Author's response to reviews

Title: Hospital Safety Culture in Taiwan: A Nationwide Survey Using Chinese Version Safety Attitude Questionnaire

Authors:

Wui-Chiang Lee (wclee@vghtpe.gov.tw)
Hwei-Ying Wung (c_wung05@tjcha.org.tw)
Hsun-Hsiang Liao (shing@tjcha.org.tw)
Chien-Ming Lo (chienming@tjcha.org.tw)
Fei-Ling Chang (feiling@tjcha.org.tw)
Pa-Chun Wang (drtony@tpts4.seed.net.tw)
Angela Fan (fan_angela@hotmail.com)
Hsin-Hsin Chen (hsin412@gmail.com)
Han-Chuan Yang (yanghc@asia.edu.tw)
Sheng-Mou Hou (shengmou@ntuh.gov.tw)

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Author's response to reviews: see over
June 29, 2010

Dr. Melissa Norton  
The Editor-in-Chief  
*BMC Health Services Research*  
BioMed Central Ltd,  
Middlesex House,  
34-42 Cleveland Street,  
London W1T 4LB, UK.

Dear Dr. Norton:

Please find the revised manuscript entitled “Hospital Safety Culture in Taiwan: A Nationwide Survey Using Chinese Version Safety Attitude Questionnaire.” It is re-submitted to the *BMC Health Service Research* journal for possible publication.

The original manuscript has been revised appropriately, addressing three referees’ concerns and suggestions. The authors use the “tracking changes” functions of *Microsoft Word 2003* software and highlight all changes made when revising the manuscript. The revised manuscript conforms to the journal style. Professional English proofreading were carried out appropriately.

There is no interest conflict to any other organization. All listed authors have seen and approved for the final manuscript, and concurred in submission. On behalf of the Taiwan Joint Commission on Hospital Accreditation and the study taskforce of Taiwan Patient Safety Culture Survey, I sincerely appreciate for your great help.

Please address all correspondence regarding this manuscript to:  
Dr. Wui-Chiang Lee, MD, PhD, MHS  
Department of Medical Affairs and Planning, Taipei Veterans General Hospital  
#201, Sec. 2, Shih-Pai Road, Taipei 11217, Republic of China (Taiwan)  
Email: wclee@vghtpe.gov.tw

Yours sincerely,

Dr. Wui-Chiang Lee
Point-by-point responses to the editors and all referees

To the first referee Professor Andrew Symon:

1. **Question**: The first concern is the number of hospitals not participating in the survey.
   **Answer**: There were 528 hospitals all around the Taiwan area in 2008, and 37.8% (200/528) hospitals participated in the survey. Those who did not take part in the survey were mainly small-scale district hospitals. Because the participation was voluntary, the taskforce could not study the reasons of the non-participants. In the Focus Group after the survey, we acknowledged that one of the explanations was that small hospitals did not have the infrastructure and manpower to process the administration of the SAQ. Even though we have collected as many as 45,242 questionnaires from 37% of all hospitals, the study results were not based on a systemic sampling design and thus the study results represent the safety culture of middle and large-scale hospitals mainly. We address this potential bias in external validity in the “Limitation” section (page 15).

2. **Question**: The response rates of different occupational groups.
   **Answers**: The mean response rate was 69.4% (from 52.3% to 86.1%). On average, nurses had the highest response rate (72.4%), followed by technicians (69.5%), pharmacists (67.2%), administration workers (63.8%), and other staffs (60.8%). Physicians had the lowest response rate 56.1%. These have been added on the Result section (page 10).

3. **Question**: the statement of “to develop a valid safety culture survey instrument in Chinese…” in the Background section.
   **Answer**: the authors appreciate the kind remind. Under authorization we translated the English version SAQ to Chinese, the SAQ-C. As mentioned in the Methodology section, the SAQ-C has been tested in one medical center. The aim of this study was to verify the psychometric properties of the SAQ-C across many hospitals and to figure out the hospital safety culture using the valid instrument. The authors revise the inappropriate descriptions (page 5).

4. **Question**: the removal of the “Stress Recognition” dimension.
   **Answers**: A pilot validity study using the SAQ-C was conducted at an academic medical center in Taipei, Taiwan [reference: Lee WC et al. Validation study of the Chinese safety attitude questionnaire in Taiwan (in Chinese). Taiwan J Public Health 2008;27:6-15.17]. Using the structural equation model (AMOS 5.0), we
found that the association between “Stress Recognition” and “safety culture” was quite weak than the other five dimensions (figure below). Removing this dimension did not alter model fitness. We discussed this finding with Dr. Bryan Sexton, the developer of the SAQ, and he also got similar message from the other studies using the SAQ in the other countries. It is possible that the SAQ was originated from the FMAQ for avian safety culture survey. Most of the pilots and crew staffs would deny that stress will influence their performance; however, almost all health care personnel agree that stress will influence their clinical performance. Because nearly all respondents gave the same score (agree strongly) to the questions, this dimension cannot distinguish the difference in safety culture. The authors addressed the reasons of removing the Stress Recognition in the previous paper which was cited (Lee et al. 2008). The international comparison was usually by dimension, such as Teamwork climate, Working condition, etc.

5. **Question**: the fifth concern is if Likert scales were also applied to the extra items measuring staff’s perception of collaboration in their working experience.

   **Answers**: Yes, the core and extra items are all measured using the same 5-scale Likert scales. We clarify that in the methodology section (page 7).

6. **Question**: the Abstract states that the survey was carried out in 2007 and 2008; however, on page 8 it is stated that the survey was carried out in May to June 2008.

   **Answers**: the initiation of the survey and the linguistic translation of the SAQ were in 2007. The nationwide survey was in 2008. To avoid confuse, we delete the “2007” in the Abstract.

7. **Question**: the collaboration perception was not compared between “with” and “without” nurses.
Answers: All occupational groups were calculated when we examined the percentage of healthcare personnel of a given hospital who had positive attitudes to nurses, physicians, and pharmacists, respectively (Table 3). If we did not count the 29,357 nurses (64.9% of all respondents), the percentage of positive attitudes to nurses was decreased (68.9±16.8 vs. 71.1±10.5%). This means that more nurses than the other occupation staffs felt good collaboration with the other nurses. On the other hand, fewer nurses than the other occupation groups felt good collaboration with physicians and pharmacists because the percentage of positive attitudes to physicians (66.3±17.5 vs. 60.0±13.4%) and pharmacists (62.9±18.2 vs. 52.4±16.0) were significantly increased if nurses were not counted. The potential influence of the skewed occupational groups are enhanced in the Discussion section (page 14).

8. **Question:** to get the range of scores among the hospitals.
   **Answers:** The range of score of each dimension was the highest for “Perception of management” (78.2%), followed by “Job satisfaction” (72.2%), “Working conditions” (68.0%), “Teamwork climate” (65.1%), and “Safety climate” (60.4%). These statistics have been added on the Result section (page 9 to 10). Their implications are added in the Discussion section (page 12).

9. **Question:** to address some consideration of the possibility of bias, either from a skewed sample of hospitals, or a skewed sample of occupational groups.
   **Answers:** Because systemic sampling design was not used in this study, there were skewed sample of hospitals (large and middle-scale hospitals) and occupational groups (nurses). Their influences to the external validity are enhanced in the Discussion section (page 15).
To the second referee Professor Jane Sandall

1. **Question:** to address the difference between safety culture and safety climate? What concept the SAQ is measuring?

   **Answers:** There has been a quite debate in terms of the differences between “safety culture” and “safety climate”. Guldenmund et al. summaries the commonly used working definitions for each of them (*Guldenmund F.W., The Nature of Safety Culture: A Review of Theory and Research. Safety Science, 2000. 34: p. 215-257*). If fact, only the outward expression of a safety culture of an organization can be assessed using psychometric questionnaires that measure collective attitudes of personnel within the organization. Therefore, the aim of this study, as well as previous studies using the psychometric questionnaires, was to measure the safety climate of the organization. We clarify this point in the Background (page 5)

<table>
<thead>
<tr>
<th>Table 1. the working definitions of “safety culture” commonly used</th>
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<tbody>
<tr>
<td>1. Safety culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, and an overriding priority, nuclear plant safety issues receive the attention warranted by their significance. <em>International Safety Advisory Group (1991)</em></td>
</tr>
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<td>2. The set of beliefs, norms, attitudes, roles, and social and technical practices that are concerned with minimizing the exposure of employees, managers, customers and members of the public to conditions considered dangerous or injurious. <em>Pidgeon (1991)</em></td>
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<tr>
<td>3. The concept that the organization's beliefs and attitudes, manifested in actions, policies, and procedures, affect its safety performed. <em>Ostrom et al. (1993)</em></td>
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<td>4. In a total safety culture (TSC), everyone feels responsible for safety and pursues it on a daily basis. <em>Geller (1994)</em></td>
</tr>
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<td>5. The collective mental programming towards safety of a group of organization members. <em>Berends (1996)</em></td>
</tr>
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<td>6. The safety culture of an organization is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, and organization's health and safety Management. <em>Lee (1996)</em></td>
</tr>
<tr>
<td>7. Safety cultures reflect the attitudes, beliefs, perceptions, and values that employees share in relation to safety. <em>Cox and Cox (1991)</em></td>
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<table>
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<tr>
<th>Table 2. the working definitions of “safety climate” commonly used</th>
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<tr>
<td>1. A summary of molar perceptions that employees share about their work environments. <em>Zohar (1980)</em></td>
</tr>
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</table>
### Question 2
Comparing the results to that of the US? What current evidence exists regarding culture and specific aspects of safety.

**Answers:** The international standard of acceptable hospital safety culture in each SAQ dimension was 60%. We highlight that the average positive perceptions on a national basis was below this standard in the Discussion section. We did not compare the results to any country given the differences in background, study design, sampling, settings (different units), and occupations.

Accumulating evidence from previous studies supports the relationship between mature safety culture and patient safety, and improving a healthcare organization’s safety culture is linked to improved patient outcomes. A well-developed patient safety culture, as measured by the SAQ, has been shown to correlate with fewer medication errors, lower ventilator associated pneumonia rates, fewer bloodstream infections in intensive care units, and shorter ICU lengths of stay (references: Pronovost PJ, et al. Jt Comm J Qual Saf 2004; Pronovost PJ et al. Joint Commission journal on quality and patient safety / Joint Commission Resources. 2006; Sexton JB et al. J Perinatol 2006; and Pronovost P et al. N Engl J Med 2006). Such a relationship has not been proved in Taiwan, but we are collecting the clinical outcome information and conducting the analysis.

### Question 3
The SAQ validation papers and the SAQ websites were not referenced.
4. **Question:** Are the methods appropriate and well described?
**Answers:** It is quite difficult to conduct a nationwide hospital-based safety culture survey with restrained budget, manpower, and timeframe. We believe that the methodology used in this survey is appropriate. As in the Acknowledgement section, we appreciate Dr. Bryan Sexton, the original developer of the SAQ, who came to Taiwan and mentored the taskforce of the survey administration, scoring system, and interpretation. The limitations of the study design are discussed in the Discussion section.

5. **Question:** add strengths and limitations of existing questionnaires, and how the SAQ is different.
**Answers:** A few psychometric instruments are available to measure organizational patient safety climate, and their strengths and limitations have been widely reviewed. Colla et al. (*Qual Saf Health Care, 2005*) compared 9 most commonly used instruments. All the existing instruments used Likert scales, mostly to measure attitudes of individuals with five common dimensions of patient safety climate: leadership, policies and procedures, staffing, communication, and reporting. The strengths of these tools varied, but only the Safety Attitudes Questionnaire (SAQ) has been used to evaluate the association between organizational climate and patient outcomes. Favorable scores on four out of six dimensions of the SAQ were associated with lower nurse turnover rate, shorter lengths of stay, fewer medication errors, lower ventilator associated pneumonia, and lower bloodstream infection rates (*official citation: Sexton JB, Thomas EJ. The Safety Climate Survey: Psychometric and Benchmarking Properties. Technical Report 03-03, The University of Texas Center of Excellence for Patient Safety Research and Practice (AHRQ grant # 1PO1HS1154401 and U18HS1116401).* We enhanced the strengths and limitations of the existing questionnaires and the difference of the SAQ (page 5-6).

6. **Question:** add a reference for back-translation (page 6).
**Answer:** A reference is added (Sperber AD: Translation and validation of study instruments for cross-culture research. Gastroenterology 2004,126:S124-S128.)

7. **Question:** confirm that scoring methodology is same as that used by SAQ team (page 8).
**Answers:** We are 100% sure that the scoring system is the same as that used by SAQ team. The SAQ team leader, Dr. Bryan Sexton, came to Taiwan and instructed the taskforce using the same scoring and calculating system as his own
8. **Question:** There could be more discussion about the potential use for the tool.  
**Answers:** we add more discussion about the potential use for the SAQ tool in Taiwan in the Discussion section (page 13-14).
To referee three Professor Carl J Lombard

1. **Question:** the error in Abstract in terms of the year 2007.
   **Answer:** we correct the error in the Abstract. The main part of the survey was in 2008 (as stated in page 8). The preparation of the survey, including the Chinese translation, was in 2007.

2. **Question:** the word “survey” instead of “questionnaire” in the Abstract and text.
   **Answer:** we correct the words and use “questionnaire” throughout the whole manuscript.

3. **Question:** the introduction of the participating and non-participating hospitals.
   **Answer:** There were totally 528 hospitals in Taiwan 2008, including 20 large-scale medical centers providing tertiary care (usually 1000 beds or more), 77 middle-scale regional hospitals (usually 400 to 1000 beds), and 431 small-scale district hospitals (like the community hospitals in US). The 200 participating hospitals were 20/20 (100%) large-scale, 57/77 (74%) middle-scale, and 123/528 (28%) small-scale hospitals. Potential bias of the study results existed given a large share of the respondents was from large and middle-scale hospitals. We enhance the description of the target population in the Results section (page 10) and its potential influence in the Discussion section (page 15).

4. **Question:** the concern on individual respondent’s informed consent of the survey.
   **Answers:** hospital-level informed consent was needed. Healthcare workers of the participating hospitals could take part in the survey completely voluntary. No personal identification number was recorded, and the privacy of the respondent was fully protected. This statement is on the cover page of the questionnaire. Healthcare worker returned the unanswered SAQ to the hospital coordinators if he or she was not willing to answer after reading the cover page. There is no need to sign the individual-level informed consent.

5. **Question:** Did each participant complete his/her own questionnaire? Was this complete at home or at work? Did they have to return it to the hospital administrator or did they post it to the TJCHA?
   **Answer:** Each participant completed his or her own questionnaire at work unit of the hospital. They returned the questionnaire to the administrator of the hospital. The administrator collected the answered questionnaire and filled out a form recording the number of total delivered questionnaire, including the respondent and non-respondent SAQ. All questionnaire were sealed in a specific large envelop and then mailed to the TJCHA taskforce. The questionnaire was
interpreted by a specially designed optical character-recognition system. We enhance the aforementioned in the Method section (page 8).

6. **Question:** the processes of respondents’ completeness of the questionnaire  
   **Answer:** we enhanced the processes in the Methods section (page 8)

7. **Question:** the ordinal description of the questions on the SAQ-C.  
   **Answer:** The detail descriptions of all core items in English and Chinese are shown in Additional file.

8. **Question:** the confirmatory factor analysis was done at the individual level data which is fine.  
   **Answer:** thanks for the positive and encouraging comments.

9. **Question:** the distribution of SAQ-C scores across hospitals are better displayed by histograms or boxplots.  
   **Answers:** because there are 200 hospitals and the graphs would be too crowd to read if histograms or boxplots were used. We used mean and standard deviation in all statistic figures and to be consistent with previous SAQ studies.

10. **Question:** the concern of an ecological bias analysis and to conduct multi-level analysis.  
    **Answers:** As referee’s kind remind and suggestion, we re-analyze the association between SAQ and safety behavior using individual as the unit of analysis (page 9). Generalizing estimation equation methods were used and the results are displayed in a new Table 4 (page 26).

11. **Question:** Grammar error on page 7 line 2.  
    **Answer:** we correct the grammar errors. Thanks.

12. **Question:** the statement of sufficient external validity and why proper sampling design was not considered.  
    **Answers:** This study was sponsored by the Department of Health. The focus of the nationwide survey using a valid questionnaire was to figure out the status quo of hospital patient safety culture in Taiwan. Because the taskforce feedback the survey results to the participating hospitals, more hospitals than our expectation (120) took part in the study, especially the large-scale medical centers and regional hospitals. To introduce and facilitate the use of safety culture survey, the TJCHA decided to accept all hospitals. The potential bias from the non-systematic sampling and skewed target groups is enhanced in the Discussion section.

13. **Question:** What does the statement “hospital leaders were willing to participate in the survey” mean in view of the fact that 7.4% of the respondents were managers?  
    **Answers:** Hospital leaders usually mean the superintendent of the hospital. One hospital has one leader (superintendent). Two-hundred of all 528 hospital leaders agreed to participate to the safety culture survey. In this study, managers are the
leaders of different working units of the hospital. For example, there are nursing managers (or the head nurse), physician managers (usually the Director of the department), and technician managers, etc. at different units. Because the safety climate perception between managers and non-managers was not the focus of this study, and to avoid confusion, we delete the description of manager/non-manager in Table 1. We use “superintendent” to replace “leader” on page 8.