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A Multi-Level of Patient Safety Culture Effect on Safety Performance-The Case of Nurse

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A MULTI-LEVEL OF PATIENT SAFETY CULTURE EFFECT ON SAFETY PERFORMANCE-THE CASE OF NURSE

Strictly as per the compliance and regulations of:



A Multi-Level of Patient Safety Culture Effect on Safety Performance-The Case of Nurse

Yi-Hsuan Lee^α & Cheng-Chia Yang^σ

Abstract - Past scales or studies on safety culture are mostly based on single-level measurement. This study established as a multi-level model of patient safety culture scale based on literature review to investigate the relationship among organization-level of patient safety culture, unit-level of patient safety culture and safety performance. This was a cross-sectional study, and distributed 705 questionnaires to nursing staffs in two regional hospitals. A total of 363 valid samples were returned; the valid return rate was 51.8%. Confirmatory factor analysis (CFA) was performed to test the factor structure. The construct composite reliability was significant, and factor loading was >0.5, thus indicating an acceptable model fit. Structure Equation Modeling (SEM) proved that the effect of organization-level of patient safety culture on individual safety performance is mediated by unit-level of patient safety culture.

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1. INTRODUCTION

In recent years, patient safety has been concerned in medical care of different nations. Many researches have probed into the factors of medical safety, and found risks and negligence in current medical environment. In the past, little attention was paid to patient safety in medical industry. In 1991, a study by Harvard University reported that 3.7% of hospitalized patients had medical injury, 28% encountered medical negligence, and 76% of the cases were avoidable (Brennen et al., 1991). Baker et al.(2004) suggested that 3~16% of the patients in hospitals encountered adverse events and 28~51% of the cases could be avoided. Upon retrospective cases, these reports indicate the influences of adverse events on patients and health care system. Thus, medical injury cannot be neglected, and many countries have started initiating patient safety.

According to the report "To Err is Human" by the Institute of Medicine (IOM) in the U.S., it is estimated that there are at least 44,000~98,000 deaths are related to medical errors every year, and 53~58% medical injuries are avoidable medical errors. It suggested that health care organizations should develop safety culture, design organizational process and enhance credibility

and safety care steps (Kohn, Corrigan and Donaldson, 2000). "An Organisation with a Memory" of the National Health Service of Britain in 2000 indicated that in 1999, there were 400 deaths related to medical negligence, and 10,000 people had physical or mental obstacles due to medical negligence (Department of Health, 2000). These two reports reveal that medical institutions should try to avoid system errors and human negligence, enhance safety culture, and health care safety by learning from accidental events.

Many countries have included patient safety as national policy. Since 2001, the Joint Commission on Accreditation of Healthcare Organization (JCAHO) has demanded hospitals to implement strategic plans of patient safety. The hospital administrations should be responsible for safety culture and prevention of medical errors (Kobs, 2001). In 2002, Health Canada stated that safety culture is an important role in enhancing patient safety (Baker and Norton, 2002). The report of Department of Health indicated that safety culture is critical to effectively learn from errors. Safety culture has positive influence on organizational performance, which demonstrates the importance of safety culture (Department of Health, 2000).

In recent years, many researches have developed scales to measure medical safety culture. Colla et al. (2005) compared the common scales on patient safety culture. Other researches also probed into current safety culture in health care facilities by these scales. For instance, Pronovost (2003) measured the commitment of Johns Hopkins Hospital to patient safety by SCS. Singer (2003) studied the difference of safety culture in 15 hospitals. Pronovost (2006) measured safety culture of intensive care unit by SAQ questionnaire.

Past scales or studies on safety culture are mostly based on single-level measurement. Zohar (2005) suggested that safety culture should be multilevel. Different units have different interpretations on organizational policy, and organizational and unit climates have mutual influence on each other. Medical industry involves the distinctness and profession. Priority of safety culture in different professional units in hospitals would be different. Information and regulation for personal safety behavior are from the units which undertake the organizational policy. This study intends to probe into the possible correlation between the three. The research purposes are below: propose multilevel

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scale on safety culture in medical industry, study the relationship between organization-level safety culture, unit-level safety culture and individual safety performance.

II. THEORETIC DEVELOPMENT

a) *Safety Performance*

Measurement on managers' safety monitoring and safety implementation performance is the critical factor of safety culture enhancement. Thus, organizations should construct measurement measures in developing overall safety culture process in order to evaluate the efficacy of organizational operation. Overall organizational performance must be measured by safety performance. However, there are various views on definition and scope of safety performance, and the constructs of safety performance are inconsistent.

Neal and Griffin (2000) divided safety performance factors into predisposing factors, determination factors and composite factors. Predisposing factors include individual and organizational factors; individual factors include: ability, experience and personality traits; organizational factors include: leadership, group regulations and organizational climate. Determination factors measure direct factors of difference of individual safety obedience and participation, and they include safety knowledge, safety skill and safety motivation. Composite factors are defined as safety system, step and personal-task behavior, including safety commitment, obedience and participation. Siu and Phillips (2004) divided safety performance into accidental events and occupational injury which is measured by self-report. Huang et al. (2006) studied manufacturing industry, construction industry, service industry and transportation industry, and divided safety performance into safety control and injury rate which is measured by self-report. Based on literature review above, the definition and constructs of safety performance differ according to the researchers' backgrounds; however, the literature mostly focuses on management system and behavioral constructs.

Traditional safety performance of organizations is measured by accidental frequency and severity rate. It is not based on specific standard, and it does not indicate if the management system is still under control (Petersen, 2000). Thus, some researches treat safety behavior model as a criterion to measure safety performance (Chhokar and Wallin, 1984).

Based on the above, this study defines safety performance as the evaluation on safety process of individual behavior. Upon the characteristics of medical industry, this study does not adopt inspection figures to avoid participants' resistance. The survey is based on anonymous questionnaires, and participants report their safety performance by self-report.

b) *Safety Culture*

Swuste (2008) suggested that the difference between safety culture and safety climate is not specifically defined. Many scholars have interpreted culture and climate differently; however, their definitions are similar. Zohar (1980) first defined safety climate as employees' overall perception of organizational characteristics and environment-related safety. The perception would be influenced by organizational system, policy and personal traits, and attitude; it would also influence organizational safety performance. Cox and Cox (1991) suggested that safety culture reflects employees' shared safety attitude, belief, perception and values. Schein (1992) defined safety climate as organizational climate and affection in contact between organizational members and external people. Moreover, safety climate appears before safety culture and safety culture is a kind of regular behavior. For instance, interaction, group rules, value of belief, philosophy, rules of games, climate, thinking habit, mental model, language model, share and consistent symbols could be treated as complexity of culture. Schein also assumed that climate is culture. Cooper (2000) indicated that safety culture is a sub-culture of the organization, and it would influence the members' attitude and behavior; it is also related to organizational safety performance. Moreover, safety climate, safety behavior and safety management influence each other, and form safety culture model which is influenced by interaction between personal psychology, situations and behavior. Common tools on personal psychology are measurement for belief, values, attitude and views, and are used for interviews with the employees. Behavior measurement is based on self-report. Situation is measured by observation or inspection through organizational policy, operational step, management system, and communication channels and process.

Zohar (2008) proposed multilevel model of safety culture to probe into roles of different levels in organizations on culture. Senior management develops and participates organizational policy and process, such as customer service, production quality and employee safety, as well as declares organizational policy and goals. However, successful implementation of policy relies on cooperation among senior, middle level and lower management. For instance, due to delayed production, lower management rushes the progress and violates the safety-oriented principle of senior management. Thus, it would result in low degree of safety climate. Such cases demonstrate the difference of organizational policy in different units. Traditional organizational climate is based on single-level analysis, and multilevel model distinguishes policy and practice. Senior management is responsible for policy planning, introduction process and transformation from policy into strategic instruction. Lower management is in charge of

the execution. Thus, organization-level climate is to set up corporate strategy and senior management. With priority of safety in different units, group-level climate would influence unit members' behavior, and organization-level climate would influence group-level climate. For instance, when organization policy is production-oriented, and neglects safety record, lower management would concern more about production efficiency than safety inspection figures (Zohar, 2005).

Based on the above, this study probes into safety culture extended from climate, and defines safety culture as employees' perception of safety culture. The perception of organizational values on safety will influence the employees' values, attitude and cognition. It includes two levels: organization-level and unit-level safety culture. The researcher proposes the hypothesis below.

H1: Organization-level safety culture positively influences unit-level safety culture.

c) Relation between safety culture and safety performance

Zohar (1980) measured safety climate by quantitative study, and concluded eight constructs in the questionnaire: safety training, management's safety attitude, safety behavior, job environment risk, safety execution, situation of safety committee, safety communication and safety progress at work. Cox and Cox (1991) indicated five dimensions: safety attitude, responsibility, environmental safety, efficacy of management on safety and personal exemption. O'Toole (2002) studied correlation between organizational culture and employees' cognition of safety, and suggested that commitment to safety management, education and knowledge, safety monitoring process, employees' involvement and commitment are the factors to measure safety culture. Siu, Phillips and Leung (2004) investigated the relationship between safety climate and safety performance of construction workers, and divided safety climate into safety attitude and communication. They found that safety attitude would influence occupational injury. Katz-Navon et al. (2005) suggested that safety culture is the prediction factor of medical errors, and indicated a correlation between culture, safety practice and medical error frequency. Clarke and Ward (2006) suggested that safety climate is the mediating factor of leadership and safety participation. Huang et al. (2006) measured safety climate by four constructs: managers' support for safety, safety policy, safety training and safety management. They found that safety climate positively influences safety performance. Stock (2007) pointed out that safety culture promotion in medical institutions would enhance safety performance and reduce medical errors. There is also a positive correlation between safety culture and safety performance. Wu et al. (2007) defined safety culture as

employees' perception of safety climate. The perception is influenced by organizational and individual factors, and it would further affect safety behavior and performance. Based on the above, this paper proposes the hypotheses below:

H2: Organization-level safety culture positively influences safety performance.

H3: Unit-level safety culture positively influences safety performance.

III. RESEARCH METHOD

a) Research tools and operational definitions of variables

This study refers to the scale of safety culture revised based on SCS, (Pronovost, 2003), PSCHO (Singer et al., 2003) and SAQ (Sexton et al., 2004) developed by foreign researches. Organization-level safety culture refers to employees' perceived organizational involvement in safety and commitment to safety, and it is measured by organizational management and commitment. Unit-level safety culture refers to employees' perceived unit's safety process planning and management. Communication, inspection management and accident management are used to describe individuals' perception of unit safety culture. Safety performance is to measure task-related behavior. Individual safety behavior is measured by safety obedience, safety participation and safety behavior based on Neal and Griffin (2000) and Singer et al. (2003). The questionnaire design is based on Likert 5-point scale, and modified according to expert review by five clinical and managerial experts. Finally, the formal questionnaire remained the original constructs, and included 38 items, including 15 items on organizational safety culture, 12 items on unit safety culture, and 11 items on safety performance.

b) Research subjects and sampling method

Since medical professional groups are diverse, the research subjects are the nurses of hospitals. Nurses are the front-line personnel to take care of patients, and they are the majority in hospitals. In 2006, ASHRM indicated that nurses are very important for enhancing patient safety culture (American Society for Healthcare Risk Management, 2006). In order to control interference of policy and system in hospitals, this study enrolled 414 (50.4%) and 291 (51%) nurses from two regional teaching hospitals of the same system as the subjects. Both hospitals passed the new hospital evaluation of Department of Health in 2006, and were rated as excellence. The hospitals provided the lists of all nurses, and the researchers distributed and retrieved questionnaires in the hospitals. The investigation lasted from April 1 to April 18, 2008. There were 705 questionnaires distributed, and 403 were returned. After eliminating questionnaires with contradictory and

incomplete answers, there were 363 effective questionnaires and 40 invalid ones. The valid return rate was 51.8%.

IV. RESULTS

a) Sample Description

In term of job position, most subjects are nurse practitioners (79.61%), followed by nurses (15.70%) and nurse specialists are the least (4.68%); regarding seniority, most have seniority of 5 ~10 years (26.72%), followed by over 10 years (25.34%), and new employees with less than 6 months are the least (2.47%); regarding their ages, most are 31~40 years old (33.3%); most of them work in regular wards (38.29%), followed by intensive care units (22.04%).

b) Reliability and validity analyses

The design of scale in this study is based on related literatures and experts' opinions. Thus, the

questionnaire has certain degree of content validity. Exploratory Factor Analysis and Cronbach α analysis are applied to confirm the validity and reliability of the scales. According to result of factor analysis, this study selects factors with Kaiser>1, and eliminates factors with factor loading lower than 0.5 in order to enhance the explanatory power of the model. The reliability of the scales is over 0.7. As shown in Table 1, the constructs are analyzed by confirmatory factor analysis to ensure the degree of single construct characteristic. Finding shows that preliminary fit of models are acceptable ($\chi^2/df=1.9$, GFI=0.87, RMR=0.04, PNFI=0.79, PGFI=0.74, IFI=CFI=0.94, TLI=0.93 and RMSEA=0.05). Regarding overall model, except for GFI=0.87 which is not significant, all other measures are acceptable, indicating goodness of fit of the constructs.

Table 1 : Research Framework for the Result of Confirmatory Factor Analysis (CFA)

Factors	Item	Mean	Load	SE	SMC	CR	AVE	α value
Organizational management	OC1	4.19	0.61	0.26	0.37	0.93	0.68	0.78
	OC2	3.76	0.56	0.40	0.31			
	OC5	3.96	0.78	0.17	0.61			
	OC6	3.76	0.83	0.16	0.69			
	OC7	4.27	0.67	0.31	0.45			
	OC8	4.06	0.72	0.28	0.52			
Organizational commitment	OC9	4.29	0.81	0.15	0.66	0.91	0.77	0.85
	OC13	3.99	0.84	0.17	0.71			
	OC14	3.84	0.90	0.14	0.80			
Communication	OC15	3.76	0.72	0.30	0.51	0.86	0.80	0.79
	UC1	3.56	0.89	0.13	0.79			
	UC2	3.69	0.80	0.19	0.63			
Inspection management	UC4	3.67	0.57	0.48	0.32	0.92	0.75	0.85
	UC5	4.10	0.77	0.19	0.60			
	UC6	4.14	0.84	0.16	0.71			
	UC7	4.07	0.78	0.24	0.61			
Accident management	UC8	4.22	0.71	0.21	0.50	0.90	0.82	0.86
	UC9	4.19	0.76	0.20	0.57			
	UC10	4.15	0.86	0.14	0.73			
Safety behavior	UC11	4.17	0.87	0.11	0.76	0.64	0.51	0.71
	SP3	4.15	0.59	0.45	0.35			
	SP4	3.67	0.80	0.40	0.64			
Safety participation	SP5	3.66	0.52	0.37	0.27	0.75	0.51	0.72
	SP6	3.79	0.62	0.61	0.38			
	SP7	3.37	0.73	0.39	0.53			
Safety compliance	SP8	3.50	0.73	0.45	0.53	0.80	0.66	0.72
	SP10	4.40	0.78	0.24	0.60			
	SP11	4.33	0.73	0.33	0.53			

According to analysis of Bentler (1993) by normal loading, SMC and errors, CR of constructs is over 0.6, and AVE is over 0.5, which indicates good construct validity. Regarding discriminant validity, correlation coefficients among constructs demonstrate the correlation. As shown in Table 2, Square maximum of pair correlation coefficient is 0.50 which is less than

minimum VE (0.51) of constructs, and also meets the criteria suggested by Fornell and Larcker (1981).

Table 2 : Descriptive Statistics and Intercorrelations between Measures in Dimensions

	1	2	3	4	5	6	7
2	0.67***						
3	0.71***	0.61***					
4	0.66***	0.57***	0.55***				
5	0.66***	0.50***	0.55***	0.71***			
6	0.13*	0.15*	0.12*	0.22**	0.14*		
7	0.34***	0.24***	0.34***	0.32***	0.22***	0.22***	
8	0.25***	0.19***	0.21***	0.35***	0.27***	0.32***	0.34***

1. Organization management 2. Organization commitment 3. Communication 4. Inspection management
5. Accident management 6. Safety behavior 7. Safety compliance 8. Safety participation

* $p < .05$, ** $p < .01$, *** $p < .001$

According to analytical results above, reliability, convergent and discriminant validity of constructs are acceptable. For estimating structural model by MLE, the number of samples should be 100~150. Bagozzi (1988) suggested that number of samples should be over 50, and five times of the estimated parameter. This study has 363 valid samples, which meets the requirement above.

The overall model fit of this study is measured by preliminary fit criteria; overall model fit and fit of internal structure of model. Preliminary fit measures are below: (1) measurement errors should be positive, (2) factor loading should be at least 0.5 or over 0.95, (3) meeting significance level. Result shows that part of measures of overall model fit ($\chi^2/df=2.36$, GFI=0.82,

RMR=0.09, PNFI=0.72, PGFI=0.7, IFI= 0.87, CFI=0.87, RMSEA=0.06) are not acceptable. Path from organization-level safety culture to safety performance is insignificant, and thus, this study modifies the model and eliminates the path.

Measures of the modified model are acceptable. Regarding overall model fit measures ($\chi^2/df=2.34$, GFI=0.89, RMR=0.05, PNFI=0.76, PGFI=0.73, IFI=CFI=0.9, RMSEA=0.05), except for GFI which is insignificant, all other measures are acceptable. As to fit of internal structure of model, the finding shows that CR of latent variables is over 0.6 and AVE is over 0.5. Factor loading of constructs is over 0.5, indicating good fit of internal structure of this model. (Table 3).

Table 3 : Fully Mediated Path Model of Result

Dimensions/items	Factor Loading	T-value	SE	SMC	CR	AVE
Organization management					0.80	0.66
λ_{y11} OC1	0.61	-	0.26	0.37		
λ_{y12} OC2	0.56	9.15	0.40	0.31		
λ_{y13} OC3	0.78	11.94	0.18	0.61		
λ_{y16} OC6	0.83	12.30	0.16	0.69		
λ_{y17} OC7	0.66	11.65	0.31	0.45		
λ_{y18} OC8	0.71	11.75	0.28	0.51		
λ_{y19} OC9	0.82	13.06	0.15	0.66		
Organizational commitment					0.90	0.76
λ_{y113} OC13	0.82	-	0.17	0.71		
λ_{y114} OC14	0.88	20.44	0.14	0.80		
λ_{y115} OC15	0.69	14.76	0.30	0.51		
Communication					0.85	0.67
λ_{y21} UC1	0.87	-	0.13	0.79		
λ_{y22} UC2	0.77	18.27	0.19	0.63		
λ_{y24} UC4	0.53	11.34	0.48	0.32		

Dimensions/items	Factor loading	T-value	SE	SMC	CR	AVE
Inspection management					0.90	0.74
λ_{y25} UC5	0.75	-	0.19	0.57		
λ_{y26} UC6	0.82	16.82	0.16	0.67		
λ_{y27} UC7	0.76	15.27	0.24	0.58		
λ_{y28} UC8	0.69	13.94	0.21	0.47		

Safety behavior					0.75	0.51
λ_{x33} SP3	0.51	-	0.45	0.27		
λ_{x34} SP4	0.79	6.25	0.40	0.62		
λ_{x35} SP5	0.55	6.86	0.30	0.31		
Safety participation					0.79	0.55
λ_{y36} SP6	0.61	-	0.30	0.38		
λ_{y37} SP7	0.72	9.48	0.35	0.52		
λ_{y38} SP8	0.72	8.77	0.50	0.52		
Safety compliance					0.80	0.67
λ_{y310} SP10	0.77	-	0.24	0.60		
λ_{y311} SP11	0.72	7.42	0.32	0.53		

As to organizational management of organization-level safety culture, team work training of the units to improve patient care performance and safety ($\lambda_{y112}=0.83$) is the most important factor. Although other coefficients are low, they are at least 0.5. The finding demonstrates that promotion of organizational management of safety culture in nursing should rely on a complete group care training model systematic evaluation. Regarding organizational commitment, senior management's creation of working atmosphere is the highest ($\lambda_{y114}=0.88$), followed senior management's consideration of patient safety in discussion of reform of current plans ($\lambda_{y113}=0.82$). It demonstrates enhancement of employees' perception of cohesion in hospitals and senior leaders' commitment. When employees encounter medical disputes, the hospitals provide immediate support and commitment for nurses, and senior management creates a safety culture. Senior management supports employees directly, and introduces organizational strategies in patient safety, such as aims, core value and tasks of hospitals, in order to enhance the creation of safety culture.

Regarding communication of unit-level safety culture, perception of proper channels to reflect patient safety is the most important ($\lambda_{y21}=0.87$). It shows that communication of unit-level safety culture should rely on complete reporting channels to allow front-line nurses to immediately discover the problems and report them successfully in order to enhance safety culture. Regarding inspection management, unit supervisors' regular monitoring and inspection of progress of patient safety ($\lambda_{y26}=0.82$) is the core factor. The finding suggests that as to inspection management, the units should set up safety inspection regulations and regularly conduct evaluation management. Moreover, the units should improve the abnormal inspection. Regarding accident management, supervisors will introduce the causes and results to employees in order to prevent the accidents ($\lambda_{y211}=0.86$); secondly, the supervisors will actively investigate the causes, clarify responsibilities and analyze the causes ($\lambda_{y210}=0.84$). As to accident investigation management, it is important to probe into the causes, improve them, and share the results. In order to enhance unit-level safety culture, reporting system and systematic management of abnormal

events are the priority. In addition, unit supervisors' concrete regulations on responsibilities and duties of different levels on safety indicated by organization and regular announcement of safety policy will enhance safety system.

Regarding safety behavior in safety performance, when staffs violate the patient safety policies, other staffs usually do not report the minor cases in order to maintain the colleague relationship ($\lambda_{x34}=0.79$). Although other coefficients are low, they are at least 0.5. Regarding safety participation, attention to new knowledge to enhance patient safety or reduce medical errors ($\lambda_{y37}=0.72$) and proposal to direct supervisors when having ideas or opinions to enhance patient safety ($\lambda_{y38}=0.72$) are core factors. Regarding safety obedience, when treating or caring for patients, employees' active communication and identifying patients' identity with at least two measures ($\lambda_{x310}=0.77$) and implementation of important items of work units and rotation ($\lambda_{y311}=0.72$) are important.

Hypotheses of this study are significant. Organization-level safety culture ($\gamma_{11}=0.96$) positively influences unit-level safety culture. It means that higher value of organization on safety culture has more positive influence on unit supervisors' creation and effect of safety culture. Unit-level safety culture ($\gamma_{13}=0.55$) positively influences safety performance, indicating that higher safety culture will more positively influence employees' task-related safety behavior. Hypothesis of organization-level safety culture on safety performance is insignificant. However, according to the path, organization-level safety culture indirectly influences safety performance by unit-level safety culture. Indirect effect is 0.53. The result shows that unit-level safety culture is the mediating variable between organization-level safety culture and safety performance.

V. CONCLUSIONS

a) Research Implications

This empirical study probes into to critical issues:

- 1) This study applies the multilevel scale on safety culture in medical industry, and probes into the correlation among organization-level safety culture, unit-level safety culture and individual safety performance. Different from past researches on

safety culture upon single level analysis, this study divides safety culture into organization and unit levels, and distinguishes the professional groups, reduce variance of professional cognition in different units. The subjects of this study are nurses who frequently care for patients. According to the fitness test, the overall model fit is acceptable. It means that scale and theoretical model of this study are supported, and there are causal relations among constructs.

- 2) Safety culture formation influences execution results by variance of different levels. This study finds that unit climate, as compared to organizational safety climate, is more influential on employees' safety behavior. It shows that single level analysis is not suitable for evaluation of safety culture. Although senior management values and promotes safety, lower management' implementation of safety policy and information communication will influence the unit members differently. Influence of lower management is the most significant. Past researches on social cognition suggested that with the same information, the individuals would have different cognitions (Hamilton and Sherman, 1996). When the individuals receive new information, they would modify the previous judgment (Bodenhausen, 1987). Thus, the policy passed from top to the bottom will rely on lower management's execution of policy and process, which would result in a kind of interpersonal network of social interaction. Lower management's policy execution will moderate the final implementation result. In the process of top-down passage of policy, the same policy would be changed, and result in employees' inconsistency of information in organization. Thus, analysis on safety culture formation should be based on different levels.

b) Practical Implications

Currently, safety culture in medical industry of Taiwan is still at the stage of promotion, and the culture has not been embedded in employees' daily jobs. In the past, due to inequality between medical patriarchy and information, patients usually passively receive the medical personnel's information, which results in different cognitions. Moreover, with professional division of work and busy clinical routines, it is difficult for the units to communicate and negotiate with each other, thus leading to many medical disputes. However, in recent years, patients' rights have been concerned, and more attention has been paid to patient safety. Since 2004, the Department of Health has actively promoted patient safety, and annually announced "objectives of patient safety" of hospitals as direction of policy. Since 2006, hospital evaluation system in Taiwan has regulated patients' rights and patient safety in hospitals.

Thus, the researcher proposes the following suggestions:

- 1) To enhance internal communication channels and partners' problem-solving ability by justice and non-punishment culture. Since safety culture promotion in medical industry is set in relative late, the safety culture and system are incomplete during the initial stage, and nurses are usually uncertain about organizational systems and communication channels. They are even not used to reporting abnormal events since they worry about colleagues' blames and senior management's punishment. Thus, senior management and lower management should both emphasize the importance of safety by caring leadership and encouragement to involve safety issues in daily routines. By developing communication channels and demanding for safety job regulation and obedience, they can thus enhance safety culture. Regarding organizational system and communication, medical errors were regarded as individual responsibilities in the past. However, organizations should develop justice culture, and recognize the problems of overall system and process after the incidents. Independent investigation facilities can clarify causes and improve the system, and finally have feedback. The measures have been rooted in culture of aviation industry (Helmreich, 2000).

Thus, the organizations should set up complete reporting system, accident investigation, and smooth communication channels. In recent years, the Department of Health, Executive Yuan, has actively promoted reporting system of patient safety and even constructed Taiwan Patient-safety Reporting System to encourage the hospitals to report abnormal events, and construct exchange and learning platform. It aims to allow hospitals to learn from error reporting, and learn to improve and prevent the errors. IOM suggests that reporting system without punishment is the first step to construct safe medical system. The construction of organizational culture without punishment should be based on organizational system, such as constructing patient safety committee, investigating abnormal events by independent units and senior management as a committee to arbitrate the incidents. In the initial stage of promoting safety culture in hospitals, nurses are usually influenced by peer pressure or relationship. In order to root safety culture in jobs, the organizations should construct "justice culture", and recognize that the reporting aims to discover the problems in organizational process and managerial system, instead of attributing the problems to certain people. It will thus enhance safety behavior, successfully promote reporting system, and construct incident investigation. In addition, hospitals' setting of reporting system, incident dealing process and improvement, cross-unit

improvement serious events and proposal of suggestions, sharing and learning of information, knowledge sharing and feedback, knowledge sharing channels and platform in the organizations, new knowledge patient care and construction of communication channels for employees' opinions on safety will significantly enhance overall safety performance.

2) Enhancing medial teams' shared educational training. The finding demonstrates that the nurses suggest that team work training is the key factor of safety culture. Medical care should be based on team work. In complicated care system, the work cannot be accomplished by a person. Patient safety will rely on the efforts of different professional teams. Traditional medical and nursing education lacks team work training courses. However, in many high-risk industries, there are various team trainings, such as crew resource management training in aviation industry. Past researches have helped medical personnel to recognize adverse events by crew resource management training, and improved communication related to patient safety (Grogan, 2004). For instance, Haller et al. (2008) suggested that medical teams upon team resource management would enhance safety culture. It is the aspect to be improved in safety culture enhancement of medical industry in Taiwan. Future organizations should design complete training model meeting medial, nursing and technical teams' demands, and set up training evaluation in order to fulfill actual medical care, enhance team efficacy and communication, and enhance safety culture.

3) Integrating shared objectives of patient safety, developing indices and long-term promotion of employees' capacity. Safety culture is based on employees' perceived safety priority. In order to enhance employees' cohesion and identification with the team, patient safety should be treated as annual strategic direction. Senior management should arrange patient safety plan with shared value, plans nurses' core capacity, enhances patient safety learning plan, and enhance common consensus education of policy introduction for head nurses. Organizational climate can be regarded as social cognition which is based on sense making activities (Zohar, 2005). In daily patients care, in the nurses' complicated work division and busy routines, the organization constructs sense-making activities and executes safety process and strategy. When senior management constantly promotes patient safety, the nurses repetitively face adverse events in patient safety, thus resulting in low safety climate. The organization should evaluate the units with low safety climate, and solve and discuss

adverse events in complicated situations in morning meetings, regular conferences and quality control activities to lead to common consensus. Thus, the construction of patient safety management system, successful communication, passing of organizational vision and tasks, managers' commitment and recognition of relationship between personal and group performance will possibly enhance safety culture.

By questionnaire survey, this study proposes multilevel scale of safety culture in medical industry, and probes into relationship between organization-level safety culture, unit-level safety culture and personal safety performance. The questionnaire is designed according to domestic and foreign literatures. The constructs have good reliability and validity. The scale can be the proper tool to measure multilevel safety culture in medical industry. Future studies can conduct related study from different views and dimensions. The finding can serve as reference for policy setting to Department of Health and patient safety rating in new hospital evaluation.

Representative of samples in this study should be improved, and the samples cannot reveal overall situations in medical industry in Taiwan. However, hospitals in this study are rated as excellence in 2006 and they should be representative samples. This study only probe into the nurses, thus future studies can expand the subjects, and examine different levels of hospitals, different departments, units and nurses.

This study finds that unit safety culture, as compared to organizational safety culture, is more influential on safety behavior. Future studies can probe into the influence of different variance relationship between leaders and subordinates in different medical groups on safety attitude and behavior. Social teams in Chinese and Western societies are different. For instance, Western society values rights and duties of groups. However, Chinese society believes in the concept of hierarchy upon the Confucian culture, and the interaction between supervisors and subordinates are based on Vertical Dyad Linkage Model (Graen et al., 1982). After developing the scope in and out of the groups in organizations, researches can further explore whether the nurses led by head nurses in lower organizational relationship follow safety regulations. When head nurses treat safety as priority, will unit nurses' safety behavior be influenced in supervisor-subordinate relationship? In higher organizational relationship, when nurses witness head nurses' violation of patient safety, will the nurses report the adverse events or will they conceal the head nurses' errors for social exchange and mutual benefit. It will be the aspect for further study.

Future studies can focus on influence of nursing supervisors' leadership on safety culture and safety

behavior, probe into the effects of senior management, middle-level management and lower management on nurses, and examine the influence of Charismatic Leadership and Paternalistic Leadership on subordinates' common consensus of safety.

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