parker, 2009). The framework describes patient safety culture at five stages (pathological stage, reaction stage, bureaucratic stage, preactive stage and generative stage) and from nine dimensions (teamwork, safety training and education, personnel management, open communication, organizational learning, investigation of adverse events, attribution and reporting of adverse events, priority of patient safety and continuous improvement strategy), and formulates different safety culture training contents according to different safety culture features in each period. In 2006, the MaPSaF was applied in the UK health service system. Its advantage is to enable medical staff to more clearly recognize the multi-dimension attributes and dynamic variability of safety culture, and explore the in-depth information of cultural connotation and its characteristics. It can also identify the change and development trend of hospital patient safety culture, and provide more targeted and valuable management advice to assessment departments (Luo, et al., 2015). However, due to its dynamic nature, it is not convenient in practical operation (Yang, et al., 2016).

2.3.1.2 Current Situation of Patient Safety Culture Assessment in China

Research on patient safety culture starts rather late in China. Since the first self-designed questionnaire for patient safety culture assessment was adopted by Liu (2008), patient safety

culture assessment has drawn more and more attention from medical institutions at all levels since 2008. The patient safety culture is mainly assessed by the form of questionnaires. There are three main types of questionnaires, including self-designed questionnaires, modified questionnaires, and Chinese version of foreign questionnaires.

Self-designed questionnaires are mainly designed by researchers based on extensive reading of literature and revised through consultation with experts. For example, in 2008, Liu (2008) designed a questionnaire on patient safety culture in hospitals, with a total of 17 items including importance attached to patient safety by managers, staff communication and cooperation, nurse allocation, procedures for shifting of duty, reporting of error and non-error safety incidents, handling and feedback of reported incidents, and overall patient safety assessment. Liu conducted a survey on 941 nurses using the convenience sampling method. The results show that the safety culture in Chinese hospitals is still in a state of excoriation culture. With so many types of patient unsafety incidents, we should establish a non-punishment voluntary reporting system of patient safety incidents and safety assessment indicator system based on advanced safety culture as soon as possible.

Chinese version of foreign questionnaires refer to the direct translated versions of foreign scales. For example, in 2009, Li and Liu (2009) carried out an investigation on 613 nurses using the Chinese version of HSOPSC. Results show that 55.8% of the nurses rate "excellent" (16.2%) or "very good" (39.6%) as for patient safety in their department. Dimensions with low rate of consent include "personnel allocation" (34.7%), "non-punitive response to mistakes" (41.1%), "inter-departmental collaboration" (41.4%) and "incident reporting frequency" (45.5%). In 2014, Luo, et al. (2015) applied the Chinese version of MaPSaF for the first time to evaluate the patient safety culture.

The modified questionnaires mainly refer to those that have been translated and revised after expert consultation based on openly used foreign questionnaires. For example, in 2008, Chen (2008) consulted SAQ in the United States to compile a patient safety culture assessment questionnaire in line with characteristics of nursing care in China. It is also pointed out that the research on patient safety culture provides a new perspective for the improvement of nursing safety management in China and effective prevention of accidental nursing mistakes (Chen & Zhou, 2009).

With the deepening understanding of the importance of patient safety, relevant research has been increasing year by year (Xia & Zhou, 2015). They systematically analyzed literature of patient safety culture assessment in China and found that the research is mainly carried out in Beijing, Shanghai, Guangzhou and the eastern coastal cities in China, while more than 50% of provinces and cities have not been touched upon. Areas needed to be improved in the patient safety culture include non-punitive response to mistakes, frequency of adverse events reporting, personnel allocation, openness of communication, and collaboration between departments. The hospital of the researcher adopted the Chinese version of HSOPSC scale in 2013 to carry out a survey on nurses' cognition of patient safety culture (Li et al., 2014). The areas to be improved in this study are consistent with those in the study of Xia (2015).

For clarity sake, we think patient safety culture it refers to the common values, strategies and attitudes of the employees formed by the medical institutions to achieve patient safety. In line with this we see patient safety values as the total evaluation and general opinion shared by the employees of a medical institution on the significance and importance of patient safety issues. Therefore, patient safety values include two aspects: practiced values (ie, patient safety values reflected in actual actions of medical staff) and espoused values (patient safety values claimed in publicity materials of medical institutions) (Patankar et al., 2015).

2.3.2 Patient Safety Culture Improvement Strategy Research

(1) Patient safety culture improvement strategy research abroad

To build or improve patient safety culture, medical institutions must take targeted improvement strategies based on patient safety culture assessment. The research focus of foreign scholars has transferred from safety culture assessment to safety culture improvement strategy. A number of patient safety culture comprehensive improvement projects based in hospitals, departments, inpatient wards or medical teams have been carried out. The key ones are shown in Table 2-2, and they are proved to be effective.

Table 2-2 Patient Safety Culture Improvement Strategy Research Abroad

Literature	Project Name	Main Strategy
Frankel, et al. (2008)	Executive Walk Rounds, EWRs	The hospital management should strengthen communication and exchange with the first-line medical service providers, establish good relationship, identify and collect risk information to safeguard patient safety.
Bleakley, Boyden, Hobbs, Walsh, and Allard(2006)	Structured Educational Intervention	We should carry out training from three aspects of the continuous standardized education, theory and practice of team self-assessment, proximity to error event reporting.
O'Leary, et al. (2011)	Structured Inter-Disciplinary Round, SIDR	We should combine structured communication tools with regular inter-disciplinary meetings.
Guerlain, Turrentine, Bauer, Calland, and Adams (2008)	Crew Resource Management, CRM	We should train and improve the team communication and coordination skills such as communication, leadership, inter-personal relations, and conflicts resolving of the crew.
Blegen, et al. (2010)	The Triad for Optimal Patient Safety project, TOPS	We should launch multi-disciplinary team training, establish safety teams based on inpatient wards, encourage patients to take part in team work and assess effects of safety results.
Paine, et al.(2010)	The Comprehensive Unit-based Safety Program, CUSP	Training on safety science, identification of safety risk, participation of administrators, learning from defects, communication and teamwork.

(2) Patient safety culture improvement strategy research in China

China has carried out many activities in the government level to improve patient safety. For example, the Ministry of Health of the People's Republic of China and the State Administration of Traditional Chinese Medicine of the People's Republic of China launched the hospital management year in 2005 with the theme of "Taking patients as the center and improvement of medical quality service as the theme" (the Ministry of Health and the State Administration of Traditional Chinese Medicine, 2005); the "patient-centered" medical safety 100-day special inspection activity in 2008 (the National Health and Family Planning Commission, 2008); the review of graded hospitals with the guideline of "quality, safety, service, management and performance" in 2011 (the National Health and Family Planning Commission, 2011); and the action plan of further improvement of medical services with the aim of improving patient feeling of medical treatment in 2015 (the National Health and Family Planning Commission, 2015). However, research on patient safety culture is still at the stage of patient safety culture assessment, and few studies have been conducted on strategies for improving patient safety culture. Some scholars discuss the impact of establishing adverse events reporting system on patient safety culture and learn from foreign CUSP projects to improve patient safety culture.

Jiang and Li (2004) analyzed the difficulties faced in setting up a reporting system for medical adverse events and the countermeasures; Cai, Lin, Shen, and Sheng, (2007) promoted the construction of a non-punitive medication error reporting system; Lv, Li, and Zhang (2007) started to report non-punitive nursing risk incidents. The reporting of adverse events was conducive to discovering problems existed in the system by managers and preventing the recurrence, thus forming a good patient safety culture atmosphere (Yang et al., 2016). Cui, Xi, Zhang, Deng and Liu (2016). carried out CUSP projects in 12 departments of a tertiary hospital in Beijing. Results show that the positive response rate of medical staff to safety culture increases from the original 33.33% to 42.63% after implementation.

Overall, according to different research perspectives on safety culture, patient safety culture research can be roughly divided into two aspects: research on safety culture assessment and research on safety culture improvement strategy. Due to the multidimensional and multi-layered nature of safety culture, we can adopt multiple methods such as case

analysis, investigation analysis, qualitative analysis and quasi-experimental analysis to carry out a comprehensive assessment of safety culture. The questionnaire is the most commonly used assessment method. Four of the relatively mature safety culture assessment questionnaires are the safety attitude questionnaire, safety climate questionnaire, patient safety culture questionnaire, the Manchester patient safety framework. In the first two, there are controversies as for whether safety attitude and safety climate are equivalent to safety culture, the third one has limitations in investigation of adverse events, and the fourth one is qualitative research tool. Research on patient safety culture assessment and safety culture improvement strategies has been carried out extensively in foreign countries, while this research in China started relatively late and is still in the stage of safety culture assessment. The research on patient safety improvement strategies is only found in the research on the influence of non-punitive adverse events reporting on patient safety culture and application of foreign CUSP projects by some scholars.

So, to clarify our conceptual view of patient safety strategy, we think a strategy is the primary plan made for achieving a specific goal. A safety strategy includes leadership strategy, organizational mission, values, structure and purpose, process, convention and routine, history, deeds and heroes (Patankar et al., 2015). In addition, based on literature of patient safety research, we conceive patient safety strategy as the primary plan designed for achieving patient safety goals, and it includes leadership strategy, organizational structure, rules and regulations, and positive incentives.

Finally, in view of the definition of patient safety culture in this study, we deemed the four mature scales are not suitable. Therefore, based on literature review, the patient safety culture questionnaire in this research is compiled based on summary of the frequently used culture safety measurement indicators involved in previous studies, combining factors of modern patient safety management so as to measure patient safety culture more accurately and taking into consideration the context of Chinese healthcare organizations.

2.4 Patient Safety Performance

2.4.1 Patient Safety Performance Assessment

There are a number of definitions as for safety performance which fall into three categories. First, the safety performance is directly defined by the occurrence of safety accidents and its consequences, and is measured by the damage caused by a certain type of work with no specific management or by the loss of the damage. Second, the actual performance of enterprises is used to measure the effectiveness of the operation of safety work. Third, the safety performance is defined by occurrence of accidents and the actual performance of enterprises (Liu, Mei, Shen, & Zhang, 2010).

Safety performance assessment is a systematic description of the strengths and weaknesses related to safety of organizations and individuals, a necessary task for enterprises to promote the implementation of various safety management measures and the key to effective safe management of hazardous equipment and operations (Liu et al., 2010). The measurement indicators of representative studies on safety performance evaluation in China and abroad are shown in Table 2-3. It can be seen from the table that the evaluation of safety performance includes three aspects. First, the occurrence of the safety accidents and consequences. Second, organization safety production system operation indicators. Third, the individual safety behavior. It is inappropriate to measure the safety performance based on the accident data alone, since the data cannot reflect the actual performance due to the insensitivity, low material reliability, and neglect of objective risk probability (Liu et al., 2010). Therefore, safety performance should be evaluated in a comprehensive manner.

For clarity sake, we adopted Li et al. (2015) conceptual view of safety performance as referring to the operation of patient safety management system in medical institutions and the occurrence of safety (adverse) events. Therefore, it includes safety management, safety facilities, safety training, safety (adverse) events analysis.

Table 2-3 Research on Patient Safety Performance Assessment

Literature	Research Field	Safety Performance Indicators
Cox and Flin (1998).	Theoretical research	Accident and incident performance
Wu (2001)	Manufacturing	Safety organization, safety management, safety measures, safety equipment, safety training and accident survey
Ji (2011)	Coal Mining	Safety compliance behavior and safety participative behavior
Li and Huang (2012)	Coal Mining	Safety compliance behavior and safety participative behavior
Yang (2013)	Construction Industry	Safety behavior (safety compliance and safety participation) and safety results (occurrence rate of safety accidents, amount of relatively severe safety accidents, and loss caused by safety accidents)
Wang (2014)	Construction Industry	Occurrence rate of safety accidents, amount of relatively severe safety accidents, and loss caused by safety accidents
Patankar et al. (2015)	Theoretical Research	Accidents, accident proneness, mistake and all types of safe and unsafe behaviors
Li et al. (2015)	Healthcare	Safety management, safety facilities, safety training and accident analysis

Overall, past research on safety performance shows that different organizations and different scholars have different evaluation indexes on safety performance. Basically, they can be classified into three types: the first is the situation of accident occurrence, the second is the situation of the safety management system operation, and the third is the safety behavior. The situation of accident occurrence includes accident loss (loss of working hours, number of accidents, loss of accidents) and accident handling (accident analysis, accident investigation and accident statistics). The items covered by the operation of safety system vary according to different research perspectives and research objects. Most scholars believe that it should include employee safety education training, safety equipment and facilities and safety management situation (Liu et al., 2010) and safety behavior includes safety compliance

behavior and safety participative behavior. It is inappropriate to measure the safety performance based on the accident data alone, since the data cannot reflect the actual performance due to the insensitivity, low material reliability, and neglect of objective risk probability (Liu et al., 2010).

The current assessment of patient safety culture in China shows that "frequency of adverse events reporting" is one of the items needing improvement most in safety culture. Therefore, the researchers believe that the two indicators of "accident loss" and "accident occurrence" are not reliable. Some scholars regard safety behavior as an intermediary variable between safety culture and safety performance (Zohar, 1980; Yang, 2013). Therefore, this study argues that the safety performance assessment indicators include "safety system operation" and "accident analysis", excluding "accident loss" and "safety behavior". Judging on this, we think the hospital patient safety performance should be assessed from four aspects of safety management, safety facilities, safety training, and accident analysis (Li et al., 2015).

2.4.2 Influence of Patient Safety Culture on Safety Performance

Chinese and foreign scholars have made many positive attempts in the correlation between safety culture and safety performance. Some scholars believe that safety attitude and safety climate are equivalent to safety culture. Some scholars also define safety performance as individual safety behavior. Therefore, the impacts of safety culture (including safety atmosphere and safety attitude) on safety performance (including safety behavior) are summarized as follows. The representative research results are shown in Table 2-4. There are mainly three types of conclusions. First, the safety culture (including safety atmosphere and safety attitude) is positively correlated with safety performance (including safety behavior). Second, safety culture affects safety performance through safety behavior. Organizations with high safety performance share common safety culture characteristics, and organizational safety performance can be altered by culture (Fitzgerald, 2005). The research of Zohar (1980) shows that there is a premise underlying the influence of safety culture on safety performance, which is the organization safety culture leads to change of employee behavior, and the change of behavior, in turn, affects safety performance.

As an important field of patient safety, hospital safety performance management is a

systematic project. It is of great realistic significance to analyze and grasp the influencing factors of hospital safety performance in order to reduce the medical risks of hospitals and improve the patient safety management level (Li, et al., 2016). It is an indisputable fact that patient safety culture has a significant impact on patient safety outcomes. However, there is still little research on how the factors of patient safety culture affect hospital safety performance, which cultural factors contribute more to safety performance, and how to cultivate the safety culture environment of patients so as to maximize patient safety (Li, et al., 2015).

Overall, the literature review shows a common controversy as for the connotation of safety culture and safety performance, that is, "behavior". Some scholars believe that safety culture includes safety behavior, while some believe that safety performance includes safety behavior or consider safety behavior as an evaluation indicator, and some scholars believe that safety culture affects safety performance through safety behavior. Research on the relationship between patient safety culture and safety performance mainly focuses on three aspects. First, the influence of safety culture (including safety climate and safety attitude) on safety performance (including safety behavior). Such studies mainly focus on the influence of cultural guidance on safety outcomes. Second, the influence of safety culture (including safety climate and safety attitude) on the safety behavior. Such studies emphasize on process control research, and safety performance is evaluated through the employee behavior. Third, safety behavior plays an intermediary role between safety culture and safety performance. This type of research is consistent with Zohar (1980) who believes that "the organization safety culture leads to change of employee behavior, and the change of behavior, in turn, affects safety performance."

The concept of safety culture and safety performance has been clearly defined in this study. We think both do not include safety behavior which should be regarded as the intermediate variable between safety culture and safety performance. For clarity sake, we conceive safety behavior according with Neal (2006) thus dividing it into safety participative behavior and compliance behavior. Safety participative behavior does not directly affect patient safety, but helps to support patient safety. Safety compliance behavior is the

compliance with system and process so as to maintain safety.

Table 2-4 Factors Affecting Safety Performance

| Literature	Research Field	Variables	Conclusion
Zohar (1980)	Manufacturing	Safety climate, safety behavior, and safety performance	Safety climate affects employee safety behavior and organizational safety performance.
Griffin and Neal (2000)	Manufacturing and Mining	Safety climate, motivation, and safety behavior	Safety climate is positively correlated with safety compliance and participative behavior.
Wu (2001)	Manufacturing	Safety climate and safety performance	Safety climate is positively correlated with safety performance.
Rong (2009)	Healthcare	Safety culture and safety behavior	Nurse perception of patient safety culture is positively correlated with safety behavior.
Ye, Li, and Wang (2014)	Coal Mining	Safety climate, psychological capital, working pressure and safety behavior	Safety climate has positive impact on safety compliance behavior and safety participative behavior.
Li and Huang (2012)	Coal Mining	Transformative leader behavior, safety attitude, and safety performance	Employee safety attitude plays a mediating role between transformative leader behavior and employee safety performance.
Li, Yang, and Wang (2012)	Healthcare	Leader behavior, safety culture and safety performance	Safety culture is positively correlated with employee active performance.
Yang (2013)	Construction Industry	Safety culture and safety performance	Safety culture affects safety outcomes through safety behavior.
Zeng and Huang (2014)	Healthcare	Patient safety attitude and safety behavior	Attitude of clinical nurses towards patient safety is positively correlated with safety behavior.
Li et al. (2016)	Healthcare	Hospital safety culture, patient safety behavior and safety performance	Both hospital safety culture and patient safety behavior affect safety performance.

From the previous literature, it can be seen that there is a lack of research on the correlation mechanism between patient safety culture and safety performance. This study will explore the relationship between hospital patient safety culture and safety performance and the mechanism of action so as to provide theoretical support for the hospital to buildgood patient safety culture to guide the safety behavior of the medical staff safety behavior and

improve the hospital safety performance.

2.5 Research Hypotheses

This research is an empirical analysis of the relationship between patient safety culture and safety performance. From the theoretical analysis of the influence of patient safety culture, safety performance and safety culture on safety performance, it is known that Safety culture is an adjustable dynamic equilibrium resulted from the coordination of values, leadership strategy and attitude (Patankar & Sabin, 2010); there is a positive correlation between safety culture and safety behavior (Zohar, 1980; Griffin & Neal, 2000; Rong, 2009; Zeng & Huang, 2014; Ye, Li, & Wang, 2014; Li et al., 2016); there is a positive correlation between safety culture and safety performance (Zohar,1980; Wu,2001; Li, Yang , & Wang., 2012; Li et al., 2016), safety culture affects safety performance through safety behavior (Yang, 2013); hospital safety performance can be assessed from the four aspects of safety management, safety facility, safety training and accident analysis (Li et al., 2016). Based on the findings of literature review, the theoretical assumption model of this research is presented as follows:

Figure 2-3 Theoretical Assumption Model
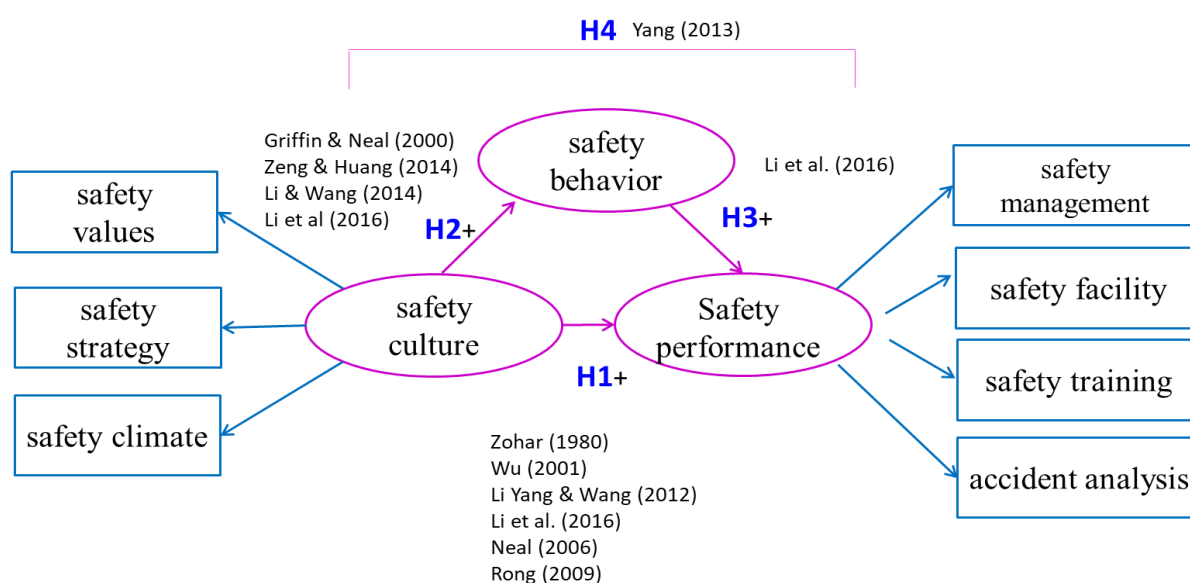
2.6 Theoretical Framework

2.6.1 Organizational Culture Structural Theory

The discussion of cultural structure is a research perspective of cultural anthropology. Many scholars believe that culture is a onion-like structure, with a core wrapped by multiple layers. Although the inner core of culture is deeply hidden, it still exerts influence on the outer structure of culture. Hofstede locates norms and values at the central core. His next layer consists of rituals, the following of heroes whilst the outer layer consists of symbols. Only the last three layers - rituals, heroes and symbols - are relevant, according to Hofstede. He calls these three layers "practices"' in contrast to the norms and values of the core. These practices are more easily changed than the norms and values, while the more outward a layer is situated, the more superficial it is. Norms and values are learned during childhood through parental upbringing and schooling and remain relatively stable during the rest of our lives. This characteristic also implies that culture is learned. However obvious, this fact offers a major justification for contemporary culture research in that it explains the quest for culture's influences, ingredients and consequences (Guldenmund, 2000). We wish to influence and change it. Although authors are relatively consensual about the general ordering of the layers, there is considerable disagreement about what the different layers might encompass, as shown in Table 2-5 (Guldenmund, 2000). Schein is very reluctant to count behavior as a cultural expression per se. He also removes values from the core, which he replaces with basic assumptions. Any other manifestation of culture is, for him, an artifact, whereas the other authors make several distinctions within those artifacts (Guldenmund, 2000).

Therefore, interpretation of the connotation structure of hospital safety culture in this study is mainly based on Schein's corporate culture structure theory(Schein, 1992). This theory lays a theoretical foundation in establishing hospital safety culture structure and investigation indicators.

Table 2-5 Interpretation of Culture Structure by Different Scholars

Reference	Central core	Layer1	Layer2	Layer3
Deal and Kennedy (1982)	Values	Heroes	Rites and rituals	Communication network
Hofstede (1986, 1991)	Values	Rituals	Heroes	Symbols
Sanders and Nuijen (1987)	Values and principles Rituals	Rituals	Heroes	Symbols
Schein (1992)	Basic underlying assumptions	Espoused values	artifacts	
Van Hoewijk (1988)	Fixed convictions	Norms and values	Myths, heroes, symbols, stories	Codes of conduct, rituals, procedures

Source: Guldenmund (2000)

2.6.2 Safety Culture Pyramid Conceptual Model

Based on the multidimensional and dynamic nature of safety culture, Patankar and Sabin (2010) proposed a pyramid conceptual model that describes the dynamic equilibrium between the four stacked layers, as shown in Figure 2-4.

(1) The basic connotations and interrelations of the four layers of the safety culture pyramid. The top of the safety culture pyramid is safety performance (or safety behavior), followed by safety climate (or employee safety attitude and viewpoint), safety strategy, and the bottom is the safety value. The model believes that the closer the relationship between values and strategies, the smaller the difference between espoused value and practiced value; the smaller the difference between espoused value and practiced value, the better the safety climate; the better the safety climate, the more excellent the safety performance.

①Safety performance: It includes accidents, accident proneness, mistakes and all types of safeor unsafe behaviors.

②Safety climate: It reflects the attitude and opinions of the sample population.

③Safety strategy: A strategy is the primary plan made for achieving a specific goal. A safety strategy includes leadership strategy, organizational mission, values, structure and purpose, process, convention and routine, history, deeds and heroes. These are the most tangible aspects of safety culture.
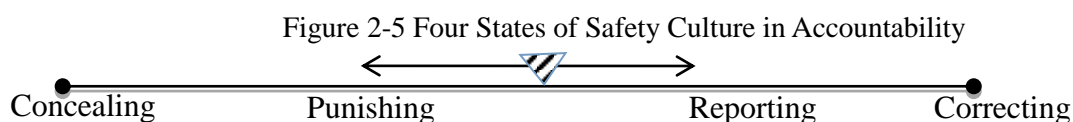
④Safety value: Common values and beliefs are the basis of culture. In order to understand organizational safety culture, it is crucial to thoroughly explore the common values, beliefs and indisputable assumptions. Values include practiced values(values embodied in the organization's actual actions) and espoused values (values claimed in the publicity materials). In order to describe the safety culture of a particular organization at a particular point in its development, we must find out the practiced values at the bottom of the pyramid, and identify the gaps between practiced values and espoused values. Cultural changes can be seen as cultural revolutions. These changes must be thorough enough and should be transformation, association and creation of values.

Figure 2-4 The Pyramid of Safety Culture
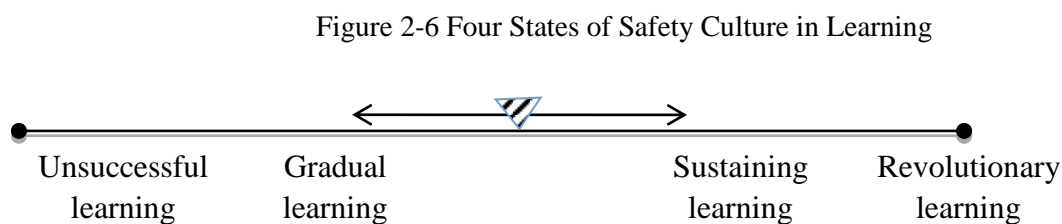

Source: Patankar and Sabin (2010)
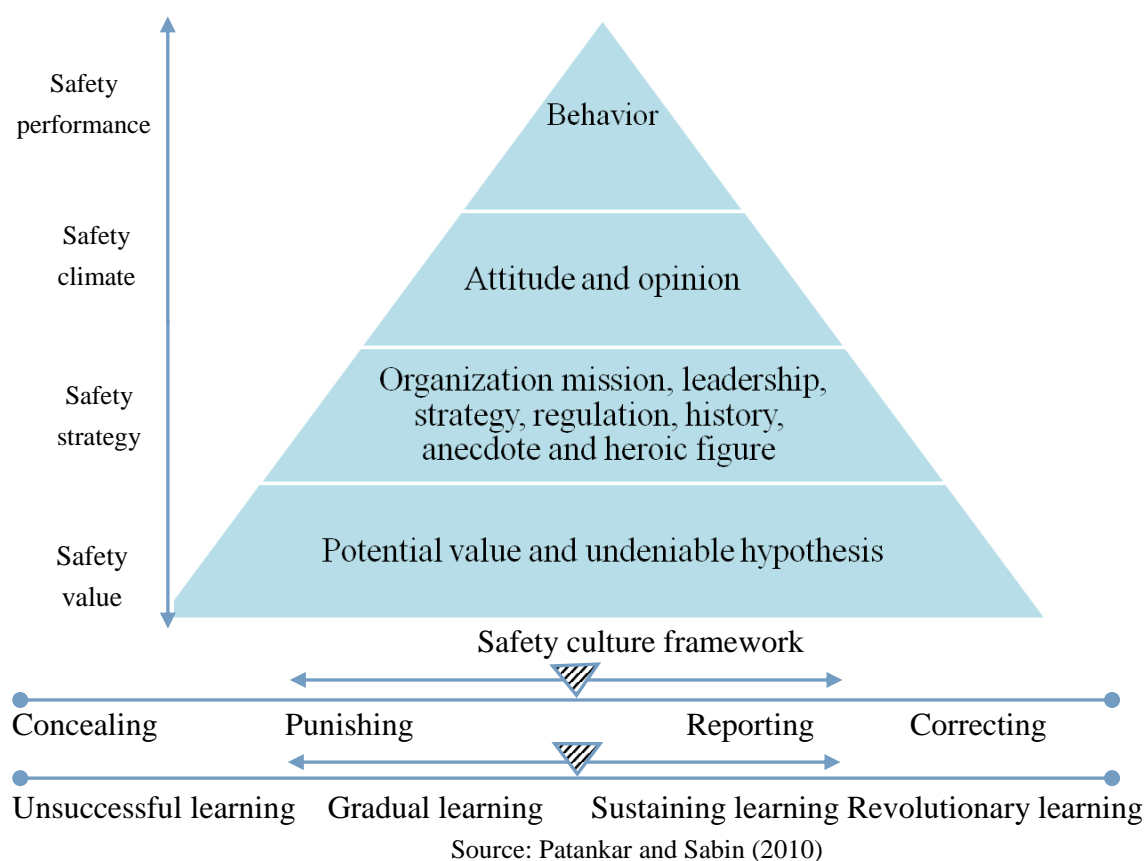
(2) The state of safety culture: All organizations have organizational values, leadership strategies, employee attitude and beliefs, and employee behavior. They exist in a balanced state: behavior is the result of a dynamic balance between value orientation, practiced

strategies and employee attitudes. Such a state can be categorized by two spectra: accountability and learning. The four notable safety culture states in the accountability spectrum are "concealing culture, punishing culture, reporting culture, and correcting culture" as shown in Figure 2-5. The four notable states in the learning level are "unsuccessful learning, gradual learning, sustaining learning, and revolutionary learning" as shown in Figure 2-6.

Figure 2-5 Four States of Safety Culture in Accountability

Concealing   Punishing   Reporting   Correcting

Source: Patankar and Sabin (2010)

Figure 2-6 Four States of Safety Culture in Learning

Unsuccessful   Gradual   Sustaining   Revolutionary
learning   learning   learning   learning

Source: Patankar and Sabin (2010)

The model explains the relationship between different levels and within a level of organizational culture structure more clearly. Therefore, it is considered as the theoretical framework to assess the status quo of safety culture and develop corresponding intervening measures.

Chapter 3: Design of Questionnaire

From the current situation of patient safety culture research both at home and abroad, it can be seen that scholars usually start from identifying several dimensions of patient safety culture, and then design the questionnaire by themselves or quote a relatively mature safety culture scale. Through the analysis of the four mature patient safety culture questionnaires in the literature review, definitions of safety culture in the SAQ, PSCHOS, and HSOPSC are different from that in this research. The MaPSaF is a qualitative research tool for patient safety culture (Parker, 2009) and does not meet the requirements of this study. Therefore, based on a review of the literature, the chapter summarizes the measurement indicators of safety culture, safety behavior and safety performance in the previous studies and designs the questionnaire combining factors in modern patient safety management.

The final questionnaire is divided into three parts, the first part is the purpose of this survey and the introduction of the basic situation; the second part is the formal questionnaire, including patient safety culture questionnaire, medical staff patient safety behavior questionnaire, and patient safety performance questionnaire; the third part is the general demographic data of the respondents. All questionnaires are scored using the Likert six-level scale. In the safety behavior questionnaire, 1 to 6 represent "never, occasionally, sometimes, often, usually and always", and in other questionnaires, 1 to 6 represent "strongly disagree, disagree, somewhat disagree, somewhat agree, agree, and strongly agree".

3.1 Patient Safety Culture Questionnaire

The questionnaire is a self-designed and self-compiled one, including safety value sub-questionnaire, safety strategy sub-questionnaire and safety climate sub-questionnaire.

The first step is the formation of the item pool. The questionnaire framework is established under the guidance of "patient safety values, patient safety strategy and safety climate". Based on books including *Safety culture: Building and sustaining a cultural change*

in aviation and healthcare (Patankar et al. 2015), *Jinchuan "Five-Stage" integrated model for safety culture management and control* Yang, Pei , Wang, Zhou, & Zhao.,2014) and *Research on safety culture system of coal mining enterprises*(Li, 2009) as well as and the Chinese version of Gershon Hospital Safety Climate Scale (C-HSCS) (Xu, 2013), the item pool is formed with a total of 139 items, including 25 items of patient safety values (7 items in espoused values and 18 items in practiced values), 79 items in patient safety strategy (24 items in leadership strategy, 11 items in organizational structure, 29 items in rules and regulations, and 15 items in positive motivation), and 35 items of patient safety climate (9 items in management support, 6 items in safety work obstruction, 7 items in feedback and training, 7 items in safety environment, and 6 items in conflict and communication).

The second step is the formation of the first draft of questionnaire. Six experts including one hospital management expert, one medical management expert, three nursing management experts, and one scale compilation expert are invited to make the first-round evaluation of the content validity and form the first draft. The experts' information is shown in Table 3-1. Each item is scored from 1 to 4, with 1 meaning "disagree with the item" and 4 meaning "strongly agreeing with the item". The item-level content validity index (I-CVI) is calculated by dividing the total number of experts giving a score of 3 or 4 to the item by the total number of experts. The average of all I-CVIs on the Scale(S-CVI/Ave) is the mean value of I-CVIs. The acceptable standard for expert content validity is I-CVI≥0.78 and S-CVI/Ave≥0.90.

The third step is the formation of the second draft of questionnaire. Five nursing experts with rich experience in clinical management are invited to discuss the questionnaire item by item through focus group meetings so as to check the structure of the questionnaire, wording of the questions and the difficulty of completing the questionnaire. The second draft is formed based on calculation of expert content validity and item content validity. The expert information is shown in Table 3-1. Each item is scored from 1 to 4, with 1 meaning "disagree with the item" and 4 meaning "strongly agreeing with the item". The acceptable standard for expert content validity is I-CVI≥0.78 and S-CVI/Ave≥0.90.

Table 3-1 Expert Information Table

Expert Consultation	Serial Number	Subject	Professional Title	Educational Background
1st round	A	Hospital management	Professor of hospital management, researcher	Doctor
	B	Medical management	Medical record information technology (sub-senior)	Master
	C	Nursing management	Associate professor of nursing	Master
	D	Nursing management	Associate professor of nursing	Master
	E	Nursing management	Associate professor of nursing	Bachelor
	F	Nursing education	Professor	Doctor
2nd round	A	Nursing management (nursing department)	Associate professor of nursing	Master
	B	Nursing management (internal medicine)	Associate professor of nursing	Master
	C	Nursing management (surgery)	Associate professor of nursing	Bachelor
	D	Nursing management (ICU)	Associate professor of nursing	Bachelor
	E	Nursing management (outpatient)	Associate professor of nursing	Bachelor
3rd round	A	Hospital management	Professor of hospital management, researcher	Doctor
	B	Medical management	Medical record information technology (sub-senior)	Master
	C	Nursing management (surgery)	Professor of nursing	Bachelor
	D	Nursing management (pediatrics)	Associate professor of nursing	Bachelor

The fourth step is the formation of the third draft of the questionnaire. Two medical management experts and two nursing management experts are invited to score the questionnaires. Each item is scored from 1 to 4, with 1 meaning "disagree with the item" and 4 meaning "strongly agreeing with the item". The acceptable standard for expert content validity is I-CVI=1 and S-CVI/Ave=1.

Expert content validity results. In the first round, a total of six experts are invited to evaluate the content validity of 139 items. With the standard of I-CVI≥0.78, 41 items are deleted, 14 items are merged and one item is added, and the S-CVI/Ave = XXX (≥0.9required). In the second round, a total of five experts are invited to evaluate the content validity of 85 items. With the standard of I-CVI≥0.78, 11 items are deleted, seven items are revised, and one item was merged, as shown in Table 3- 2 and Table 3-3. In the safety value sub-scale, one item is deleted. There is duplication of meaning between the item 10 "In nursing, I believe my colleagues can conscientiously implement risk assessment and prevention" and item 17 "I take the initiative to emphasize the management of key links (key groups and key time slots), so item 17 is deleted; two items are revised: the item 6 "I believe the hospital should establish the ethics idea that patient safety is closely related to the interests, life, health and happiness of employees" is revised into "I believe the hospital should establish the ethics idea that patient safety is related to everyone concerned" since the expression is easier to understand; The item 13 "In nursing, I voluntarily comply with safety-related laws, regulations, system, and procedures" is revised to "In nursing, I 100% comply with safety-related laws, regulations, system, and procedures"; Two items are merged into one: the item 8 "I think the hospital does regard patient safety as a top priority in decision-making processes, regulations and meeting agendas" and item 9 "I think the hospital does regard patient safety as the top priority in the allocation of resources (including manpower, time, equipment, and funds) have similar meaning, so they are merged into "I think the hospital does regard patient safety as the top priority in decision-making and allocation of resources (including manpower, time, equipment, and funds)".Nine items are deleted in the safety strategy sub-scale:there is duplication of meaning between the item 2 "I think our hospital has a specially-assigned person responsible for patient safety management" and the item 15 "I think there is a full-time safety management employee with clear

responsibility in our hospital", so the item 2 is deleted. The item 3 "I think the patient safety management plan developed by the hospital leaders is feasible" contains the meaning of item 7 "The hospital provides necessary resources to ensure patient safety", so the item 7 is deleted. There is duplication of meaning among the item 4 "In our hospital, hospital leaders encourage subordinate managers and employees to participate in the formulation of appropriate strategies and techniques to achieve patient safety goals", the item 6 "I think our hospital leaders fully respect the professional opinions of managers and front-line employees at all levels who are fully empowered", and the item 8 "I think our hospital leaders support safety seminar", so item 4 and item 8 are deleted, with item 6 retained. As for the item 10 "I think our hospital has established an impartial culture in the management of adverse events" and the item 37 "I think the identification process and results of adverse events by our hospital are fair and impartial", experts believe the item 37 is the manifestation of the item 10 and is easier for understanding, so the item 37 is retained and the item 10 is deleted. There is duplication of meaning between the item 29 "The detailed safety management standards in our hospital can ensure patient safety" and the item 28 "Safety supervision and inspection system in our hospital is easy to implement", so the item 29 is deleted. The item 37 "I think the identification process and results of adverse events by the hospital are fair and impartial" contains meanings expressed in the item 35 "I do not fear being penalized or treated unfairly when I report an adverse event" and the item 36 "I am fully aware of the boundary between acceptable and unacceptable behaviors", so the item 35 and 36 are deleted. The item 41 "The hospital carries out various award recognition activities, and sets up typical examples for safety production" and the item 42 "The hospital has department-level and hospital-level safety production models" have similar meaning, so the item 42 is deleted. Three items are revised. Three items in the questionnaire express two levels of meaning and are revised. The item 1 "I think our hospital classifies patient safety as key organizational values and incorporates it into the organizational mission" is revised to "I think our hospital integrates the patient safety values into the hospital mission". The item 5 "Our hospital leaders immerse themselves with the first-line staff, observe and discuss the existing or potential problems threatening patient safety, and assist the first-line medical staff to resolve the problems" is revised to "Our hospital leaders immerse themselves with the first-line staff and assist them to

resolve existing or potential problems threatening patient safety".The item 14 "I think there is a safety management committee in our hospital with reasonable structure and clear responsibilities" is revised to "I think the safety management committee of our hospital has reasonable structure and clear responsibility". In the safety climate sub-scale, one item is deleted. Both the item 7 "In my department, the leaders try their best to take precautions to ensure patient safety" and the item 22 "My leaders turn a blind eye to recurrent patient safety issues" are talking about whether the leaders pay attention to patient safety issues, and experts suggest to retain the positive item. Two items are revised. As for the item 16 "In my department, my leaders often discuss with us about safety issues", experts believe that safety issues are too general and revise it to "In my department, my leaders often discuss with us about safety issues (such as patient safety issues and employee safety behavior issues); as for the item 20 "I feel there is no pressure to bring safety issues to the safety supervisor", experts believe that exposure of safety issues should not be limited to the office. Instead, they should be expressed in time. So the item is revised to "In my department, when seeing things that may cause adverse influence on patients, the staff can talk about it freely".

In the third round, four experts are invited to score the 46 items. With the standard of I-CVI=1、S-CVI/Ave=1, all items are acceptable.

The third draft of the safety values questionnaire consists of two dimensions and 15 items, including seven items in "espoused values" and eight items in "practiced values". The third draft of the safety strategy questionnaire consists of four dimensions and 34 items, including eight items in "leadership strategy", six items in "organizational structure", 12 items in "rules and regulations", and eight items in "positive incentive". The third draft of safety climate questionnaire consists of five dimensions and 25 items, including seven items in management support, three items in safety work obstacle, five items in feedback and training, six items in safety environment, and four items in conflict and communication. The details are shown in Table 3-4.

Table 3-2 Items Deleted in the Second Round and Reasons of Deletion

Name of Scale	Retained Item	Deleted Item	Reason for Deletion
Safety Value	Item 10 "In nursing, I believe my colleagues can conscientiously implement risk assessment and prevention".	Item 17 "I take the initiative to emphasize the management of key links (key groups and key time slots).	Item 10 contains the contents of Item 17.
Safety Strategy	Item 3 "I think the patient safety management plan developed by the hospital leaders is feasible".	Item 7 "The hospital provides necessary resources to ensure patient safety".	Item 3 contains the contents of Item 7.
	Item 6 "I think our hospital leaders fully respect the professional opinions of managers and front-line employees at all levels who are fully empowered".	Item 4 "In our hospital, hospital leaders encourage subordinate managers and employees to participate in the formulation of appropriate strategies and techniques to achieve patient safety goals", and Item 8 "I think our hospital leaders support safety seminar".	Duplication of Meaning
	Item 15 "I think there is a full-time safety management employee with clear responsibility in our hospital".	Item 2 "I think our hospital has a specially-assigned person responsible for patient safety management".	Duplication of Meaning
	Item 28 "Safety supervision and inspection system in our hospital is easy to implement".	Item 29 "The detailed safety management standards in our hospital can ensure patient safety".	Duplication of Meaning

Item 37 "I think the identification process and results of adverse events by our hospital are fair and impartial".	Item 35 "I do not fear being penalized or treated unfairly when I report an adverse event" and Item 36 "I am fully aware of the boundary between acceptable and unacceptable behaviors".	Item 37 contains the meaning expressed in Item 35 and 36.
Item 37 "I think the identification process and results of adverse events by our hospital are fair and impartial".	Item 10 "I think our hospital has established an impartial culture in the management of adverse events".	Item 37 is the manifestation of Item 10 and is easier to understand.
Item 41 "The hospital carries out various award recognition activities, and sets up typical examples for safety production".	Item 42 "The hospital has department-level and hospital-level safety production models".	Similarity of Meaning
Item 7 "In my department, the leaders try their best to take precautions to ensure patient safety".	Item 22 "My leaders turn a blind eye to recurrent patient safety issues".	Both items are talking about whether the leaders pay attention to patient safety issues, and experts suggest to retain the positive item.

Table 3-3 Items Revised in the Second Round and Reasons of Revision

Name of Scale	Before Revision	After Revision	Reason for Revision
Safety Value	Item 6 "I believe the hospital should establish the ethics idea that patient safety is closely related to the interests, life, health and happiness of employees".	Item 6 "I believe the hospital should establish the ethics idea that patient safety is related to everyone concerned".	The expression is easier to understand.
	Item 13 "In nursing, I voluntarily comply with safety-related laws, regulations, system, and procedures".	Item 13 "In nursing, I 100% comply with safety-related laws, regulations, system, and procedures".	Expression is more accurate.
Safety Strategy	Item 1 "I think our hospital classifies patient safety as key organizational values and incorporates it into the organizational mission".	Item 1 "I think our hospital integrates the patient safety values into the hospital mission".	The original item contains two levels of meaning.
	Item 5 "Our hospital leaders immerse themselves with the first-line staff, observe and discuss the existing or potential problems threatening patient safety, and assist the first-line medical staff to resolve the problems".	Item 5 "Our hospital leaders immerse themselves with the first-line staff and assist them to resolve existing or potential problems threatening patient safety".	The original item contains two levels of meaning.
	The item 14 "I think there is a safety management committee in our hospital with reasonable structure and clear responsibilities".	Item 14 "I think the safety management committee of our hospital has reasonable structure and clear responsibility".	The original item contains two levels of meaning.
Safety Climate	Item 16 "In my department, my leaders often discuss with us about safety issues".	Item 16 "In my department, my leaders often discuss with us about safety issues (such as patient safety issues and employee safety behavior issues).	Experts believe that safety issues are too general and should narrow it down.
	Item 20 "I feel there is no pressure to bring safety issues to the safety supervisor".	Item 20 "In my department, when seeing things that may cause adverse influence on patients, the staff can talk about it freely".	Experts believe that exposure of safety issues should not be limited to the office. Instead, they should be expressed in time.

Table 3-4 Measurement Items of Patient Safety Culture Questionnaire

Name of Questionnaire	Measurement Dimension	Measurement Indicators	Reference
Patient Safety Value Quest.	Espoused Values	I believe the hospital should establish the concept of "safety first".	Li (2009)
		I believe the hospital should establish the safety concept of "prevention first".	Li (2009)
		I believe the hospital should establish the safety concept of "people first" ("patient and patient family centered")	Li (2009)
		I believe the hospital should establish the scientific outlook of "intrinsic safety" (use measures such as design to make production equipment or production system themselves safe)	Li (2009)
		I believe the hospital should establish the emotional view of "cherishing life".	Li (2009)
		I believe the hospital should establish the ethics of "patient safety is closely related to everyone".	
		I believe the hospital should establish the view of "safety is benefit".	Li (2009)
	Practiced Values	I believe that the hospital should put patient safety at first in decision-making and allocation of resources (including manpower, time, equipment and fund).	
		In nursing, I believe my colleagues conscientiously implement risk assessment and prevention measures.	Li (2009)
		I believe my colleagues regard patient safety as their own task.	
		In nursing, I voluntarily invite patients and patient family members to take part in safety management.	Li (2009)
		In Nursing, I 100% comply with laws and regulations, system and procedures related to patient safety.	Li (2009)
		I believe participation of safety training and meeting is a waste of time.	
		I voluntarily learn the professional skills that ensure patient safety.	Li (2009)
		I regard department nursing safety record as my own safety record.	

Patient Safety Strategy Quest.	Leadership Strategy	I believe my hospital integrates the patient safety value into hospital mission.	Patankaret al. (2015)
		I believe the patient safety management scheme made by the hospital is feasible.	
		Our hospital leaders immerse themselves with the first-line staff and assist the medical staff to resolve the existing or potential problems threatening patient safety.	Patankaret al. (2015)
		I believe our hospital leaders fully respect the professional opinions of management staff at all levels and the first-line staff, giving them full authorization.	Patankaret al. (2015)
		In our hospital, all important safety meetings are participated by hospital decision makers.	Patankaret al. (2015)
		Our hospital assesses patient safety culture regularly.	Patankaret al. (2015)
		I believe that the hospital feeds the patient safety culture assessment results back in time to managers at all levels and the whole staff.	Patankaret al. (2015)
		I believe that our hospital will take corresponding measures for improvement based on the patient safety culture assessment results.	Patankaret al. (2015)
	Organizational Structure	I believe the safety management committee of our hospital has reasonable structure and clear responsibilities.	Li (2009)
		I believe our hospital has full-time specially assigned safety management staff.	Li (2009)
		I believe the safety management head of all departments have clear responsibilities.	Li (2009)
		I believe that all departments of our hospital have part-time safety officers with clear responsibilities.	Li (2009)
		I believe the safety management organizational structure and personnel allocation of our hospital are reasonable.	Li (2009)
		I believe that the responsibilities, rights and interests of safety management institutions are clear and reasonable.	Li (2009)

Rules and Regulations	I believe there is ambiguity and vagueness in the safety regulations of our hospital.	Li (2009)
	I believe that all the communication systems (including internal communication system and doctor-patient communication system) are effective.	Patankaret al. (2015)
	I believe that the multiple-department collaboration system of our hospital functions well and can resolve the patient safety issues jointly.	Patankaret al. (2015)
	I believe the system of patient participation in safety management is not effectively implemented.	Li (2009)
	I believe the medical risk early warming indicator system of our hospital is comprehensive and reasonable.	Patankaret al. (2015)
	I believe the safety (adverse) events prevention and handling system reflects the improvement of patient safety through systematic thinking and procedures.	Patankaret al. (2015)
	The hospital formulates complete and systematic employee safety publicity education and training system.	Li (2009)
	The safety supervision and inspection system of our hospital is easy for implementation.	Li (2009)
	The safety rules and regulations are not perfectly implemented in our hospital.	Li (2009)
	The safety production responsibility and reward and penalties system of our hospital is effective.	Li (2009)
	The hospital reviews and revises relevant regulations, standards and procedures of safety management.	Li (2009)
	In our hospital, the national safety standard, norm, and system are kept track of.	Li (2009)
Positive Incentive	Our hospital implements policies to encourage reporting of adverse events.	Patankaret al. (2015)
	I believe the identification process and results of adverse events by our hospital are fair and impartial.	Patankaret al. (2015)
	I can frankly talk about safety issues with hospital managers.	Patankaret al. (2015)
	The hospital disseminates patient safety value through multiple channels.	Patankaret al. (2015)
	The hospital has a strong safety culture climate.	Patankaret al. (2015)
	The hospital carries out various selection and commendation activities and set up role models for safety production.	Patankaret al. (2015)

		The hospital sets up reward/recognition mechanism and ensures that every safety objective has the proper priority.	Patankaret al. (2015)
		Hospital leaders support employee scientific research and innovation to improve patient safety.	Patankaret al. (2015)
Patient Safety Climate Quest.	Management Support	When introducing the hospital, the leaders will first talk about patient safety and the idea.	Wu, Geng, and Fu, G. (2013)
		When making the annual plan, the hospital leaders will take patient safety control into consideration.	Wu et al. (2013)
		Hospital leaders stick to carry out patient safety examination regularly and will take effective measures for improvement after the examination.	Wu et al. (2013)
		Hospital leaders will not curtail investment in prevention of major hidden safety risks even if the budget is tight.	Wu et al. (2013)
		Hospital leaders encourage employees to report patient safety (adverse) events without being afraid of the negative influence.	Xu (2013)
		In my department, the leaders encourage us to put forward suggestions for patient safety improvement and give us tangible support.	Wu et al. (2013)
		In my department, the leaders try their best to take precautionary measures to ensure patient safety.	Xu (2013)
	Safety Work Obstacle	I have enough time in work and I always abide by patient safety management system.	Xu (2013)
		My workload is not heavy and it barely affects my implementation of patient safety management system.	Xu (2013)
		My department is adequately staffed so that I can always implement patient safety management system.	Xu (2013)

Feedback and Training	In my department, the leaders offer me adequate safety education and training to ensure that I can effectively finish my job and safeguard patient safety.	Xu (2013)
	In my department, the leaders invest adequate fund and time in employee safety training.	Wu et al. (2013)
	In my department, the leaders teach the employees to pay attention to and identify the potential dangers threatening patient safety in work.	Xu (2013)
	In my department, the leaders correct unsafe work practice of employees.	Xu (2013)
	If I come across patient safety (adverse) events in my work, I will report it to department leaders and relevant departments in time.	Wu et al. (2013)
Safety Environment	The hospital holds patient safety management meeting regularly.	Xu (2013)
	The hospital has adequate resources to ensure patient safety (such as medical equipment, facilities and protective goods).	Wu et al. (2013)
	I can get the medical facilities needed to ensure patient safety at any time.	Wu et al. (2013)
	My department has a good medical treatment order.	Wu et al. (2013)
	If any things that may cause adverse influence on patient are seen in my department, the staff can speak it out freely.	Wu et al. (2013)
	In my department, I must comply with patient safety procedure before I get recognition from colleagues.	Wu et al. (2013)
Conflict and Communication	Departments of the hospital collaborate well, offering optimal treatment and caring for patients.	Wu et al. (2013)
	There is few conflicts between colleagues in my department.	Xu (2013)
	The colleagues help each other in my department.	Xu (2013)
	The communication between leaders and employees is good in my department.	Xu (2013)

3.2 Patient Safety Behavior Questionnaire

The patient safety behavior questionnaire quotes the Medical Staff Patient Safety Behavior Scale compiled by Tang, Xiao, and Ren. (2016). Based on Neal's theory of safe behavior(Neal,2006), the scale interprets *the Implementing Regulations for Evaluation Standard of Tertiary General Hospitals in 2012* promulgated by the National Health and Family Planning Commission of the PRC and proposes individual behavior requirements to achieve patient safety. The item base is established based on the items closely related to individual behavior in the 30 safety behavior practices promulgated by the National Quality Forum (NQF) of the US. The preliminary scale is established after a panel of experts carry out content validity evaluation. After a formal survey on 369 medical staff, another reliability and validity testis performed on the scale, including Pearson correlation analysis, Cronbach's alpha, and factor analysis. The Cronbach's α coefficient of the questionnaire is 0.65-0.85, and the retest reliability is 0.84-0.92. The author conducts an exploratory factor analysis and extracts 10 common factors of safety behavior. They are classified into two major dimensions with 31 items in total: safety compliance behavior (surgery/invasive operation, prevention of complications, effective communication, medication safety, check system, standard prevention, and critical illness management), and safe participative behavior (learning and training, adverse events reporting, and patient participation).

The original questionnaire used Likert five-point scale, and the answer was the frequency of behavioral occurrences, with 1 meaning never, 2 occasionally, 3 sometimes, 4 often, and 5 always. This study adopts the Likert six point scale as shown in Table 3-5.

Table 3-5 Measurement Items in Medical Staff Patient Safety Behavior Questionnaire

Dimension		Measurement Indicator
Safety Compliance Behavior	Surgery/invasive operation	I comply with the operation norms of surgery and invasive operation.
		I wash my hands as required before contacting patients.
		I inevitably do not strictly follow the aseptic operation rules every month because of the busy work.
		I follow the standard procedures for drainage/treatment of related drainage tubes, such as catheterization.
	Standard prevention	For infectious or communicable diseases, I will make a reasonable protection for myself and the patient.
		For medical waste and sharps, I will discard after correct classification.
		I know the emergency procedures of various types of occupational exposure.
	Medication safety	My use/management of high-risk drugs complies with relevant regulations.
		I will comprehensively evaluate the patient's drug response and adverse reactions.
		I will assess medication necessity and offer suggestions.
	Critical illness management	I am familiar with all kinds of critical values and disposal/observation methods.
		I can accurately assess and handle/care critically ill patients.
		I have never made mistakes in handling/caring critically ill patients.
	Effective communication	When meeting questions in work, I will consult in time.
		I make no mistakes when issuing/executing a doctor's advice.
		When finding that my colleagues have unsafe behavior, I will promptly remind them whether the harm has been done or not.

	Check system	For any operation, I will check by myself.
		For any operation, I can use at least two ways to identify the identity of patients.
		If students or visiting students are found to perform the check alone, I will stop them immediately.
	Prevention of complications	I can fully assess and prevent the pressure sores and the risk of falling down for every patient.
		I can fully assess and prevent the risk of deep venous thrombosis of every patient.
		I can fully assess and prevent the risk of myocardial ischemia of every patient.
		I can fully assess and prevent the malnutrition of every patient.
Safety Participative Behavior	Patient participation	After I fully communicate with patients and their families, I respect the treatment options and opinions of the patients.
		I will ask the patient to repeat the important information communicated to confirm their full understanding.
	Learning and training	I will periodically review the basic knowledge and basic theory and practice basic skills.
		If the hospital holds relevant academic activities, I always voluntarily participate.
		When I come up with suggestions that can promote patient safety, I will propose them to our leader.
	Adverse events reporting and learning	I will pay attention to the adverse events that occur to myself and others and conduct an in-depth analysis.
		When I find that my own behavior endangers patient safety, I will honestly report it whether it does harm to the patient or not.
		When a colleague is found to do something jeopardizing the safety of the patient, I will not report if it is not serious.

Source: Tanget al. (2016)

3.3 Patient Safety Performance Questionnaire

The safety performance questionnaire in this study is based on the patient safety performance questionnaire compiled by Li et al. (2015). Li et al. (2015) take reference from research of Copper, Wu and Liu. Through consultation with hospital management experts, they repeatedly revise the research tools and finally form the patient safety performance questionnaire. The Cronbach's α coefficient of the questionnaire is 0.531 to 0.949. The author carries out an exploratory factor analysis and extracts four common factors: safety management, safety facilities, safety training, and accident analysis.

The original questionnaire consists of 26 items including one item of "Overall Evaluation of Safety Performance Level", seven items of "Safety Management", five items of "Safety Facilities", seven items of "Safety Training", and two items of "Accident Occurrence Frequency" and four items of "Accident Analysis" in "Safety Accident" as well as one open question. The original questionnaire uses the Likert five-point grading system. The author revises the "Overall Evaluation of Safety Performance Level" to three items, revises the dimension of "Safety Accident" to "Safety (Adverse) Events" according to the definition of safety (adverse) accidents in *the Implementing Regulations for Evaluation Standard of Tertiary General Hospitals in 2012*. The new scale adopts the Likert six-point grading method as shown in Table 3-6.

3.4 Pre-Test

Twenty nurses from a level 3A hospital in Anhui Province are selected to carry out a pre-test on the questionnaire. All respondents should answer questions such as difficulty of items, accuracy of expression, reasonableness of items, and whether there is better wording. The items are not modified after the pre-test, and the ultimate Chinese version of the questionnaire come into shape.

Table 3-6 Measurement Items of Medical Staff Patient Safety Performance Questionnaire

Dimension	Measurement Indicator	
Safety Management	The hospital has a perfect organizational system for patient safety management (such as medical quality management committee and medical risk management organization).	
	The hospital has a perfect institutional system of patient safety management.	
	Patient safety management has always been the focus of hospital management.	
	When there are issues related to patient safety, the medical staff can work together to resolve them.	
	The hospital has good communication channels to solve patient safety issues.	
	The hospital has emergency plan for critical patient safety incidents.	
	To ensure patient safety, the hospital will allocate the workload according to the health conditions of the medical staff.	
Safety Facilities	The workplace and passages are regularly sterilized in line with hygiene requirements.	
	Hospital medical equipment (such as CT machine and aspirator) has corresponding protective measures to reduce patient injury.	
	The hospital strictly implements the medical equipment disinfection and sterilization system.	
	The medical staff use medical equipment in full accordance with the operating procedures.	
	When necessary, the hospital provides personal protective equipment to the patient.	
Safety Training	The hospital regularly conducts training on patient safety related knowledge.	
	Training courses meet the needs of clinical work.	
	Selection of teachers in the training is reasonable and can meet training needs.	
	After the training, the hospital evaluates the effectiveness of the training.	
	The hospital conducts regular patient safety simulation exercises.	
	The hospital provides necessary safety training for employees who change positions.	
Safety (Adverse) Events	Occurrence Frequency	How many times of safety events occur in the past one year?
		How many times of safety events occur in the past three years?
	Analysis	The hospital conducts statistical analysis of patient safety (adverse) events on a regular basis.
		The hospital conducts an in-depth investigation of the causes of patient safety (adverse) events.
		The hospital does not completely reveal the findings in the hospital.
		The hospital uses statistical analysis of patient safety (adverse) events as a reference for improvement of safety performance.

Source: Li et al. (2015)

3.5 Chapter Summary

Based on literature review and expert consultation, this chapter uses the scale development and evaluation methods to develop the measurement tools for this study. The questionnaire is divided into three parts. The first part is the introduction of the purpose of the survey and the basic situation of the questionnaire. The second part is a formal questionnaire composed of three questionnaires: the patient safety culture questionnaire, the medical staff patient safety behavior questionnaire, and the patient safety performance questionnaire. There are a total of 133 items and one open question. The third part is the general demographic data of the respondents with a total of 11 items. Questionnaires are all scored based on the Likert six-point scale. As for the safety behavior questionnaire, the scores from 1 to 6 represent respectively "never, occasionally, sometimes, often, usually, always", and in other questionnaires the scores from 1 to 6 represent respectively "strongly disagree, disagree, somewhat disagree, somewhat agree, agree, and strongly agree".

The patient safety culture questionnaire includes three sub-questionnaires, with a total of 74 items: patient safety value sub-questionnaire (two dimensions and 15 items: seven items in the dimension of "espoused values" and eight items in the dimension of "practiced values"); patient safety strategy sub-questionnaire (four dimensions and 34 items: eight items in the dimension of "leadership strategy", six items in the dimension of "organizational structure", 12 items in the dimension of "rules and regulations" and eight items in the dimension of "positive incentive"); safety climate sub-questionnaire (five dimensions and 25 items: seven items in the dimension of "management support", three items in the dimension of "safety work obstacle", five items in the dimension of "feedback and training", six items in the dimension of "safety environment" and four items on the dimension of "conflict and communication");

The safety behavior questionnaire consists of two dimensions and 31 items: the dimension of safety compliance behavior (four items in surgery/invasive operations, four items in prevention of complications, three items in effective communication, three items in medication safety, three items in check system, three items in standard prevention, and three

items in critical illness management); the dimension of safety participative behavior (three items in learning and training, three items in adverse events reporting, and two items in patient participation).

The safety performance questionnaire includes the overall evaluation of safety performance levels and four dimensions of 28 items in total as well as one open question: "overall evaluation of safety performance levels" (three items); the dimension of "safety management" (seven items);the dimension of "safety facilities" (five items); the dimension of "safety training"(seven items); the dimension of "adverse events" (two items in "adverse events occurrence frequency" and four items in "adverse events analysis").

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Chapter 4: Reliability and Validity Test of the Formal Questionnaire

4.1 Research Methods

This section mainly includes the sampling procedure and sample, the strategy to analyze data, the measures and its respective validity and reliability indicators.

4.1.1 Sampling Method and Procedures

To test the universality of the research model, the researcher selects ten primary hospitals, two secondary hospitals and two tertiary hospitals in Anhui Province to increase the sample size and scope. These hospitals are located in the city of Hefei and Anqing and the county of Wangjiang and Lixin in Anhui Province and are the long-term cooperation institutions for patient safety research project of our research team. In each hospital, two liaison officers are selected and trained to take charge of the on-site quality control, scale distribution and collection, and mailing. The liaisons chosen are nurses with a bachelor degree or above, mastering basic knowledge in nursing research and having experience in questionnaire surveys. The official survey is conducted from September 2017 to December2017. In order to avoid selection bias, researchers and liaison officers issue notices at selected hospitals and explain the purpose of the study to recruit nurses willing to fill out the questionnaire voluntarily. The survey is conducted mainly in two ways. The first is field survey, which is mainly carried out in Hefei. The researcher leads the trained liaison officers to distribute the questionnaires on the spot and watch the questionnaires being filled out; the second is the commissioned survey, which is carried out in Anqing, Wangjiang County and Lixin County. The questionnaire is mailed to the hospital liaison officers (attached with the Questionnaire Distribution Description and Notice). The liaison officers assist in the distribution and supervise the respondents to fill out the questionnaires. Then the questionnaires are mailed to

the researcher after collection. A total of 482 questionnaires are distributed, and 468 are collected. Apart from the 14 questionnaires with incomplete general data, there are in total 468 valid questionnaires collected. The effective collection rate was 97.10%. Among them, 79 valid questionnaires are from primary hospitals, 147 valid questionnaires are from secondary hospitals, and 242 valid questionnaires are from tertiary hospitals.

4.1.2 Data Analysis Strategy

Data analysis proceeds in two phases. In the first phase, we test the robustness of variables used. It is not uncommon for researchers to assume the validity and reliability of previously used measures. However, despite the credit and fundamental robustness of theoretic grounding such measures may deserve, it is true that its interpretation is subjected both to the specificities of languages used as well as the cultural idiosyncrasies and thinking patterns from the specific population inquired. Hence, it is prudent to test for the quality of measures regarding validity and reliability. Otherwise, the researcher may be assuming too much about what is being measured and with how much measurement error. In the second phase, structural equation model is used to analyze the relationship between variables.

Validity can be defined as the extent to which a tool can accurately assess the construct it purports to measure rather than other construct (Nunnally & Bernstein, 1994). Validity includes construct validity, convergent validity, divergent validity and predictive validity (Zikmund ,Babin, Carr, & Griffin. 2013). Confirmatory factor analysis (CFA) is a technique suitable for constructs measured in a scale that has a previously known structure due to its underlying theory. According to Hair, Black, Babin, and Anderson.(2010), when the fit index such as chi-square and CMIN/DF is less than 3 and the p value is not at a significant level, the hypothetical model agrees with the theoretical model. The cut-offs of the fit index of CFA are not constant, and can be adjusted constantly according to complexity of the model (the number of expected parameters) and size of the sample (Hair et al., 2010). It is often observed the adoption of less stricter rules of thumb for models with greater complexity.

In this study, the researcher tends to adopt Hu and Bentler's (1998) cut-offs, namely, CFI$\geq$.90; TLI$\geq$.90; RMSEA$\leq$.08; SRMR$\leq$.06 as corroborated recently by Schermelleh-Engel, Moosbrugger, and Muller (2003). The sample size of this study is large. In this case, the

chi-squared measurement is prone to deviation. Therefore, when the value does not reach the threshold, it should be dealt with appropriately (Hair et al., 2010).

Additionally, we measured reliability on the basis of Cronbach's alpha which should range from .70 to .80 except when measures are novel or have never been tested in the setting, and a lower value of .60 is then acceptable (Nunnaly & Bernstein, 1994). Usually, researchers report values well above .80, which can be taken as indicative of too much redundancy between items. This is especially relevant when developing measures to be used in organizational settings as the extension of scales tend to increase participation drop out. However, as our findings are also intentionally developed targeting not only this study but also thinking of possible future research, we opted to preserve items that leverage reliability above.80, although they can be considered expendable. Also, due to criticism to this measure, we complemented it with composite reliability indicator which should be .70 for acceptance (Hair et al., 2010).

Lastly, as there are many cases where the overall quality of multidimensional constructs seems good but these incorporate some poor quality factors, we also took into consideration the average variance extracted, which should not fall below .500 for acceptance. The main evaluation indexes and criteria of reliability and validity of the study were shown in table 4-1.

Table 4-1 The main evaluation indexes and criteria of reliability and validity

Indexes	Criteria
CMIN Value	Significance ProbabilityP＞0.05 (Not Significant)
CMIN/DF	＜3
CFI	≥0.90
TLI	≥0.90
PCFI	＞0.5
RMSEA	≤0.08
SRMR	≤0.06
Cronbach's alpha	＞0.60
AVE	＞0.50

Source: Hu and Bentler (1998); Nunnaly and Bernstein (1994)

4.2 Sample Characteristic Analysis

The sample comprehends 468 nursing professionals working in primary, secondary and tertiary hospitals in China. The large majority of participants is female (97.6%) and aged diversely from below 25 years old up to retirement age. The largest part (73.1%) is married. The largest part of the sample reports an organizational tenure up to 10 years (65%) closely followed by the professional tenure (67.3%).

The majority of participants (54.3%) ranked functionally as charge nurses followed by head nurses (12.2%). Most participants ranked professionally from primary nurse to senior nurse with the largest part at the intermediate level. Their reported workload per week ranges considerably from 10 hours up to 77 hours. The typical workload is 40 hours per week (57.1%) with a concentration of reports between 40 (including) up to 50 weekly hours achieving 86.2% of the sample. The average reported weekly workload is 42.6 hours (sd=6.1). The nature of employment contract varies with the majority being contracted either as formal establishment (36.3%) or internal hire (34.2%). Employment agencies account for 20.5% of the sample. The sample comprises nurses working in several departments from Medicine (27.1%), surgery (14.3%), Emergency (11.5%), ICU (9%) and many others. The characteristics of the sample were described in Table 4-2.

4.3 Reliability and Validity of the Questionnaire

4.3.1 Reliability and Validity of Safety Values Questionnaire

Safety values were measured with the author's 15-item scale, which comprehends two factors: espoused safety values (7 items, e.g. "I think the hospital should establish the concept of 'the patient safety is related to everyone' ") and practiced safety values (8 items, e.g. "In nursing work, I actively invite my patients and their families to join in the safety management").

Table 4-2 Analysis of General Demographic Characteristics of the Sample

| Categories		Frequency	Valid%
Age	less than 25 years old	77	16.5
	26-35 years old	247	52.8
	36-45 years old	90	19.2
	＞45 years old	54	11.5
Married status	Married	342	73.1
	Unmarried	122	26.1
	Other	4	0.9
Education	Technical secondary school education or below	11	2.4
	Junior college education	189	40.4
	Bachelor	264	56.4
	Master	4	0.9
Level of hospital	primary hospitals	79	16.9
	Secondary hospitals	147	31.4
	Tertiary hospitals	242	51.7
Organizational tenure	Less than 1 year		
	1-5 years	156	33.3
	6-10 years	148	31.6
	11-15 years	47	10.0
	16-20 years	34	7.3
	over 21 years	83	17.7
Professional tenure	Less than 1 year	18	3.8
	1-5 years	152	32.5
	6-10 years	145	31.0
	11-15 years	60	12.8
	16-20 years	31	6.6
	over 21 years	62	13.2
Professional categories	(Vice) Nursing Dean	2	0.4
	Head of the Nursing Department	5	1.1
	Supervisor of Nursing Care	4	0.9
	Head Nurse	57	12.2
	Team Leader	29	6.2
	Professional Nurse	31	6.6
	Charge Nurse	254	54.3
	Assistant Nurse	30	6.4
	Rotary Nurse	34	7.3
	Other	22	4.7
Professional title	Primary	115	24.6
	Intermediate	191	40.8
	Sub-senior	145	31.0
	Senior	17	3.6
Employment contract	Formal Establishment	170	36.3
	Personnel Agency	96	20.5
	Internal Hired	160	34.2
	Others	42	9.0
Main working area or department	No Specific Department	46	9.8
	Medicine	127	27.1
	Surgery	67	14.3
	Obstetrics	28	6.0
	Pediatrics	41	8.8
	emergency department	54	11.5
	ICU	42	9.0
	Operating Room	20	4.3
	Anesthesia	1	0.2
	Outpatient Service	19	4.1
	Others	23	4.9

The confirmatory factor analysis of the original structure showed unacceptable fit indices (CMIN/DF=4.434, p<.001; CFI=.930; TLI=.917; PCFI=.788; RMSEA=.087 [Lo90=.079 Hi90=.096 PCLOSE<.001]; SRMR=.0492). Consequently, we conducted an exploratory factor analysis. It suggested a two-factor solution. However, it contained three cases of unacceptable commonalities. By removing these, the analysis showed a two-factor valid solution (KMO=.905, Bartlett's X^2=2767.332(66), p<.001) explaining 60% variance after rotation. The ensuing CFA show improved fit indices but still below optimal level. Thus, we used Lagrange Multipliers to detect those cases where errors covariate sufficiently to harm the model fit. The items with lower standard factor loadings are found through error covariance, and it is these items that result in poor convergent validity. Results of the Lagrange Multipliers method are consistent with the modified index. From the analysis of items whose errors covariate, we judged their semantic nature is too similar and thus, items themselves and respective errors correlate too much, distorting the factor analysis. As a result, we choose to remove the one with lowest factor loading in each pair of items.

The ultimate fix indices of safety value model are as follows: CMIN/DF=3.313, p<0.001; CFI=0.971;TLI=0.961;PCFI=0.733;RMSEA=0.072[Lo90=0.057;　Hi90　=　0.086　; PCLOSE=0.008], SRMR=0.0308.

The dimension of espoused values and practiced values have good reliability (CR=0.915, and 0.813; Cronbach alpha=0.838 and 0.732)（Figure 4-1）. As for the espoused values, AVE=0.643, and as for the practiced values, AVE=0.522.

Figure 4-1 CFA Safety Values Model
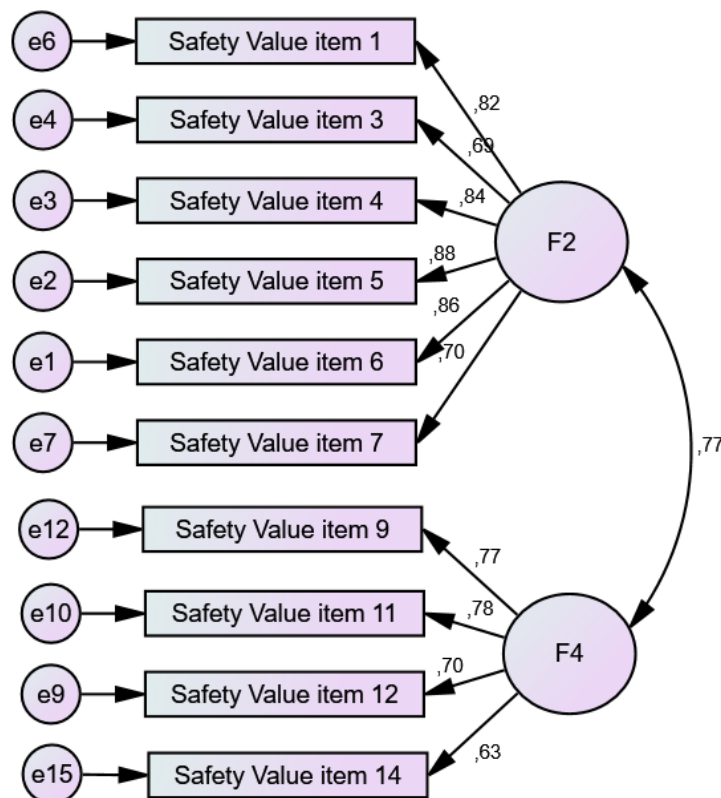
4.3.2 Reliability and Validity of Safety Strategy Questionnaire

Safety strategy was measured with the author's scale comprehending four factors: leadership strategies (8 items, e.g. "I believe our hospital has integrated the patient safety values into the hospital mission"), organizational safety structure (6 items, e.g. "I believe our hospital is staffed with full-time safety management personnel with explicit responsibility"), rules and regulations (12 items, e.g. "I believe the safety (adverse) incident precaution and settlement system in our hospital reflects the improvement of patient safety through systematic thinking and process improvement"), and policy incentives (7 items, e.g. "The hospital publicizes patient safety values via many channels").

The confirmatory factor analysis of the original structure shows unacceptable fit indices (CMIN/DF=4.434, p<.001; CFI=.930; TLI=.917; PCFI=.788; RMSEA=.087 [Lo90=.079 Hi90=.096 PCLOSE<.001]; SRMR=.0492).

After exploratory factor analysis, a preliminary five-factor solution is obtained. After analyzing one of these factors (the last one) we realize that the composition includes only three items from another scale that are the only ones to have been negatively worded. Therefore, we excluded these items. A renewed factor analysis shows a valid four-factor solution (KMO=.958, Bartlett's X^2 (300)=7.741E3, p<.001). All items show acceptable communalities after removal of some items following procedures stated in the data analysis strategy section. Hence, we fixed the solution in this four-factor, which explains 66% total variance (after varimax rotation). All factors are interpretable comprehending items as expected, thus showing good facial validity.

The ensuing CFA shows improved fit indices above acceptance level (CMIN/DF=3.125, p<.001; CFI=.925; TLI=.916; PCFI=.829; RMSEA=.069 [Lo90=.063 Hi90=.074 PCLOSE<.001]; SRMR=.0439) thus rendering the model acceptable.

Lagrange Multipliers indicate no serious case of covariance between errors suggesting the data fits well the four-factor model trimmed down to 24 items (Figure 4-2). The four factors showed good reliability (CR=.821, .924, .912, .912; Cronbach Alpha=.791, .909, .890, and .867) as well as good convergent validity (AVE=.535, .669, .536, .600, respectively).

Figure 4-2 CFA Modified Model of Safety Strategy Questionnaire
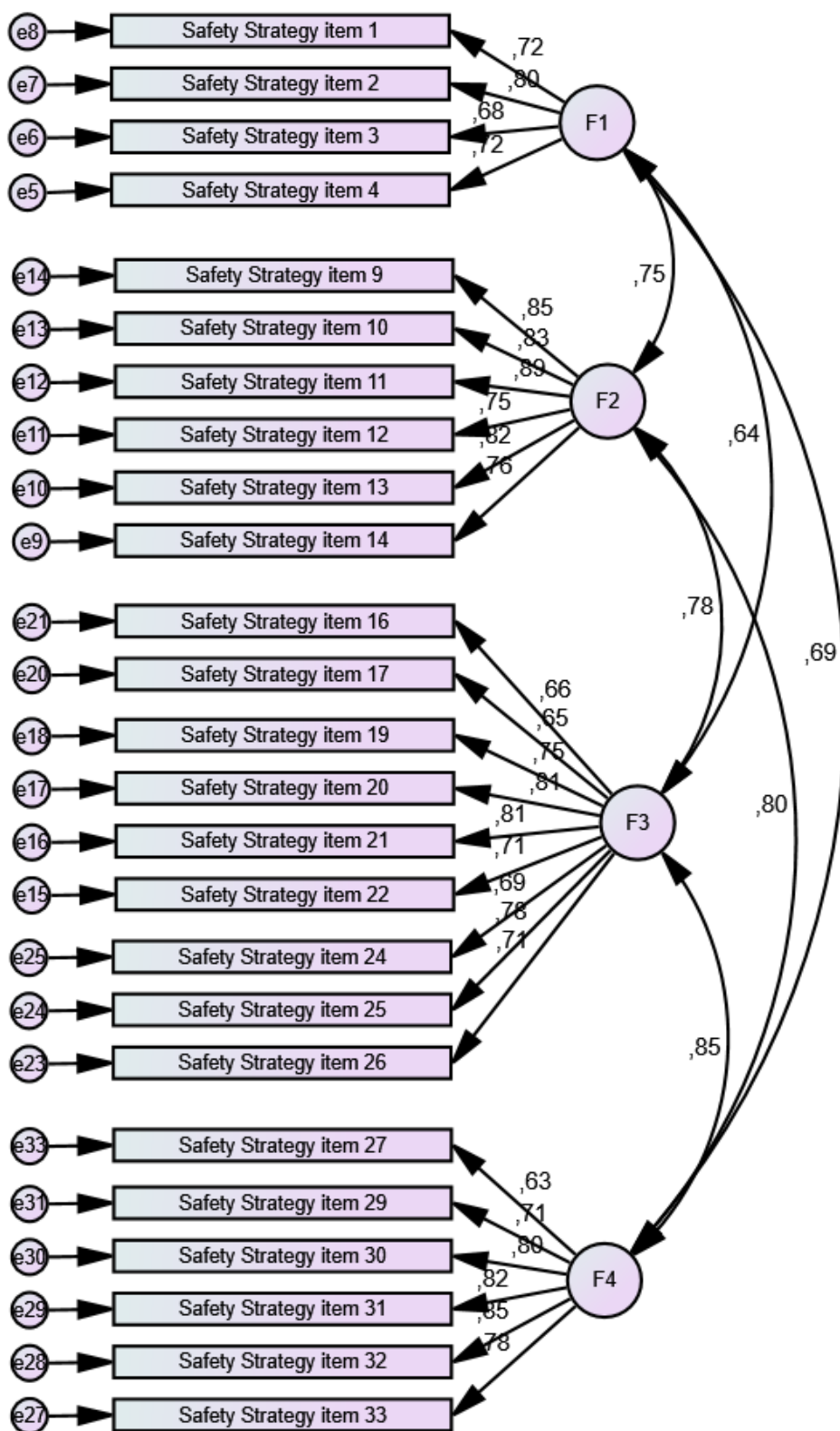
4.3.3 Reliability and Validity of Safety Climate Questionnaire

Safety climate was measured with author's scale comprehending five factors: Safety management support (7 items, e.g. "Hospital leaders will not cut down fund on removing potential dangers even when there is a financial strain"), safety resources / obstacles to safety work (3 items, e.g. "In my department, we have enough personnel allocation which enables me to follow the patient safety management system from the beginning to the end"), safety training (5 items, e.g. "In my department, my leaders put adequate finance and time into safety training of the staff"), safety climate (6 items, e.g. "The hospital holds meetings about patients' management regularly) and conflicts & communication (4 items, e.g. "In my department, there are few conflicts among the colleagues").

The Confirmatory Factor Analysis of the original structure showed unacceptable fit indices (CMIN/DF=5.814, p<.001; CFI=.813; TLI=.788; PCFI=.718; RMSEA=.102 [Lo90=.097 Hi90=.0106 PCLOSE<.001]; SRMR=.0871). The exploratory factor analysis showed a valid three-factor solution (KMO=.883, .663<MSA<.948, Bartlett's X^2 (78) = 2801.712, p<.001) after removal of items that failed to match criteria as stated in the data analysis strategy section above. The operation led to preserving 13 items that explained 65.6% variance after rotation.

The confirmatory factor analysis shows that the fit indices are acceptable: CMIN/DF=2.887, p<0.001; CFI=0.957; TLI=0.947; PCFI=0.773; RMSEA=0.064 [Lo90=0.053 Hi90=0.074 PCLOSE=0.019]; SRMR=0.0383. Lagrange Multipliers indicate no serious case of covariance between errors suggesting the data fits well the three-factor model trimmed down to 13 items（Figure 4-3）. The three factors showed good reliability: Management support and feedback (8 items, CR=.902, Cronbach alpha=.889), Conflict and communication (3 items, CR=.793, Cronbach alpha=.748), and obstacles on safety work (3 items, CR=.770, r_{SB}=.763). The model has good convergent validity (AVE=.536, .567, and .628, respectively).

Figure 4-3 CFA Model of Safety Climate
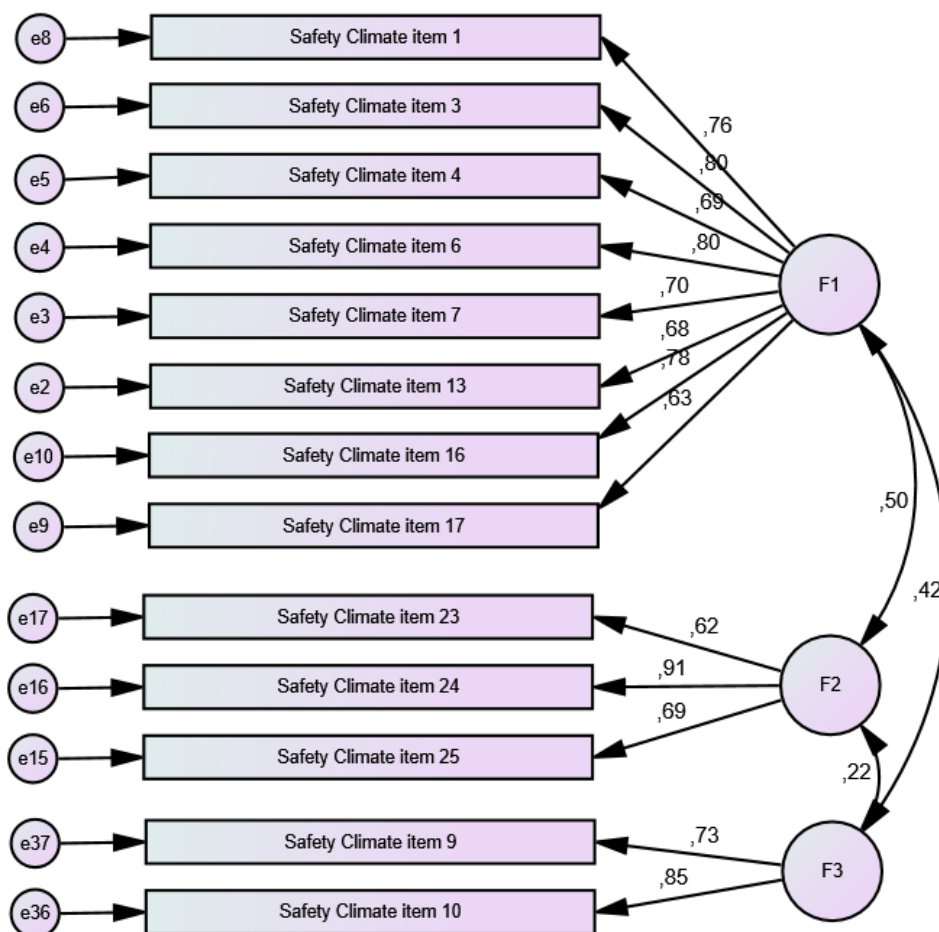
4.3.4 Reliability and Validity of Safety Behavior Questionnaire

Safety behavior was measured with Tang, et al.(2016) 31 item scale that comprehends eleven factors: Surgery invasive procedure (4 items, e.g. "I follow the surgery and invasive operation norms"), standardized prevention (3 items, e.g. "I know the emergency disposal procedures after occupational exposure"), medication safety (3 items, e.g. "I will make an assessment and give suggestions on the necessity of using drugs"), management of emergency and severe cases (3 items, e.g. "I can accurately evaluate and deal with critically ill patient"), effective communication (4 items, e.g. "I appeal to others in time when meeting questions during work"), checking system (3 items, e.g. "In any operation, I can use at least two methods to identify patient identity"), and complication prevention (4 items, e.g. "I can fully

assess and prevent the pressure sores and risk of falling of every patient"), patient participation (2 items, e.g. "I will require patients to retell the important information in the communication to make sure they fully understand it"), learning and training (3 items, e.g. "I regularly review basic knowledge and fundamental theories as well as practice basic skills"), and accident reporting (3 items, e.g. "If my behavior endangers patient safety, I will honestly report it without concealment no matter whether the harm was done or not").

The Confirmatory Factor Analysis of the original structure showed unacceptable fit indices (CMIN/DF=3.763, p<.001; CFI=.824; TLI=.790; PCFI=.691; RMSEA=.077 [Lo90=.079 Hi90=.081 PCLOSE<.001]; SRMR=.0659).

We conducted an exploratory factor analysis which showed many cases of insufficient commonality, thus suggesting respondents did not aggregate many items into the same overall latent construct. By removing these items, as well as those that contributed to lower factorial validity we found a five factor solution with positive indicators (KMO=.901, .830<MSA<.947, Bartlett's X^2 (136)=3386.591, p<.001). This solution explains 67.4% of total variance (after varimax rotation). All factors are interpretable comprehending items as expected, thus showing good facial validity. Confirmatory factor analysis of the five-factor construct (Figure 4-4) shows that the fit indices are acceptable (CMIN/DF=2.873, p<0.001; CFI=0.938; TLI=0.923; PCFI=0.752; RMSEA=0.063 [Lo90=0.055 Hi90=0.072 PCLOSE=0.004]; SRMR=0.0480).

This solution is considerably different from the one proposed by the author, but to our view it is an acceptable one because some of the original factors were preserved while new ones emerged expressing an alternative semantic aggregation followed by respondents. We believe all factors have semantic identity (they have facial validity) and all show acceptable to good reliability: F1 complication prevention (CR=.861, Cronbach alpha=.856), F2 medication & emergency safety (CR=.810, alpha=.801), F3 learning safety (CR=.821, alpha=.813), F4 surgery / invasive procedure (CR=.650, alpha=.644), and F5 checking system (CR=.700, alpha=.680). The first three show good convergent validity (AVE=.610, .518, .604) but both surgery/invasive procedure and checking system failed to do so (AVE=.386, and .440, respectively). This might be understandable as not all participants are directly involved in surgery activities. Hence, we provisory settled for this final factorial solution due to its

closeness to the original theoretic structure. It comprehends 17 items, distributed respectively as follows: complication prevention (4 items, e.g. "I can fully assess and prevent the myocardial ischemia risk of every patient"), medication & emergency safety (4 items, e.g. "I am familiar with all types of critical values and the treatment / observation method"), safety learning (3 items, e.g. "I always take part of academic activities help by the hospital voluntarily"), surgery / invasive procedure (3 items, e.g. "I will adopt necessary protection measures to myself and patients when dealing with infectious communicable disease"), and checking system (3 items, e.g. "I check any operation in person").

Figure 4-4 Five Factor Structure Model of Safety Behavior
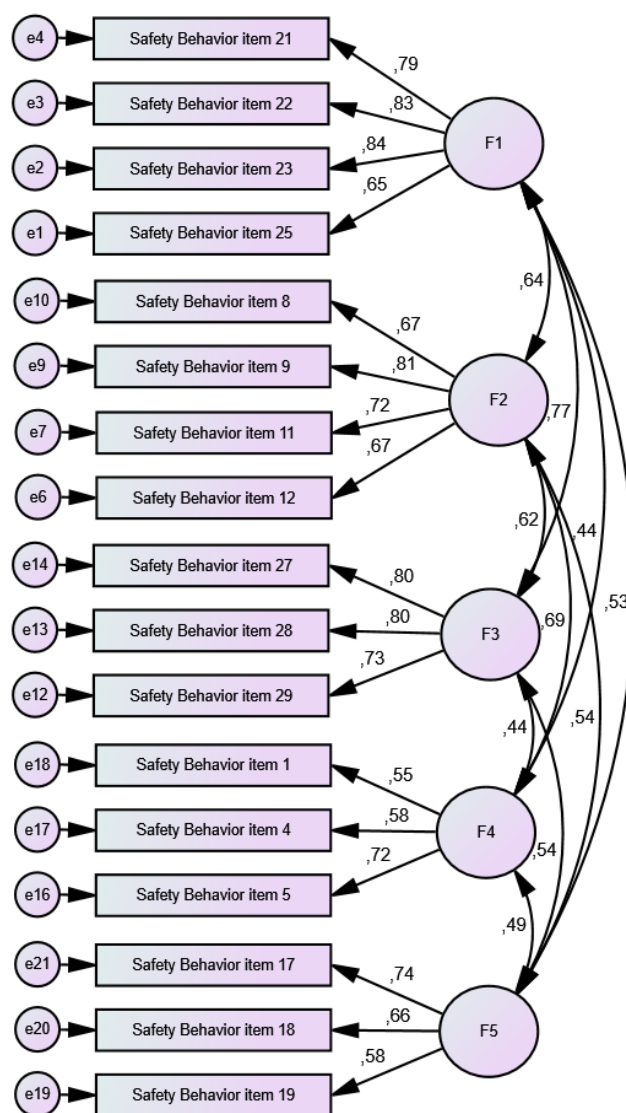
Due to the magnitude of correlations between factors and the poor convergent validity of the two last factors, we tested a 2nd order factor model where a single factor aggregates all factors, thus corresponding to the overarching construct of safety behavior. The model showed good fit indices (CMIN/DF=3.174, p<.001; CFI=.925; TLI=.910; PCFI=.775; RMSEA=.068 [Lo90=.060 Hi90=.076 PCLOSE<.001]; SRMR=.0568) similar to those of the 1st order model. All factor loadings have significant meaning (Table 4-3).

Table 4-3 Unstandardized coefficients for 2nd order safety behavior CFA

			Estimate	S.E.	C.R.	P
Safety learning	<---	Safety behavior	1,652	,205	8,050	***
Medication & emergency	<---	Safety behavior	1,210	,157	7,684	***
Complication prevention	<---	Safety behavior	1,238	,159	7,807	***
Surgery / invasive procedure	<---	Safety behavior	,560	,083	6,780	***
Check system	<---	Safety behavior	1,000			

As this is a more parsimonious model concerning construct comprehensiveness, and safety behavior shows both good reliability indicators (CR=.869) and convergent validity (AVE=.574), we consider this to be the final factor structure for this construct (Figure 4-5).

4.3.5 Reliability and Validity of Safety Performance Questionnaire

Safety Performance was measured with the 25 item scale of Liet al. (2015), which comprehends four factors: Safety management (7 items, e.g. "When there are problems related to patients' safety, the medical staff cooperates to solve problems"), safety facilities (5 items, e.g. "The medical workers strictly follow the process when using the medical equipment"), safety training (6 items, e.g. "Trainers are suitable to meet the requirements of training"), and adverse events analysis (4 items, e.g. "The hospital makes deep research on the reason of the adverse event").

The Confirmatory Factor Analysis of the original structure showed unacceptable fit indices (CMIN/DF=4.781, p<.001; CFI=.915; TLI=.903; PCFI=.804; RMSEA=.090 [Lo90=.084 Hi90=.096 PCLOSE<.001]; SRMR=.0521).

Figure 4-5 2nd Order CFA Final Model of Safety Behavior
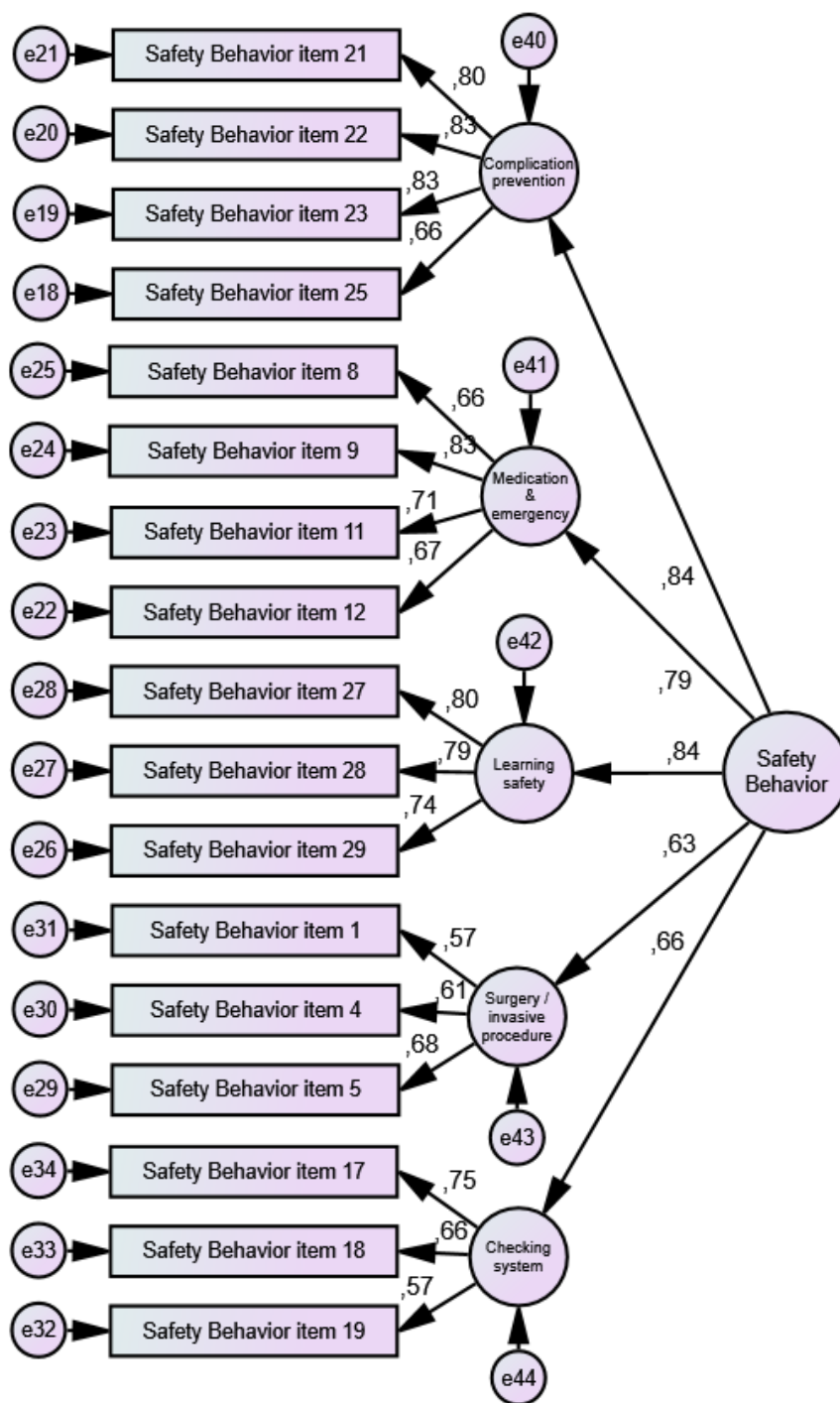
Exploratory factor analysis yields a preliminary five-factor solution. After analyzing one of the factors (the last one), we find that there is an item in this factor that is negatively worded. After removing these items, the updated factor analysis showed a valid four-factor result (KMO=0.938, Bartlett's $X^2(210)$=9061.071, p<0.001). All items show an acceptable

covariance. Therefore, we finally adopt this four-factor solution. This solution explains 67.4% of total variance (after varimax rotation). All factors are interpretable comprehending items as expected, thus showing good facial validity.

The ensuing CFA still showed unacceptable fit indices (CMIN/DF=5.126, p<.001; CFI=.916; TLI=.914; PCFI=.798; RMSEA=.094 [Lo90=.088 Hi90=.100 PCLOSE<.001]; SRMR=.0524) with the subsequent Lagrange Multipliers indicating some cases of covariance between errors. By removing all affected items, we were able to find a model that preserved the same four factor structure and had good fit indices (CMIN/DF=3.065, p<.001; CFI=.966; TLI=.959; PCFI=.802; RMSEA=.066 [Lo90=.059 Hi90=.075 PCLOSE<.001]; SRMR=.0369). The final factorial solution was trimmed down to 17 items, distributed respectively as follows: Safety management (4 items), safety facilities (5 items), safety training (5 items), and adverse events analysis (3 items).

This model (Figure 4-6) has good reliability indices (CR=0.937, CR=0.918, CR=0.926, and CR=0.848, respectively; Cronbach alpha=0.936, 0.916, 0.919, and 0.789). These factors have good convergent validity (AVE=0.789, 0.693, 0.715, and 0.664).

This model (Figure 4-6) has good reliability indices (CR=.937, CR=.918, CR=.926, and CR=.848, respectively; Cronbach alpha=.936, .916, .919, and .789). The factors also have good convergent validity (AVE=.789, .693, .715, and .664).

Figure 4-6 CFA Model of Safety Performance Questionnaire
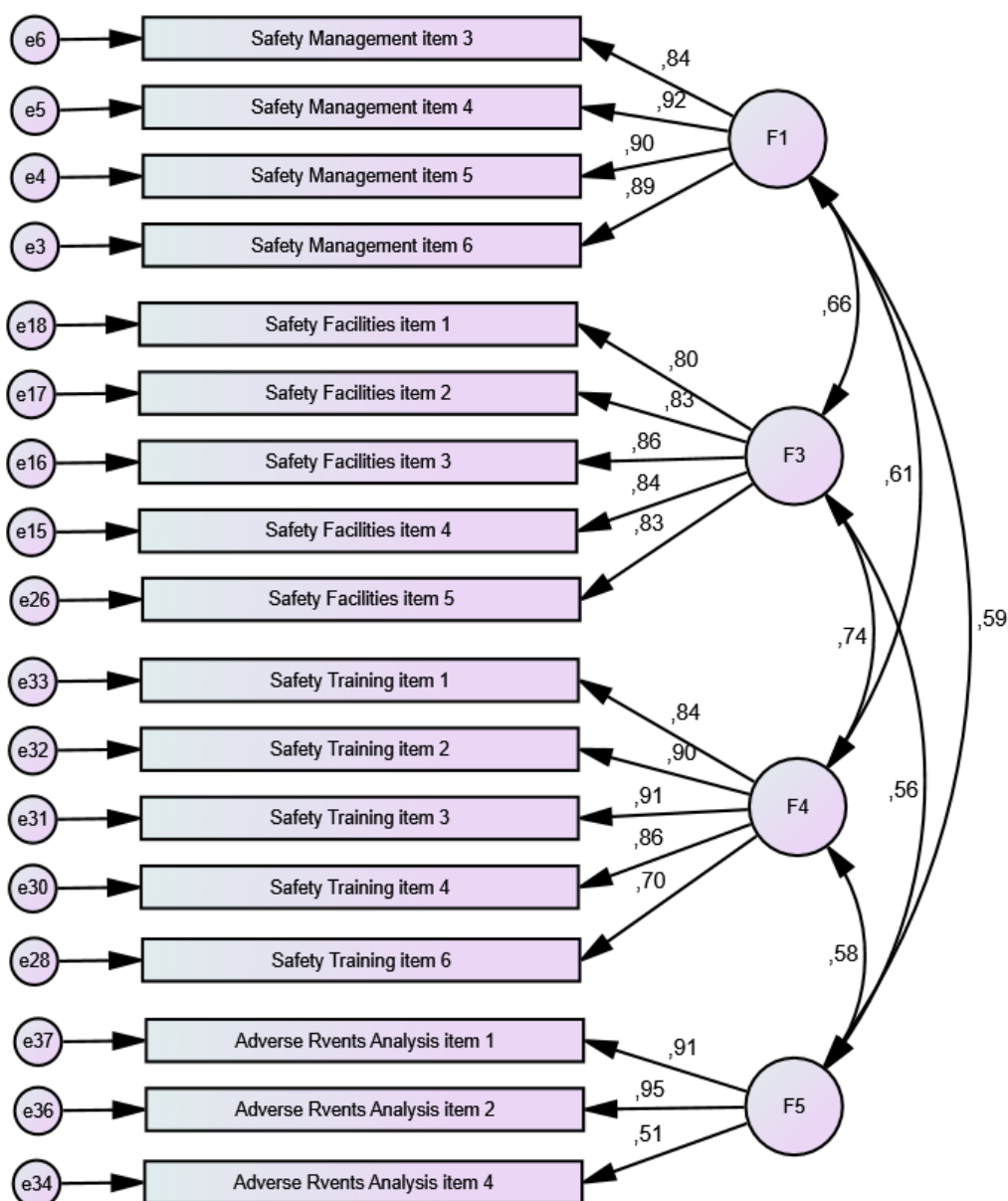
4.4 Chapter Summary

This chapter mainly uses the factor analysis method to evaluate validity of the scale, including confirmatory factor analysis and exploratory factor analysis. Internal consistency is also used to evaluate the reliability of the scale. The results are summarized as follows.

The safety value in patient safety culture is a two-factor model. The factors are named espoused value and practiced value. The safety strategy is a four-factor model. The factors are

named leadership strategy, organizational safety structure, rules and regulations, and policy incentives. The safety climate is a three-factor model. The factors are named management support and feedback, safety work obstacle, conflict and communication. Each model has a good fit index and good reliability and convergence validity.

Patient safety behavior is a second-order factor model constructed with safety behavior as the center, aggregating all factors. This model shows a good fit index. It is more streamlined and structurally complete with good reliability and convergence validity.

The patient safety performance is a four-factor model. The factors are named safety management, safety facilities, safety training, and adverse events analysis. The model fit index is good with good reliability and convergence validity.

Chapter 5: Structural Equation Model Analysis of Safety Culture and Safety Performance

This chapter examines the relationship between safety culture and safety performance, including the relationship between safety values, safety strategy and safety climate; the relationship between safety culture and safety behavior; the relationship between safety behavior and safety performance, and the mediating effect of safety behavior between safety culture and safety performance.

5.1 Test Method of Mediation Effect

The theoretic model establishes a set of relationships between constructs. Firstly, that safety culture is inferred by safety values, safety strategy and safety climate. Secondly, that safety behavior is an expression of safety culture, and thirdly that safety performance is contingent upon safety behavior and safety culture. So, the full model establishes a possible mediation effect from safety behavior between safety culture and safety performance.

Due to the multidimensionality of constructs in interplay, with the consequent complexity and multiplicity of parameters under estimation in Structural Equation Modelling, we think it is counterproductive to test upfront the full model together into a single SEM. Although the sample size is large and suitable for this sort of data analysis technique, it is also probable that many errors may covariate between constructs due to its partially overlapping nature (e.g. safety climate and safety behavior, as regards some dimensions). Thus, we opted to conduct a sequential testing of the model. We shall start by testing the interplay between safety values, strategy and climate. Then we move toward testing the relationship between safety behavior and safety performance. Then we will test the relationship between safety behavior and safety culture. Lastly, we test all constructs together.

5.2 Structural Equation Model Analysis of Relationship between Safety Culture and Safety Performance

5.2.1 Structural Equation Model Analysis of Relationship between Safety Value, Strategy and Climate

According to the literature review, there are three possible relationships between safety value, safety strategy, and safety climate. First, the three are interrelated as second-order factors. Second, the three constitute a second-order or third-order factor (under each construct there is a second-order factor). Third, culture is first expressed by values, and values determine the climate and strategy.

To test the predictive model in the first case, we conduct a confirmatory factor analysis. The three constructs are related to each other at the first-order factor level. This model shows that the fit indices are unacceptable (CMIN/DF = 2.658 p<0.001; CFI = 0.872; TLI = 0.862; PCFI = 0.808; RMSEA = 0.060 [Lo90 = 0.057 Hi90 = 0.062]; SRMR = 0.0543). The correlation coefficient is between 0.10 (p<0.001 is not significant) and 0.88, indicating that there is no direct relationship between these components. The same model is used to test the correlation of the second-order factors and similarly the fit indices are still unacceptable (CMIN/DF=2.783 p<0.001; CFI=0.859; TLI=0.851; PCFI=0.815; RMSEA=0.062 Lo90 = 0.059 Hi90 = 0.064 PCLOSE <0.001; SRMR = 0.0615). There are some error covariances at the second-order factor level, which reduces the possibility of using the Lagrange Multipliers method to increase the fit index without changing the basic structure. Finally, we examine a third-order factor model in which all second-order factors are aggregated into one latent variable. However, the results obtained are not ideal (CMIN/DF=2.759 p<0.001; CFI=0.861; TLI=0.853; PCFI=0.817; RMSEA=0.061 Lo90=0.059 Hi90=0.064 PCLOSE<0.001; SRMR=0.0623).

In general, although there are many theoretical possibilities, and we believe that these constructs may be related to the safety culture, semantically they are not considered as a single potential construct in the mind of subjects. The safety value is closer to the nature of culture, which is also consistent with the findings of previous research on and questionnaires

of organizational culture (e.g. FOCUS, Jaap J.vanMuijen, et al., 1999). Therefore, we regard safety value as the fundamental foundation of safety culture, and regard safety climate and safety strategy as the external expression of safety value.

Therefore, in the test model, safety value is regarded as a predictive variable, and safety climate and strategy are considered as dependent variables. The safety value --->safety climate model shows acceptable fit indices (CMIN/DF=2.776 p<0.001; CFI=0.918; TLI=0.909; PCFI=0.824; RMSEA=0.062 Lo90=0.056 Hi90=0.067 PCLOSE <0.001; SRMR=0.0638), and all paths are significant, $p<0.01$ (Figure 5-1, Table 5-1), and standardized path value is between 0.32 and 0.67. The biggest path is between safety value and management support and feedback. The smallest path is between safety value and safety work obstacle.

Figure 5-1 SEM for Safety Values to Safety Climate
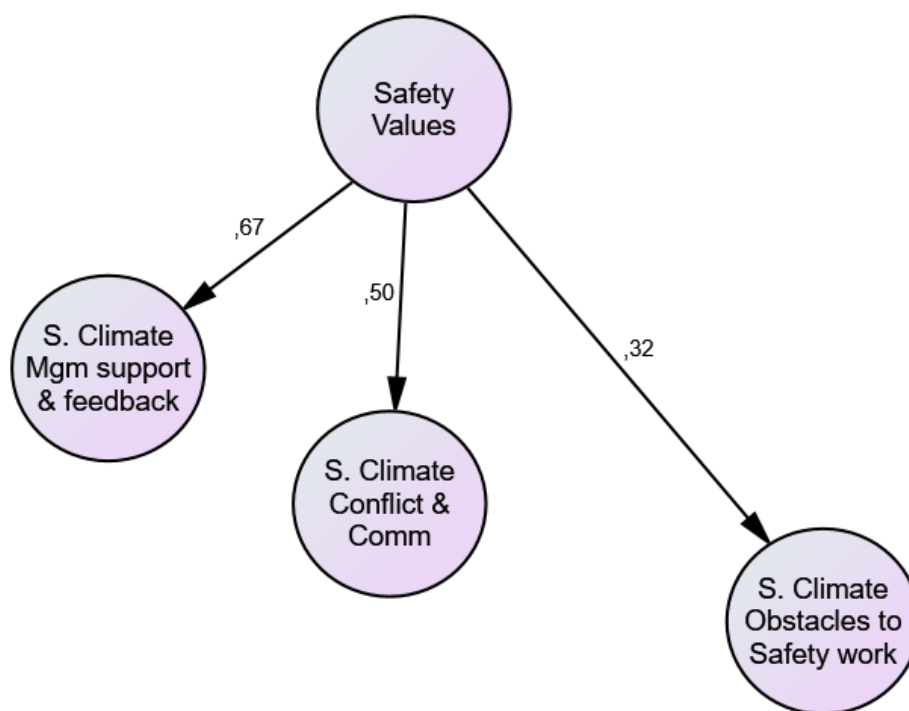
Table5-1 Regression Weights for Safety Values-Safety Climate SEM

			Estimate	S.E.	C.R.	P
Safety climate (management support)	<--	Safety Values	,984	,086	11,448	***
Saf. climate (conflict & communication)	<--	Safety Values	,656	,083	7,892	***
Saf. Climate (obstacles to safety work)	<--	Safety Values	,899	,163	5,512	***

The safety value--->safety strategy model showed unacceptable fit indices, but approaching cut-offs (CMIN/DF=2.950 p<0.001; CFI=0.891; TLI=0.882; PCFI=0.825; RMSEA=0.065 Lo90=0.061 Hi90=0.068 PCLOSE<0.001; SRMR=0.0573). The second model (safety values -> safety strategy) showed liminal unacceptable fit indices (CMIN/DF=2.950 p<.001; CFI=.891; TLI=.882; PCFI=.825; RMSEA=.065 Lo90=.061 Hi90=.068 PCLOSE<.001; SRMR=.0573). Lagrange Multipliers confirmed the correlation between two important errors. After removal of the two items from safety strategy, the fit indices of the whole structural equation model became acceptable (CMIN/DF=2.653 p<0.001; CFI=0.911; TLI=0.904; PCFI=0.839; RMSEA=0.059 Lo90=0.055 Hi90=0.064 PCLOSE<0.001; SRMR=0.0522). The path between safety value and safety strategy is significant with p<0.01 (Figure 5-2, Table 5-2), and the standardized value is 0.71. By removing these two items from safety strategy we achieved comfortable fit indices for the overall SEM model (CMIN/DF=2.653 p<.001; CFI=.911; TLI=.904; PCFI=.839; RMSEA=.059 Lo90=.055 Hi90=.064 PCLOSE<.001; SRMR=.0522). The path between safety values and safety strategy is significant with p<.01 (Figure 5-2, Table 5-2) with a standardized expressive value of 0.71.

Table 5-2 Regression Weights for Safety Values-Safety Strategy SEM

			Estimate	S.E.	C.R.	P	Label
Safety Strategy	<---	Safety Values	,758	,070	10,768	***	

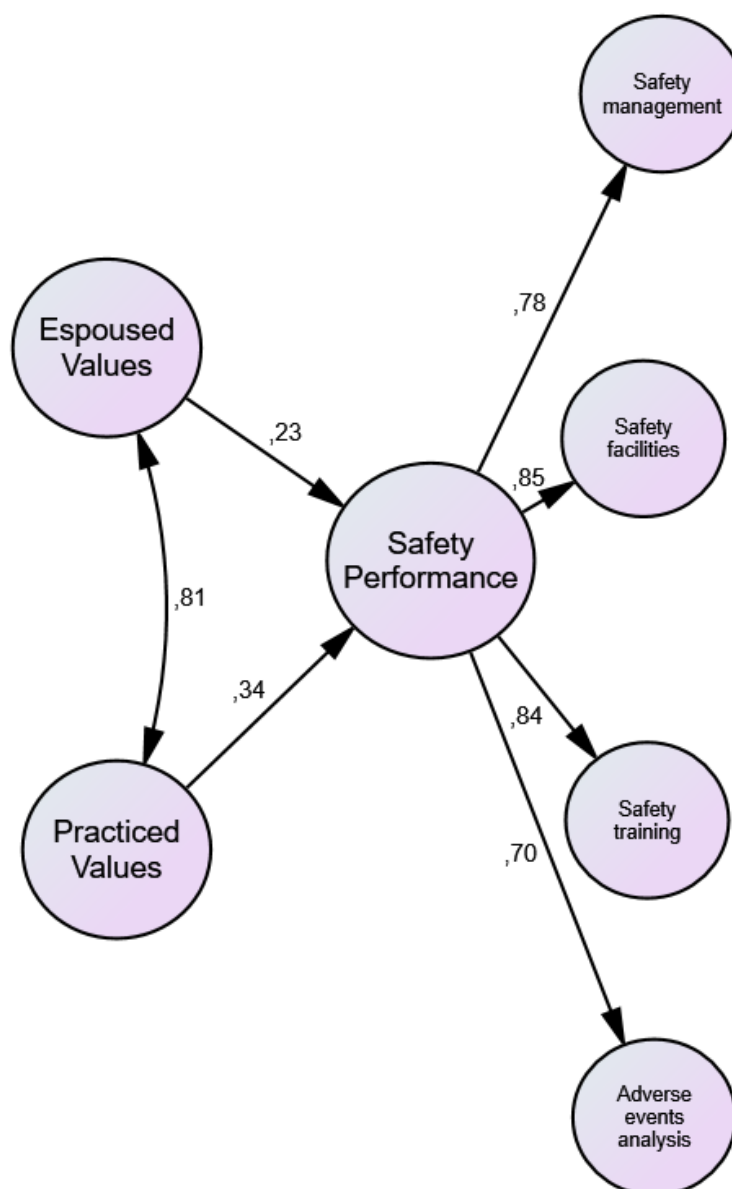Figure 5-2 SEM for Safety Values to Safety Strategy
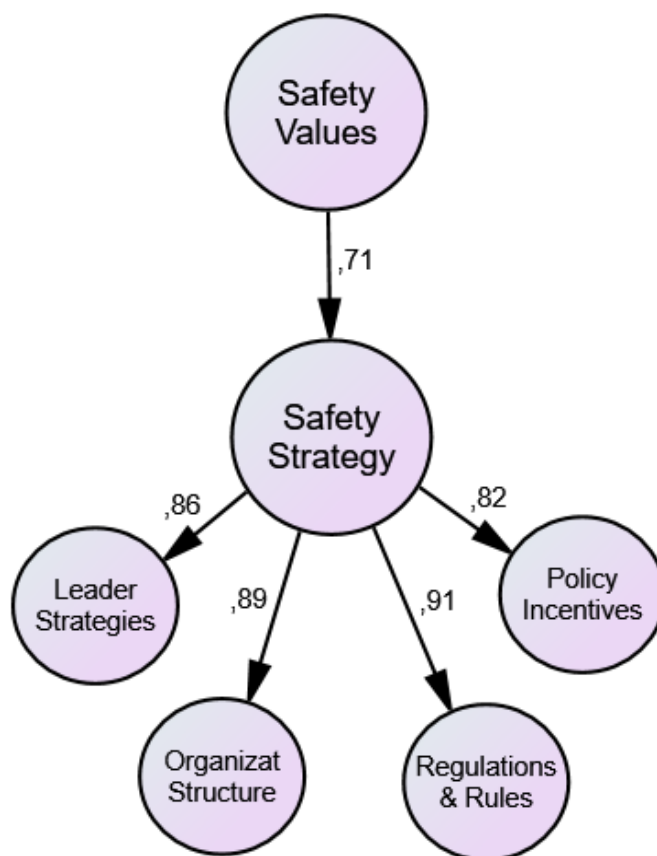
5.2.2 Structural Equation Model Analysis of Relationship between Safety Behavior and Safety Performance

The SEM for the relationship between safety behavior and safety performance (dependent variable) incorporated the five factors of safety behavior, all correlated and linked to a second order factor representing safety performance. The SEM showed acceptable fit indices (CMIN/DF=2.634 p<.001; CFI=.922; TLI=.914; PCFI=.835; RMSEA=.059 Lo90=.055 Hi90=.063 PCLOSE<.001; SRMR=.0538) thus showing the model has good fit with data and can reliably be interpreted（Figure 5-3, Table 5-3）.

Figure 5-3 SEM for Safety Behavior to Safety Performance
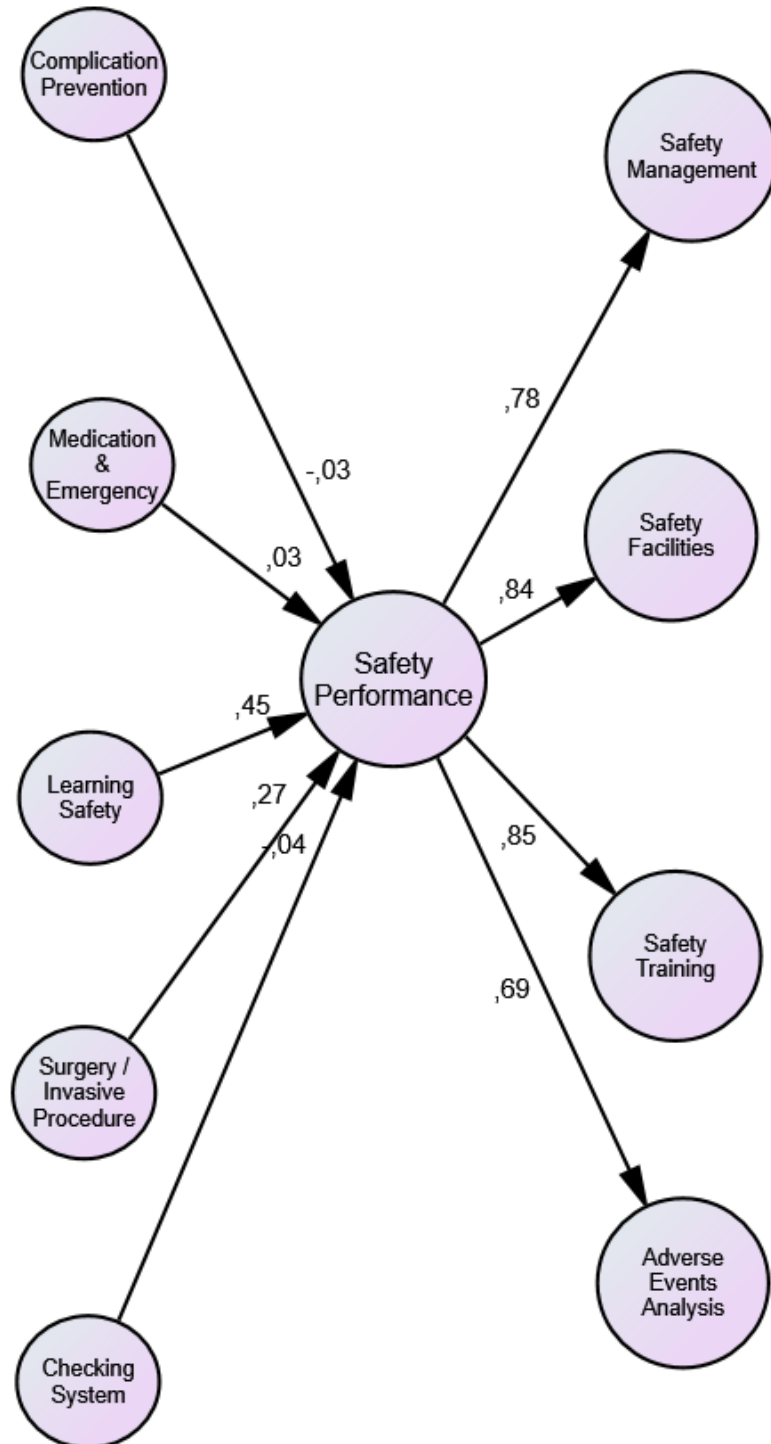
Table 5-3 Regression Weights for Safety Behavior-Safety performance SEM

			Estimate	S.E.	C.R.	P
Safety Performance	<--	Complication Prevention	-,030	,088	-,340	,734
Safety Performance	<--	Medication & Emergency	,027	,089	,307	,759
Safety Performance	<--	Learning safety	,314	,070	4,455	***
Safety Performance	<--	Surgery/Invasive proced.	,395	,140	2,826	,005
Safety Performance	<--	Checking system	-,031	,066	-,474	,635
SafetyPerf. (Safety facilities)	<--	Safety Performance	,953	,069	13,784	***
SafetyPerf. (Safety training)	<--	Safety Performance	1,052	,076	13,871	***
SafetyPerf. (Adverse Events An)	<--	Safety Performance	,883	,072	12,300	***
SafetyPerf. (Saf. management)	<--	Safety Performance	1,000			

There are two significant paths between safety behavior and safety performance, namely, safety learning (beta=0.45, p<0.001) and surgery/invasive operation (beta=0.27, p<0.01).

For a more comprehensive analysis, and considering the magnitude of correlations found between 1st order factors, we conducted an analysis of a model with a single 2nd order factor. This model has good fit indices (CMIN/DF=2.705 p<.001; CFI=.917; TLI=.910; PCFI=.845; RMSEA=.060 Lo90=.057 Hi90=.064 PCLOSE<.001; SRMR=.0575) (Figure 5-4). The fit indices of the two models are similar. We believe that both models have theoretical support because we can adjust the degree of abstraction of constructs to either second order or first order. The success of one model does not negate the other, but the second-order factor model is more concise.

Figure 5-4 SEM for Safety Behavior to Safety Performance
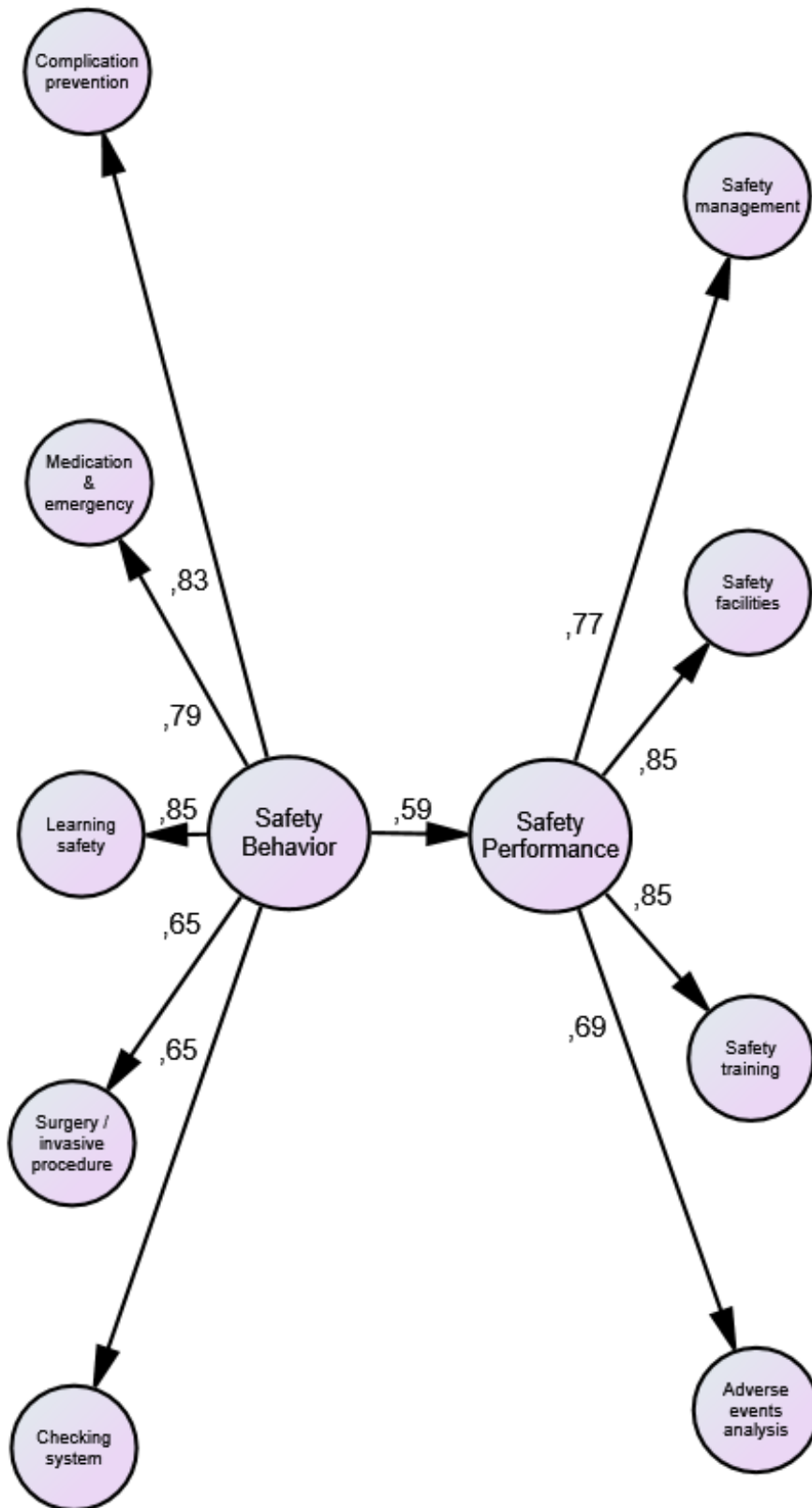
5.2.3 Relationship between safety culture and safety behavior

The SEM for the relation between safety culture (values) and safety behavior (dependent variable) incorporated both the 1st order safety values factors linked to the 2nd order safety behavior factor. The SEM showed acceptable fit indices (CMIN/DF=2.619 p<.001; CFI=.910; TLI=.899; PCFI=.813; RMSEA=.059 Lo90=.054 Hi90=.064 PCLOSE<.001; SRMR=.0586) thus indicating the model has good fit with data and can be reliably interpreted (Figure 5-5, Table 5-4).

Figure 5-5 SEM for Safety Value to Safety Behavior
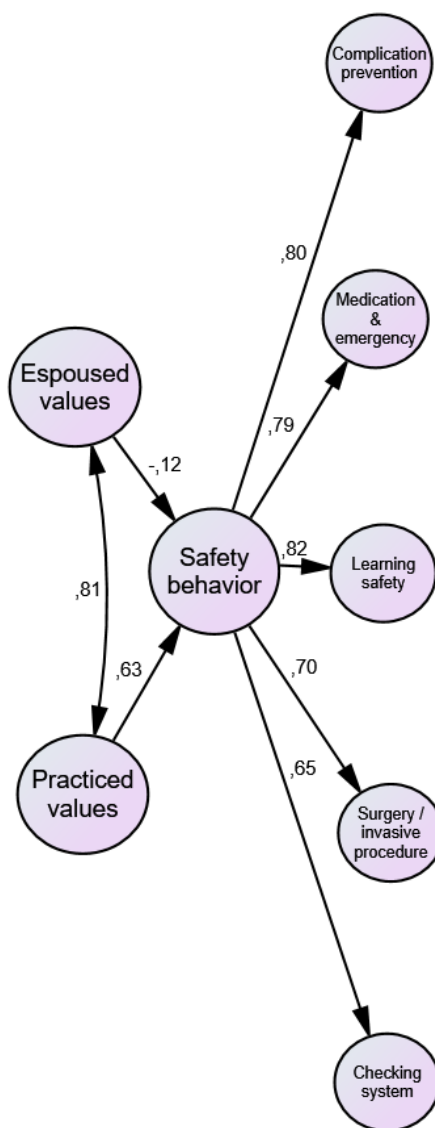
Table 5-4 Regression Weights for Safety Culture-Safety Behavior SEM

			Estimate	S.E.	C.R.	P
Safety behavior	<---	Practiced values	,528	,119	4,446	***
Safety behavior	<---	Espoused values	-,099	,098	-1,009	,313
Learning safety	<---	Safety behavior	1,377	,135	10,166	***
Medication & emergency	<---	Safety behavior	1,019	,107	9,501	***
Complication procedure	<---	Safety behavior	1,000			
Surgery / invasive procedure	<---	Safety behavior	,526	,061	8,552	***
Checking system	<---	Safety behavior	,842	,110	7,659	***

5.2.4 Structural Equation Model Analysis of Relationship between Safety Value and Safety Performance

The SEM for the relation between safety culture (values) and safety performance (dependent variable) incorporated both the 1st order safety values factors linked to the 2nd order safety performance factor. The SEM showed acceptable fit indices (Figure 5-6) (CMIN/DF=2.611 p<.001; CFI=.943; TLI=.937; PCFI=.852; RMSEA=.059 Lo90=.054 Hi90=.064 PCLOSE<.001; SRMR=.0447) thus indicating the model has good fit with data and can be reliably interpreted as shown in Table 5-5.

Table 5-5 Regression Weights for Safety Culture-Safety Performance SEM

			Estimate	S.E.	C.R.	P
Safety performance	<---	Espoused values	,216	,101	2,138	,033
Safety performance	<---	Practiced values	,328	,112	2,917	,004
SafetyPerf. (Safety facilities)	<---	Safety performance	,960	,069	13,868	***
SafetyPerf. (Safety training)	<---	Safety performance	1,036	,075	13,772	***
SafetyPerf. (Adverse Events An)	<---	Safety performance	,888	,072	12,388	***
SafetyPerf. (Saf. management)	<---	Safety performance	1,000			

Figure 5-6 SEM for Safety Values to Safety Performance

5.2.5 Structural Equation Model Analysis of Relationship between Safety Culture, Safety Behavior and Safety Performance

The SEM for the overall model comprehending the 1st order safety values factors (espoused and practiced) linked to the 2nd order safety performance factor both directly and indirectly via Safety behavior. This model has acceptable fit indices (Figure 5-7) (CMIN/DF=2.385 p<.001; CFI=.913; TLI=.906; PCFI=.847; RMSEA=.054 Lo90=.051 Hi90=.058 PCLOSE=.016; SRMR=.0551), thus indicating the model fits data and can be

reliably interpreted.

The standardized total, direct, indirect effects and their respective two tailed p value are presented as follows (Table 5-6, Table 5-7).

The total effects (direct plus indirect effects) of safety values (espoused and practiced) on safety performance is .248 (CI .070, .427, p=.039) and .329 (CI .154, .505, p=.01), respectively.

The standardized indirect effect of safety espoused values on safety performance is -.112 (CI -.232, -.026, p=.062) while for safety practiced values it reaches .352 (CI .243, .511, p=.01).

The standardized direct effect of safety espoused values on safety performance is .360 (CI .176, .600, p=.015) while for safety practiced values is null (beta= -.023, CI -.269, .185, p=.823).

The direct effects of espoused and practiced safety values on safety behavior vary considerably with the former reaching -.231 (CI -.480, -.054, p=.063) and the later an impressive .721 (CI .532, .931, p<.01). Safety behavior has a strong association with safety performance of .487 (CI .400, .602, p<.001).

Figure 5-7 SEM for Safety Values-Behavior-Performance Model
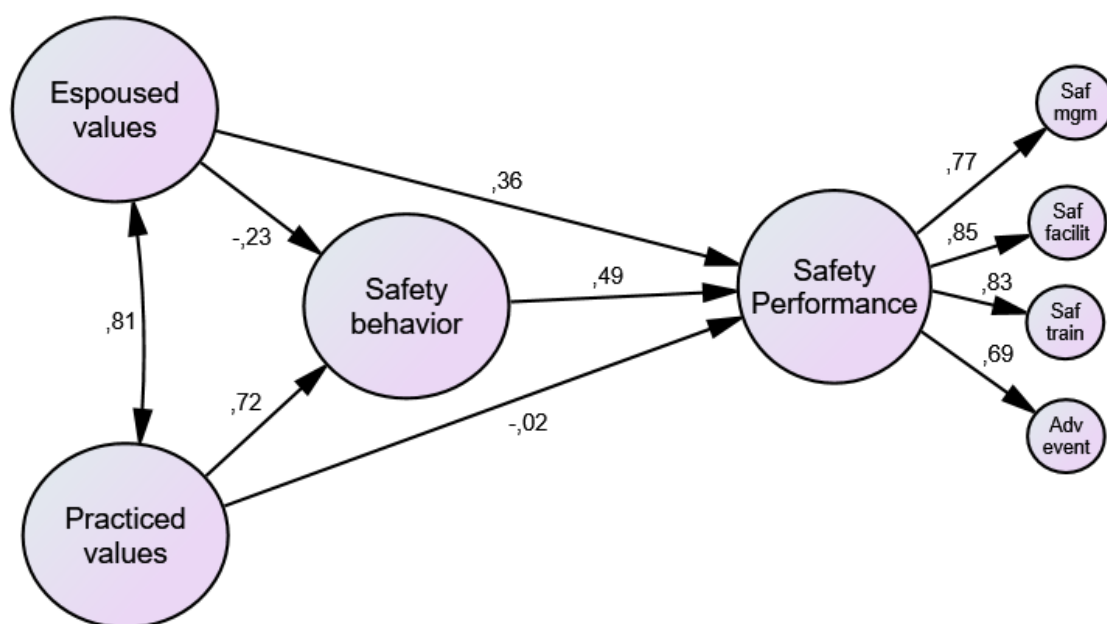
These results indicate that espoused safety values have a significant total effect on safety performance. The direct effect is significant, while the indirect effect is not, which implies there is no mediation occurring. As for practiced safety values, the findings indicate a significant total effect, asignificant indirect effect and a non-significant direct effect, which suggests safety behavior has a full mediation effect in practiced values and safety performance.

To be certain about such mediation we establish a SEM with and without the safety behavior variable (mediator) and collect data about direct and indirect effects. Findings (Tables 5-6and 5-7) corroborate this conclusion that there is no mediation between espoused values and safety performance but there is a full mediation between practiced values and safety performance.

Table 5-6 Mediation Tests (Standardized Betas)

Relationship	Direct without mediator	Direct with mediator	Indirect	Mediation
ESV – SB – SP	.249 (p=.024)	.360 (p<.001)	n.s (p=.062)	No mediation
PSV – SB – SP	.326 (p=.006)	-.023 (n.s.)	p=.01	Full

ESV – Espoused safety values, PSV – Practiced safety values, SB – Safety behavior, SP – Safety performance

Table 5-7 Non-standardized (Standardized Betas)

			Non-standardized Estimate	S.E.	C.R.	p
Safety behavior	<---	Practiced safety values	,601	,125	4,794	***
Safety behavior	<---	Espoused safety values	-,187	,103	-1,822	,068
Safety Performance	<---	Safety behavior	,491	,077	6,347	***
Safety Performance	<---	Practiced safety values	-,019	,106	-,181	,856
Safety Performance	<---	Espoused safety values	,294	,088	3,350	***

5.3 Chapter Summary

The structural equation model analysis leads to the following conclusions. Patient safety values are the fundamental foundation of patient safety culture. Patient safety strategy and safety climate are the external expressions of safety values. Safety values have a significant positive impact on safety strategies. Safety behaviors have a predictive effect on safety performance, especially participation in safety learning behaviors and compliance with surgery/invasive safety operations. Practiced values have a predictive effect on safety behavior. The relationship between safety culture, safety behavior and safety performance is as follows. Espoused safety values have a significant total effect on safety performance. The direct effect is significant, while the indirect effect is not, which implies there is no mediation occurring. As for practiced safety values, the findings indicate a significant total effect, a significant indirect effect and a non-significant direct effect, which suggests safety behavior has a full mediation effect in practiced values and safety performance.

Chapter 6: Discussion

6.1 The Core of Patient Safety Culture Change is the Fundamental Shift in Values

The results of this study show that the safety values are the core of the patient safety culture. The espoused values of the hospital directly affect safety performance, and the practiced values indirectly affect safety performance through safety behavior. According to Deal andKennedy. (1982) and Hofstede (1986), values are considered as the deep core of culture. In the safety pyramid, values are considered the foundation of culture (Patankar et al., 2015). The case of Josie King at the Johns Hopkins Hospital in the United States shows how the shift in values at the individual level (her parents) has led to a change in their strategy for dealing with the tragedy. This change will, in turn, lead to changes in their attitude towards medical malpractice and their attitude towards the medical staff (Patankar et al., 2015).

Therefore, it is believed that hospitals should build a patient safety culture that is guided and driven by correct values, and promote the transformation of the patient safety culture toward a more satisfactory state of dynamic equilibrium. For organizational leaders or managers of the 21st century, the most important thing is to learn how to put values into practice (Dolan,2009).

Patient safety culture is a state of dynamic equilibrium between the two levels of accountability and learning. If nurses and nursing managers of a hospital believe in the effectiveness of punishment and attach importance to a culture of punishment, the process of transformation needs to make them become aware of the need to change their existing values and accept non-punitive ways to improve safety performance, so as to promote patient safety culture to transform to reporting culture and impartiality culture at the accountability level. The four significant states of patient safety culture at the learning level are failed learning, intermittent or isolated learning, continuous learning, and transformative learning.

Organizational learning is "a process of discovering and correcting mistakes" (Argyris, 1977). If organizational learning is not an explicit value of an organization, we need to emphasize the importance of organizational learning for organizational success. The new learning process begins with perception and understanding of events by individuals. Through communication with team members, individuals can achieve common understanding and take common actions. Finally, at the organizational level, these understandings and actions are standardized and institutionalized, and the individual and group learning are embedded in new procedures, systems, norms, and procedures (strategy in the safety culture pyramid), so as to ensure future improvement of performance (safety performance in the safety pyramid). In fact, through such a learning approach, organizations can get rid of inefficient and unsafe practices and replace them with more optimized and safe ways of doing things, ultimately achieving the organizational culture change.

The results of this study remind nurse managers to build a patient safety culture that is guided and driven by correct values. In management practice, they should first focus on refining espoused values and then infiltrate the soul of nurses through penetration of various management strategies. These will then be internalized by nurses and become their practiced values, which will ultimately be externalized to be their daily habits.

6.2 The Positive Mediating Factor of Practiced Values on Safety Performance is Safety Behavior of Nurses

The safety behavior of nurses is the positive mediating factor of practiced values on safety performance. Relevant research results indicate that there is a deficiency in the patient safety behavior among Chinese nurses. Sun (2011) carries out a survey on 122 obstetric nurses with the self-designed Nurse Maintaining Patient Safety Nursing Behavior Questionnaire and finds that their patient safety nursing behavior is only above the average level, which coincides with the results of Chen (2015). Zhou and Qiao (2015) conducted a survey on 90 patients who have undergone surgery. The patients' evaluation of safety nursing behavior was also only above the average. Therefore, how to remove unsafe behavior of

nurses has become an important issue for nursing education and management experts.

Zhang, Xu, and Zhang (2017) believe that hospital values management should be based on various policies and systems of the hospital. It should be promoted through the path of "knowledge, attitude, and practice" of the medical staff, and be internalized in the heart, externalized in action and institutionalized in system. The "knowledge-attitude-practice" model is a commonly used behavioral intervention model which divides behavioral changes into three processes of knowledge acquisition, belief generation and behavior formation. Patient safety education is an important means for nurses to acquire knowledge. Medical education and management experts believe that patient safety education should start from medical schools (Myung et al., 2012). However, medical education institutions in China only introduce basic concepts of patient safety, lacking the curriculum system and training model for patient safety education, which is far from being able to cultivate the concept and awareness of patient safety in medical students (Tao & Wang, 2016).Therefore, the acquisition of patient safety knowledge and the formation of safety values of Chinese nurses mainly rely on on-the-job education. In recent years, the Chinese government has adopted a series of patient safety promotion strategies. Medical institutions at all levels have attached great importance to the training of patient safety knowledge for on-the-job nurses. However, most of the contents are relatively fragmented and disorganized with no uniform training system. The setting and implementation of training courses are also limited by time of clinical nurses and difficulty in manpower arrangement (Mei, 2012).

In 2014, the Chinese Hospital Association organized to establish the "China Patient Safety Education and Research Collaboration Network", but only 37 large hospitals nationwide participated in it. Although studies on patient safety have been carried out for more than ten years, most of them are theoretical studies, with few practical studies on patient safety training and improvement (Li, 2016). The basic idea of the "knowledge-attitude-practice" theory is that when knowledge is accumulated to a certain degree, it will inevitably lead to changes of attitude and eventually result in changes of behavior (Xia, 2012）.In addition, we must pay attention to the influence of practice on values. According to Zeng (2015), nurses in Chinese hospitals rarely receive encouragement for their behavior to improve patient safety performance. Rewards to nurses are mostly at the spirit

level. The material rewards are given to departments rather than nurses. The incentive effect is not satisfactory.

The results of this study remind nurse managers that it takes time for nurses to accumulate patient safety knowledge to achieve a qualitative change. Changes in unsafe behaviors of nurses cannot be achieved overnight without repeated systematic training. At the same time, we must pay attention to the facilitating role of practice in promotion of behaviors. The correct behaviors conducive to patient safety performance should be strengthened through reasonable incentive measures.

Chapter 7: Conclusion and Outlook

7.1 Conclusion

From the present research there are many conclusions we believe deserve highlight. Namely, those pertaining the nature of the new measure of patient safety culture; its validity and reliability together with measures of safety behavior and safety performance; and the interplay between these variables in explaining patient safety performance, separating the role of espoused and practiced values as well as the potential role of safety behavior as a mediator.

7.1.1 Patient Safety Culture Questionnaire is Developed

This research defines the patient safety culture as the values, strategies, and attitudes shared by employees of medical institutions to achieve patient safety. Therefore, the patient safety culture questionnaire includes the patient safety values sub-questionnaire, the patient safety strategy sub-questionnaire, and the patient safety climate sub-questionnaire. The patient safety values are the total evaluation and general views of the significance and importance of the patient safety issues shared by employees of medical institutions. The sub-questionnaire includes two dimensions of espoused values and practiced values. Patient safety strategy is the primary plan made to achieve patient safety goals, including leadership strategy, organizational structure, rules and regulations and positive incentives. The sub-questionnaire includes four dimensions of leadership strategy, organizational structure, rules and regulations, and positive incentives. The patient safety climate refers to the viewpoints of medical institution employees on patient safety. This sub-questionnaire includes five dimensions of management support, safety work obstacle, feedback and training, safety environment, and conflict and communication. The questionnaire adopts the Likert 6-point scale.

7.1.2 Safety culture questionnaire, safety behavior questionnaires, and safety performance questionnaire are valid and reliable

The safety value is a two-factor model. The factors are named as espoused values and practiced values; the safety strategy is a four-factor model. The factors are named as leadership strategy, organizational safety structure, rules and regulations, and policy incentives; the safety climate is a three-factor model. The factors are named as management support and feedback, safety work obstacle, and conflict and communication. Each model has a good fit index and good reliability and convergence validity.

Patient safety behavior is a second-order factor model with safety behavior as the central construct, and aggregates all factors. This model shows a good fit index, with a more concise and complete structure as well as good reliability and convergent validity.

The patient safety performance is a four-factor model. The factors are named as safety management, safety facilities, safety training, and adverse events analysis. The model fit index is good with good reliability and convergent validity.

7.1.3 Explanative Model between Patient Safety Culture and Safety Performance of Chinese Nurses

The conclusion is as follows.

(1) Patient safety values are the fundamental foundation of patient safety culture. Patient safety strategy and safety climate are the external expression of safety values. Safety values have a significantly positive influence on safety policies and safety climate as shown in Table 7-1.

(2)Safety behavior has a predictive effect on safety performance, especially safety learning behavior and surgery/invasive operation safety behavior as shown in Table 7-2.

(3) Practiced values have a predictive effect on safety behavior a shown in Table 7-3.

(4) The relation found between safety culture, safety behavior and safety performance is as follows: Espoused safety values directly affect safety performance, and practiced values affect safety performance through safety behavior, which suggests that safety behavior has a full mediation effect between practiced values and safety performance. Espoused safety

values have a significant total effect on safety performance. The direct effect is significant, while the indirect effect is not, which implies there is no mediation occurring. As for practiced safety values, the findings indicate a significant total effect, asignificant indirect effect and a non-significant direct effect, which suggests safety behavior has a full mediation effect between practiced values and safety performance.

Table 7-1 Standardized Path Coefficient between Safety Values, Safety Climate and Safety Strategy

Predictive Variable	Dependent Variable	Dependent Variable	p Value
Safety Values	Safety Climate (Management Support and Feedback)	0.67	＜0.01
	Safety Climate (Conflict and Communication)	0.50	＜0.01
	Safety Climate (Safety Work Obstacle)	0.32	＜0.01
	Safety Strategy (Leadership Strategy)	0.86	＜0.01
	Safety Strategy (Organizational Structure)	0.89	＜0.01
	Safety Strategy (Rules and Regulation)	0.91	＜0.01
	Safety Strategy (Positive Incentive)	0.82	＜0.01

Table 7-2 Standardized Path Coefficient between Safety Behavior and Safety Performance

Predictive Variable	Dependent Variable	Dependent Variable	P Value
Safety Behavior (Prevention of Complications)	Safety Performance	-0.03	0.734
Safety Behavior (Medication and Emergency Safety)	Safety Performance	0.027	0.759
Safety Behavior (Safety Learning)	Safety Performance	0.314	0.01
Safety Behavior (Surgery and Invasive Operation)	Safety Performance	0.395	0.005
Safety Behavior (Check System)	Safety Performance	-0.031	0.635

Table 7-3 Standardized Path Coefficient between Safety Behavior and Safety Values

Predictive Variable	Dependent Variable	Dependent Variable	P Value
Safety Values (Espoused Values)	Safety Behavior	-0.099	0.313
Safety Values (Practiced Values)	Safety Behavior	0.528	0.01

7.2 Limitations

No research is without limitations as any choice made (either about theory and approaches to the topics, or as regards methodological options) is always made at the expense of many other possibilities. All options must be made with criteria but it is wise to acknowledge that no choice is perfect, and therefore, any choice brings with it limitations. To overcome such limitations we must firstly recognize their existence and moderate our conclusions on the basis of this recognition.

Firstly, the samples are limited to two tertiary hospitals, two secondary hospitals, and ten primary hospitals that have research cooperation relationship with the author in Anhui Province, with no survey on other hospitals within Anhui or hospitals in other provinces. The universality of findings is therefore not guaranteed and benefits from further discussion. We believe research would benefit from having other scholars collecting data from hospitals in different provinces in China to further validate the measures and model.

The model constructed in this study is only the result of cross-sectional survey data. This means no causal relations can be claimed despite our reasoning that culture should antecede behavior, and behavior should antecede performance. Despite this, it is also true that, according with extant definitions of organizational culture (e.g. Edgar Schein，1992), the values that become fixed as the right ones and taught to future generations, are those that were judged as leading to good performance, which implies a circular causality in the process. This should be better researched in the future, with longitudinal research methods or experimental research methods can be used to verify the relationship between variables and the stability of the model.

Lastly, the true conceptual nature of culture implies a determined degree of shared values between individuals of the same group. Due to the anonymous nature of data collection

(with merely institutional belonging identified) we had no capacity to evaluate the extent to which answers pertaining safety culture were sufficiently shared within the same units, so to rigorously use this concept. So, it is true that it is more correct to state that this research is dealing with perceptions of organizational values (individual level) rather than shared values (team or organizational level). Despite this limitation, we trust the low standard deviations found are indicative of a relatively aligned view of safety culture values, and therefore, we trust these are shared to a great extent in the units that empirically participated in this research.

7.3 Innovations and Future Research

We believe some original contributes from this research may be in play and possibly deserve further attention in the future. Firstly, a patient safety assessment scale is developed based on the organizational culture structure theory and the safety culture pyramid model to provide assessment tools for the current status and continuous improvement of patient safety culture. We think this model has shown psychometric qualities proven beyond usual standard in a real nursing professional setting and thus can be used with confidence. Secondly, the explanative model optimized via structural equation model is very informative of the relationship between patient safety culture and safety performance in nursing, revealing the mechanism of patient safety culture on safety performance, which enrichesthe theoretical body of research on patient safety culture in China, and provides new ideas and methods for improvement of patient safety performance.

We found very promising, both to build theory and to improve practical safety management that espoused values and practiced values do not operate in the same manner with safety behavior and safety performance. The true professional nature of the sample offers some assurance that findings arise from a mature and relevant sample, which may find these results rewarding from the point of view of opening opportunities for professional and management improvement.

Future research about patient safety culture, safety behavior and safety performance in China may focus on some other variables specifically linked, e.g. with how human resources

policies may leverage the model, probably as a moderator. Also, how the specificities of units (e.g. intensive care, internal medicine) can change the way variables are linked (probably more strong relations in higher health risk services). Also, the use of diaries, of more qualitative research focused on the entire team instead of team individuals, longitudinal designs, and using non-intrusive methods may facilitative the understanding of work processes involved in safety management risk, flows of learning within the individual and between individuals (at team knowledge transfer level), the hierarchical role of facilitating these learning environments to improve teams ability to prevent and better manage safety risks, the role of leadership in changing safety culture in institutional settings, or the role of third parties (e.g. patients family, hospital providers, facilities design) in promoting high levels of patient safety performance and management. There is still a long way to have a comprehensive view of this topic in China but this is also a promise that, with future research, the system will build up capacity to further improve, in a sustained but relentless way, those that need attention and, recognize and spread learning as example, of the centers that have achieved already high levels of best practice in patient safety management.

Bibliography

Argyris,C.(1977).Double loop learning in organizations. *Harvard Business Review, 55*, 115-125.

Bleakley, A., Boyden, J., Hobbs, A., Walsh, L., & Allard, J. (2006).Improving teamwork climate in operating theatres: the shift from multi-professionalism to inter-professionalism. *Journal of Interprofessional Care,20* (5), 461-470.

Blegen, M. A., Sehgal, N. L., Alldredge, B. K., Gearhart, S., Auerbach, A. A., & Wachter, R. M. (2010). Improving safety culture on adult medical units through multidisciplinary teamwork and communication interventions: the TOPS Project. *Quality & Safety in Health Care,*(19), 346-350.

Brborović, H., Šklebar,I., Brborović, O., Brumen,V., & Mustajbegović, J. (2014). Development of a Croatian version of the US Hospital Survey on Patient Safety Culture questionnaire: dimensionality and psychometric properties. *Postgraduate Medical Journa,. 90* (1061), 125-132.

Cai, Z. B., Lin, Y., Shen, Y. F., & Sheng, B. Y. (2007). Application of non-punishment strategies in hospital medication errors. *Chinese Journal of Hospital Administration, 23* (4), 258-260. In Chinese.

Cameron, K. S.,& Quinn, R. E. (2006). Organizational culture diagnosis and reform. Beijing: China Renmin University Press.

Cao, R. G. (2007). China has not formed the climate of healthcare safety culture yet. *Contemporary Medicine, 10*, 50. In Chinese.

Carroll, J. S.(1998). Safety culture as an ongoing process: Culture surveys as opportunities for enquiry and change. *Work and Stress, 129* (3), 272-284.

Chen, C. C. (2016). *Status and influence factors of nurses' perceptions of patient safety culture in secondary and tertiary hospitals of Zhengzhou.* Master thesis, Zhengzhou University. In Chinese.

Chen, F. L. (2008). *Patient safety culture assessment about nurses in hospital.* Master thesis, The Second Military Medical University. In Chinese.

Chen, F. L., & Zhou, L.(2009). Formulation of patient safety culture assessment questionnaire. *Nursing Journal of Chinese People's Liberation Army*, 1, 35-36. In Chinese.

Chen, W. W. (2015). Research on the nursing behavior of obstetric nurses in safeguarding patient safety. *Journal of Traditional Chinese Medicine Management, 23* (8), 165-167. In Chinese.

Colla, J. B., Bracken, A. C.,Kinney, L. M., & Weeks, W. B. (2005). Measuring patient safety climate: A review of surveys. *Quality & Safety in Health Care, 14* (5), 364-366. ,

Cooper, M. D. (2000). Towards a model safety culture. *Safety Science, 36* (2), 111-136.

Cox, S., & Cox, T.(1991). The structure of employee attitudes to safety: an European example. *Work and Stress*, *5* (2), 93-106.

Cox, S., & Flin, R.(1998). Safety culture: Philosophers' stone or man of straw? *Work and Stress,12*(3), 189-201.

Cui, Y., Xi, X. M., Zhang, J. S., Deng, X. X., & Liu, S. J. (2016). Implementation and result evaluation of hospital safety culture improvement. *Chinese Hospital Management Magazine, 32*(12), 922-925. In Chinese.

Deal, T. E., & Kennedy, A. A. (1982). Corporate cultures. Reading: Addison-Wesley.

Denison, D. R. (1990). *Corporate culture and organizational effectiveness.* New York: John Wiley.

DiCuccio, M. H. (2015).The relationship between patient safety culture and patient outcomes: A systematic review. *Journal of Patient Safety, 11* (3), 135-142.

Dolan, S. L. (2009). *Values management-survival of enterprises in the 21st century.* Beijing: China Renmin University Press.

Dong, X. G. (2014). *Influence of construction enterprise safety culture on safety performance.* Doctoral dissertation, Southwest Jiaotong University. In Chinese.

Du, X. S. (2010). Systematic construction of safety culture in colliery enterprises. Doctoral dissertation, China University of Mining and Technology. In Chinese.

Fitzgerald, M. K.(2005). Safety performance improvement through culture change. *Process Safety Environmental Protection, 83* (4), 324-330.

Frankel, A., Grillo, S. P., Pittman, M., Thomas, E. J., Horowitz, L., Page, M., & Sexton, B. (2008). Revealing and resolving patient safety defects: the impact of leadership Walk Rounds on frontline caregiver assessments of patient safety. *Health Services Research,43*(6), 2050-2066.

Geller, E.S. (1994). Ten principles for achieving a total safety culture. *Professional Safety* September, 18-24.

Glick, W.H. (1985). Conceptualizing and measuring organizational and psychological climate: pitfalls in multilevel research. *Academy of Management Review, 10* (3), 601-616.

Glisson, C., & James, L. R. (2002). The cross-level effects of culture and climate in human service teams. *Journal of Organizational Behavior, 23*(6), 767–794.

Griffin, M. A., &Neal, A. (2000). Perceptions of safety at work: a framework for linking safety climate to safety performance, knowledge, and motivation. *Journal of Occupational Health Psychology,5* (3):347-358.

Groves, P. S., Meisenbach, R.J., & Scott-Cawiezell, J. (2011). Keeping patients safe in healthcare organizations: a structuration theory of safety culture. *Journal of Advanced Nursing, 67*(8), 1846-1855.

Guerlain, S., Turrentine, F. E., Bauer, D. T., Calland, J. F., & Reid, A. (2008).Crew resource management training for surgeons: feasibility and impact. Cognition, *Technology &Work, 10,* 255-264.

Guldenmund, F.W. (2000).The nature of safety culture: a review of theory and research. *Safety Science,34* (2000), 215-257.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate data analysis (7th ed). Harlow: Pearson.

Haukelid, K. (2008).Theories of (safety) culture revisited—An anthropological approach. *Safety Science,46*(3), 413-426.

Hofstede, G. R. (1986). Werkenaan de organisatiecultuur. *Bedrijfskunde, 58* (2), 102-106.

Hu, L. T., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to under parameterized model misspecification. *Psychological methods, 3*(4), 424-453.

Huang, Z. H. (2007). Medical service safety and patient safety culture. *Jiangsu Healthcare Administration, 4*(18), 1-3. In Chinese

International Safety Advisory Group (1991). *Safety Culture* (Safety Series No. 75-INSAG-4). Vienna: International Safety Advisory Group.

James, L. R., James, L. A., & Ashe, D. K. (1990). *The meaning of organizations: The role of cognition and values. In B. Schneider (Ed.), Organizational climate and culture*. San Francisco: Jossey-Bass.

James, L.R. (1982). Aggregation bias in estimates of perceptual agreement. *Journal of Applied Psychology,67* (2), 219-229.

Jaques, E. (1952). *The changing culture of a factory.* London: Tavistock.

Ji, D. J. (2011). *Study on safety shared mental model of mine team.* Master thesis, Liaoning Technology University. In Chinese.

Jiang, R. F., & Li, L. (2004). Establishment of the medical malpractice reporting system. *Chinese Journal of Hospital Administration, 20* (3), 181-182. In Chinese.

Jones, A.P., &James, L.R. (1979). Psychological climate: dimensions and relationships of individual and aggregated work environment perceptions. *Organizational Behavior and Human Performance,23*, 201-250.

Kohn, L.T., Corrigan, J.M.,& Donaldson, M. S. (2000).To err is human: Building a safer health system. Institute of Medicine Report. Washington DC: National Academy Press.

Kroeber, A. L., & Kluckhohn, D. (1952). Culture: A critical review of concepts and definitions. Cambridge MS: the Peabody Museum.

Lee, T.R.(1996). Perceptions, attitudes and behavior: the vital elements of a safety culture. *Health and Safety,10*, 1-15.

Li, J. (2011). *Study on the status of inpatients' safety willingness and behavior to participate in the maintenance of the patients*. Master thesis, Chongqing Medical University. In Chinese.

Li, J. (2016). *Hospital patient safety training demands research and curriculum construction*. Master thesis, Anhui Medical University. In Chinese.

Li, L., & Liu, X. Q. (2009). The assessment and analysis of hospital patient safety culture by nursing personnel. *Chinese Journal of Nursing, 44*(4), 304-307. In Chinese.

Li, L. L., Hu, S. H., Liu, A. Q., Ding, P., Lu, C. Y., Ni, X. M., et al. (2014). Understanding of the nurses in a certain "3A" Hospital in Anhui Province of patient safety culture. *Chinese Nursing Management, 7* (14), 740-744. In Chinese.

Li, N. W., & Huang, P. (2012). Relationship between transformational leadership behavior, safety attitude and safety performance-an empirical study of coal mining enterprises. *Soft Science,* 2012,*26* (1), 68-71. In Chinese.

Li, S. (2009). *Research on the safety culture system of coal mine enterprises.* Doctoral dissertation, China University of Mining and Technology. In Chinese.

Li, Y., Guo, S. J., Jiang, N. H., Liu, X., Li, S. W., Zhao, H., et al. (2015). Construction of patient safety culture and safety performance correlation questionnaire. *Chinese Hospital Management, 35* (1), 48-50. In Chinese.

Li, Y., Sun, C. J., Liang, C., Cui, L. J., Mao, J. F., Wu, G. S., et al. (2016). Influential factors of the hospital safety performance and the promotion strategy research. *Chinese Hospital Management, 36* (7), 46-48. In Chinese.

Li, Y. X., Yang, Z. J., & Wang, Y. S. (2012). The effect of leadership behavior and safety culture on safety performance the case of nurse. *Fu Jen Management Review, 19* (1), 47-72. In Chinese.

Liu, S. X., Mei, Q., Shen, B., & Zhang, Z. Z. (2010). Literature review on safety performance. *China Safety Science Journal, 20* (5), 131-139. In Chinese.

Liu, Y. E., Zhang, P., & Deng, A. H. (2011). Research progress on patient safety climate and adverse incidents reporting. *Today Nurse, 2011*(2), 12-14.

Liu, Y. L. (2008). *Research on hospital safety culture and patient safety events.* Doctoral dissertation, Huazhong University of Science and Technology. In Chinese.

Luo, M., Xie, H. L., Ouyang, Q., Liu, Y. E., Cheng, F. Q., & Hu, B. B. et al. (2015). Construction and assessment of the Chinese version of the Manchester patient safety framework. *Modern Clinical Nursing, 14* (12):1-6.In Chinese.

Lv, H., Li, Z. L., & Zhang, Y. H. (2007). Our hospital's practices and afterthoughts on carrying out nursing risk management. *Chinese Journal of Hospital Administration, 23* (2), 119-120. In Chinese.

Ma, S. M. (2011). Empirical studies on impact of leader-member exchange on enterprise safety culture. Doctoral dissertation, China University of Mining and Technology. In Chinese.

Mearns, K., Flin, R., Gordon, R., & Fleming, M. (1998).Measuring safety climate on offshore installations.*Work & Stress, 12*(3), 238-245.

Muething, S.E., Goudie, A., Schoettker, P.J., Donnelly, L.F., Goodfriend, M.A.,& Bracke,T.M., et al. (2012).Quality improvement initiative to reduce serious safety events and improve patient safety culture. *Pediatrics, 130* (2), e423-e431.

Muijen, J. J., et al. (1999). Organizational culture: The focus questionnaire [J]. *European Journal of Work & Organizational Psychology, 8* (4), 551-568.

Mei, H. (2012). *Research on the safety training content system of clinical nurses*. Master

thesis, Second Military Medical University. In Chinese.

Myung, S. J., Shin, J. S., Kim, J. H., Roh, H.R., Kim, Y., Kim, J. et al. (2012). The patient safety curriculum for undergraduate medical students as a first step toward improving patient safety. *Journal of Surgical Education, 69* (5), 659-664.

Neal, A., & Griffin, M.A. (2006). A study of the lagged relationships among safety climate, safety motivation, safety behavior, and accidents at the individual and group levels. *Journal of Applied Psychology,91* (4), 946-953.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychological theory*. New York: MacGraw-Hill.

O'Leary, K. J., Buck, R., Fligiel, H. M., Haviley, C., Slade, M. E., &Landler, M. P. et al. (2011).Structured interdisciplinary rounds in a medical teaching unit: improving patient safety. *Archives of Internal Medicine,171* (7), 678-684.

Ostrom, L., Wilhelmsen, C., & Kaplan, B.(1993).Assessing safety culture. *Nuclear Safety, 34* (2), 163-172.

Ouchi, W. (2007). *Z theory*. Beijing: China Machine Press. In Chinese.

Pace, W.D.(2007).Measuring a safety culture: Critical pathway or academic activity? *Society of General Internal Medicine*, *22* (1), 155-156.

Paine, L. A., Rosenstein, B. J, Sexton, J. B., Kent, P., Holzmueller, C. G., & Pronovost, P. J. (2010). Assessing and improving safety culture throughout an academic medical centre: a prospective cohort study. *Quality & Safety in Health Care*, (19), 547-554.

Parker, D. (2009).Managing risk in healthcare: understanding your safety culture using the Manchester Patient Safety Framework (MaPSaF).*Journal of Nursing Management, 17* (2), 218-222.

Patankar, M. S., Brown, J. P., Sabin, E. J., &Bigda-Peyton, T. G. (2015). *Safety culture: building and sustaining a cultural change in aviation and healthcare (Sun, J. et al. Trans.)*. Beijing: China Worker Publishing House. In Chinese.

Patankar, M. S.,& Sabin, E. (2010).*The safety culture perspective. In E. Salas and D. Maurino (Eds)*, *Human factors in aviation,(2nd ed.)*. Chennai: Elesevier.

Pettigrew, A.M. (1979). On studying organizational cultures. *Administrative Science Quarterly*, (24), 570-581.

Pidgeon, N.F.(1991). Safety culture and risk management in organizations. *Journal of Cross-Cultural Psychology,22* (1),129-140.

Pumar-Mendez, M.J., Attree, M., & Wakefield, A. (2014).Methodological aspects in the assessment of safety culture in the hospital setting: a review of the literature. *Nurse Education Today*, *34* (2), 162-170.

Ren, S. L. (2011). *Status quo and countermeasure analysis of patient safety management in three TCM hospitals in Beijing*. Master Thesis, Beijing University of Chinese Medicine. In Chinese.

Robbins, S. P., & Judge, T. A. (2012). *Organizational behavior (14th ed.).* Beijing: China

Renmin University Press.

Rong, Y. F. (2009). *Exploring the relationship between patient safety culture and safety behavior.* Master thesis, Hualien: Department of Public Health, Tzu Chi University. In Chinese.

Rousseau, D. M. (1990). *Assessing organizational culture: The case for multiple methods. In B. Schneider (Ed.), Organizational climate and culture (pp.153–192).* San Francisco: Jossey-Bass.

Schein, E.H.(1992). *Organizational Culture and Leadership.* San Francisco: Jossey-Bass.

Schein, E. H. (2017). *Corporate culture survival guide.* Hangzhou: Zhejiang People's Publishing House.

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online, 8* (2), 23-74.

Schneider, B., & Bartlett, C. J. (1968). Individual differences and organizational climate: The research plan and questionnaire development. *Personnel Psychology, 21*, 323–333.

Schneider, B. (Ed.). (1990). *Organizational climate and culture*. San Francisco: Jossey-Bass.

Sexton, J. B., Helmreich, R. L., Neilands, T. B., Rowan, K., Vella, K., & Boyden, J., et al. (2006). The safety attitudes questionnaire: psychometric properties, benchmarking data, and emerging research. *BMC Health Services Research, 6* (3), 44.

Silva, S., Lima, M. L., & Baptista, C. (2004). OSCI: an organisational and safety climate inventory. *Safety science, 42* (3), 205-220.

Singer, S. J., Gaba, D. M., Geppert, J. J., Sinaiko, A. D., Howard, S. K., & Park, K. C. (2003). The culture of safety: results of an organization-wide survey in 15 california hospitals. *Quality & Safety in Health Care, 12* (2), 112-118.

Sun, L. Z. (2011). Research on the nursing behavior of obstetric nurses in safeguarding patient safety. *Nursing Magazine, 26*(12), 5-8. In Chinese.

Tang, P., Xiao, M. C., & Ren, H. Y. (2016). Establishment and evaluation of patient safety behavior scale in medical staff. *Chongqing Medicine, 45* (5). 614-616. In Chinese.

Tao, Y. H., & Wang, Y. M. (2016). The status quo of patient safety education at home and abroad and the countermeasures. *West China Medical Journal,31* (1), 157-160. In Chinese.

Tylor, E. B. (1992). *Primitive Culture*. Shanghai: Shanghai Literature and Art Publishing House.

Wang, J. L. (2014). An empirical study on the influence of construction enterprises safety culture on safety performance. *Journal of Safety Science and Technology, 10* (8), 125-129. In Chinese.

Wang, Y. H. (2007). *Corporate safety culture assessment system research.* Doctoral Dissertation, Tianjin University. In Chinese.

Wang, Y. B. (2012). *Cause analysis and countermeasures of medical malpractice events.*

Xi'an: The Fourth Military Medical University. In Chinese.

World Health Organization. (2008). *World alliance for patient safety: Research for patient safety- better knowledge for safer care.* Geneva: World Health Organization Press.

World Health Organization. (2009). *Summary of the evidence on patient safety: implications for research.* Geneva: World Health Organization Press.

Wu, C. Z. (2001). *Relationship between safety climate and safety performance in four types of manufacturing industries in central Taiwan.* Doctoral dissertation, Taiwan: National Changhua University of Education. In Chinese.

Wu, J. J., Geng, X. L., & Fu, G. (2013). Study on the impact of safety atmosphere to employee safety behavior based on the intermediary effect method. *Journal of Safety Science and Technology, 9* (3):80-86. In Chinese.

Xia, C. F. (2015). *Patient safety culture survey and evaluation of a general hospital.* Master thesis, Anhui Medical University. In Chinese.

Xia, C. F., & Zhou, S. (2015). Evidence-based analysis of patient safety culture assessment in China. *Journal of Medical Postgraduates, 28* (5), 526-529. In Chinese.

Xia, W. (2012). Theory and empirical study of water safety education for pupils. Master thesis, Central China Normal University. In Chinese.

Xu, N. (2013). *Investigation on the influence of hospital safety climate on sharp injuries among nurses*. Master thesis, Shanxi Medical University. In Chinese.

Yang, H. X., Jiang, D. D., & Chen, Y. Y. (2016). Patient safety culture research process. *Chinese Nursing Management, 16* (2):235-239.In Chinese.

Yang, S. J. (2013). *Empirical analysis and comparative study on the relationship between safety culture and safety performance of construction enterprises.* Doctoral dissertation, Southwest Jiaotong University. In Chinese.

Yang, Z. Q., Pei, W. T., Wang, Y. Q., Zhou, M., & Zhao, Q. L. (2014). *Five stages of Jinchuan's integrated mode for safety culture control.* Beijing: China Coal Industry Publishing House. In Chinese.

Ye, X. F., Li, X. C., & Wang, Z. N. (2014). Influence of safety climate on safety behavior: moderating mediation model. *Soft Science, 10*, 18-38. In Chinese.

Zeng, W., & Huang, F. Y. (2014). The relationship between clinical nurses' attitude toward patient safety in Macau. *Journal of Nursing Administration, 14*(5), 317-319. In Chinese.

Zeng, Z. Y. (2015). *Research on safety culture construction strategy of the third people's hospital of chengdu.* Master thesis, Southwest Jiaotong University. In Chinese.

Zhang, B. Y. (2016). *Safety culture assessment of oil enterprises*. Master thesis, Northeast Petroleum University. In Chinese.

Zhang, M. Y. (2014). Improvement of medical disputes investigation and prevention solution system-with 13 public hospitals in Dongguan as the case. *Chinese Health Service Management*, (10), 757-760. In Chinese.

Zhang, N., Xu, J. H., & Zhang, T. (2017). Hospital values management. *Jiangsu Health System Management, 28* (1), 103-105. In Chinese.

Zhang, Q. (2015). *Investigation of the status quo of perception of patient safety culture of employees of a level 3A hospital.* Master thesis, Chongqing Medical University. In Chinese.

Zhao, X. N. (2008). *Influence of aviation safety culture on crew safety flight behavior*, Doctoral dissertation, Shanxi Normal University. In Chinese.

Zhou, S. Z., & Qiao, G. Y. (2015). Evaluation of surgery patients on the safety nursing behaviors of nurses. *Chinese Journal of Nursing Education, 12* (3), 218-220. In Chinese.

Zhou, S., Zhu, Z. M., Liu, Z. Y., Chen, R. X., Zhang, W., & Wang, G. L. (2013). Effective strategies to improve patient safety. *Chinese Hospital Management, 33*(11), 40-41. In Chinese.

Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013).*Business research methods. (9th ed.).* Ohio: South-Western.

Zohar, D. (1980). Safety climate in industrial organizations: theoretical and applied implications. *Journal of Applied Psychology,65* (1), 96-102.

Zohar, D., & Hofmann, D. A. (2012). Organizational culture and climate. *Oxford handbook of industrial and organizational psychology, 1*, 643-666.

Webliography

China Healthcare. (2017). *WHO: Patient safety makes healthcare safer.* Retrieved March 30, 2018, from https://www.cn-healthcare.com/articlewm/20171108/ content- 1018571.html.

Legal Daily. (2002). *Investigation of 326 hospitals in China shows that occurrence rate of medical disputes is as high as 98%.* Retrieved March 1, 2018, from http://news.sohu.com/94/31/news147933194.shtml. In Chinese.

National Health and Family Planning Commission of PRC, State Administration of Traditional Chinese Medicine of PRC. (2005). *The Ministry of Health of the People's Republic of China and the State Administration of Traditional Chinese Medicine of the People's Republic of China launched the hospital management year in 2005 with the theme of "Taking patients as the center and improvement of medical quality service as the theme".* Retrieved March 1, 2018, from http://www.nhfpc.gov.cn/bgt/pw10505/200511/7fb45446b23e4f499d267349f7fbcfe1.shtml. In Chinese.

National Health and Family Planning Commission of PRC. (2008). *The ministry of health launched the "patient-centered" medical safety 100-day special inspection activity in 2008.* Retrieved March 1, 2018, from http://www.nhfpc.gov.cn/zwgkzt/wsbysj/200812/38465.shtml. In Chinese.

National Health and Family Planning Commission of PRC . (2008). *The general office of the ministry of health prints and distributes the activity plan of medical quality 10,000 li trip of 2009.* Retrieved March 1, 2018, from http://www.nhfpc.gov.cn/zwgkzt/wsbysj/200905/40782.shtml. In Chinese.

National Health and Family Planning Commission of PRC. (2011). *The ministry of health prints and distributes the interim measures for hospital grading.* Retrieved March 1, 2018, fromhttp://www.nhfpc.gov.cn/zwgkzt/wsbysj/201109/53040.shtml. In Chinese.

National Health and Family Planning Commission of PRC. (2015). *The national health and family planning commission promulgates the implementation plan of activities to further improve medical service (2015-2017).* Retrieved March 1, 2018, from http://www.nhfpc.gov.cn/zwgk/zxgzya1/201506/dafdbd15b3d94ca181f322c52a0aec9c.shtml. In Chinese.

Institute of Medicine. (1999) *To Err is Human: Building A Safer Health System.* Retrieved April 4, 2018, fromhttp://www.nationalacademies.org, http://www.nationalacademies.org/hmd/~/media/Files/Report%20Files/1999/To-Err-is-Human /To%20Err%20is%20Human%201999%20%20report%20brief.pdf

World Health Organization. (2014). *10 facts on patient safety.* Retrieved March 1, 2018, from http://www.who.int/features/factfiles/patient_safety/en/.

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Appendix

Introduction:

Dear nursing staff,

This questionnaire is related to patients' safety culture, safety behaviors, and safety performance management. We hope that you can spare your precious time to fill in this questionnaire. Your answers will contribute to the researches on the patients' safety management in Chinese hospitals, and also will provide scientific evidences to guarantee patients' safety. We want to express our sincere gratitude to your support and contribution. Wish you health and happiness!

(The following questions are related to your personal information. Don't worry about information leakage. Your answers will be confidential!)

1. Context of the Questionnaire: The whole questionnaire is divided into four parts. Please fill in the blanks according to your own circumstance. Thank you very much!)

Part A Patient Safety Culture

Please answer the following questions according to the realities about the "Safety Value" in the hospital (Q1-7 are about believing in the value; Q8-15 are about practicing the value)	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
1. I think the hospital should establish the concept of "safety first".	□1	□2	□3	□4	□5	□6
2. I think the hospital should establish the safety concept of "prevention first".	□1	□2	□3	□4	□5	□6
3. I think the hospital should establish people-oriented safety concept (which means to center on the patient and the patient's family).	□1	□2	□3	□4	□5	□6
4. I think the hospital should establish the scientific outlook of "intrinsic safety" (which means to make sure the equipment and systems themselves are safe by means of designing etc.).	□1	□2	□3	□4	□5	□6
5. I think the hospital should establish the concept of "cherishing life".	□1	□2	□3	□4	□5	□6
6. I think the hospital should establish the ethnic view of "the patient's safety is related to everyone."	□1	□2	□3	□4	□5	□6
7. I think the hospital should establish the concept of "safety is benefit",	□1	□2	□3	□4	□5	□6
8. I think the patients' safety comes first when the hospital is making a decision, policy or agenda.	□1	□2	□3	□4	□5	□6
9. In the nursing work, I think all my colleagues implement measurements about risk assessment and prevention carefully.	□1	□2	□3	□4	□5	□6
10. I think all my colleagues regard the patients' safety as their own responsibility.	□1	□2	□3	□4	□5	□6
11. In the nursing work, I actively invite my patients and their families to join in the safety management.	□1	□2	□3	□4	□5	□6
12. In the nursing work, I obey the regulations, rules and procedures related to safety perfectly.	□1	□2	□3	□4	□5	□6
13. I think it is a waste of time to attend the safety training and meetings.	□1	□2	□3	□4	□5	□6
14. I learn professional skills to guarantee the patients' safety actively.	□1	□2	□3	□4	□5	□6
15. I regard the department nursing safety records as my own safety records, and I am proud of it.	□1	□2	□3	□4	□5	□6

Please answer the following questions based on the reality of "safety strategy" in your hospital (Q1-8 are about leaders' strategies; Q9-14 are about organization construction;Q15-26 are about making regulations and rules; Q27-34 are about policy incentives.)	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
1. I believe our hospital has integrated the patient safety values into hospital mission.	□1	□2	□3	□4	□5	□6
2. I believe the patient safety management plan made by our hospital is feasible.	□1	□2	□3	□4	□5	□6
3. Leaders of our hospital help the medical staff resolve the existing or potential problems that pose threat to patient safety.	□1	□2	□3	□4	□5	□6
4. I believe leaders of our hospital fully respect the professional advice of all levels of managerial staff and the front-line employees and delegate due power to them.	□1	□2	□3	□4	□5	□6
5. The important safety meetings in our hospital are all attended by decision-making managerial leaders.	□1	□2	□3	□4	□5	□6
6. We regularly evaluate patient safety culture.	□1	□2	□3	□4	□5	□6
7. I believe our hospital can give the patient safety culture evaluation results to all levels of managerial staff and the whole staff in time.	□1	□2	□3	□4	□5	□6
8. I believe our hospital will adopt corresponding improvement measures according to the patient safety culture evaluation results.	□1	□2	□3	□4	□5	□6
9. I believe the hospital safety management committee has a reasonable personnel structure and explicit responsibility.	□1	□2	□3	□4	□5	□6
10. I believe our hospital is staffed with full-time safety management personnel with explicit responsibility.	□1	□2	□3	□4	□5	□6
11. I believe the responsibilities of safety management leaders at all levels within the hospital are explicit.	□1	□2	□3	□4	□5	□6
12. Our department has part-time safety supervisor with explicit responsibility.	□1	□2	□3	□4	□5	□6
13. I believe the safety management of our hospital has a reasonable organizational structure and personnel allocation.	□1	□2	□3	□4	□5	□6
14. I believe the responsibilities, rights and interests of safety management institutions at all levels within our hospital are explicit and reasonable.	□1	□2	□3	□4	□5	□6
15. I believe the safety rules and regulations of our hospital	□1	□2	□3	□4	□5	□6

are vague and ambiguous.					
16. I believe the communication systems (including internal communication system and doctor-patient communication system) established by our hospital are effective.	□1	□2	□3	□4	□5	□6
17. I believe the multi-department collaboration system functions well in our hospital, jointly resolving the safety problems of patients.	□1	□2	□3	□4	□5	□6
18. I believe the system in which patients take part in patient safety management is not effectively carried out in our hospital.	□1	□2	□3	□4	□5	□6
19. I believe the medical risk early warning indicator system of our hospital is comprehensive and reasonable.	□1	□2	□3	□4	□5	□6
20. I believe the safety (adverse) incident precaution and settlement system of our hospital reflects the improvement of patient safety through systematic thinking and process improvement.	□1	□2	□3	□4	□5	□6
21. The hospital formulates complete and systematic employee safety publicity education and training system.	□1	□2	□3	□4	□5	□6
22. The safety supervision and inspection system of our hospital is easy to implement.	□1	□2	□3	□4	□5	□6
23. The safety rules and regulations of our hospital are not fully implemented.	□1	□2	□3	□4	□5	□6
24. The safety production responsibility and rewards and penalties system is effective.	□1	□2	□3	□4	□5	□6
25. The hospital reviews and revises the rules and regulations, standards and procedures of safety management as needed.	□1	□2	□3	□4	□5	□6
26. In our hospital, the national safety standard, norm and system can be traced.	□1	□2	□3	□4	□5	□6
27. Our hospital encourages us to report adverse incidents.	□1	□2	□3	□4	□5	□6
28. I believe the hospital can identify adverse incidents in a fair and just manner both in terms of the process and results.	□1	□2	□3	□4	□5	□6
29. I can frankly discuss safety issues with hospital managers.	□1	□2	□3	□4	□5	□6
30. The hospital publicize patient safety values via many channels.	□1	□2	□3	□4	□5	□6

31. The hospital has a good safety culture atmosphere.	□1	□2	□3	□4	□5	□6
32. The hospital launches various awarding activities to set up a typical model of safety production.	□1	□2	□3	□4	□5	□6
33. The hospital establishes reward/recognition mechanism and make sure every safety target has a proper priority.	□1	□2	□3	□4	□5	□6
34. Hospital leaders support employee in research and innovation to improve patient safety.	□1	□2	□3	□4	□5	□6

Please answer the following questions according to the realities about the "Safety Climate" in the hospital. (Q1-7 are about management support; Q8-10 are about the obstacles on safety work; Q11-15 are about feedback and training; Q16-21are about safety climate; Q22-25 are about conflicts and communication.)	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
1. When introducing the hospital, hospital leaders first talk about the patients' safety and its	□1	□2	□3	□4	□5	□6
2. Hospital leaders pay attention to the guarantee of the patients' safety when making annual planning.	□1	□2	□3	□4	□5	□6
3. Hospital leaders insist on having inspection on patients' safety regularly. Effective measures will be taken after the inspection.	□1	□2	□3	□4	□5	□6
4. Hospital leaders will not cutting down the fund on removing potential dangers even when it is a financial strain.	□1	□2	□3	□4	□5	□6
5. Hospital leaders encourage staff to report patients' adverse events without worrying about the negative effects caused by those events.	□1	□2	□3	□4	□5	□6
6. In my department, leaders encourage staff to offer some suggestions in order to improve the patients' safety. They will get practical support.	□1	□2	□3	□4	□5	□6
7. In my department, leaders try their best to take precautions to ensure the patients' safety.	□1	□2	□3	□4	□5	□6
8. I have enough time in my work, and I always follow the patient safety management system.	□1	□2	□3	□4	□5	□6
9. My workload is not heavy and it hardly has any negative effect on my following the patient safety management system.	□1	□2	□3	□4	□5	□6
10. In my department, we have enough personnel allocation which enables me to follow the patient safety management system from the beginning to the end.	□1	□2	□3	□4	□5	□6
11. In my department, leaders provide me with enough safety education and training in order to ensure my finishing my work and guaranteeing the patients' safety	□1	□2	□3	□4	□5	□6

effectively.						
12. In my department, my leaders put adequate finance and time into safety training for staff.	□1	□2	□3	□4	□5	□6
13. In my department, leaders guide the staff to notice and identify the potential risks that may pose a threat on the patients' safety.	□1	□2	□3	□4	□5	□6
14. In my department, leaders ask staff to correct their unsafe practice in work.	□1	□2	□3	□4	□5	□6
15. If a patient adverse event occurs in my work, I will report to the leaders of my department and departments concerned in time.	□1	□2	□3	□4	□5	□6
16. The hospital holds meetings about patients' safety management regularly.	□1	□2	□3	□4	□5	□6
17. The hospital has adequate resources to guarantee the patients' safety, such as medical equipment, facilities and protective equipment.	□1	□2	□3	□4	□5	□6
18. I can get the medical equipment that is needed to guarantee the patients' safety at any time.	□1	□2	□3	□4	□5	□6
19. In my department, the medical order is fine.	□1	□2	□3	□4	□5	□6
20．in my department, the staff can feel free to air their points of view, if they see something that can be harmful to patient.	□1	□2	□3	□4	□5	□6
21.I can only obtain my colleagues acknowledgment when I obey the patients' safety procedures in my department.	□1	□2	□3	□4	□5	□6
22. Departments of the hospital well cooperate with each other, and provide the best treatment and nursing for the patients.	□1	□2	□3	□4	□5	□6
23. In my department, there are fewer conflicts among the colleagues.	□1	□2	□3	□4	□5	□6
24. In my department, colleagues help each other.	□1	□2	□3	□4	□5	□6
25. In my department, leaders and staff communicate well.	□1	□2	□3	□4	□5	□6

Part B Safety Behavior

Please answer the following questions based on the reality of your *"safety behavior"*. *(Safety behaviors can be divided into safety participation behavior and safety compliance behavior. The former refers to behavior that does not directly affect patient safety but helps support patient safety; while the latter refers to compliance with rules and regulations to maintain patient safety.)*	Never	Occasionally	Sometimes	Often	Usually	Always
1. I follow the surgery and invasive operation norms.	□1	□2	□3	□4	□5	□6
2. I wash my hands as required before contact with patients.	□1	□2	□3	□4	□5	□6
3. I inevitably do not strictly carry out the aseptic operation several times a month due to heavy workload.	□1	□2	□3	□4	□5	□6
4. I follow the standard procedure of drainage pipe disposal/nursing such as urinary catheterization.	□1	□2	□3	□4	□5	□6
5. I will adopt necessary protection measures to myself and patients when dealing with infectious communicable disease.	□1	□2	□3	□4	□5	□6
6. I will sort the medical waste and sharp apparatus before disposing it.	□1	□2	□3	□4	□5	□6
7. I know the emergency disposal procedures after occupational exposure.	□1	□2	□3	□4	□5	□6
8. My use/management of high-alert medications complies with corresponding norms.	□1	□2	□3	□4	□5	□6
9. I will comprehensively evaluate the drug reaction and untoward reaction of patients.	□1	□2	□3	□4	□5	□6
10. I will make an assessment and give suggestions on the necessity of using drugs.	□1	□2	□3	□4	□5	□6
11. I am familiar with all types of critical values and the treatment/observation method.	□1	□2	□3	□4	□5	□6
12. I can accurately evaluate and deal with/nurse critically ill patient.	□1	□2	□3	□4	□5	□6
13. I never come across negligence or mistake while dealing with/nursing critically ill patients.	□1	□2	□3	□4	□5	□6
14. I appeal to others in time when meeting questions during work.	□1	□2	□3	□4	□5	□6
15. I never make any mistake in issuing/implementing doctor's advice.	□1	□2	□3	□4	□5	□6
16. I will remind colleagues in time when finding out their unsafe behavior no matter whether the damage has been caused or not.	□1	□2	□3	□4	□5	□6

17. I check any operation in person.	□1	□2	□3	□4	□5	□6
18. In any operation, I can use at least two methods to identify patient identity.	□1	□2	□3	□4	□5	□6
19. When spotting students or advanced students checking operations by themselves, I will stop them immediately.	□1	□2	□3	□4	□5	□6
20. I will carry out in-depth communication with patients and their relatives and respect their choice and opinion.	□1	□2	□3	□4	□5	□6
21. I will require patients to retell the important information in the communication to make sure they fully understand it.	□1	□2	□3	□4	□5	□6
22. I can fully assess and prevent the pressure sores and risk of falling of every patient.	□1	□2	□3	□4	□5	□6
23. I can fully assess and prevent the deep venous thrombosis risk of every patient.	□1	□2	□3	□4	□5	□6
24. I can fully assess and prevent the myocardial ischemia risk of every patient.	□1	□2	□3	□4	□5	□6
25. I can fully assess and treat the malnutrition of every patient.	□1	□2	□3	□4	□5	□6
26. I regularly review basic knowledge and fundamental theories as well as practice basic skills.	□1	□2	□3	□4	□5	□6
27. I always take part in the academic activities held by the hospital voluntarily.	□1	□2	□3	□4	□5	□6
28. When I come up with suggestions that can improve patient safety, I will report to my superiors.	□1	□2	□3	□4	□5	□6
29. I pay close attention to the adverse incidents of myself and others, analyzing them and learning from them.	□1	□2	□3	□4	□5	□6
30. If my behavior endangers patient safety, I will honestly report it without concealment no matter whether the harm has been done or not.	□1	□2	□3	□4	□5	□6
31. When finding that colleague's behavior endangers patient safety, I usually choose not to report if the situation is not serious.	□1	□2	□3	□4	□5	□6

Part C Hospital Safety Performance

Safety performance is all measurable results that the hospital obtains in terms of providing health service according to the patients' safety target. It includes two aspects, namely the overall operating condition of the safety system and damage of doctors and patients due to medical injury.

1. You think the "Safety Performance Level" of the patients in your department is:

□extremely excellent   □excellent   □acceptable   □not good   □bad

2. how much of the safety work do you think need to be improved in your department?

□strongly believe that the department needs improvement   □believe that the department needs improvement

□some of the work needs improvement   □do not need improvement   □do not need any improvement

3. Compared to other departments, how do you think of the "Safety Performance Level" of the patients in your department?

□extremely excellent   □good   □much the same   □worse   □extremely bad

4. Safety Management

Please answer the following questions according to the realities about the "Safety Management" in the hospital	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
1. The hospital has a complete organizational system about the patients' safety management, such as medical quality management committee, and medical risk management organization.	□1	□2	□3	□4	□5	□6
2. The hospital has complete policy system about the patients' safety management.	□1	□2	□3	□4	□5	□6
3. The patients' safety management is always the key point of the management work in hospital.	□1	□2	□3	□4	□5	□6
4. When there are problems related to the patients' safety, the medical staff can cooperate to solve the problems.	□1	□2	□3	□4	□5	□6
5. The hospital has good communication methods to solve the problems about the patients' safety.	□1	□2	□3	□4	□5	□6
6. The hospital has contingency plan on major patients' safety event.	□1	□2	□3	□4	□5	□6
7. To ensure the safety of the patients, the hospital will appropriately allocate workload according to the health state of the medical staff.	□1	□2	□3	□4	□5	□6

5. Safety Facilities

Please answer the following questions according to the realities about the "Safety Facilities" in the hospital	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
1. The workplace and galleries is disinfected regularly in order to meeting the standards of hygiene.	□1	□2	□3	□4	□5	□6
2. There are some protection measures when the diagnosis equipment (such as CT machine and aspirator) is being used so that there will be less harm to the patients.	□1	□2	□3	□4	□5	□6
3. The hospital strictly obeys the regulations of disinfecting the medical equipment.	□1	□2	□3	□4	□5	□6
4. The medical workers strictly follow the process when using the medical equipment.	□1	□2	□3	□4	□5	□6
5. The hospital provides personal protective equipment when it is necessary	□1	□2	□3	□4	□5	□6

6. Safety Training

Please answer the following questions according to the realities about the "Safety Training" in the hospital.	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
1. The hospital has regular training related to the patients' safety.	□1	□2	□3	□4	□5	□6
2. The training courses meet the requirements of the work.	□1	□2	□3	□4	□5	□6
3. Trainers are suitable to meet the requirements of the training.	□1	□2	□3	□4	□5	□6
4. After the training, the hospital evaluates the effectiveness of the training.	□1	□2	□3	□4	□5	□6
5. The hospital has simulation drilling of safety incidents for the patients.	□1	□2	□3	□4	□5	□6
6. The hospital has safety training for the staff who switch their positions.	□1	□2	□3	□4	□5	□6
7. The training courses is closely related to work.	□1	□2	□3	□4	□5	□6

7.Adverse Events

7.1 The Number of the Adverse Events

Please answer the following question according to your experience. *(Your answers will be confidential!)*		Times						
		0	**1**	**2**	**3**	**4**	**5**	**6 or above**
1. Last year, how many adverse events have happened?	Level I							
	Level II-III							
	Level IV							
	Medical disputes							
2. In the past three years, how many adverse events have happened?								

7.2 Adverse Events Analysis

Please answer the following questions according to the realities about "adverse events analysis" in the hospital.	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
1. The hospital analyzes the adverse events regularly.	□1	□2	□3	□4	□5	□6
2. The hospital makes deep research on the reason of the adverse events.	□1	□2	□3	□4	□5	□6
3. The hospital has not published all the results of the survey.	□1	□2	□3	□4	□5	□6
4. The hospital regards the analysis of adverse events as the reference to the improvement of safety performance.	□1	□2	□3	□4	□5	□6

PartD Please offer some suggestions or point views on the patients; safety, behaviors or performance in your hospital.

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Suggestions or point views：



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2. Personal Information(please tick the appropriate box below)

2.1 Please Tick the description that best fits your position:

□(Vice) Nursing Dean □Head of the Nursing Department □ Supervisor of Nursing Care

□Head Nurse □Team Leader □Professional Nurse □Charge Nurse □Assistant Nurse

□Others(Rotary Nurse)

2.2 Your professional title:

□Primary □Intermediate □Sub-senior □Senior □Others

2.3 Your highest education degree:

□Technical secondary school education or below □Junior college education

□Bachelor □Master □Doctor

2.4 Gender:□Male □Female

2.5 Marriage Status: □Married □Unmarried □Others

2.6 Age:

□less than 25 □26-35 □36-45 □over 45

2.7 How long have you been working in this hospital?

□less than 1 year □1-5 years □6-10 years □11-15 years □16-20 years □over 21 years

2.8 How long have you been working in this profession?

□less than 1 year □1-5 years □6-10 years □11-15 years □16-20 years □over 21 years

2.9 Average work time per week: hours

2.10 Employed type:

□Formal Establishment □Personnel Agency □Internal Hired □Others

2.11 Which one is your main working area or department?

In this questionnaire, we regard your department as your working area, department or clinical department, where you devote most of your time or***medical service.***

□   A. No Specific Department   □   G. ICU (all types)

□   B. Medicine   □   H. Operating Room

□   C. Surgery   □   I. Anesthesia

□   D. Obstetrics   □   J. Outpatient Service

□   E. Pediatrics   □   K. Radiology

□   F. ED   □   L. Others