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A National Study of Patient Safety Culture and Patient Safety Goal in Chinese Hospitals

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Objectives: This study aimed to measure the patient safety culture and the current practice of patient safety goals in China.

Methods: This cross-sectional survey was conducted between November 2020 and November 2021. The 12-dimensions Hospital Survey on Patient Safety Culture questionnaire and the 14-items Survey on the Current Practice of Patient Safety Goal questionnaire were electronically distributed to 8164 healthcare providers across 26 provinces in China. Data were analyzed using descriptive statistics, correlation analysis, and multivariate linear regression.

Results: A total of 8164 surveys were received, of which 7765 were valid and analyzed. The average positive response rate for the Hospital Survey on Patient Safety Culture survey was 69.68% (43.41%–91.54%). The percentage of positive responses in 5 dimensions (organizational learning, teamwork within units, feedback about error, management support for safety, and teamwork across units) was above the control limits, and 3 (nonpunitive response to error, staffing, and frequency of event reporting) were below the control limits. The average positive response rate for the Survey on the Current Practice of Patient Safety Goal survey was 96.11%. Patient safety culture was positively related to the current practice of patient safety goals ($r = 0.34$, $P < 0.001$).

Conclusions: Our study concludes that although healthcare providers in China feel positively toward patient safety culture and practicably toward patient safety goals, considerable work is still needed to promote a patient safety movement.

Key Words: patient safety culture, patient safety goal, healthcare provider, perception, cross-sectional

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Patient safety culture (PSC) is defined as the common attitude, beliefs, values, and behaviors of health caregivers shared in the process of ensuring patient safety.¹ Recently, PSC has been increasingly recognized as a fundamental component of the healthcare system. It has been proven that positive PSC helps improve patient outcomes,² such as reducing adverse patient outcomes³ and surgical site infection.⁴ Patient safety culture also seems to benefit staff

well-being. Several empirical studies have demonstrated correlations between PSC and burnout,⁵ workplace violence, and job satisfaction.⁶ During the COVID-19 pandemic, almost all disciplines reported high levels of depression, anxiety, and uncertainty,⁷ health workers who maintained a higher level of PSC showed more resilience.⁸ Moreover, the research base connecting PSC with patient participation in quality control activities is also growing.⁹ At present, experts and scholars have gradually reached a consensus that the development of a safety culture is a crucial achievable strategy in the patient safety movement, and the Global Patient Safety Action Plan 2021–2030 issued by the World Health Organization also highlights the instillation of a safety culture in the design and delivery of health care.¹⁰ Stakeholders of patient safety have taken a series of measures to promote this culture of safety worldwide, one of which is the launch of patient safety goals.

Among these, the National Patient Safety Goals (NPSGs) first initiated by the Joint Commission (TJC) in 2002 were the most influencing.¹¹ In 2002, the TJC organized a patient safety advisory group consisting of clinical nurses, physicians, pharmacists, engineers, and other specialists dealing with patient safety issues in clinical settings. The advisory group and other stakeholders collaborate with TJC to identify and disseminate emerging information on patient safety issues; TJC then formulates NPSGs for the year by determining the highest priority for patient safety issues based on the adverse effects, economic indicators, and effectiveness of these events.¹² The earliest version of NPSGs came into effect on June 1, 2003, and was issued annually, thus initiating the formulation and implementation of patient safety goals in countries around the world.¹³ Australia and the United Kingdom also took similar actions as the Australian Council for Safety and Quality in Health Care's Priority Programs and the United Kingdom's National Patient Safety Alerts initiatives, respectively.

Following this trend, under the guidance of the Medical Administration Department of the Ministry of Health, the China Hospital Association issued China's first Patient Safety Goal in 2007 based on the practice of hospital management and experience of international patient safety goals.¹⁴ Except for the year 2007, which had only 8 goals, the other years had 10 goals; thus, these goals are also known as the Chinese Top 10 Goals of Patient Safety. As of 2021, a total of 7 versions have been released, with a total of 14 goals.

Although hospitals have devoted themselves to building a safer health environment under the guidance of various patient safety goals, the effects of these efforts on PSC remain to be elucidated. Almost 15 years after the China Hospital Association patient safety goals were proposed in China, we conducted a national study to measure the PSC and the current practice of patient safety goals in China. This study should provide healthcare organizations with a baseline level of PSC in Chinese hospitals and decision makers with a better understanding of the strategies of the patient safety movement.

METHODS

This study used a descriptive cross-sectional survey. Approval was obtained from the ethics committee of the affiliated institution

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All data generated or used during the study are available from the corresponding author by request.

The ethics committee of the First Affiliated Hospital of Chongqing Medical University where the current study took place reviewed and approved the study (2019-043).

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(2019-043). All participants were informed of the purpose of the study on the first page of the online questionnaire, and only those who expressed willingness to participate completed the survey. Patients' identifiers were anonymized to protect their privacy. The Strengthening the Reporting of Observational Studies in Epidemiology¹⁵ guidelines were used in this study.

Participants

This was a cross-sectional study of electronic survey data collected from November 2020 to November 2021 from 8164 healthcare workers across 26 provinces within the secondary or tertiary hospitals of a large academic health system in the east-middle-west regions of China. Because of the COVID-19 pandemic, a convenience sampling technique was adopted, and cluster sampling was applied to each surveyed institution. Clinical staff who had obtained relevant professional qualification certificates and had contact with patients, such as physicians, nurses, pharmacists, and rehabilitation therapists, were included in this study. Individuals who mainly served hospitals but not patients were excluded, such as workers engaged in finance, security, medical record management, and library management. At the end of 2020, there were 10.678 million healthcare providers in China (including 4.086 million practicing/assistant physicians and 4.709 million registered nurses), and 60.2% were distributed in 8.112 million hospitals.¹⁶ All potential hospitals were recruited by the Chinese Hospital Association—a national, industrial, and nonprofit social group voluntarily formed by medical institutions at or above the secondary level, with more than 4000 member institutions.

Measurement Tools

The questionnaire consisted of 3 parts: (a) general information surveys, such as age, sex, and education level, and (b) the Hospital Survey on Patient Safety Culture (HSOPSC) questionnaire 1.0, which was developed by the Agency for Healthcare Research and Quality (AHRQ) in 2004¹⁷ and is widely used to measure awareness of PSC. The HSOPSC contains 42 items that measure 12 dimensions (7 dimensions measure safety culture at the unit/department level, 3 measure it at the hospital level, and 2 measure its outcomes) and 2 separate questions (an overall grade on patient safety for their work unit and to indicate the number of events they reported over the past 12 months). Each item was anchored by a 5-point Likert scale (1 = never or strongly agree, 5 = always or strongly disagree). After reversing code negatively worded items, the percent positive response of each item and the overall survey were calculated using the toolkit guide.¹⁸ This study used a Mandarin version of the HSOPSC questions translated by Xiao,¹⁹ and the total Cronbach α coefficient was 0.825, demonstrating reliability. The study also adopted the Practice of Patient Safety Goal (POPSG) questionnaire, which was developed through a literature review and the Delphi method and consisted of 14 items. A 5-level Likert scale and percent positive response were applied.

Data Collection and Analysis

Data were distributed electronically via a free questionnaire (<https://www.wjx.cn/>). The link between the questionnaire and posters promoting the study was sent by the Chinese Hospital Association to all the potential hospitals. The head of the hospital then delivered these materials to each department or unit via WeChat. To ensure the quality of the study, each IP address was only allowed to submit once after answering all the questions.

The R software (V. 4.0.2; R Foundation for Statistical Computing, Vienna, Austria.) was used to analyze and visualize the data. Averages, standard deviations, minimum and maximum scores, and percentiles were used for descriptive statistics. Multivariate linear

regression analyses were used to test the relationships between independent variables and overall HSOPSC scores, and Pearson correlation analysis was used to correlate the HSOPSC scores with POPSG. The significance level was set at $P < 0.05$.

RESULTS

Demographic Statistics

A total of 8164 healthcare providers across 26 provinces participated, of which 19 answered all items with "not applicable," and 160 nonhospitals (nursing home, medical device company, etc) and 224 hospital workers did not have contact with patients (librarian, financial staff, etc) were excluded. Finally, 7765 surveys (95.10%) were valid and included in the final analyses, as shown in Table 1.

Of these, 77.63% ($n = 6027$) were female, and the number of age brackets was relatively equal. Almost 48.84% were nurses in direct contact with patients. The numbers of participants with primary and intermediate professional titles were higher (43% and 34.9%, respectively). As expected of the medical profession, 64.43% of the participants had a bachelor's degree ($n = 5002$). Up to 56.89% of participants worked in the east ($n = 4417$) of China, 68.69% were from general hospitals ($n = 5333$), and 85.01% were from tertiary hospitals ($n = 6600$); in addition, participants working for 40 to 59 hours per week were the majority, accounting for 71.3%. It is a comforting result that 95.56% of participants reported having received patient safety-related training and that only 35.15% had experienced incidents related to patient safety.

The HSOPSC and POPSG Scores

Table 2 shows the scores for the overall and for each single dimension of the HSOPSC and the percentage of positive responses reported by the AHRQ in 2018²⁰ and this study. It seems that the overall average positive response rate for the HSOPSC survey was 69.68%, ranging from 43.41% (U7) to 91.54% (U2), which is slightly higher than that reported by the AHRQ (65%). The percent positive responses in 5 dimensions (U2, U3, U5, H1, and H2), which are above the upper control limitations of 75%, are identified as positive areas and are also higher than those in the AHRQ data. Three dimensions (U6, U7, and O2), which are below the lower control limits of 55%, are negative areas and also lower than those in the AHRQ data.²¹

In Table 1, the Z test and Kruskal-Wallis H test were used to compare the percentage of positive scores between different groups, and the results implied that a significant difference ($P < 0.05$) existed in the overall scores of HSOPSC in different genders, age brackets, types of occupation, location and types of hospitals, working time per week, training on patient safety, and experienced patient safety incidents (F statistics = 1.127, 15.018, 28.755, 1.066, 1.133, 1.147, 1.216, 1.643, and 1.193, respectively). Variables with $P < 0.05$ in the univariate analysis were entered into the multivariate linear regression, and the overall score of the HSOPSC was set as the dependent variable. The final model is presented in Table 3.

Table 4 summarizes the scores and percentage of positive responses of the POPSG. The average positive response rate for the POPSG survey was 96.11%. G1, G2, and G3 received the highest positive response rates, and G14, G9, and G8 received the lowest.

The Relationship Between HSOPSC and POPSG Scores

To explore the relationship between HSOPSC and POPSG scores, the Pearson correlation coefficient matrix was applied

TABLE 1. Characteristics of the Participants (N = 7764)

Variables	n (%)	Score of HSOPSC, Mean ± SD	Statistics	P
Sex			1.127*	0.004
Male	1737 (22.37%)	45.26 ± 6.36		
Female	6027 (77.63%)	46.83 ± 6.11		
Age			15.018 [†]	<0.001
<25	632 (8.16%)	47.58 ± 6.32		
26–29	1626 (20.99%)	47.20 ± 6.31		
30–34	2036 (26.28%)	46.23 ± 6.23		
35–39	1636 (21.12%)	46.07 ± 6.15		
>40	1834 (23.67%)	46.10 ± 5.96		
Types of occupation			28.755 [†]	<0.001
Doctors who have direct contact with patients	2395 (30.85%)	45.47 ± 6.15		
Nurses who have direct contact with patients	3792 (48.84%)	46.96 ± 6.10		
Healthcare providers who do not have direct contact with patients, pharmacists, and others	892 (11.49%)	46.23 ± 6.19		
Healthcare providers who have direct contact with patients, therapists, and others	238 (3.07%)	48.02 ± 7.04		
Managers	447 (5.76%)	47.43 ± 6.06		
Professional title			1.066 [†]	0.079
Internship	557 (7.17%)	47.63 ± 6.53		
Primary	3341 (43.03%)	46.78 ± 6.27		
Intermediate	2710 (34.9%)	46.05 ± 6.09		
Senior vice	803 (10.34%)	46.00 ± 5.93		
Senior	353 (4.55%)	46.13 ± 6.09		
Education level			1.076 [†]	0.052
High school	94 (1.21%)	45.28 ± 6.49		
Associate degree	1243 (16.01%)	46.82 ± 6.35		
Baccalaureate degree	5002 (64.43%)	46.63 ± 6.12		
Graduate degree	1425 (18.35%)	45.74 ± 6.26		
Locations of hospital			1.133 [†]	0.003
The east	4417 (56.89%)	45.71 ± 6.07		
The middle	1653 (21.29%)	47.30 ± 6.15		
The west	1694 (21.82%)	47.69 ± 6.28		
Types of hospital			1.147*	0.001
General hospital	5333 (68.69%)	46.76 ± 6.13		
Specialized hospital	2431 (31.31%)	45.85 ± 6.31		
Levels of hospital			0.961*	0.802
Tertiary	6600 (85.01%)	46.49 ± 6.22		
Secondary	1164 (14.99%)	46.43 ± 6.06		
Working time per week			1.216	<0.001
<40 h	806 (10.38%)	47.06 ± 6.29		
40–59 h	5536 (71.3%)	46.82 ± 6.14		
60–79 h	1052 (13.55%)	45.01 ± 6.10		
80–99 h	238 (3.07%)	44.29 ± 6.33		
More than 100 h	132 (1.7%)	44.1 ± 5.69		
Training on patient safety			1.643*	<0.001
Yes	7264 (93.56%)	46.79 ± 6.11		
No	500 (6.44%)	41.96 ± 5.7		
Experienced patient safety incidents			1.193*	<0.001
Yes	2729 (35.15%)	45.32 ± 6.04		
No	5035 (64.85%)	47.10 ± 6.19		

*Z test.

[†]Kruskal-Wallis H test.

TABLE 2. Scores of the HSOPSC and Each Dimension

Variables	Scores, Mean ± SD	Percent Positive Response		Comment
		Current Study	AHRQ 2018 ²⁰	
Level 1—work area/unit				
U1 Manager expectations for safety	3.91 ± 0.76	72.76%	80%	—
U2 Organizational learning	4.46 ± 0.58	91.54%	72%	Positive area
U3 Teamwork within units	4.52 ± 0.59	90.39%	82%	Positive area
U4 Communication openness	3.75 ± 0.73	63.35%	66%	—
U5 Feedback about error	4.29 ± 0.73	82.47%	69%	Positive area
U6 Nonpunitive response to error	3.11 ± 1.11	45.20%	47%	Negative area
U7 Staffing	3.13 ± 0.80	43.41%	53%	Negative area
Level 2—Hospital				
H1 Management support for safety	4.17 ± 0.70	80.98%	72%	Positive area
H2 Teamwork across units	4.01 ± 0.75	75.76%	62%	Positive area
H3 Handoffs and transitions	3.67 ± 1.07	65.71%	48%	—
Outcomes				
O1 Overall perceptions of safety	3.90 ± 0.70	71.75%	66%	—
O2 Frequency of event reporting	3.55 ± 1.15	52.81%	67%	Negative area
Overall	3.87 ± 0.52	69.68%	65%	—

and visualized as a heatmap (Fig. 1). The values in the square lattices in the top-right corner represent the magnitude of the *r* value. The asterisks in the square lattices in the lower-left corner represent the level of statistical significance, among which one represents *P* < 0.05, 2 represent *P* < 0.01, and 3 represent *P* < 0.001. The colors denote positive (red) and negative (blue) correlation values, respectively. Figure 1 shows that the overall score of the HSOPSC is positively related to that of the POPSG (*r* = 0.34, *P* < 0.001); in addition, the HSOPSC is related to each item of the POPSG (*P* < 0.001), and except for U6 (*r* = 0.06, *P* > 0.05), POPSG is also related to each item of the HSOPSC (*P* < 0.001).

DISCUSSION

In this study, the 12 dimensions of the HSOPSC questionnaire and the 14 items of the POPSG questionnaire were electronically applied and had a good response rate (95.10%). The overall

percentage of positive response of PSC, with 69.68%, although below the targeted 75%, was acceptable. In general, Chinese health workers were likely to evaluate the PSC higher than that in the United States,²⁰ Cameroon,²² and Japan,²³ in which HSOPSC tools were used. Differences in the overall scores of the HSOPSC were statistically significant (*P* < 0.05) for different genders, age brackets, types of occupation, locations, and types of hospitals, which are different from those in other countries or regions due to multiple factors such as national cultural norms, race, or included participants.²⁴ In addition, several researchers have also noted that consensus on the measurement tools, scoring strategies, and statistical analyses of safety culture has not been reached yet,^{24,25} and further research is still warranted to accurately understand and measure safety culture.²⁶

Interestingly, when conducting an international comparison, we found that U7 Staffing (43.41%), U6 Nonpunitive response to error (45.20%), and O2 Frequency of event reporting (52.81%) had the

TABLE 3. Final Multivariate Linear Regression Analysis of Factors Associated With the Scores of the HSOPSC

Independent Variables	<i>B</i>	Stand Error	β	<i>t</i>	<i>P</i>	Confidence Interval	
						Lower	Upper
Locations of hospital (the east)	-1.738	0.177	-0.139	-9.821	<0.001	-2.084	-1.391
Sex	0.878	0.183	0.059	4.795	<0.001	0.519	1.237
Types of hospital	-0.551	0.160	-0.041	-3.436	0.001	-0.866	-0.237
Types of occupation (nurses who have direct contact with patients)	0.512	0.237	0.041	2.159	0.031	0.047	0.977
Types of occupation (managers)	1.195	0.344	0.045	3.470	0.001	0.520	1.871
Types of occupation (healthcare providers who have direct contact with patients, therapists, and others)	1.855	0.439	0.052	4.230	<0.001	0.995	2.715
Education level (graduate degree)	1.353	0.661	0.085	2.047	0.041	0.057	2.650
Working time per week (60–79 h)	-1.570	0.205	-0.087	-7.675	<0.001	-1.972	-1.169
Working time per week (80–99 h)	-2.377	0.397	-0.066	-5.993	<0.001	-3.154	-1.599
Working time per week (>100 h)	-2.576	0.524	-0.054	-4.914	<0.001	-3.604	-1.548
Training on patient safety	-4.514	0.275	-0.179	-16.385	<0.001	-5.054	-3.974
Experienced patient safety incidents	1.789	0.145	0.138	12.372	<0.001	1.506	2.073

*R*² = 0.106; *F* = 36.762; *P* < 0.001.

TABLE 4. Scores of the POPSG

No.	Variables	Scores (Mean ± SD)	Percent Positive Response
1	G1 Identify patients correctly	4.83 ± 0.62	97.87%
2	G2 Use medicines and blood safely	4.72 ± 1.00	97.97%
3	G3 Improve safety during perioperative period	4.51 ± 1.33	96.76%
4	G4 Prevent healthcare associated infection	4.71 ± 0.82	97.10%
5	G5 Improve staff communication	4.70 ± 0.63	96.86%
6	G6 Prevent and reduce accidental harm	4.74 ± 0.65	97.08%
7	G7 Improve catheter-associated safety	4.65 ± 0.96	96.86%
8	G8 Encourage patient participation	4.66 ± 0.81	95.56%
9	G9 Reduce equipment-related incidents	4.63 ± 0.85	95.08%
10	G10 Improve EHR-associated safety	4.63 ± 0.94	95.74%
11	G11 Encourage incidents reporting	4.76 ± 0.74	97.08%
12	G12 Improve clinic critical value managing	4.77 ± 0.83	97.83%
13	G13 Provide first aid training for all staff	4.81 ± 0.58	97.27%
14	G14 Improve burnout and stress	4.40 ± 1.11	86.51%
15	Overall	4.68 ± 0.63	96.11%

EHR, Electronic Health Record.

lowest positive response rates, which showed considerable potential to improve from a hospital, department, and outcome perspective. U7 Staffing implied that participants considered the staff insufficient to handle the workload, which is similar to reports in Hungary,²⁷ Spain,²⁸ and Sweden.²⁹ A possible explanation is that many countries facing the challenge of shortage of medical staff globally,³⁰ particularly the data acquisition dates of November 2020–November 2021, are affected by the COVID-19 pandemic.³¹ With the pandemic, health workers have been facing an increased volume and intensity of patient care, which has led to ongoing negative consequences, one of which is staff shortage. A global shortage of 6 million nurses has been reported during COVID-19.³² In addition, the attributions of a systematic increase in the aging population and a decreasing number of births have thrown great challenges to the healthcare system globally,^{32–34} leading to longer working time and burnout, and may even report more adverse events subsequently.^{35–37} U6 Nonpunitive response to error indicates that blame culture is still pervasive in the Chinese healthcare system and that barriers to O2 Frequency of event reporting may also exist. Unfortunately, similar areas of weakness in U6 and O2 were also observed in almost 70% of related studies.²¹ A punitive culture of safety incidents does little to make the system safer and would make it difficult to identify possible causes, thus preventing learning from mistakes. The Swiss cheese model proposed by James Reason has illustrated that when an error eventually occurs, it is the general and higher system, but not the individuals, that should be scrutinized at first.³⁸ Thus, urgent improvement initiatives of the shift in ideology and the development of coping policies or strategies of hospitals are warranted.

In addition, we found that the overall average positive response rate (96.11%) for the POPSG survey was high, consistent with similar research conducted in the Taiwan region.³⁹ Among these, G1 Identify patients correctly, and G12 Improve clinic critical value managing had the highest positive response rate. Identification plays a dominant role in patient safety and has been recognized as the root cause of sentinel events.⁴⁰ Institutions and managers have seen the dual benefits of patient safety and economic profit of

identification correctly, and in addition, with the development of technologies, emerging creative patient identifiers such as wristbands, barcode, radio frequency identification (RFID) chips, and even fingerprints⁴¹ have been developed and applied in the clinical setting. Clinic critical value refers to the results/value that represent a pathophysiological state at such variance with normal (expected values) as to be life-threatening unless something is done promptly and for which some corrective action could be taken, which was first proposed by Lundberg at *JAMA* in 1990,⁴² who believed that first aid should be provided when critical value shows. Such beliefs are valued by the medical field and adopted in the standard report system by the JCI. China introduced this belief in early 2000 and set the reporting of the clinical critical value as a compulsory item in hospital accreditation in 2011.⁴³ Therefore, empowered by technology, supported by the institution and required by the government, these 2 goals have the highest positive response rates; however, as mentioned previously, the participants reported that the goal of improving burnout and stress was practiced less in clinical settings compared with other goals.

Although more statistical analysis is needed, the heatmap results show that the HSOPSC is closely related to the POPSG on both an overall and a dimensional level. The insights might draw from previous literature, by which addressing and understanding the safety culture of an organization is the first step toward improving patient safety.⁴⁴ Among these, the most reliable and effective strategy for improving the quality of care is to change the way frontline healthcare professionals think about patient safety.^{3,45} Moreover, as a complex adaptive system, the healthcare system has a noticeable characteristic of coevolution,⁴⁶ this is, consistently, several well-practiced staff members could improve the climate of patient safety in the whole department.

Although this study provides significant results regarding PSC and patient safety goals, some limitations persist and provide directions for future research. First, although little difference exists between the self-report score and onsite judgment,³⁹ comprehensive approaches are recommended to measure these levels.

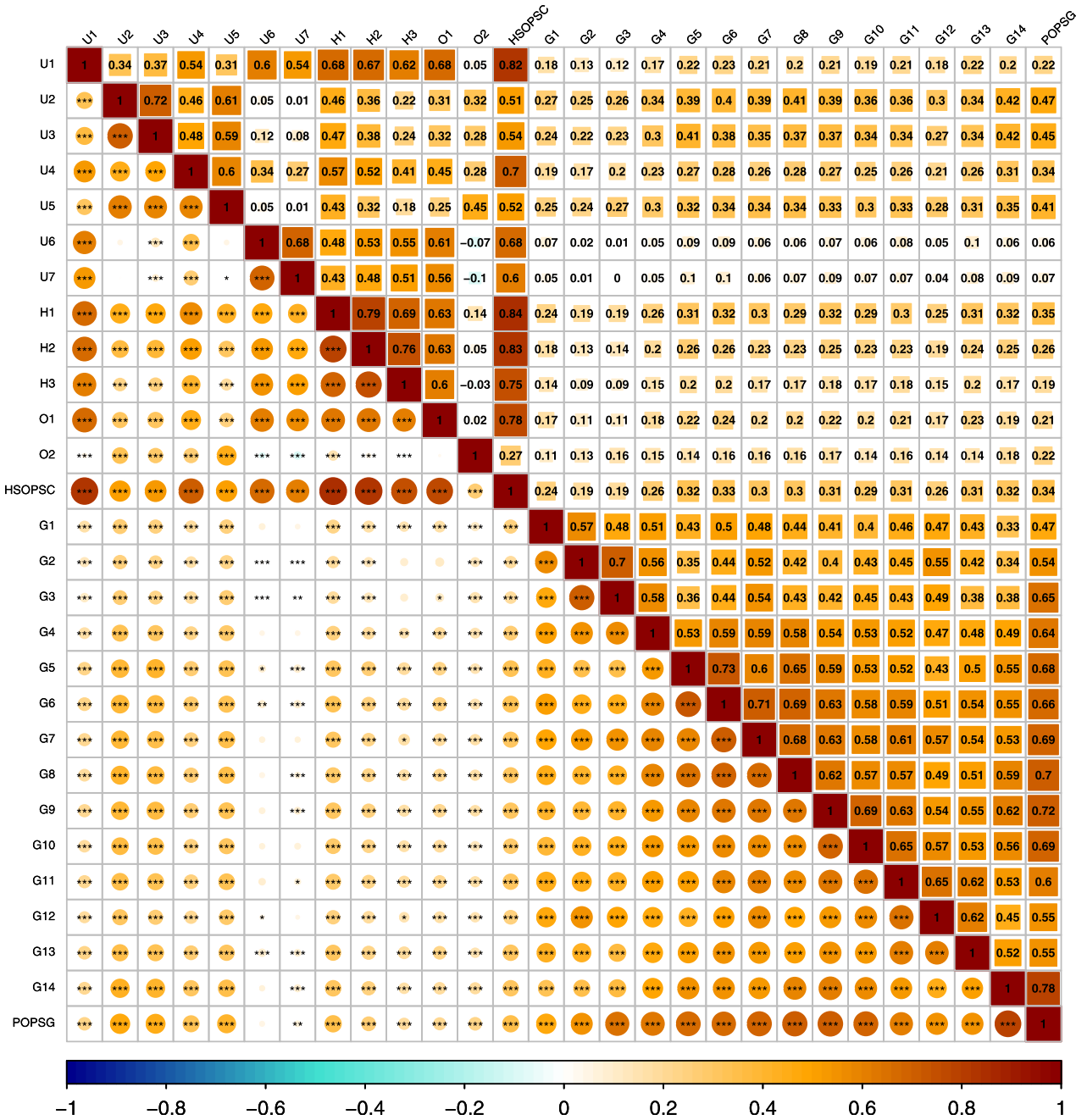


FIGURE 1. Heatmap of Pearson correlation coefficient matrix.

Second, taking into account the key role of policymakers, future research could be conducted to investigate the view of larger stakeholders. Finally, because this was an observational study using an external internet survey, its results may not provide strong evidence of cause and effect.

CONCLUSIONS

To the best of our knowledge, this is the first national study conducted in mainland China to evaluate the degree of PSC and the current practice of patient safety goals across different hospitals. Our study implied that although healthcare providers in China feel positively toward PSC and practicably toward patient

safety goals, considerable work is still needed to promote a patient safety movement.

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