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The Relationship between Safety Leadership and Safety Performance: An Empirical Study from Chinese Public Hospitals Nurse

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Abstract

This study investigated the safety leadership and safety performance of 490 nurses in Chinese public hospitals through an online questionnaire. It analyzed the relationship between the gender, age, work experience and education level of the nurses on these two variables. This study conducted descriptive, difference, and Pearson correlation analyses on the collected data. The study showed that older nurses with medium work experience and higher education performed better in safety performance, while female, young, experienced and highly educated nurses performed best in safety leadership. A positive and significant correlation existed between nurses' safety performance and safety leadership. The researchers suggested strengthening training and continuing education to improve nurses' safety awareness and skills, particularly for nurses with more extended work experience or lower education levels, to improve overall safety performance and leadership.

Keywords: Safety Leadership, Safety Performance, Chinese Public Hospitals Nurse

Introduction

Globally, the healthcare industry has been facing complex safety management challenges. As the core personnel of medical services, the safety performance of hospital nurses not only directly affects the treatment effect and safety of patients but also has a profound impact on the overall operation and service quality of the hospital (Park & Kim, 2018). According to a report released by the World Health Organization, medical errors and related safety issues are one of the most severe and common challenges in the global health system, with millions of patient injuries and deaths caused by medical errors each year (World Health Organization, 2019). In China, the government and medical institutions also attach great importance to the safety performance management of nurses. In recent years, China has issued a series of policy documents, such as the "Regulations on Hospital Infection Management" (2020) and the "Regulations on Nursing Management of Medical Institutions" (2016), to strengthen the occupational safety and health protection of nurses.

According to the "China Health Statistical Yearbook" (2020), there were more than 4 million registered nurses in China in 2019. However, the problems of occupational exposure and psychological stress in the working environment are still serious. Media reports also frequently reveal various safety hazards and occupational injury incidents encountered by nurses at work, which not only affect the careers of nurses themselves but also threaten the stable operation of the entire medical system.

Related theoretical research shows that safety leadership is critical in improving nurses' safety performance. The safety climate theory proposed by Zohar (2002) believes that leaders' safety behaviors and attitudes can significantly affect employees' safety cognition and behavior. Leaders can improve nurses' safety performance by setting safety goals, providing safety training, and encouraging safety communication (Barling et al., 2002). In addition, safety leadership also includes transformational and transactional leadership styles, which have different effects on safety performance in different situations (Clarke, 2013). Although existing studies have shown that leadership significantly impacts safety performance, there is still a lack of empirical research on this relationship in the nursing environment of hospitals.

The subjects of this study are nurses in Chinese public hospitals. As a critical medical team member, nurses' safety leadership and safety performance have an essential impact on the overall quality of medical services in hospitals. Safety leadership refers to nurses' ability to influence their colleagues' and subordinates' safety attitudes and behaviors through leadership behaviors at work (Mullen & Kelloway, 2009). Safety performance refers to the performance of nurses in complying with safety regulations and avoiding occupational injuries and accidents at work (Manapragada et al., 2019).

Related studies have shown that nurses' safety leadership significantly impacts their safety performance. For example, Barling et al (2002) found through empirical research on Canadian hospitals that safety leadership can significantly improve the safety performance of nurses. In addition, Clarke's (2013) meta-analysis also supports this conclusion, believing that both transformational leadership and transactional leadership styles can have a positive impact on safety performance. However, most of these studies focus on Western countries and pay less attention to the nurse group in Chinese public hospitals.

In China, the working environment of nurses is complex and high-risk. Nurses in public hospitals not only face heavy workloads and high-intensity work pressure but also need to deal with various potential occupational hazards, such as needlestick injuries, infectious disease exposure, and occupational violence. Therefore, this study investigates nurses' safety leadership and safety performance levels to provide effective leadership training and management strategies for hospital managers to improve nurses' safety performance and overall medical quality.

The research questions are as follows:
1. What is Chinese public hospital nurses' level of safety leadership after the COVID-19 Pandemic?
2. What is higher vocational college students' level of safety performance after the COVID-19 Pandemic?

3. Do Chinese public hospital nurses' safety leadership differ according to gender, age, work experience and education level?
4. Do Chinese public hospital nurses' safety performance differ according to gender, age, work experience and education level?
5. Is there a relationship between Chinese public hospital nurses' safety leadership and safety leadership?

Methodology

Research Design

This study investigated the safety leadership and safety performance of nurses in Chinese public hospitals through an online questionnaire, and analyzed the relationship between the gender, age, work experience and education level of nurses on these two variables. This study conducted descriptive analysis, variance analysis and Pearson correlation analysis on the collected data.

Sample / Respondents

The respondents of this study were nurses from Chinese public hospitals who voluntarily participated in the survey. Table 1 shows the essential demographic characteristics of the respondents. Regarding gender distribution, male respondents accounted for a large proportion, with 375, accounting for 76.5% of the total; female respondents accounted for 115, accounting for 23.5%. Regarding age, the largest number of respondents were between 18 and 25 years old, with a total of 263, accounting for 53.7%; there were 145 respondents between 26 and 39 years old, accounting for 29.6%; and there were 82 respondents aged 40 and above, accounting for 16.7%. Regarding experience, respondents with 5-10 years of work experience accounted for 33.3%, a total of 163 people; respondents with 11-19 years of work experience accounted for 50.2%, a total of 246 people; respondents with 20 years of work experience and above accounted for 16.5%, a total of 81 people. As for education level, 198 respondents have college degrees, accounting for 40.4%; the proportion of respondents with bachelor's degrees or above is relatively high, including 249 undergraduates, accounting for 50.8%, and 43 postgraduates, accounting for 8.8%.

In general, there are 490 respondents in this study, covering multiple dimensions such as gender, age, work experience and education level, providing a rich sample data basis for the study.

Table 1
Demographic characteristics of respondents

Variables	Characteristics	N	%
Gender	Male	375	76.5%
	Female	115	23.5%
Age (Year)	18-25	263	53.7%
	26-39	145	29.6%
	≥40	82	16.7%
Work experience (Year)	5-10	163	33.3%
	11-19	246	50.2%
	≥20	81	16.5%
Education level	Junior college	198	40.4%
	Undergraduate	249	50.8%
	Postgraduate	43	8.8%
Total		490	100%

Instruments

The safety performance scale used in this study was adapted from (Chan et al., 2023). The scale divides safety leadership into safety compliance (4 items) and safety participation (2 items). The safety leadership scale was adapted from Khasanah et al (2019), including safety motivation, safety policy, and safety concern, with 7, 4, and 5 items, respectively. Except for the demographic part, the questionnaire adopts the Likert five-level scoring method with a score range of 1-5 points. 5 experts verified the questionnaire, and a pilot study was conducted. The Cronbach coefficients were all higher than 0.7, meeting the use standard (Creswell, 2017).

Data Collection and Analysis

This study used a convenient sampling network to distribute questionnaires and received 501 questionnaires, of which 11 were invalid and 490 were valid. This study used descriptive, variance, and Pearson correlation analyses to analyze the remaining 490 data. According to MacFarland & Yates (2016), due to the non-normal distribution of the data, this study used the Mann-Whitney U test and Kruskal-Wallis H test for variance analysis (Elliott & Hynan, 2011; Nachar, 2008; Sherwani et al., 2021).

Result

Figure 1 illustrates the mean safety performance scores of nurses based on gender. The average safety performance score for male nurses is 3.51, while the score for female nurses is 3.49. This indicates that male nurses have slightly higher safety performance than female nurses. This difference suggests that gender may play a role in safety performance, potentially due to varying attitudes, experiences, or job expectations between male and female nurses.

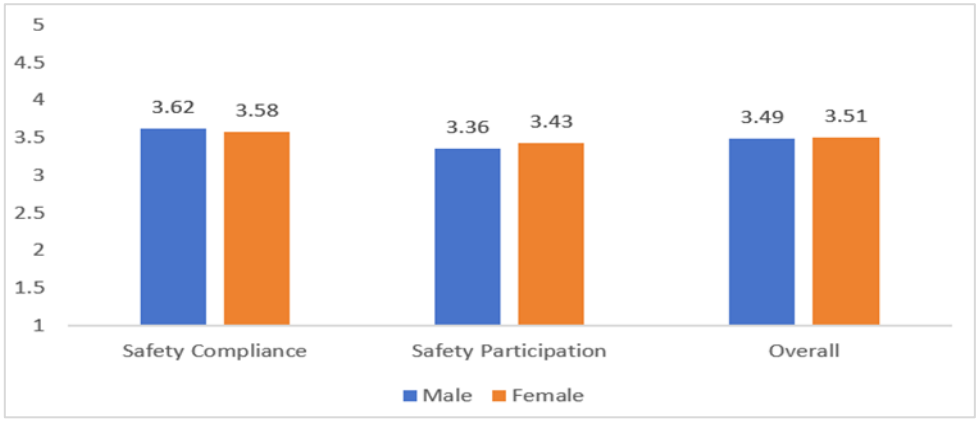

Figure 1: Mean safety performance of teachers of different genders

Figure 2 presents the mean scores for safety compliance, safety participation, and overall safety performance across different age groups of nurses (18-25, 26-39, and ≥40). Nurses aged 40 and above demonstrate the highest average scores across all categories: 3.68 for safety compliance, 3.43 for safety participation, and 3.56 for overall safety performance. Nurses aged 18-25 follow with scores of 3.60 for safety compliance, 3.40 for safety participation, and 3.50 overall. The group aged 26-39 scores the lowest, with 3.59 for safety compliance, 3.30 for safety participation, and 3.44 overall. This trend indicates that older nurses perform better regarding safety compliance and participation, potentially due to greater experience and more ingrained safety practices.

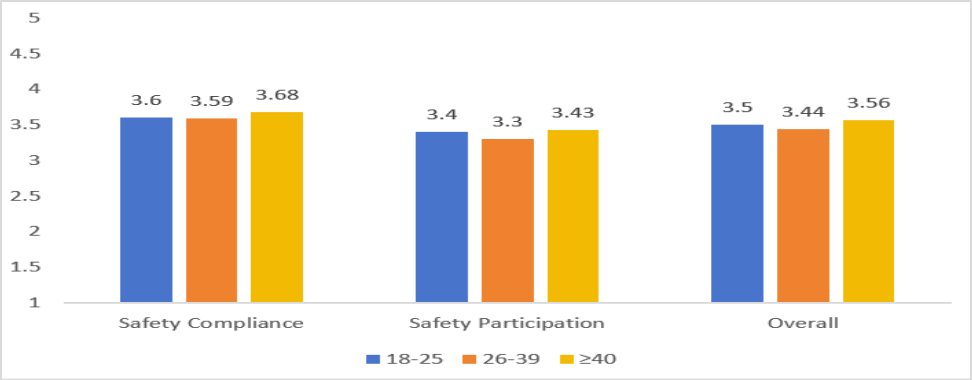

Figure 2: Mean safety performance of nurses of different ages (Year)

As shown in Figure 3, Nurses with 5-10 years of experience have an average safety compliance score of 3.67, those with 11-19 years have a score of 3.64, and those with 20 or more years have the lowest score of 3.40. Regarding safety participation, nurses with 11-19 years of experience have the highest score at 3.44, followed by those with 5-10 years at 3.37 and those with 20 or more years at 3.21. For overall safety performance, nurses with 11-19 years of experience score the highest at 3.54, those with 5-10 years score 3.52, and those with 20 or more years score the lowest at 3.31. The data suggests that nurses with moderate work experience (11-19 years) exhibit the highest overall safety performance, followed closely by those with 5-10 years of experience, while nurses with the most extensive experience (20+ years) have the lowest scores across all categories. This trend may indicate that mid-career nurses are more engaged and effective in safety practices than their more experienced colleagues.

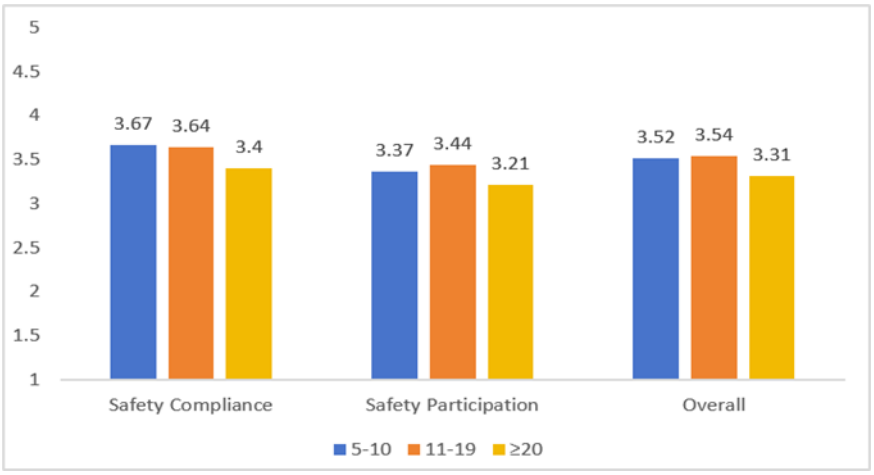

Figure 3: Mean safety performance of nurses of different work experience (Year)

Figure 4 shows the mean scores for safety compliance, safety participation, and overall safety performance across different education levels of nurses (junior college, undergraduate, and postgraduate). Nurses with postgraduate education have the highest safety compliance score of 3.65, followed by undergraduate education at 3.63 and junior college at 3.57. For safety participation, postgraduate nurses score 3.42, slightly higher than undergraduate nurses at 3.41 and junior college nurses at 3.33. Overall safety performance scores are highest for postgraduate nurses at 3.54, undergraduate nurses at 3.52, and junior college nurses at 3.45. This data suggests that higher educational attainment correlates with better safety performance across all categories.

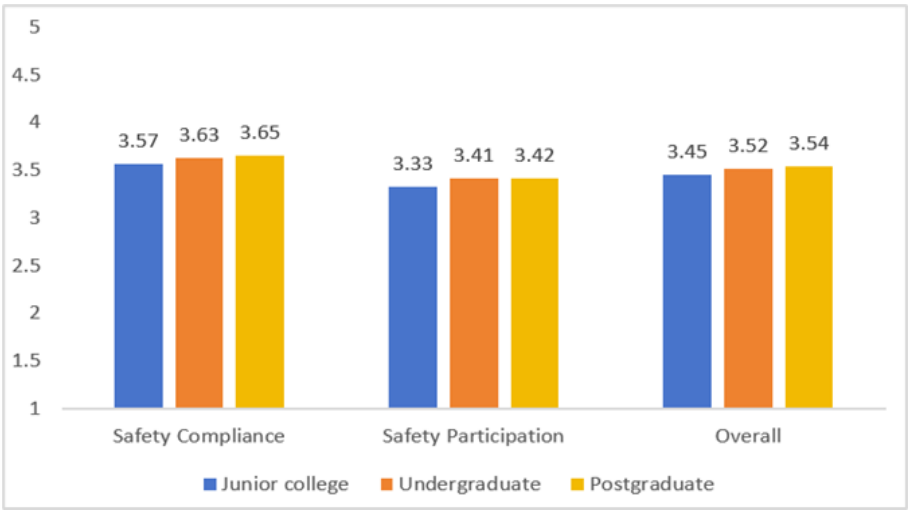

Figure 4: Mean safety performance of nurses of different education levels

Table 2 analyses nurses' safety performance differences based on gender, age, work experience, and education level. The data indicates that for safety compliance, there are no significant differences for gender ($z = -0.256$, $p = 0.798$), age ($H = 0.505$, $p = 0.604$), or education level ($H = 0.438$, $p = 0.646$). However, a significant difference is observed for work experience ($H = 4.044$, $p = 0.018$). Regarding safety participation, the analysis shows no significant differences for gender ($z = -1.088$, $p = 0.277$), age ($H = 0.720$, $p = 0.487$), work experience ($H = 1.883$, $p = 0.153$), or education level ($H = 0.406$, $p = 0.667$). For overall safety

performance, there are no significant differences for gender (z = -0.413, p = 0.679), age (H = 0.520, p = 0.595), or education level (H = 0.507, p = 0.603). However, work experience again shows a significant difference (H = 3.469, p = 0.032). These results suggest that work experience significantly influences nurses' safety compliance and overall safety performance.

Table 2
Analysis of differences among nurses' safety performance

Dimension	Gender		Age		Work experience		Education level	
	z	p	H	p	H	p	H	p
Safety Compliance	-0.256	0.798	0.505	0.604	4.044	0.018*	0.438	0.646
Safety Participation	-1.088	0.277	0.720	0.487	1.883	0.153	0.406	0.667
Total	-0.413	0.679	0.520	0.595	3.469	0.032*	0.507	0.603

Note: *p < 0.05 (5% level of significance).

Figure presents the mean scores for safety motivation, safety policy, safety concern, and overall safety performance based on gender. Female nurses have a slightly higher safety motivation score of 3.61 than males at 3.58. Regarding safety policy, female nurses again scored higher at 3.53, compared to male nurses at 3.45. For safety concerns, female nurses scored 3.45, notably higher than the 3.3 scored by male nurses. Overall safety performance scores are also higher for female nurses at 3.53, compared to 3.44 for male nurses. This data suggests that female nurses generally have better safety performance and adherence across all measured categories than their male counterparts.

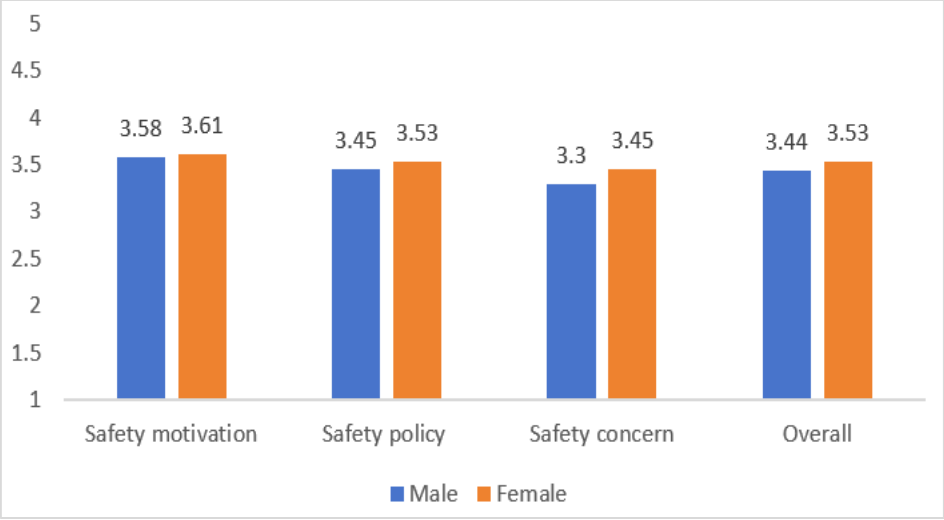

Figure 5: Mean safety leadership of nurses of different genders

As presented in Figure 6, Regarding safety motivation, the scores were relatively similar across the age groups, with the 18-25 group scoring 3.61, the 26-39 group scoring 3.50, and the 40 and above group scoring 3.63. For safety policy, the 18-25 group scored 3.61, while the 26-39 group scored lower at 3.20. Regarding safety concerns, the 18-25 group scored 3.52, the 26-39 group scored the lowest at 3.01, and the 40 and above group scored 3.32. The overall safety perceptions were 3.58 for the 18-25 group, 3.24 for the 26-39 group, and 3.48 for the 40 and above group. These results indicate slight variations in safety perceptions

across different age groups, with the 26-39 group consistently rating aspects of safety lower than the other groups.

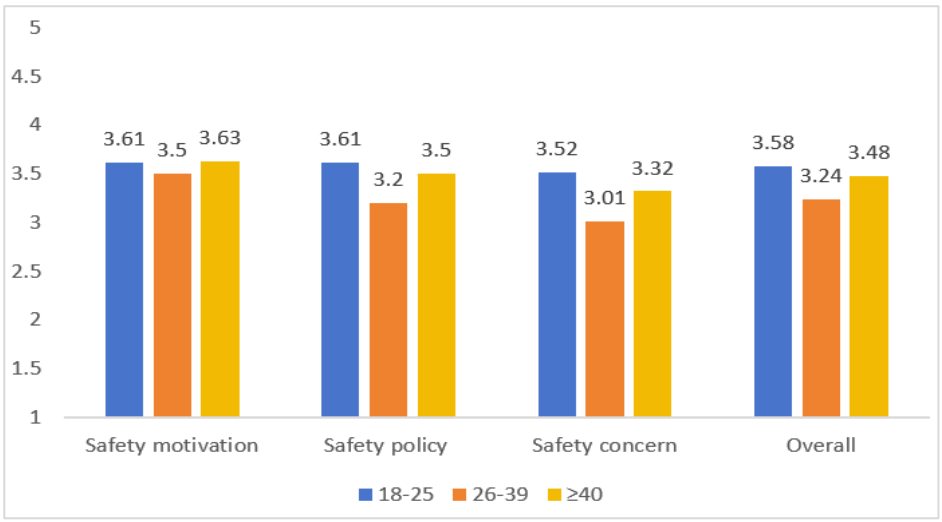

Figure 6: Mean safety leadership of nurses of different ages (Year)

As seen in Figure 7, for safety motivation, the scores were 3.59 for the 5-10 years group, 3.62 for the 11-19 years group, and 3.50 for the 20 years or more group, indicating that those with 11-19 years of experience have the highest safety motivation. Regarding safety policy, the scores were 3.58 for the 5-10 years group, 3.34 for the 11-19 years group, and 3.64 for the 20-year or more group. This shows that individuals with the longest experience perceive safety policies most positively. Regarding safety concerns, the 5-10 years group scored 3.42, the 11-19 years group scored 3.22, and the 20 years or more group scored 3.51, indicating higher safety concerns among the most experienced group. Overall safety perceptions were 3.53 for the 5-10 years group, 3.39 for the 11-19 years group, and 3.55 for the 20 years or more group, showing the highest overall safety perception among the most experienced group.

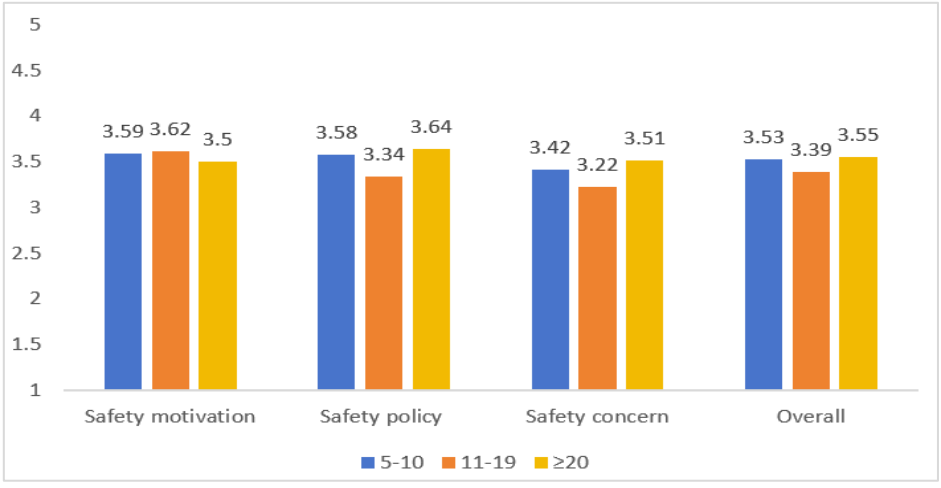

Figure 7: Mean safety leadership of nurse of work experience (Year)

Figure 8 compares perceptions of safety motivation, safety policy, safety concern, and overall safety among three education levels: junior college, undergraduate, and postgraduate. For safety motivation, the scores were 3.55 for junior college, 3.60 for undergraduate, and 3.70

for postgraduate, indicating that postgraduates have the highest safety motivation. Regarding safety policy, the scores were 3.27 for junior college, 3.58 for undergraduate, and 3.76 for postgraduate. This shows that postgraduates perceive safety policies most positively, while junior college students rate them the lowest. Regarding safety concerns, the junior college group scored 3.13, the undergraduate group scored 3.46, and the postgraduate group scored 3.55, indicating that postgraduates have the highest safety concerns. In contrast, junior college students have the lowest. Overall safety perceptions were 3.32 for junior college, 3.55 for undergraduate, and 3.67 for postgraduate, showing that postgraduates have the highest overall safety perception.

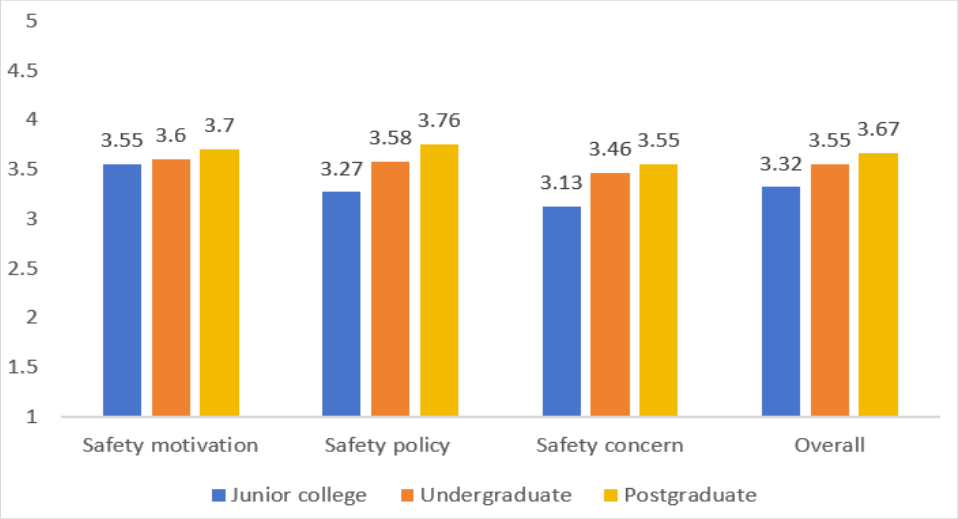

Figure 8: Mean safety leadership of nurses of education level

Table 3 analyses nurses' safety leadership differences based on gender, age, work experience, and education level. For gender, there are no significant differences across all dimensions, as indicated by the non-significant p-values (e.g., safety motivation: $z = -0.466$, $p = 0.641$). In contrast, age significantly impacts safety policy ($H = 10.528$, $p < 0.001$) and safety concern ($H = 22.613$, $p < 0.001$), suggesting that the age of the nurses influences these aspects of safety leadership. Work experience also shows significant differences in safety policy ($H = 5.571$, $p = 0.004$) and safety concern ($H = 6.145$, $p = 0.002$), indicating that different levels of work experience affect these dimensions of safety leadership. Furthermore, education level demonstrates significant differences across multiple dimensions: safety policy ($H = 9.987$, $p < 0.001$), safety concern ($H = 12.854$, $p < 0.001$), and overall safety leadership ($H = 9.127$, $p < 0.001$). This highlights that higher educational attainment is associated with better performance in these areas of safety leadership.

Table 3
Analysis of differences among nurses' safety leadership

Dimension	Gender		Age		Work experience		Education level	
	z	p	H	p	H	p	H	p
Safety Motivation	-0.466	0.641	1.318	0.269	0.806	0.447	0.716	0.489
Safety Policy	-0.565	0.572	10.528	0.000***	5.571	0.004**	9.987	0.000***
Safety Concern	-1.961	0.050	22.613	0.000***	6.145	0.002**	12.854	0.000***
Total	-1.519	0.129	13.730	0.000***	2.201	0112	9.127	0.000***

Note: **p < 0.01 (1% level of significance). ***p < 0.001 (1‰ level of significance).

The relationship between safety performance and safety leadership of nurses is analyzed in Table 4, revealing significant correlations across various dimensions. Safety compliance (SC) shows a strong positive correlation with safety participation 1 (SP1) ($p < 0.01$) and safety participation (SP) ($p < 0.01$). Furthermore, SC is positively correlated with safety motivation (SM) ($p < 0.01$) and safety policy 2 (SP2) ($p < 0.01$).

Safety participation 1 (SP1) is highly correlated with SP ($p < 0.01$) and shows a moderate positive correlation with SM ($p < 0.01$). Similarly, SP has strong correlations with SM ($p < 0.01$), SP2 ($p < 0.01$), and overall safety compliance (SC) ($p < 0.01$). Safety motivation (SM) also correlates significantly with SP2 ($p < 0.01$) and overall safety compliance (SC) ($p < 0.01$).

Safety compliance (SC) and safety leadership (SL) show a strong correlation ($p < 0.01$). Moreover, SP1 is correlated with SL ($p < 0.01$), and SP is strongly correlated with SL ($p < 0.01$). SM has the highest correlation with SL ($p < 0.01$), followed by SP2 ($p < 0.01$). Overall safety compliance (SC) also correlates highly with SL ($p < 0.01$). This data indicates that all dimensions of safety leadership are significantly interrelated, highlighting the importance of integrated safety practices among nurses.

Table 4
Relationship between safety performance and safety leadership of nurses

Dimension	SC	SP^1	SP	SM	SP^2	SC	SL
SC	1						
SP^1	.670**						
SP	.951**	.866**					
SM	.661**	.668**	.723**				
SP^2	.163**	.101*	.152**	.158**			
SC	.249**	.213**	.256**	.280**	.751**		
SL	.518**	.483**	.550**	.713**	.756**	.829**	1

Note: **p < 0.01 (1% level of significance).

Discussion and Conclusion

The results showed that the safety performance score of female nurses was 3.51, slightly higher than male nurses at 3.49. The highest score was 3.56 for nurses aged 40 and above,

followed by the 18-25 group, and finally, the 26-39 group with the lowest score of 3.44. Nurses with 11-19 years of experience scored the highest, 5-10 years scored 3.52, and those with more than 20 years of experience scored the lowest. Nurses with postgraduate education scored the highest, with undergraduates at 3.52 and specialists at 3.45. In general, nurses with older age, medium work experience, and higher education performed better in safety. The difference analysis results showed that nurses' safety compliance and safety performance were significantly affected by work experience, and other factors did not have significant differences.

The safety leadership score of female nurses was 3.53, higher than male nurses at 3.44. The safety leadership score of nurses aged 18-25 was the highest, the score of the 40-year-old group was 3.48, and the score of the 26-39 group was the lowest. Nurses with more than 20 years of work experience scored the highest, the 5-10 experience group scored 3.53, and the 11-19 experience group scored the lowest. Nurses with a postgraduate degree scored the highest, 3.67; those with a bachelor's degree scored 3.55; and those with a college degree scored the lowest. In general, female, young (18-25 years old), experienced (more than 20 years) and highly educated (postgraduate) nurses performed best in safety leadership. The difference analysis results showed no significant difference in the safety leadership and its dimensions of nurses in terms of gender. Still, there were some significant differences in demographic variables. The study also found a significant positive correlation between the safety performance and safety leadership of nurses in Chinese public hospitals, and there was a positive correlation between each sub-dimension. Therefore, based on the above analysis, the researchers put forward the following four suggestions to improve the safety performance and safety leadership of nurses in Chinese public hospitals:

1. Conduct safety training and education regularly

Our research shows that nurses with higher education levels and more extended work experience score higher in safety motivation and safety policies. Therefore, regularly providing nurses with safety training and continuing education can improve their understanding and attention to safety policies and enhance safety motivation. These trainings should include the latest safety operating procedures, risk management strategies, and the cultivation of safety leadership.

2. Improve the visibility and enforcement of safety policies

The study found that nurses with different experience groups and educational backgrounds scored differently on safety policies. Hospitals should strengthen the promotion and implementation of safety policies to ensure that every nurse understands and complies with safety regulations. This can be achieved through regular policy briefings, posting safety notices, and setting up dedicated safety supervisors. In addition, nurses should be encouraged to participate in the policy formulation and feedback process to feel the fairness and transparency of the policy.

3. Establish an effective safety communication mechanism

The data show that older, more experienced nurses scored higher on safety concerns. This may indicate that they are better at identifying potential safety issues. Therefore, hospitals should establish an effective safety communication mechanism to encourage nurses to report safety hazards and incidents promptly and promote the transmission of information up and

down. Communication can be strengthened by setting up anonymous reporting channels, holding regular safety discussions, and establishing safety committees.

4. Implement psychological support and incentives

Hospitals should pay attention to the mental health of nurses, provide psychological counselling and support services, and help them cope with stress and anxiety at work. At the same time, incentives, such as setting up safety awards and selecting annual safety nurses, should be implemented to encourage nurses to be proactive at work and improve their safety leadership and job satisfaction.

Contribution

This study enriches the existing literature on safety leadership and safety performance. Although existing studies have explored the safety performance of nurses, few studies have combined gender, age, work experience, and education level for analysis. This study fills this gap and provides a new perspective for a more comprehensive understanding of safety behavior in the nurse population.

Second, this study found specific characteristics of specific populations (such as older nurses with moderate work experience who performed better in safety performance, and female, young, and highly educated nurses who performed best in safety leadership). This finding provides empirical evidence for hospital managers to develop training and education plans, which can more specifically improve the safety awareness and skills of different populations, thereby optimizing overall safety performance and leadership.

In addition, this study revealed a positive correlation between nurses' safety performance and safety leadership. This finding not only supports the key role of safety leadership in improving safety performance in theory, but also emphasizes the importance of improving nurses' safety leadership in practice.

Finally, this study proposes suggestions for strengthening training and continuing education, especially for nurses with longer work experience or lower education. This suggestion has important practical significance in the current nurse training and development strategy, which will help to enhance the overall safety awareness and skills of nurses and thus improve the overall safety performance of the hospital.

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