Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/mjafi

Original Article

A study of assessment of patient safety climate in tertiary care hospitals

Brig Abhijit Chakravarty^{a,*}, Maj Anupam Sahu^b, Brig Manash Biswas^c,
Surg Capt Kaustuv Chatterjee^d, Subrata Rath^e

^a Commandant, Military Hospital Jhansi, C/O 56 APO, India

^b Resident, Dept of Hospital Administration, Armed Forces Medical College, Pune 411040, India

^c Professor & Head, Dept of Obstetrics & Gynaecology, Armed Forces Medical College, Pune 411040, India

^d Officer-in-Charge, Med Informatics, INHS Asvini, Colaba, Mumbai, India

^e Head of Department, SQC & OR, Indian Statistical Institute, Pune, India

ARTICLE INFO

Article history:

Received 4 August 2014

Accepted 5 January 2015

Available online 12 March 2015

Keywords:

Patient safety climate

Quality improvement

Teamwork

Stress recognition

ABSTRACT

Background: Medical errors are being detected with increasing frequency in healthcare environment, in many cases leading to patient harm. Measurement and improvement of patient safety climate has been identified as a strategic effort towards addressing this vital issue.

Method: Safety Attitude Questionnaire (SAQ), validated by previous research was administered to 300 respondents in three tertiary care hospitals of India, the respondents representing various categories of healthcare workers and variations in safety scale score was analyzed by various statistical tools.

Results: No variation was observed in the Patient Safety Index score among the study hospitals. However, significant variations were observed among different categories of healthcare workers across dimensions of Teamwork, Perception of Management and Stress Recognition. Multiple Regression models identified Teamwork and Perception of Management to have significant correlation with Patient Safety Index Score.

Conclusion: Patient Safety Climate can be effectively assessed and such assessment utilized for focused improvement efforts towards safety in healthcare organizations.

© 2015, Armed Forces Medical Services (AFMS). All rights reserved.

Introduction

Hospitals provide care in a complex, dynamic environment with its focus on delivering patient care in a resource constrained competitive market. Modern medical care involves

quick decision making by health care professionals with risk of errors being committed in such circumstances and sometimes, a possibility of unintentional harm to a patient. Medical errors are being detected with increasing frequency, such errors causing 44,000–98,000 deaths annually in hospitals of

* Corresponding author. Tel.: +91 (0) 9198766418 (mobile).

E-mail address: a.chak165@gmail.com (A. Chakravarty).

<http://dx.doi.org/10.1016/j.mjafi.2015.01.007>

0377-1237/© 2015, Armed Forces Medical Services (AFMS). All rights reserved.

USA – more than that caused by car accidents, breast cancers or AIDS.¹

Safety is a fundamental principle of patient care, involving a broad range of actions in performance improvement, environmental safety and risk management including infection control, safe use of medicines, equipment safety, safe clinical practice and safe environment of care. Several International organizations like the Institute of Medicine, USA and The Joint Commission are urging health care organizations to address patient safety through safety culture surveys and appropriate quality interventions following such surveys.²

The current focus on measuring and improving patient safety in hospitals has brought to the fore the concept of safety culture that includes shared beliefs, values, norms and behavioral characteristics of the hospital staff.³ Relative difficulty in measuring several non-tangible components of safety culture has led to a shift towards evaluating patient safety climate, patient safety climate being the measurable component of safety culture.⁴

Very few research or publications exist on the vital issue of patient safety or safety culture in India, as observed during search of several medical database. The present paper aims to explore composite patient safety climate followed by further enquiry into various dimensions of patient safety climate in three large multi-speciality tertiary care hospitals located in major metropolitan cities of India towards identifying future directions for developing a strong safety climate.

Materials and method

The study had an observational, cross-sectional design and was conducted over a period of six months in the clinical care areas of three large tertiary care hospitals located in different metropolitan cities of India, clinical area being recognized as the study areas of interest. All the three hospitals are similar in their role, capacity, bed complement and staff-mix and thus considered suitable for the study.

The study instrument used for the study to generate safety climate profile of the study hospitals was the self-administered Safety Attitude Questionnaire (SAQ), the instrument being developed by the University Of Texas and widely utilized in the health care environment. The psychometric properties of the instrument had been repeatedly validated and confirmed for application in hospitals.^{5,6} An additional reason for utilizing the instrument is accumulating evidence of SAQ eliciting provider attitudes responsive to improvement interventions.⁷

The study instrument was suitably modified to a 46 item questionnaire, retaining all the essential questions of the SAQ Ambulatory Version. The modified instrument was thoroughly scrutinized by five domain experts for its content validity. The modified SAQ used for the study is a single page questionnaire and takes 15–20 min for completion. Each of the 46 items is answered using a five point Likert scale. The instrument measures patient safety climate along six dimensions, namely Team work climate (ten items), Job satisfaction (five items), Safety climate (sixteen items), Stress management (five items), Working conditions (five items) and Perception of recognition (five items). SAQ items score reflect

the level of agreement of the respondents with individual item statements and both multi-dimensional and hospital wise composite scale scores can be generated for suitable analysis.

A pilot study was initially carried out at one of the study hospitals and calculation of sample size was obtained at a sample of 300. Therefore, the study instrument was administered to 100 respondents for each hospital (clinician, post-graduate residents, nurses and para-medical workers), the respondents being selected by a procedure of stratified random sampling with the strata being that of operationally similar tertiary care hospitals in three different cities of India and different categories of healthcare workers to be found in teaching hospitals. At least three months of exposure to their current clinical area was adopted as inclusion criteria for the study and similar representation of the staff-mix was maintained in all study hospitals. All collected data was entered in electronic spreadsheet and suitably formatted for statistical analysis using MINITAB version 16 statistical software, statistical significance being defined as p (0.05).

Patient Safety Climate composite scale score (PSC Index) was calculated for individual respondents by taking the average of scaled items, whereas results at the level of hospitals and category of healthcare workers was calculated by arriving at composite mean scores for individual hospitals and staff category. Composite mean values of the study hospitals as well as different category of healthcare workers were compared for significant inter-unit and intra-unit variability by using ANOVA. Subsequently, ANOVA was also utilized for testing inter-unit variability across each of the six scale dimensions of SAQ. Similarly, Mann–Whitney U test and ANOVA was undertaken for testing multi-dimensional variability among different category of healthcare workers operating in the study hospitals.

Finally, Multiple Regression and Co-relation analysis was performed to understand strength of correlation of the scale safety climate dimensions as independent variables with the composite scale score for identifying suitable improvement interventions.

Results

The study was conducted in three large tertiary care hospitals, the survey instrument being exercised on 100 respondents per hospital. The response rate for the questionnaire was 100%, each respondent being followed up by co-workers of the study for assured response to the study instrument.

The respondents were divided among various categories of healthcare workers, post-graduate residents forming the largest contributors with 32% of total respondents. 56% respondents were male while 44% were females, the healthcare workers being dispersed across different shift of duties in the study hospitals. The respondents belong to different age groups with 65% of them below 35 years and 71% being in the service bracket of 1–10 years (Table 1).

Any variation in safety climate composite scale score (PSC Index) among the study hospitals was assessed by ANOVA, such variations being observed to be non-significant (Table 2). To further confirm the presence or absence of variations in PSC Index among study hospitals, multiple ANOVA tests were

Table 1 – Demographic character of study respondents.

Socio-demographic characteristics	Study subjects (n = 300)	
	No	%
Job Category		
Clinical Specialist (Cl Spl)	51	17
Post-graduate Residents (Cl Res)	96	32
Nursing Officer (Nro)	85	28
Para Medical (PM)	68	23
Gender		
Male	168	56
Female	132	44
Working shift		
Morning	65	22
Evening	8	3
Night	5	2
Variable shift	222	74
Age group		
<25 y	68	23
25 > 30 y	56	19
30 > 35 y	68	23
35 > 40 y	35	12
40+ y	73	24
Years of experience		
1–5 y	163	54
6–10 y	51	17
11–15 y	32	11
>15 y	54	18

performed across all six dimensions of the SAQ scale, with the variations again coming to be non-significant against all dimensions (Table 3).

PSC Index among various categories of healthcare workers was subsequently examined by ANOVA, the Index being observed to be highest among clinicians, the difference between the clinicians and other categories of healthcare workers being statistically significant (Table 4).

Subsequently, ANOVA tests were conducted to examine how PSC Index differs among different categories of healthcare workers in different hospitals. While the scale score of post-graduate residents were similar in all the study hospitals, the score of the clinicians and para-medical workers were observed to be widely varying among the study hospitals (Fig. 1).

Repeated Mann–Whitney U test were performed to analyze any significant variation in scale score among clinicians of different specialization, no positive finding being observed during such comparisons (Fig. 2).

We also decided on analyzing the variations observed in PSC Index among different categories of health workers by conducting multiple ANOVA across all six dimensions of the

SAQ scale, such tests revealing significant differences in safety scale scores for the dimensions of Team work Climate, Perceptions of Management and Stress Recognition (Table 5).

Finally, Multiple Regression and Co-relation analysis was performed to identify the nature and strength of association of separate dimensions of the SAQ scale with the PSC Index score of the study hospitals. Safety scale score was observed to be significantly associated with the dimensions of Team-work Climate and Perception Management (Table 6).

Discussion

Our study has explored various dimensions of Patient Safety Climate in three tertiary care hospitals located in different cities of India. This study also provides a detailed insight into the Patient Safety and Quality related attitudes and behavioral norms of healthcare workers in acute care inpatient units.

It was reassuring to observe that Patient Safety Climate is well-dispersed among all three study hospitals, the composite scale score being similar with minimal variation. Further confirmation of similar observations was obtained while analyzing variations among the study hospitals across six scale dimensions, variations against each individual scale dimensions being found to be statistically non-significant. However, our study finding goes against similar studies conducted in hospitals of Western developed countries, where wide variation in safety scale score was observed among participating hospitals.⁸

It was interesting to analyze the variations in composite PSC Index among various categories of healthcare workers. The clinicians were observed to score high composite scale scores when compared to other categories of healthcare workers being studied, the difference in score being statistically significant. The higher composite score of clinicians may be explained by higher probable patient-centric attitude, altruistic motives and greater accountability towards patient outcomes among this group of healthcare workers. However, composite scale scores in similar category of healthcare workers in different hospitals were observed to be different, thus revealing existence of more empirical and meaningful safety climate variations within hospital or clinical area level rather than between hospitals. Lower composite scores among clinicians in one particular hospital and among Post-graduate residents, Nurses and Para-medical workers in general identify them as provider categories for future suitable interventions to improve their safety attitude. Our observations bring out the necessity of both capturing safety climate assessment in different hospitals and focused Quality Improvement activities at individual hospital or clinical unit level.

Doctors have traditionally been hardworking professionals with their core value firmly placed on the patient being cared for.⁹ Similar safety scale score among clinicians from different specialties without any statistically significant variation reinforces the personality and practices of the medical professional operating in hospitals in the country.

Analysis of variations in safety scale score among different categories of healthcare workers observed across all six scale

Table 2 – Comparison of PSC index among study hospitals.

Level	N	Mean	St dev
Hospital Bangalore	100	3.6477	0.3442
Hospital Mumbai	100	3.5938	0.3328
Hospital Pune	100	3.5971	0.4648
p = 0.541.			

Table 3 – Summary of comparison of six scale parameters for three study hospitals.

Hospitals	Hospital Bangalore		Hospital Mumbai		Hospital Pune		F value	P value	Comments
Parameters	Mean score	S.D.	Mean score	S.D.	Mean score	S.D.			
Safety climate score	3.41	0.31	3.40	0.41	3.36	0.46	0.51	0.601	Not significant
Team work climate	3.75	0.51	3.62	0.49	3.66	0.65	1.43	0.24	Not significant
Perception Mgmt	3.63	0.78	3.63	0.74	3.53	0.88	0.56	0.57	Not significant
Working conditions	3.79	0.68	3.66	0.62	3.75	0.78	0.87	0.42	Not significant
Stress recognition	3.43	1.04	3.20	0.91	3.50	0.99	2.49	0.09	Not significant
Job satisfaction	4.31	0.85	4.45	0.73	4.26	0.89	1.50	0.23	Not significant

dimensions revealed significant differences for the dimensions of Teamwork Climate, Perceptions of Management and Stress Recognition. Our findings are similar to a study carried out by Schwendimann et al in hospitals of USA and Switzerland.¹⁰ Emphasis on these scale dimensions find further support from the Multiple Regression models for understanding correlation of such dimensions with patient safety outcomes.

Teamwork Climate reflects perceived quality of cohesion, team spirit and collaboration among healthcare workers and the quality of teamwork has been observed to impact the effectiveness of care, patient safety and clinical outcomes.¹¹ Post-graduate residents, nurses and paramedical workers have scored lower perception in teamwork climate when compared to the clinicians, probably reflecting deficiencies in co-operation and inter-personal relations among members of healthcare teams.

Post-graduate residents and nurses do not demonstrate high perception about managerial intent towards well-being and safety of patients when compared to clinicians. This is an area of concern; as such negative perception may actually indicate managerial deficiencies and affect staff morale and thus, needs to be considered for immediate and sustained improvement efforts. Hospital Management is expected to lead by example and consistently demonstrate their focus on Quality and Patient Safety and any deficiency on this dimension may harm patient care outcome of hospitals concerned.

Stressed and fatigued healthcare workers will be more prone towards committing procedural errors, compromising patient safety in clinical areas. Rigorous training and prolonged exposure to critical care interventions have probably contributed to higher stress resilience among clinicians, whereas comparatively younger Post-graduate residents and nursing personnel are failing to identify the link between stress at the workplace and their own performance, leading to

significant difference across this particular dimension of the safety instrument.

One redeeming finding of our study was the consistent high scores for all the four groups of healthcare workers in respect of the dimension of Job Satisfaction, indicating that all respondents are reasonably satisfied with their job condition and will be positively inclined towards accepting and implementing future Quality Improvement Initiatives.

Assessing safety climate through SAQ offers a powerful feedback tool to generate staff interest as well as identify priority areas for Quality Improvement Efforts.¹² Our study firmly points towards certain safety dimensions like Teamwork, Perception of healthcare workers about managerial focus and Stress recognition, which need to be addressed on priority by suitable and sustained hospital-wide improvement efforts. Our study proves that a need exists for repeated safety culture assessments followed by issue or unit specific interventions, which will lead to long-term changes in patient safety climate when compared to a single study. A committed leadership, encouragement and practice of teamwork built on a foundation of mutual trust and respect and a sustained campaign towards developing system resilience against stress will be some of such interventions that a hospital will have to focus upon for developing a strong future safety climate.

Table 4 – Comparison of PSC Index among different categories of healthcare workers.

Provider Category	Number of respondents	Mean	S D
Clinicians	51	3.7470	0.3589
PG residents	96	3.6139	0.3525
Nurses	85	3.5708	0.4603
Para-medical workers	68	3.5634	0.3228

p = 0.039.

Fig. 1 – Comparison of composite scale scores for different categories of healthcare workers in different hospitals.

Fig. 2 – Comparison of scale score among various specializations. p value >0.05 in all comparisons.

Table 5 – Comparison of six scale dimensions among different groups of health-care workers.

Profession	Safety Climate Score		Team Work Climate		Perception Mgmt		Working Conditions		Stress Recognition		Job Satisfaction	
	No. of Observations	Mean	No. of Observations	Mean	No. of Observations	Mean	No. of Observations	Mean	No. of Observations	Mean	No. of Observations	Mean
Clinicians	51	3.43	51	4.10	51	4.25	51	4.00	51	3.94	51	4.62
PG Residents	96	3.43	96	3.65	96	3.67	96	3.86	96	3.61	96	4.44
Nurses	85	3.31	85	3.92	85	3.42	85	3.85	85	3.42	85	4.62
Paramedical worker	68	3.40	68	3.62	68	3.62	68	3.69	68	3.10	68	4.64
p-Value	0.203		0.005		0.002		0.081		0.039		0.122	
Comment	Not significant		Significant		Significant		Not Significant		Significant		Not Significant	

Table 6 – Multiple regression and co-relation analysis.

Predictor	Coef	SE coef	T	P
Constant	2.2340	0.1708	13.08	0.000
Team work climate	0.21942	0.04403	4.98	0.000
Perception Mgmt	0.07729	0.03360	2.30	0.022
Working conditions	–0.03898	0.04059	–0.96	0.338
Stress recognition	0.03595	0.02252	1.60	0.111
Job satisfaction	0.02249	0.03351	0.67	0.503

The study suffers from a limitation of all study hospitals having similar role and patient profile, thus precluding generalization of the study findings in the Indian context.

We conclude that patient safety climate of healthcare organizations can be effectively assessed using validated questionnaires like SAQ and capturing respondent variations in different dimensions of safety culture brings out focus areas for sustained Quality Improvement Efforts.

Future research need to be directed towards assessment of patient safety climate in various healthcare organizations along the hierarchy of Indian healthcare landscape to jump-start the long overdue movement towards better patient safety in our hospitals.

Conflicts of interest

All authors have none to declare.

Acknowledgment

This paper is based on Armed Forces Medical Research Committee project No. 4418/2013 granted by the office of the Directorate General Armed Forces Medical Services and Defence Research Development Organisation, Government of India.

REFERENCES

1. Linda TK, Janet MK, et al., eds. *To Err Is Human: Building a Safer Health System*. National Academies Press; 1999.
2. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington. 2001.
3. Morello RT, Lowthan JA, Barker AL, McGinnes R. Strategies for improving patient safety culture in hospitals: a systematic review. *Qual Saf Health Care*. 2013;22:11–18.
4. Colla JB, Bracken AC, Kinney LM, Weeks WB. Measuring patient safety climate: a review of surveys. *Qual Saf Health Care*. 2005;14:364–366.
5. Sexton JB, Helmreich RL, Neilands TB, et al. The Safety Attitude Questionnaire: psychometric properties, benchmarking data and emerging research. *BMC Health Serv Res*. 2006;44:1–10.
6. Pamie LA, Rosenstein BJ, Sexton JB, et al. Assessing and improving safety culture throughout an academic medical centre: a prospective cohort study. *Qual Saf Health Care*. 2012;19:547–554.
7. Pronovost PJ, Bezenholtz SM, Goeschel CA, et al. Improving patient safety in intensive care units in Michigan. *J Crit Care*. 2008;23:207–221.
8. Singer SJ, Gaba DM, Geppert JJ, Sinaiko AD. The culture of safety: results of an organisation-wide survey in 15 California hospitals. *Qual Saf Health Care*. 2003;12:112–118.
9. Grant P. ‘The people not the policy’: quality improvement, junior doctors and cultural change. *Q Manage Health Care*;20(3):168–175.
10. Schwendimann R, Zimmermann N, Kung K, et al. Variation in safety culture dimensions within and between US and Swiss hospitals: an exploratory study. *Qual Saf Health Care*. 2013;22:32–41.
11. Clancy CM. Team STEPPS: optimising teamwork in the peri-operative setting. *AORN J*. 2007;86:18–22.
12. Nieva VF, Sorra J. Safety culture assessment: a tool for improving patient safety in healthcare organizations. *Qual Saf Health Care*. 2003;12(suppl):17–23.