Factors affecting patient safety culture among dental healthcare workers: A nationwide cross-sectional survey

Hsin-Chung Cheng a,b*, Amy Ming-Fang Yen c, Yi-Hsuan Lee b

a School of Dentistry, College of Oral Medicine, Taipei Medical University, Taipei, Taiwan
b Department of Dentistry, Taipei Medical University Hospital, Taipei, Taiwan
c School of Oral Hygiene, College of Oral Medicine, Taipei Medical University, Taipei, Taiwan

Received 3 November 2018; Final revision received 27 November 2018
Available online 28 March 2019

Abstract  Background/purpose: Patient safety is a major healthcare challenge. Due to a lack of safety culture knowledge among dental professionals, our objectives were to measure the level of patient safety culture using the Safety Attitude Questionnaire in Chinese (SAQ-C) and identify factors associated with positive attitudes toward patient safety.

Materials and methods: A nationwide cross-sectional survey was conducted within dentistry departments of 20 hospitals and in 40 dental clinics, from which were randomly chosen. The survey (SAQ-C) comprised of 32 items and reflects five dimensions of patient safety culture. The second section collects demographic information that supposedly affects attitudes toward patient safety. Logistic regression analyses were used to identify factors that supposedly influenced positive attitudes toward patient safety.

Results: Mean SAQ-C scores were significantly higher in respondents who were male, older, dentists, supervisors, and working in clinics. Positive attitudes toward patient safety were found in 172 participants (55.7%). Multivariate analyses revealed age and place of work are significantly associated with positive safety attitudes. A limitation of this study is that the association between SAQ-C scores and patient outcomes could not be examined.

Conclusion: With a lack of research in the dental field, our study provides important information on patient safety attitudes for dental healthcare workers. Results from this study present the current status of patient safety culture and help raise awareness of it. Most notably, the study identified several factors associated with positive attitudes toward patient safety. The information can be used to improve patient safety in the future.

* Corresponding author. School of Dentistry, College of Oral Medicine, Taipei Medical University, 250 Wu-Hsing Street, Taipei City 110, Taiwan. Fax: +886 2 27362295.
E-mail address: g4908@tmu.edu.tw (H.-C. Cheng).

https://doi.org/10.1016/j.jds.2018.12.001
1991-7902/© 2019 Association for Dental Sciences of the Republic of China. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Introduction

Patient safety has become a major healthcare challenge since concerns about not harming patients have received increased attention in recent years.\(^1\)\(^2\) Numerous studies revealed that high chances exist of adverse events occurring in general healthcare environments,\(^3\)\(^4\) including dental healthcare environments.\(^5\)\(^6\) These unintended adverse events can lead to hospital admissions,\(^3\) a prolongation of hospital stays,\(^4\) increased medical expenditures,\(^7\) and the occurrence of serious permanent injury or death.\(^1\)\(^2\)\(^3\)\(^4\)\(^5\)\(^6\)\(^7\)\(^8\) Evidence from several studies suggested that these adverse events are often preventable, and are therefore manageable and avoidable.\(^1\)\(^2\)\(^3\)\(^4\)\(^5\)\(^6\)\(^7\)\(^8\)

Establishment of a supportive patient safety culture in healthcare organizations is widely accepted to be among the highest priorities for reducing adverse events and improving patient safety as well as quality of care.\(^9\) The safety climate generally refers to measurable components of safety culture. Assessment of the patient safety climate for healthcare workers is considered essential as a primary strategy to promote patient safety in organizations.\(^10\)\(^11\) The literature on assessing patient safety climate is extensive, especially in terms of general medicine, maternal units, pharmacists, and residential aged care facilities.\(^11\)\(^12\)\(^13\)\(^14\) However, there is little information dealing with the patient safety climate for dental healthcare workers.\(^15\)

In this study, we adopted the Safety Attitude Questionnaire in Chinese (SAQ-C) to explore the climate of patient safety among dental healthcare workers, including dentists and dental assistants, and to understand factors that promote positive attitudes of the patient safety climate. Recognition of factors that affect the patient safety climate will help focus attention on effective efforts to promote patient safety in dental healthcare environments.

Materials and methods

Setting

In total, there are more than 170 hospitals and 6200 clinics located in the six administrative divisions of Taiwan according to the classification by Bureau of National Health Insurance: Taipei, Northern, Central, Southern, Kaoping, and Eastern Divisions. We used a stratified sampling method to randomly proportionally select 20 hospitals and 40 clinics from each of the six divisions. A multistage stratified sampling scheme was used to obtain a nationally representative sample which has been used for several published studies.\(^16\)\(^17\)

Data collection

We mailed the SAQ-C which measures the patient safety climate among dental healthcare workers to the selected 20 hospitals and 40 clinics. The SAQ has been widely used in several countries\(^18\)\(^19\)\(^20\) and was translated into a Chinese version.\(^21\) Dental healthcare workers who had worked in their facility for at least 1 month were invited to participate in the survey on a voluntary basis. We called the selected facilities and asked them to return the completed questionnaires after 2 weeks. We mailed questionnaires again if the facilities reported not receiving them or had misplaced them.

The SAQ-C is comprised of 32 items and reflects five dimensions of patient safety culture: teamwork climate, safety climate, job satisfaction, perception of management, and working conditions. All patient safety items used a five-point Likert response scale: strongly disagree, slightly disagree, neither agree nor disagree, slightly agree, and strongly agree. The second section of the survey collected demographic information that supposedly affects attitudes toward patient safety. The demographic information included gender, age, level of education, occupation, level of position, job status, place of work, days of work per week, years in the facility, and whether or not the worker usually had direct contact with patients. The study protocol was reviewed and approved by the institutional review board of Taipei Medical University Hospital. Written informed consent was obtained from all participants.

Statistical analysis

Since the SAQ-C contains both positively and negatively worded items, the latter were reverse-scored so that a higher score always indicated a more-positive perception of the item. Responses to SAQ-C items on the five-point Likert scale were converted to scale scores as follows: strongly disagree = 0; slightly disagree = 25; neither agree nor disagree = 50; slightly agree = 75; and strongly agree = 100. A mean score of ≥75 on the SAQ-C was defined as having a “positive safety attitude”. Frequencies and percentages were used to describe the demographic information of participants.

For each dimension, the mean and standard deviation of the SAQ-C score were calculated. A one-way analysis of variance (ANOVA) was used to compare mean SAQ-C scores across demographic factors for the five dimensions. Univariate and multivariate logistic regression analyses were used to identify factors that supposedly influenced positive safety attitudes. The odds ratio (OR) and 95% confidence interval (CI) were estimated from the logistic regression model. Statistical significance was defined as \(p < 0.05\). All statistical analyses were performed using SPSS vers. 17.0 (SPSS, Chicago, IL, USA).

Results

Of the 309 participants, 228 (73.8%) were female and 200 (64.7%) were working in hospitals. As shown in Table 1, 46.6% of participants worked more than 5 days per week. Most participants were full-time workers (88.0%) and had graduated from college (73.5%). Only 14.2% of participants reported having a supervisory position. About half of participants were dentists (53.1%), and the majority of participants (89.3%) usually had direct contact with patients.

The main results of the SAQ-C scores among dental healthcare workers are presented in Table 2. The means with standard deviations were 76.3 ± 15.9 for SAQ-C, 78.9 ± 16.3 for teamwork climate, 75.7 ± 15.7 for safety...
climatic, 78.7 ± 19.9 for job satisfaction, 75.0 ± 18.3 for perception of management, and 72.9 ± 20.1 for working conditions. Overall, the mean SAQ-C scores significantly differed in several factors, such as gender, age, occupation, level of position, and place of work. Similar results were also demonstrated within each safety dimension. However, the mean scores of job satisfaction and working conditions did not significantly differ between males and females. The mean scores of perception of management and working conditions did not significantly differ for occupation or level of position.

Positive safety attitudes were detected in 172 out of 309 participants (55.7%). Factors associated with positive safety attitudes were examined by a logistic regression model, and results are given in Table 3. Participants aged 31–35 years and >35 years were more likely to have positive safety attitudes (OR, 2.43, 95% CI, 1.25–4.71; OR, 2.79, 95% CI, 1.64–4.75, respectively), as were those working in clinics (OR, 2.07, 95% CI, 1.27–3.36). Having more than 10 years in a facility was also identified as a factor associated with positive safety attitudes (OR, 2.39, 95% CI, 1.14–5.00). Those in non-supervisory roles were found to have less-positive safety attitudes (OR, 0.37, 95% CI, 0.18–0.76). The multivariate analyses identified two significant factors associated with positive safety attitude: age and place of work.

Discussion

This study provides an overall assessment of the patient safety climate among dental healthcare workers using the SAQ-C. To date, this is the first nationwide study focusing on patient safety attitudes of dental healthcare workers in hospitals and clinics. Similarly, Leong et al. measured attitudes towards patient safety among dental faculties, working in clinics of seven US dental schools, using a survey instrument developed by the US Agency for Healthcare Research and Quality (AHRQ). We found that the mean SAQ-C scores were significantly higher in workers who were male, an older age, dentists, supervisors, and working in clinics. In addition, our results suggested that the age, level of position, place of work, and years in the facility were associated with dental healthcare workers having positive attitudes towards patient safety.

Our results indicated that the mean scores for SAQ-C, teamwork climate, safety climate, job satisfaction, perception of management, and working conditions were higher than reports of pediatric surgical intensive care units. Our findings were also higher than reports of pediatric surgical intensive caregiving for which the mean scores for teamwork climate, safety climate, job satisfaction, perception of management, and working conditions were 69.1, 70.9, 55.3, and 55.6 in a Dutch pediatric surgical intensive care units.

Comparing our scores with Swedish community pharmacists, the dental healthcare workers rated higher only for perception of management and rated lower for teamwork climate, safety climate, job satisfaction, and working conditions.

Our findings, that the mean SAQ-C scores were significantly higher in workers who were male, an older age, dentists, supervisors, and working in clinics, were consistent with previously published studies. Gender being associated with differences in all domains of SAQ-C found in our study was also comparable to another study in which males performed better than females in teamwork climate, job
Our data also suggest that dental healthcare workers aged 31–35 years and >35 years were more likely to have positive safety attitudes (OR, 2.43; 95% CI, 1.25–4.71; OR, 2.79; 95% CI, 1.64–4.75, respectively). This result is similar to the age-associated differences in perceptions of the patient safety climate found in maternity units of midwives aged >35 years old who produced a better safety climate than midwives aged <35 years.12

Our observation that working for more than 10 years in a facility was associated with a positive safety attitude (OR,
2.39, 95% CI, 1.14–5.00) is in accordance with a prior report. The more-experienced group of midwives was found to have higher scores in the teamwork and safety climate domains than less-experienced midwives. The result emphasizes the need to improve the safety climate to enhance positive attitudes toward patient safety for less-experienced dental healthcare workers.

To our knowledge, this is the first nationwide population-based study on the patient safety climate among dental healthcare workers. However, our findings should be interpreted with caution due to a few limitations. The first limitation of this study is that we were unable to examine the association between SAQ-C scores and the risk of healthcare-related injuries or harm to patients. Second, we measured SAQ-C scores and present patient safety attitudes, but gaps between attitudes and actual practice behaviors toward patient safety may exist. Despite these limitations and due to the lack of research in the dental area, our study provides important information on patient safety attitudes of dental healthcare workers.

The results from the study can be used to understand the current status of patient safety culture in dental healthcare organizations and help raise dental healthcare workers awareness of patient safety. Most notably, the study identified several factors associated with positive attitudes toward patient safety in dental healthcare workers. The information can be used to guide interventions toward promoting improvements in patient safety. Further study is needed to examine the association between the SAQ-C scores and patient outcomes in the dental field.

### References

1. Makeham MA, Kidd MR, Saltman DC, et al. The Threats to Australian Patient Safety (TAPS) study: incidence of reported errors in general practice. Med J Aust 2006;185:95–8.
2. Kirch DG, Boysen PG. Changing the culture in medical education to teach patient safety. Health Aff (Millwood) 2010;29:1600–4.
3. Woods DM, Thomas EJ, Holl JL, Weiss KB, Brennan TA. Ambulatory care adverse events and preventable adverse events leading to a hospital admission. *Qual Saf Health Care* 2007;16:127–31.

4. Classen DC, Pestotnik SL, Evans RS, Lloyd JF, Burke JP. Adverse drug events in hospitalized patients. Excess length of stay, extra costs, and attributable mortality. *JAMA* 1997;277:301–6.

5. Chicka MC, Dembo JB, Mathu-Muju KR, Nash DA, Bush HM. Adverse events during pediatric dental anesthesia and sedation: a review of closed malpractice insurance claims. *Pediatr Dent* 2012;34:231–8.

6. van Noort R, Gjerdet NR, Schedle A, Björkman L, Berglund A. An overview of the current status of national reporting systems for adverse reactions to dental materials. *J Dent* 2004;32:351–8.

7. Bates DW, Spell N, Cullen DJ, et al. The costs of adverse drug events in hospitalized patients. Adverse drug events prevention study group. *JAMA* 1997;277:307–11.

8. Zegers M, de Bruijne MC, Wagner C, et al. Adverse events and potentially preventable deaths in Dutch hospitals: results of a retrospective patient record review study. *Qual Saf Health Care* 2009;18:297–302.

9. Nieva VF, Sorra J. Safety culture measurement: a tool for improving patient safety in healthcare organizations. *Qual Saf Health Care* 2003;(Suppl. 2):i17–23.

10. Bonney E, Baker GR. Current strategies to improve patient safety in Canada: an overview of federal and provincial initiatives. *Healthc Q* 2004;7:36–41.

11. Zwart DL, Langelaan M, van de Vooren RC, et al. Patient safety culture measurement in general practice. Clinimetric properties of 'SCOPE'. *BMC Fam Pract* 2011;12:117.

12. Raftopoulos V, Savva N, Papadopoulou M. Safety culture in the maternity units: a census survey using the safety attitudes questionnaire. *BMC Health Serv Res* 2011;11:238.

13. Norden-Hägg A, Sexton JB, Kälvermark-Sporrong S, Ring L, Kettis-Lindblad A. Assessing safety culture in pharmacies: the psychometric validation of the Safety Attitudes Questionnaire (SAQ) in a national sample of community pharmacies in Sweden. *BMC Clin Pharmacol* 2010;10:8.

14. Etherton-Beer C, Venturato L, Horner B. Organisational culture in residential aged care facilities: a cross-sectional observational study. *PloS One* 2013;8:e58002.

15. Leong P, Afrow J, Weber HP, Howell H. Attitudes toward patient safety standards in U.S. dental schools: a pilot study. *J Dent Educ* 2008;72:431–7.

16. Pan WH, Yeh WT, Chang HY, Hwu CM, Ho LT. Prevalence and awareness of diabetes and mean fasting glucose by age, sex, and region: results from the Nutrition and Health Survey in Taiwan, 1993–1996. *Diabet Med* 2003;20:182–5.

17. Cheng HC, Su CY, Yen AM, Huang CF. Factors affecting occupational exposure to needlestick and sharps injuries among dentists in Taiwan: a nationwide survey. *PloS One* 2012;7:e34911.

18. Modak I, Sexton JB, Lux TR, Helmreich RL, Thomas EJ. Measuring safety culture in the ambulatory setting: the safety attitudes questionnaire ambulatory version. *J Gen Intern Med* 2007;22:1–5.

19. Hutchinson A, Cooper KL, Dean JE, et al. Use of a safety climate questionnaire in UK health care: factor structure, reliability and usability. *Qual Saf Health Care* 2006;15:347–53.

20. Deilkas ET, Hofoss D. Psychometric properties of the Norwegian version of the safety attitudes questionnaire (SAQ), Generic version (Short Form 2006). *BMC Health Serv Res* 2008;8:91.

21. Lee WC, Wung HY, Liao HH, et al. Hospital safety culture in Taiwan: a nationwide survey using Chinese version safety attitude questionnaire. *BMC Health Serv Res* 2010;10:234.

22. Pooley MJ, van der Starre C, van den Bos A, van Dijk M, Tibboel D. Patient safety culture in a Dutch pediatric surgical intensive care unit: an evaluation using the safety attitudes questionnaire. *Pediatr Crit Care Med* 2011;12:e310–6.

23. Carney BT, Mills PD, Bagian JP, Weeks WB. Sex differences in operating room care giver perceptions of patient safety: a pilot study from the veterans health administration medical team training program. *Qual Saf Health Care* 2010;19:128–31.

24. Huang DT, Clermont G, Sexton JB, et al. Perceptions of safety culture vary across the intensive care units of a single institution. *Crit Care Med* 2007;35:165–76.