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Patient safety culture assessment in Iran using the "Hospital survey on patient safety culture" tool: A systematic review and meta-analysis

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Abstract

Background:

Paying attention to patient safety is a crucial aspect of the healthcare provision delivery. Integrating and coordinating the different parts of the health system can ensure a safe, highquality and efficient care. Patient safety culture (PSC) is a broad, complex and multi-dimensional conceptual framework. In recent years, several studies have been conducted to evaluate PSC using the "Hospital Survey on Patient Safety Culture" (HSOPSC) tool. The aim of this study was to examine the level of PSC in Iranian hospitals.

Methods:

ISI/Web of Sciences (WoS), PubMed/MEDLINE, Embase, CINAHL, PsychINFO and Scopus as well as Iranian databases including MagIran and SID were searched from January 2000 to July 2018. The Newcastle-Ottawa Scale checklist was used to assess the quality of the studies. The mean score of the participants' responses for each dimension of the questionnaire was calculated using the DerSimonian-Laird's random model with a 95% confidence interval.

Results:

In the current systematic review and meta-analysis, 27 studies conducted between 2012 and 2017 were included. The participants were 9,264. Low scores (in the range 37.79-65.43) were found, especially when compared to other countries such as Lebanon, Turkey and the USA.

Conclusion:

Our results showed that in Iran the level of PSC is low and requires special attention from healthcare managers and providers. PSC should be a very important priority in Iran's health sector. Health decision- and policy-makers should pay particular attention to offering training programs to promote and develop PSC.

Keywords: Patient safety culture, Iran, hospital survey on patient safety culture, systematic review, meta-analysis

Background

Paying attention to patient safety is a crucial aspect of the healthcare provision delivery. Nowadays, in advanced countries, measuring this indicator is of high interest for the healthcare providers to make evidence-based decision and implement adequate plans and programs ¹. Properly integrating and coordinating the different parts of the health system can ensure a safe, efficient and high-quality healthcare ². Patient safety culture (PSC) is a broad, complex and multi-dimensional conceptual framework ³, which enables to assess the behavior of individuals and organizations based on shared beliefs and values. The ultimate goal of PSC is to reduce injuries and increase patient safety ⁴. In presence of high safety standards, errors are less likely to occur, and, when they occur, are promptly reported ^{5,6}.

Deaths due to unwanted but avoidable accidents has led hospital managers to consider PSC as their top priority ^{7, 8}. Different healthcare organizations, including hospitals and other healthcare centers, are working to provide an appropriate assessment of PSC in order to improve patient safety-related procedures ⁹. Unfortunately, despite the relevant damage caused by insecure care, there is little evidence of the role and effect of PSC in developing countries, and therefore, these countries do not have a good understanding of the patient's safety status in their hospitals ^{10, 11}.

The "Hospital Survey on Patient Safety Culture" (HSOPSC) developed by the Agency for Healthcare Research and Quality (AHRQ) can be used to assess PSC ¹². HSOPSC is a validated, reliable tool, which comprises of 12 dimensions and 42 questions. It is psychometrically sound, and confirmed by extensive analyses including item analysis, reliability assessment, intercorrelation, exploratory and confirmatory factor analysis ¹³⁻¹⁵. This tool has been translated into different languages and is used in several countries. It can help healthcare managers, policy- and decision-makers design *ad hoc* interventions and measures.

Iran is one of the developing countries that offers widespread hospital services, whose safety levels and standards need to be monitored by healthcare decision- and policy-makers, in order to improve and enhance the level of PSC in the country. In recent years, several studies have been conducted to evaluate PSC utilizing the HSOPSC tool. The aim of this study was to examine the level of PSC in Iranian hospitals through a systematic review and meta-analysis of the published investigations.

Methods

Search strategy

The present study was based on the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA) guidelines ¹⁶, reported in **Appendix 1**. International scholarly databases such as ISI/Web of Sciences (WoS), PubMed/MEDLINE, Embase, CINAHL, PsychINFO and Scopus as well as Iranian databases including MagIran and SID were searched from January 2000 to July 2018. The following search strategy was used: ("Patients safety culture" OR "Patient culture" OR "PSC" OR "Patient safety" OR "Safety" OR "Hospital safety" OR "Safety climate" OR "Hospital survey") AND ("Hospital" OR "Government hospital" OR

"Private hospital" OR "Teaching hospital") AND ("Hospital Survey on Patient Safety Culture" OR "HSOPSC") AND ("Iran"). Also, each reference list of the included studies was hand-searched for getting more relevant studies and reducing the risk of missing potentially eligible investigations.

Inclusion and exclusion criteria

We included studies that: i) used the HSOPSC tool for PSC evaluation, ii) were published either in Persian or English, and iii) were conducted in hospitals. We excluded studies that: i) used a tool other than HSOPSC, ii) were carried out outside of hospitals and healthcare centers and iii) did not fully report the 12 dimensions of the instrument.

Data extraction

Two authors independently extracted relevant study data and information, including the surname name of the first author, the year of publication, the city of the study, the number and type of participants, and the scores for the items in the questionnaire. Disagreements between the two authors were resolved through discussion.

Quality assessment

The Newcastle-Ottawa Scale (NOS) checklist was used to critically appraise the quality of the retained studies. This checklist assesses 3 domains (namely, selection, comparability and outcomes). Evaluation of the quality of studies is reported in the **Appendix 2**.

Data analysis

The mean score of the participants' responses for each dimension of the questionnaire was calculated using the DerSimonian-Laird's random model with a 95% confidence interval (CI)¹⁷. To evaluate heterogeneity among included studies, I² test was used ¹⁸. Egger's linear regression test was used to evaluate the publication bias ¹⁹. Sensitivity analysis was also performed to ensure the stability of the results for all the dimensions of the questionnaire ²⁰. All statistical significances were set at p-values less than 0.05. All data were analyzed using the commercial software STATA Ver.14 (Stata Corp, College Station, TX, USA).

Results

The process of searching and selecting proper studies is pictorially represented in **Figure 1**. In the initial search, 176 studies were found and, after the removal of duplicates, 97 of them were retained. At this stage, 35 studies were selected based on title and/or abstract review and the removal of irrelevant studies. The full text of these 35 studies was reviewed in depth and, in the end, 27 studies were deemed eligible for inclusion in the present systematic review and meta-analysis $^{21-47}$.

Studies were conducted between 2012 and 2017. Participants were 9,264. The main characteristics of the selected studies are shown in **Table 1**.

The mean of the responses of the 12 dimensions of the HSPSC tool is given in **Table 2** and **Appendix 3**. More in detail, higher scores were reported for the dimension of "organizational learning and continuous improvement" (mean 65.43), whereas lower scores for the dimension of "non-punitive response to error" (mean 37.79).

Sensitivity-analysis was performed. Before and after the sensitivity analysis, results did not change and confirmed the stability of the findings. Publication bias assessment was also performed by the Egger's linear regression test, and results showed that there was no evidence of publication bias. The results of the 12 dimensions of this tool in Iran, compared to other countries such as the USA ⁴⁸, Lebanon ⁴⁹, Ethiopia ⁵⁰ and Turkey ⁵¹, are presented in **Figure 2**. The mean of reporting events in the included studies is shown in **Table 3**. The results of mean of reporting events in Iran, compared to other countries like the USA ⁴⁸, Lebanon ⁴⁹, and Ethiopia ⁵⁰, are presented in **Figure 3**. The mean of graded responses is reported in **Table 4**. These results compared to other countries like the USA ⁴⁸, Lebanon ⁴⁹, Ethiopia ⁵⁰ and Turkey ⁵¹ are shown in **Figure 4**.

Discussion

One of the challenges faced by the healthcare sectors and systems in both developed and developing countries is to increase the level of PSC. Health service providers are trying to create a good environment for the staff in order to make them properly understand and apply this crucial concept ⁵². Assessing the status of PSC helps the organization become aware of the different aspects of patient safety that require serious attention. It also enables hospitals and healthcare providers to identify the strengths and weaknesses of their organizational culture in terms of patient safety and existing problems in this area ⁴⁹. Health policy- and decision-makers in Iran should work to create a just and proper culture in the workplace and encourage healthcare workers to report incidents, events and mistakes. Health policy- and decision-makers need to consider PSC as a serious concern and to try to correct the culture of blame and punishment. They should encourage organizations to continually improve PSC-related processes and procedures.

Our results showed that the means of the responses for the different dimensions of the questionnaire ranged from 37.79 to 65.43. The dimension's scores measured in this study are low compared to the results of studies conducted in other countries, such as the USA, Lebanon and Turkey, which emphasizes that the concepts of PSC are unknown to many Iranian hospitals' staff members and managers.

Our findings concerning mean scores of the non-punitive response to error dimension are consistent with Al Ahmadi's study in Saudi Arabia ⁵³, Chen's study in Taiwan ⁵⁴ and Al-Mandhari's study in Oman ⁵⁵. Non-punitive response to error is a very important factor that enables errors to be early detected and reported, contributing to their decreasing trend ⁵⁶. Many Iranian staff members in hospitals tend to under-report errors, being afraid of the consequences and being worried about punitive policies ⁵⁷. In many Iranian health service centers, punishing workers who commit mistakes is considered the easiest option by managers

and providers, without paying attention to the root causes of errors. It seems to be a major challenge in organizations such as hospitals to promote a continuous learning and promotion environment. A systematic approach in dealing with errors in organizations can create a positive safety culture that discourages managers from taking punitive action ⁵⁸. For this reason, the American health association has recommended that organizations should reject punitive culture, putting aside mistakes caused by personnel and individual failures, and transforming mistakes in learning opportunities.

The highest level of accountability in this study regards the organizational learning and continuous improvement dimension, which is consistent with the studies done in Saudi Arabia ⁵³, Lebanon ⁴⁹ and Oman ⁵⁵.

Improving PSC requires the development of adequate training programs focused on the concepts of PSC to instruct all the staff members of an organization. Furthermore, this process should be performed on a regular basis, in order to be properly monitored and improved. Organizations that provide ongoing training on this issue for their employees are, indeed, successful and with a very low rate of errors and mistakes. Accreditation and clinical governance policy can play a positive role in promoting PSC ⁵⁹. In recent years, health managers, decision- and policy-makers in Iran have begun to pay special attention to hospital accreditation, and this has had a very positive impact on PSC ⁶⁰, even though there is room for further improvement and standards are still not completely satisfactory.

Regarding the error reporting, our study results show that compared to other countries the staff members of Iranian hospitals tend to under-report errors. A qualitative study has shown that fear of being punished by managers, high workload, being subjected to personal accountability, and misuse of the report, are among the main determinants for this under-reporting ⁶¹.

In this regard, the staff members' trust and confidence towards healthcare managers and providers, and the assurance of a proper and not punitive treatment can lead to an early discovering and reporting of errors, ultimately making efforts to find and mitigate/counteract their causes and consequences.

Despite its methodological rigor, this study suffers from some limitations, which include: a) the high observed heterogeneity, which can be due to methodological differences among selected studies; b) the lack of data concerning many hospitals in Iranian provinces, which have not performed so far any safety assessment of PSC; and c) the dearth of information concerning groups different from nurses, such as hospital managers, physicians and specialists. which has made it impossible to specifically assess PSC among different groups.

Conclusion

The present study was conducted to investigate the status of PSC in Iranian hospitals. Results showed that the level of PSC is low and requires special attention from healthcare managers and providers. PSC should be a very important priority for Iran's health sector. Health decision-and

policy-makers should pay particular attention to offering training programs in order to promote adequate levels of PSC in the country.

Abbreviations

PSC: Patient safety culture

HSOPSC: Hospital Survey on Patient Safety Culture

AHRQ: Agency for Healthcare Research and Quality

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

CI: Confidence interval

Declarations

Authors' contributions

Study design: MB, MeB, Collected data: MB, FJ and MeB, Data analysis: MB, MeB, Final revision and grammar editing: NLB, MB, and Me. All authors read and approved the final manuscript.

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Conflict of interest

The authors declare that they have no competing interests.

Ethics approval

Not applicable.

References

1. Nie Y, Mao X, Cui H, He S, Li J, Zhang M. Hospital survey on patient safety culture in China. BMC Health Serv Res. 2013; 13:228.

2. Hughes RG, Clancy CM. Working conditions that support patient safety. J Nurs Care Qual. 2005; 20:289–92.

3. Sexton JB, Helmreich RL, Neilands TB, Rowan K, Vella K, Boyden J, et al. The safety attitudes questionnaire: Psychometric properties, benchmarking data, and emerging research. BMC Health Serv Res. 2006; 6:44.

4. Ronald GS. Developing and operationalizing a culture of safety. Chinese Hosp. 2005; 9:7–8.

5. Zohar D. A group-level model of safety climate: testing the effect of group climate on microaccidents in manufacturing jobs. J Appl Psychol. 2000; 85:587–96.

6. Clarke S. Perceptions of organizational safety: implications for the development of safety culture. J Org Behavior. 1999; 20:185–98.

7. Jha AK, Prasopa-Plaizier N, Larizgoitia I, Bates DW. Research Priority Setting Working Group of the WHO World Alliance for Patient Safety. Patient safety research: an overview of the global evidence. Qual Saf Health Care. 2010; 19:42–7.

8. Jha AK, Larizgoitia I, Audera-Lopez C, Prasopa-Plaizier N, Waters H, Bates DW. The global burden of unsafe medical care: analytic modelling of observational studies. BMJ Qual Saf. 2013; 22:809–15.

9. Chen I-C, Li H-H. Measuring patient safety culture in Taiwan using the Hospital Survey on Patient Safety Culture (HSOPSC). BMC Health Serv Res. 2010; 10:152.

10. Carpenter KB, Duevel MA, Lee PW, Wu AW, Bates DW, Runciman WB, et al. Methods & Measures Working Group of the WHO World Alliance for Patient Safety. Measures of patient safety in developing and emerging countries: a review of the literature. . Qual Saf Health Care. 2010; 19:48–54.

11. Wilson RM, Michel P, Olsen S, Gibberd RW, Vincent C, El-Assady R, et al. Patient safety in developing countries: retrospective estimation of scale and nature of harm to patients in hospital. BMJ. 2012; 344:e832.

12. Association of Healthcare Research and Quality. 2017; Available from: <u>http://www.ahrq.gov/qual/hospsurveydb/index.html</u>.

13. Flin R. Measuring safety culture in healthcare: a case for accurate diagnosis. Safety Sci. 2007; 45:653–67.

14. Colla JB, Bracken AC, Kinney LM, Weeks WB. Measuring patient safety climate: a review of surveys. Qual Saf Health Care. 2005; 14:364–6.

15. Hellings J, Schrooten W, Klazinga N, Vleugels A. Challenging patient safety culture: survey results. Int J Health Care Qual Assur. 2007; 20:620–32.

16. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JP, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. BMJ. 2009; 339:b2700.

17. DerSimonian R, Laird N. Meta-analysis in clinical trials. Control Clin Trials. 1986; 7:177-88.

18. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in metaanalyses. BMJ. 2003; 327:557–60.

19. Egger M, Davey Smith G, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. BMJ. 1997; 315:629–34.

20. Copas J, Shi JQ. Meta-analysis, funnel plots and sensitivity analysis. Biostatistics. 2000; 1:247-62.

21. Abdi Z, Maleki M, Khosravi A. Staff perception about patient safety culture in selected hospitals of Tehran University of Medical Sciences. Payesh Quarterly 2012; 10:411-9.

22. Adibi H, Khalesi N, Ravaghi H, Jafari M, Jeddian AR. Development of an effective risk management system in a teaching hospital. J Diabetes Metab Disord. 2012; 11:1-7.

23. Agharahimi Z, Mostofi M, Jafari M, Raesi AR. Evaluation of staff attitudes about patients' safety culture in Noor & Ali Asghar hospitals in Isfahan-2011. Hospital Quarterly. 2012; 11:17-26.

24. Arabloo J, Rezapour A, Ebadi Fard Azar F, Mobasheri Y. Measuring Patient Safety Culture in Iran Using the Hospital Survey on Patient Safety Culture (HSOPS): an Exploration of Survey Reliability and Validity. International Journal of Hospital Research. 2012; 1:15-28.

25. Baghaei R, Nourani D, Khalkhali H, Pirnejad H. Evaluating Patient Safety Culture in Personnel of Academic Hospitals in Urmia University of Medical Sciences in 2011. J of nurs and midwife faculty of Urmia. 2012; 10:155- 64.

26. Ebadi fard azar F, Rezapoor A, Tanoomand Khoushehmehr A, Bayat R, Arabloo J, Rezapoor Z. Study of patients'safety culture in Selected Training hospitals affiliated whith Tehran university of medical sciences. JHOSP. 2012; 11:55-64.

27. Ravaghi H, Barati Marnani A, Hosseini A F, Takbiri A. The Relationship between Health Care Providers' Perceptions of Patient Safety Culture and Patients' Perceptions of Medical Errors in Teaching Hospitals in Tehran: 2011. 68-15:57 ;2012.

28. Yaghobi Far MA, Takbiri A, Haghgoshaye E, Tabarraye Y. The Survey Of Patient Safety Culture And Recognizing Its Weknesses And Strenths In Sabzevar Hospitals. Sabzevar Uni Med Sci J (JSUMS). 2012; 20:154-64.

29. Davoodi R, Mohammadzadeh Shabestari M, Takbiri A, Soltanifar A, Sabouri G, Rahmani S, et al. Patient Safety Culture Based on Medical Staff Attitudes in Khorasan Razavi Hospitals, Northeastern Iran. Iran J Public Health. 2013; 42:1292-8.

30. Izadi AR, Drikvand J, Ebrazeh A. The Patient Safety Culture in Fatemeh Zahra Hospital of Najafabad, Iran. Health Information Management 2013:895-907.

31. Moghri j, Akbari Sari A, Rahimi Forooshani A, Arab M. Patient Safety Culture Status in General Hospitals Affiliated to Tehran University of Medical Sciences. Hakim Research Journal. 2013; 16:243- 50.

32. Moghri J, Nateghi E, Arab M, Moghri M, Sari AA, Omranikhoo H, et al. Measurement of Patient Safety Culture in Iranian hospitals: A National Baseline Study. J Clin Res Gov. 2013; 2:47-52.

33. Moussavi F, Moghri J, Gholizadeh Y, Karami A, Najjari S, Mehmandust R, et al. Assessment of patient safety culture among personnel in the hospitals associated with Islamic Azad University in Tehran in 2013. Electron Physician. 2013; 5:664-71.

34. Bahrami MA, Chalak M, Montazeralfaraj R, Dehghani Tafti A. Iranian nurses' perception of patient safety culture. Iran Red Crescent Med J. 2014; 16:e11894.

35. Faghihzadeh S, Motamed N, Shoghli AR, Asuri M, Safaian Amoli M. Assessment of Nurse Viewpoints on Patient Safety Culture in Amol Hospitals in Iran, 2012. PCNM. 2014; 4: 45-55.

36. Momeni B, Golpira R, M J M. The study of the domains of patient safety culture in Rajaie Cardiovascular, Medical and Research Center in 2012. Cardiovascular Nursing Journal. 2014; 3:34-41.

37. Almasi A, Pourmirza Kalhori R, Ahmadi Jouybari T, Goodarzi A, Ahmadi AR. Evaluation of patient safety culture in personnel of hospitals in Kermanshah, 2013. J Clin Res Paramed Sci. 2015; 4:14-23.

38. Arshadi Bostanabad M, Shirzad G, Motazedi Z, Asghari E, Safari A. Barriers of nurses' participation in clinical research in Tabriz training centers, 1393. IJNR. 2015; 10:43-51.

39. Hemmat F, Atashzadeh-Shoorideh F, Mehrabi T, Zayeri F. A survey of nurses' awareness of patient safety culture in neonatal intensive care units. Iranian J Nursing Midwifery Res. 2015; 20:490-5.

40. Mohebi Far R, Alijan zade M, Safari Variani A, Khoshtarkib H, Ghanati E, Teymouri F, et al. Studying patient safety culture from the viewpoint of staffs in educational hospitals in Tehran City. JHSW. 2015; 5:57-64.

41. Saber M, Tehrani H, Hasani Kabootarkhani M, Ghorban Sabagh M, Bagheri M. Acquaintance of Kerman Hospitals' Staff about Patient Safety Culture. J Health Dev. 2015; 4:124-32.

42. Kabodi S, Ghanbari M, Ashtarian H, Bagheri F, Ajamin E. Assessing elements of patient safety culture in Kermanshah health care and educational centers. JHSW. 2016; 6:63-74.

43. Rezaean M, Aqaie Borz Abad P, Yazdanpanah A, Zinat Motlagh SF. Patient Safety Culture Status From The Perspective Medical Staff Of Yasuj Hospitals In 2015. Armaghanedanesh. 2016; 20:935-46.

44. Akbari N, Malek M, Ebrahimi P, Haghani H, Aazami S. Safety culture in the maternity unit of hospitals in Ilam province, Iran: a census survey using HSOPSC tool. Pan Afr Med J. 2017; 27:268.

45. Asefzadeh S, Kalhor K, Tir M. Patient safety culture and job stress among nurses in Mazandaran, Iran. Electron Physician. 2017; 9:6010-6.

46. Farzi S, Moladoost A, Bahrami M, Farzi S, Etminani R. Patient safety culture in intensive care units from the perspective of nurses: A cross-sectional study. Iranian J Nursing Midwifery Res 2017; 22:372-6.

47. Ghahramanian A, Rezaei T, Abdullahzadeh F, Sheikhalipour Z, Dianat I. Quality of healthcare services and its relationship with patient safety culture and nurse-physician professional communication. Health Promot Perspect. 2017; 7:168-74.

48. Famolaro T, Yount N, Burns W, Flashner E, Liu H. Hospital survey on patient safety culture 2016 user comparative database report. (Prepared by Westat, Rockville, MD, under contract no. HHSA 290201300003C). Rockville: Agency for Health care Research and Quality. AHRQ Publication. 2016:16-0021-EF.

49. El-Jardali F, Jaafar M, Dimassi H, Jamal D, Hamdan R. The current state of patient safety culture in Lebanese hospitals: a study at baseline. Int J Qual Health Care. 2010; 22:386–95.

50. Mekonnen AB, McLachlan AJ, Brien JE, Mekonnen D, Abay Z. Hospital survey on patient safety culture in Ethiopian public hospitals: a cross-sectional study. Safety in Health. 2017; 3:11.

51. Güneş ÜY, Gürlek Ö, Sönmez M. A survey of the patient safety culture of hospital nurses in Turkey. Collegian. 2016; 23:225-32.

52. Etchegaray JM, Thomas EJ. Comparing two safety culture surveys: safety attitudes questionnaire and hospital survey on patient safety. BMJ Qual Saf 2012; 21:490-8.

53. Alahmadi HA. Assessment of patient safety culture in Saudi Arabian hospitals. Qual Saf HealthCare. 2010; 19:e17.

54. Chen IC, Li HH. Measuring patient safety culture in Taiwan using the Hospital Survey on Patient Safety Culture (HSOPSC). BMC Health Serv Res. 2010; 10:152.

55. Al-Mandhari A, Al-Zakwani I, Al-Kindi M, Tawilah J, Dorvlo ASS, Al-Adawi S. Patient Safety Culture Assessment in Oman. Oman Med J. 2014; 29:264-70.

56. Sarac C, Flin R, Mearns K, Jackson J. Hospital survey on patient safety culture: psychometric analysis on a Scottish sample. BMJ Qual Saf. 2011; 20:842-8.

57. Kim J, An K, Kim MK, Yoon SH. Nurses' perception of error reporting and patient safety culture in Korea. West J Nurs Res. 2007; 29:827-44.

58. Pronovost PJ, Berenholtz SM, Goeschel CA, Needham DM, Sexton JB, Thompson DA, et al. Creating high reliability in health care organizations. Health Serv Res. 2006; 41:1599-617.

59. El-Jardali F. Hospital accreditation in Lebanon: its potential for quality improvement. Lebanese Med J. 2007; 55:39–45.

60. Yousefinezhadi T, Mosadeghrad AM, Arab M, Ramezani M, Sari AA. An Analysis of Hospital Accreditation Policy in Iran. Iran J Public Health. 2017; 46:1347-58.

61. Movahednia S, Partovishayan Z, Bastanitehrani M, Moradi F. Nurse Managers' perspectives about Reasons for not reporting medical errors in Firoozgar Hospital: 2012. RJMS. 2014; 21:110-8.

Section/topic	#	Checklist item	Reported on page #
Title: Patient safety culture ass	sessmen	t in Iran using hospital survey on patient safety culture tool: A systematic review and meta-analysis	
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Title
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Abstract (Background,methods,results,conclusion)
INTRODUCTION		· · · · · · · · · · · · · · · · · · ·	
Rationale	3	Describe the rationale for the review in the context of what is already known.	Background
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	Not applicable.
METHODS			
Protocol and registration	tocol and registration 5 Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.		Not applicable.
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	Methods
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	Methods
Search	8 Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.		Methods
Study selection	udy selection 9 State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).		Methods
Data collection process	ata collection process 10 Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.		Methods
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	Methods
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	Methods
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	Methods
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	Methods

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	Methods
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	Methods
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	Results
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow- up period) and provide the citations.	Results
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Results
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Results
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Results
Risk of bias across studies	best studies 22 Present results of any assessment of risk of bias across studies (see Item 15).		Results
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	Results
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	Discussion
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	Discussion
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	Conclusion
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	Declarations

Appendix 2. Quality assessment of studies

Study	Year		Selec	ction		Comparability	Out	come	Total score from 10
		Representativeness of the sample	Sample size	None respondents	Ascertainment of exposure	R	Assessment	Statistical test	
Abdi	2012	+	+	+	+	+	+	+	7
Boghaei	2012	+	+	+	++	++/	+	++	10
Ravaghi	2012	+	+	+	++	++	+	++	10
Ebadi fard azar	2012	+	+	+	++	++	+	+	9
Agharahimi	2012	+	+	+	+	+	+	+	7
Moghri	2012	+	+	+	+	+	+	+	7
Yaghobi Far	2012	+	+	+	+		+	+	6
Adibi	2012	+	+		+	+	+	+	6
Arabloo	2012	+	+	+	++	++	+	+	9
Moussavi	2013	+	+	+	+		+	+	6
Davoodi	2013	+	+	+	+#	++	+	++	10
Izadi	2013	+	+	+	+	+	+	+	7
Moghri	2013	+	+	+	++	+	+	+	8
Bahrami	2014	+	+	+	++	++	+	++	10
Momeni	2014	+	+		+	+	+	+	6
Hemmat	2015	+	+	+	++	++	+	++	10
Faghihzadeh	2015	+	+		+	+	+	+	6
Mohebi Far	2015	+	+	,#	+		+	+	6
Saber	2015	+	+		+	+	+	+	6
Arshadi Bostanabad	2015	+	+	+	++	+	+	+	8
Almasi	2015	+	+	+	+	+	+	+	7
Rezaean	2016	+	+	+	+	+	+	+	7
Asefzadeh	2017	+	+	+	++	+	+	+	8
Ghahramanian	2017	+	+	+	+	+	+	+	7
Akbari	2017	+	+	+	++	++	+	++	10
Farzi	2017	+	+	+	++	++	+	+	9
Kabodi	2017	+	+	+	++	+	+	+	8

Appendix 3: The mean of the response to the 12 dimensions of the HSPSC

Study ID	Means of positive responses (95% CI)	% Weight
Bahrami (214)	◆ 75.50 (75.48, 75.52)	4.20
Abdi (2010)	• 15.00 (14.98, 15.02)	4.20
Boghaei (2010)	 59.00 (58.98, 59.02) 	4.20
Ravaghi (2012)	49.20 (27.05, 71.35)	2.54
Ebadi fard azar (2012)	• 64.00 (63.98, 64.02)	4.20
Agharahimi (2012)	62.00 (42.79, 81.21)	2.82
Moghri (2012)	• 55.00 (54.98, 55.02)	4.20
Yaghobi Far (2012)	58.30 (45.95, 70.65)	3.49
Adibi (2012)	44.63 (44.61, 44.65)	4.20
Arabloo (2012)	• 60.00 (59.98, 60.02)	4.20
Moussavi (2013)	 37.00 (36.98, 37.02) 	4.20
Davoodi (2013)	56.56 (15.03, 98.09)	1.27
Izadi (2013)	 ♦ 67.00 (66.98, 67.02) 	4.20
Moghri (2013)	• 53.00 (52.98, 53.02)	4.20
Momeni (2014)	• 71.75 (71.73, 71.77)	4.20
Hemmat (2015)	• 70.16 (70.14, 70.18)	4.20
Faghihzadeh (2015)	• 60.00 (59.98, 60.02)	4.20
Mohebi Far (2015)	62.00 (40.44, 83.56)	2.59
Saber (2015)	 63.00 (62.98, 63.02) 	4.20
Arshadi Bostanabad (2015)	 56.32 (56.30, 56.34) 	4.20
Almasi (2015)	70.20 (70.18, 70.22)	4.20
Rezaean (2016)	64.87 (40.06, 89.68)	2.31
Asefzadeh (2017)	 62.90 (62.88, 62.92) 	4.20
Ghahramanian (2017)	66.57 (66.55, 66.59)	4.20
Akbar (2017)	73.90 (25.27, 122.53)	1.01
Farzi (2017)	 58.60 (58.58, 58.62) 	4.20
Kabodi (2017)	45.00 (44.98, 45.02)	4.20
Overall (I-squared = 100.0%, p = 0.000)	58.08 (52.46, 63.69)	100.00
NOTE: Weights are from random effects analysis	6	

Study ID		Means of positive responses (95% CI)	% Weight
Bahrami (214)	•	93.00 (92.98, 93.02)	4.13
Abdi (2010)	•	16.50 (16.48, 16.52)	4.13
Boghaei (2010)	•	69.00 (68.98, 69.02)	4.13
Ravaghi (2012)		65.00 (44.03, 85.97)	2.97
Ebadi fard azar (2012)	•	66.00 (65.98, 66.02)	4.13
Agharahimi (2012)		70.60 (43.55, 97.65)	2.50
Moghri (2012)	•	66.00 (65.98, 66.02)	4.13
Yaghobi Far (2012)		69.10 (52.05, 86.15)	3.28
Adibi (2012)	•	67.90 (67.88, 67.92)	4.13
Arabloo (2012)	•	62.00 (61.98, 62.02)	4.13
Moussavi (2013)	•	46.00 (45.98, 46.02)	4.13
Davoodi (2013)		79.85 (56.27, 103.43)	2.76
Izadi (2013)	•	73.00 (72.98, 73.02)	4.13
Moghri (2013)	•	62.00 (61.98, 62.02)	4.13
Momeni (2014)	•	71.75 (71.73, 71.77)	4.13
Hemmat (2015)		77.70 (77.68, 77.72)	4.13
Faghihzadeh (2015)	•	73.00 (72.98, 73.02)	4.13
Mohebi Far (2015)		69.00 (41.56, 96.44)	2.47
Saber (2015)	•	63.45 (63.43, 63.47)	4.13
Arshadi Bostanabad (2015)	•	68.66 (68.64, 68.68)	4.13
Almasi (2015)	•	30.80 (30.78, 30.82)	4.13
Rezaean (2016)		66.13 (36.04, 96.22)	2.29
Asefzadeh (2017)	•	72.50 (72.48, 72.52)	4.13
Ghahramanian (2017)	•	68.21 (68.19, 68.23)	4.13
Akbar (2017)		→ 74.76 (16.75, 132.77)	1.03
Farzi (2017)		84.00 (83.98, 84.02)	4.13
Kabodi (2017)	•	57.00 (56.98, 57.02)	4.13
Overall (I-squared = 100.0%, p = 0.000)		65.43 (58.62, 72.24)	100.00
NOTE: Weights are from random effects analysis			
-133	0	133	

Organizational learning and continuous improvement

•		• •	
Study		Means of positive	%
ID		responses (95% CI)	Weight
Bahrami (214)	•	62.00 (61.98, 62.02)	4.25
Abdi (2010)		27.50 (27.48, 27.52)	4.25
Boghaei (2010)		67.00 (66.98, 67.02)	4.25
Ravaghi (2012)		53.80 (30.67, 76.93)	2.25
Ebadi fard azar (2012)		66.00 (65.98, 66.02)	4.25
Agharahimi (2012)		— 72.80 (41.83, 103.77)	1.64
Moghri (2012)		54.00 (53.98, 54.02)	4.25
Yaghobi Far (2012)	i	54.15 (49.64, 58.66)	4.11
Adibi (2012)		51.91 (51.89, 51.93)	4.25
Arabloo (2012)	•	61.00 (60.98, 61.02)	4.25
Moussavi (2013)	•	42.00 (41.98, 42.02)	4.25
Davoodi (2013)		69.53 (47.72, 91.34)	2.37
Izadi (2013)	•	76.00 (75.98, 76.02)	4.25
Moghri (2013)		55.00 (54.98, 55.02)	4.25
Momeni (2014)		69.50 (69.48, 69.52)	4.25
Hemmat (2015)		82.80 (82.78, 82.82)	4.25
Faghihzadeh (2015)	•	70.00 (69.98, 70.02)	4.25
Mohebi Far (2015)		- 69.00 (39.60, 98.40)	1.75
Saber (2015)	•	67.07 (67.05, 67.09)	4.25
Arshadi Bostanabad (2015)	•	68.67 (68.65, 68.69)	4.25
Almasi (2015)	•	50.50 (50.48, 50.52)	4.25
Rezaean (2016)		· 66.38 (36.29, 96.47)	1.70
Asefzadeh (2017)	•	55.60 (55.58, 55.62)	4.25
Ghahramanian (2017)	•	63.25 (63.23, 63.27)	4.25
Akbar (2017)		- 58.97 (19.10, 98.84)	1.17
Farzi (2017)		69.70 (69.68, 69.72)	4.25
Kabodi (2017)	•	51.00 (50.98, 51.02)	4.25
Overall (I-squared = 100.0%, p = 0.000)	🕎	60.76 (55.70, 65.81)	100.00
NOTE: Weights are from random effects analysis		-	
-104	0	104	

Manager expectations and actions promoting safety

Bahrami (214) Abdi (2010) Boghaei (2010) Ravaghi (2012) Ebadi fard azar (2012) Agharahimi (2012) Moghri (2012) Yaghobi Far (2012) Adibi (2012) Arabloo (2012) Moussavi (2013) Davoodi (2013) Izadi (2013) Mogneri (2014) Hemmat (2015)	 80.00 (79.98, 80.02) 4.34 47.20 (47.18, 47.22) 80.00 (79.98, 80.02) 4.34 80.00 (79.98, 80.02) 4.34 62.80 (43.98, 81.62) 62.80 (43.98, 81.62) 62.80 (69.8, 67.02) 63.00 (68.98, 69.02) 4.34 69.00 (68.98, 69.02) 4.34 69.86 (69.84, 69.88) 4.34 65.00 (64.98, 65.02) 4.34 48.00 (47.98, 48.02) 4.34 	4 2 4 0
Boghaei (2010)Ravaghi (2012)Ebadi fard azar (2012)Agharahimi (2012)Moghri (2012)Yaghobi Far (2012)Adibi (2012)Arabloo (2012)Moussavi (2013)Davoodi (2013)Izadi (2013)Moghri (2013)Momeni (2014)	• 80.00 (79.98, 80.02) 4.3 • 62.80 (43.98, 81.62) 2.63 • 67.00 (66.98, 67.02) 4.3 • 67.60 (42.51, 92.69) 2.00 • 69.00 (68.98, 69.02) 4.3 • 69.00 (68.98, 69.02) 4.3 • 69.00 (68.98, 69.02) 4.3 • 69.00 (68.98, 69.02) 4.3 • 69.86 (69.84, 69.88) 4.3 • 65.00 (64.98, 65.02) 4.3	4 2 4 0 4
Ravaghi (2012) Ebadi fard azar (2012) Agharahimi (2012) Moghri (2012) Yaghobi Far (2012) Adibi (2012) Arabloo (2012) Moussavi (2013) Davoodi (2013) Izadi (2013) Moghri (2013) Monomi (2013)	● 62.80 (43.98, 81.62) 2.62 ● 67.00 (66.98, 67.02) 4.34 ● 67.60 (42.51, 92.69) 2.00 ● 69.00 (68.98, 69.02) 4.34 ● 73.60 (61.06, 86.14) 3.30 ● 69.86 (69.84, 69.88) 4.34 ● 65.00 (64.98, 65.02) 4.34	2 4 0 4
Ebadi fard azar (2012) Agharahimi (2012) Moghri (2012) Yaghobi Far (2012) Adibi (2012) Arabloo (2012) Moussavi (2013) Davoodi (2013) Izadi (2013) Moghri (2013) Momeni (2014)	 ♦ ♦	4) 4
Agharahimi (2012) Moghri (2012) Yaghobi Far (2012) Adibi (2012) Arabloo (2012) Moussavi (2013) Davoodi (2013) Izadi (2013) Moghri (2013) Moghri (2013) Momeni (2014)	● 67.60 (42.51, 92.69) 2.00 ● 69.00 (68.98, 69.02) 4.34 ● 73.60 (61.06, 86.14) 3.30 ● 69.86 (69.84, 69.88) 4.34 ● 65.00 (64.98, 65.02) 4.34) 4
Moghri (2012) Yaghobi Far (2012) Adibi (2012) Arabloo (2012) Moussavi (2013) Davoodi (2013) Izadi (2013) Moghri (2013) Moghri (2014)	 ♦ ♦	1
Yaghobi Far (2012) Adibi (2012) Arabloo (2012) Moussavi (2013) Davoodi (2013) Izadi (2013) Moghri (2013) Momeni (2014)	73.60 (61.06, 86.14) 3.30 9.86 (69.84, 69.88) 4.34 65.00 (64.98, 65.02) 4.34	
Adibi (2012) Arabloo (2012) Moussavi (2013) Davoodi (2013) Izadi (2013) Moghri (2013) Momeni (2014)	 ◆ ◆ 69.86 (69.84, 69.88) 4.34 ◆ ◆ 65.00 (64.98, 65.02) 4.34 	
Arabloo (2012) Moussavi (2013) Davoodi (2013) Izadi (2013) Moghri (2013) Momeni (2014)	• 65.00 (64.98, 65.02) 4.34	6
Moussavi (2013) Davoodi (2013) Izadi (2013) Moghri (2013) Momeni (2014)		1
Davoodi (2013) Izadi (2013) Moghri (2013) Momeni (2014)	♦ 1 48.00 (47.98, 48.02) 4.34	1
Izadi (2013) Moghri (2013) Momeni (2014)		1
Moghri (2013) Momeni (2014)	71.92 (38.44, 105.40) 1.4	1
Momeni (2014)	• 75.00 (74.98, 75.02) 4.34	1
	• 65.00 (64.98, 65.02) 4.34	1
Hommot (2015)	◆ 74.50 (74.48, 74.52) 4.34	1
	 81.70 (81.68, 81.72) 4.34 	1
Faghihzadeh (2015)	• 58.25 (58.23, 58.27) 4.34	1
Mohebi Far (2015)	65.00 (37.56, 92.44) 1.8	1
Saber (2015)	 68.55 (68.53, 68.57) 4.34 	1
Arshadi Bostanabad (2015)	• 65.92 (65.90, 65.94) 4.34	1
Almasi (2015)	• 83.70 (83.68, 83.72) 4.3	1
Rezaean (2016)	71.89 (34.85, 108.93) 1.23	3
Asefzadeh (2017)	 69.60 (69.58, 69.62) 4.34 	1
Ghahramanian (2017)	• 65.90 (65.88, 65.92) 4.3	1
Akbar (2017)	80.25 (27.23, 133.27) 0.7)
Farzi (2017)	 97.30 (97.28, 97.32) 4.34 	1
Kabodi (2017)	• 59.00 (58.98, 59.02) 4.3	1
Overall (I-squared = 100.0%, p = 0.000)	69.50 (64.66, 74.34) 100	.00
NOTE: Weights are from random effects analysis		

Teamwork within units

Study ID		Means of positive responses (95% CI)	% Weight
Bahrami (214)	•	25.50 (25.48, 25.52)	4.03
Abdi (2010)		17.80 (17.78, 17.82)	4.03
Boghaei (2010)		31.00 (30.98, 31.02)	4.03
Ravaghi (2012)	• • ·	14.80 (-0.10, 29.70)	3.51
Ebadi fard azar (2012)		51.00 (50.98, 51.02)	4.03
Agharahimi (2012)		68.80 (45.28, 92.32)	2.94
Moghri (2012)	•	18.00 (17.98, 18.02)	4.03
Yaghobi Far (2012)		13.03 (-0.89, 26.95)	3.57
Adibi (2012)	•	21.19 (21.17, 21.21)	4.03
Arabloo (2012)	•	44.00 (43.98, 44.02)	4.03
Moussavi (2013)		12.00 (11.98, 12.02)	4.03
Davoodi (2013)		21.57 (8.99, 34.15)	3.64
Izadi (2013)	•	54.00 (53.98, 54.02)	4.03
Moghri (2013)	•	23.00 (22.98, 23.02)	4.03
Momeni (2014)	•	47.00 (46.98, 47.02)	4.03
Hemmat (2015)		• 79.50 (79.48, 79.52)	4.03
Faghihzadeh (2015)		24.67 (24.65, 24.69)	4.03
Mohebi Far (2015)		65.00 (31.68, 98.32)	2.31
Saber (2015)	•	56.30 (56.28, 56.32)	4.03
Arshadi Bostanabad (2015)	•	15.16 (15.14, 15.18)	4.03
Almasi (2015)		• 75.10 (75.08, 75.12)	4.03
Rezaean (2016)		48.79 (15.61, 81.97)	2.32
Asefzadeh (2017)	•	46.80 (46.78, 46.82)	4.03
Ghahramanian (2017)	•	45.87 (45.85, 45.89)	4.03
Akbar (2017)		53.09 (-8.43, 114.61)	
Farzi (2017)		24.70 (24.68, 24.72)	
Kabodi (2017)		51.00 (50.98, 51.02)	
Overall (I-squared = 100.0%, p = 0.000)		37.79 (30.05, 45.53)	
NOTE: Weights are from random effects analysis			
-115	0	I 115	

Non-punitive response to error

	Staffing		
Study ID		Means of positive % responses (95% CI) W	eight
Bahrami (214)		32.50 (32.48, 32.52) 4.	01
Abdi (2010)		35.00 (34.98, 35.02) 4.	01
Boghaei (2010)		36.00 (35.98, 36.02) 4.	01
Ravaghi (2012)		12.20 (-0.54, 24.94) 3.	
Ebadi fard azar (2012)	•	57.00 (56.98, 57.02) 4.	01
Agharahimi (2012)		- 59.40 (39.80, 79.00) 3.	16
Moghri (2012)		23.00 (22.98, 23.02) 4.	01
Yaghobi Far (2012)		22.37 (10.61, 34.13) 3.	66
Adibi (2012)		26.05 (26.03, 26.07) 4.	01
Arabloo (2012)	•	47.00 (46.98, 47.02) 4.	01
Moussavi (2013)		22.00 (21.98, 22.02) 4.	01
Davoodi (2013)	•	26.36 (-6.65, 59.37) 2.	27
Izadi (2013)	•	48.00 (47.98, 48.02) 4.	01
Moghri (2013)	•	35.00 (34.98, 35.02) 4.	01
Momeni (2014)	•	52.25 (52.23, 52.27) 4.	01
Hemmat (2015)	•	64.00 (63.98, 64.02) 4.	
Faghihzadeh (2015)	•	22.00 (21.98, 22.02) 4.	
Mohebi Far (2015)		- 61.00 (35.52, 86.48) 2. [°]	
Saber (2015)		57.68 (57.66, 57.70) 4.	
Arshadi Bostanabad (2015)	•	18.42 (18.40, 18.44) 4.	
Almasi (2015)	_	 ◆ 96.20 (96.18, 96.22) 4. 	
Rezaean (2016)		- 62.17 (39.32, 85.02) 2.1	
Asefzadeh (2017)		60.80 (60.78, 60.82) 4.	
Ghahramanian (2017)	•	45.89 (45.87, 45.91) 4.	
Akbar (2017) –		- 29.91 (-22.21, 82.03) 1.	
Farzi (2017)	•	35.60 (35.58, 35.62) 4.	
Kabodi (2017)	•	23.00 (22.98, 23.02) 4.	
Overall (I-squared = 100.0% , p = 0.000)		41.25 (33.70, 48.80) 10	
NOTE: Weights are from random effects analysis		41.23 (33.70, 40.00)	0.00
-96.2	0	96.2	

Study ID			Means of positive responses (95% CI)	% Weight
Bahrami (214)		•	72.50 (72.48, 72.52)	4.26
Abdi (2010)	•		24.00 (23.98, 24.02)	4.26
Boghaei (2010)		•	49.00 (48.98, 49.02)	4.26
Ravaghi (2012)		•	44.30 (18.62, 69.98)	2.51
Ebadi fard azar (2012)		•	62.00 (61.98, 62.02)	4.26
Agharahimi (2012)	-	•	62.20 (31.62, 92.78)	2.14
Moghri (2012)	•		34.00 (33.98, 34.02)	4.26
Yaghobi Far (2012)		•	52.50 (22.51, 82.49)	2.18
Adibi (2012)	•		29.69 (29.67, 29.71)	4.26
Arabloo (2012)		•	54.00 (53.98, 54.02)	4.26
Moussavi (2013)) i	42.00 (41.98, 42.02)	4.26
Davoodi (2013)		•	55.27 (28.89, 81.65)	2.45
Izadi (2013)		•	65.00 (64.98, 65.02)	4.26
Moghri (2013)	•	•	43.00 (42.98, 43.02)	4.26
Momeni (2014)		•	67.50 (67.48, 67.52)	4.26
Hemmat (2015)		•	75.90 (75.88, 75.92)	4.26
Faghihzadeh (2015)		•	44.33 (44.31, 44.35)	4.26
Mohebi Far (2015)			62.00 (40.44, 83.56)	2.85
Saber (2015)		•	72.20 (72.18, 72.22)	4.26
Arshadi Bostanabad (2015)	•	_	33.00 (32.98, 33.02)	4.26
Almasi (2015)		•	57.60 (57.58, 57.62)	4.26
Rezaean (2016)	<u> </u>	•	55.88 (23.99, 87.77)	2.05
Asefzadeh (2017)		•	51.90 (51.88, 51.92)	4.26
Ghahramanian (2017)		i 🔶	66.47 (66.45, 66.49)	4.26
Akbar (2017)			58.37 (-13.46, 130.20)	
Farzi (2017)		•	62.30 (62.28, 62.32)	4.26
Kabodi (2017)	•		38.00 (37.98, 38.02)	4.26
Overall (I-squared = 100.0%, p = 0.000)		\diamond	52.71 (46.37, 59.05)	100.00
NOTE: Weights are from random effects analysis				
 -130	1 0		l 130	

Management support for patient safety

Study D		Means of positive responses (95% CI)	% Weight
Bahrami (214)	•	61.50 (61.48, 61.52)	4.25
Abdi (2010)		18.20 (18.18, 18.22)	4.25
Boghaei (2010)	•	55.00 (54.98, 55.02)	4.25
Ravaghi (2012)	+	45.80 (18.75, 72.85)	2.08
Ebadi fard azar (2012)	•	62.00 (61.98, 62.02)	4.25
Agharahimi (2012)	+•	61.40 (44.54, 78.26)	3.03
Moghri (2012)	•	40.00 (39.98, 40.02)	4.25
Yaghobi Far (2012)		— 52.67 (29.72, 75.62)	2.43
Adibi (2012)		29.09 (29.07, 29.11)	4.25
Arabloo (2012)	•	53.00 (52.98, 53.02)	4.25
Moussavi (2013)	• I	39.00 (38.98, 39.02)	4.25
Davoodi (2013)		55.09 (30.32, 79.86)	2.27
Izadi (2013)	•	62.00 (61.98, 62.02)	4.25
Moghri (2013)	•	42.00 (41.98, 42.02)	4.25
Momeni (2014)	i •	60.75 (60.73, 60.77)	4.25
Hemmat (2015)		• 71.58 (71.56, 71.60)	4.25
Faghihzadeh (2015)	•	44.75 (44.73, 44.77)	4.25
Mohebi Far (2015)	- i •	61.00 (43.36, 78.64)	2.95
Saber (2015)	•	58.57 (58.55, 58.59)	4.25
Arshadi Bostanabad (2015)	•	37.87 (37.85, 37.89)	4.25
Almasi (2015)	i •	63.30 (63.28, 63.32)	4.25
Rezaean (2016)	+	59.77 (29.31, 90.23)	1.83
Asefzadeh (2017)	•	46.60 (46.58, 46.62)	4.25
Ghahramanian (2017)	•	54.98 (54.96, 55.00)	4.25
Akbar (2017)		→ 59.49 (-21.59, 140.57)	0.41
Farzi (2017)	•	49.40 (49.38, 49.42)	4.25
Kabodi (2017)	• !	34.00 (33.98, 34.02)	4.25
Overall (I-squared = 100.0%, p = 0.000)	─�	50.28 (44.82, 55.75)	100.00
NOTE: Weights are from random effects analysis			
l -141		l 141	

Teamwork across hospital units

Study ID		Means of positive responses (95% CI)	% Weight
Bahrami (214)		• 78.50 (78.48, 78.52)	4.14
Abdi (2010)	•	19.90 (19.88, 19.92)	4.14
Boghaei (2010)	•	62.00 (61.98, 62.02)	4.14
Ravaghi (2012)		- 57.20 (40.54, 73.86)	3.29
Ebadi fard azar (2012)	•	61.00 (60.98, 61.02)	4.14
Agharahimi (2012)		- 59.40 (39.80, 79.00)	3.05
Moghri (2012)	•	47.00 (46.98, 47.02)	4.14
Yaghobi Far (2012)		56.30 (41.01, 71.59)	3.40
Adibi (2012)	•	26.39 (26.37, 26.41)	4.14
Arabloo (2012)	•	60.00 (59.98, 60.02)	4.14
Moussavi (2013)	•	39.00 (38.98, 39.02)	4.14
Davoodi (2013)	_	- 51.55 (24.35, 78.75)	2.45
Izadi (2013)	•	69.00 (68.98, 69.02)	4.14
Moghri (2013)	•	48.00 (47.98, 48.02)	4.14
Momeni (2014)	•	58.50 (58.48, 58.52)	4.14
Hemmat (2015)	•	61.75 (61.73, 61.77)	4.14
Faghihzadeh (2015)	•	52.00 (51.98, 52.02)	4.14
Mohebi Far (2015)		55.00 (27.56, 82.44)	2.43
Saber (2015)		59.08 (59.06, 59.10)	4.14
Arshadi Bostanabad (2015)	•	58.82 (58.80, 58.84)	4.14
Almasi (2015)	•	60.60 (60.58, 60.62)	4.14
Rezaean (2016)		57.92 (23.21, 92.63)	1.95
Asefzadeh (2017)	•	24.50 (24.48, 24.52)	4.14
Ghahramanian (2017)	•	62.63 (62.61, 62.65)	4.14
Akbar (2017)		→ 61.52 (-11.02, 134.06)	0.70
Farzi (2017)	•	21.10 (21.08, 21.12)	4.14
Kabodi (2017)	•	42.00 (41.98, 42.02)	4.14
Overall (I-squared = 100.0%, p = 0.000)	\diamond	51.62 (44.95, 58.29)	100.00
NOTE: Weights are from random effects analysis			
		I 134	

Hospital handoffs and transitions

Commu	nication openness		
Study ID		Means of positive responses (95% CI)	% Weight
Bahrami (214)	•	56.50 (56.48, 56.52)	4.28
Abdi (2010)	•	29.70 (29.68, 29.72)	4.28
Boghaei (2010)	•	45.00 (44.98, 45.02)	4.28
Ravaghi (2012)	+	37.30 (21.82, 52.78)	3.13
Ebadi fard azar (2012)		63.00 (62.98, 63.02)	4.28
Agharahimi (2012)	+	56.40 (27.39, 85.41)	1.87
Moghri (2012)	•	39.00 (38.98, 39.02)	4.28
Yaghobi Far (2012)	- + -i	37.26 (30.01, 44.51)	3.96
Adibi (2012)		50.91 (50.89, 50.93)	4.28
Arabloo (2012)	•	53.00 (52.98, 53.02)	4.28
Moussavi (2013)	• !	27.00 (26.98, 27.02)	4.28
Davoodi (2013)		45.46 (3.42, 87.50)	1.15
Izadi (2013)	•	68.00 (67.98, 68.02)	4.28
Moghri (2013)	•	42.00 (41.98, 42.02)	4.28
Momeni (2014)	· · · · · · · · · · · · · · · · · · ·	60.75 (60.73, 60.77)	4.28
Hemmat (2015)	•	67.50 (67.48, 67.52)	4.28
Faghihzadeh (2015)	•	35.66 (35.64, 35.68)	4.28
Mohebi Far (2015)		62.00 (36.52, 87.48)	2.14
Saber (2015)	•	62.45 (62.43, 62.47)	4.28
Arshadi Bostanabad (2015)	•	40.03 (40.01, 40.05)	4.28
Almasi (2015)	•	66.90 (66.88, 66.92)	4.28
Rezaean (2016)		• 60.33 (28.11, 92.55)	1.65
Asefzadeh (2017)	•	35.90 (35.88, 35.92)	4.28
Ghahramanian (2017)		58.75 (58.73, 58.77)	4.28
Akbar (2017)		60.44 (-6.67, 127.55)	0.54
Farzi (2017)	•	47.50 (47.48, 47.52)	4.28
Kabodi (2017)	•	41.00 (40.98, 41.02)	4.28
Overall (I-squared = 100.0%, p = 0.000)	\diamond	49.25 (43.97, 54.52)	100.00
NOTE: Weights are from random effects analysis			
l -128	1 0	l 128	

Communication openness

Study		Means of positive	%
ID		responses (95% CI)	Weight
Bahrami (214)	•	50.00 (49.98, 50.02)	4.18
Abdi (2010)	•	19.90 (19.88, 19.92)	4.18
Boghaei (2010)	•	56.00 (55.98, 56.02)	4.18
Ravaghi (2012)	+	45.40 (29.72, 61.08)	3.16
Ebadi fard azar (2012)	•	63.00 (62.98, 63.02)	4.18
Agharahimi (2012)	+ •	63.80 (39.89, 87.71)	2.38
Moghri (2012)	•	41.00 (40.98, 41.02)	4.18
Yaghobi Far (2012)		47.43 (36.85, 58.01)	3.64
Adibi (2012)	•	65.93 (65.91, 65.95)	4.18
Arabloo (2012)	•	57.00 (56.98, 57.02)	4.18
Moussavi (2013)	•	38.00 (37.98, 38.02)	4.18
Davoodi (2013)		- 51.31 (32.81, 69.81)	2.88
Izadi (2013)		• 70.00 (69.98, 70.02)	4.18
Moghri (2013)	•	44.00 (43.98, 44.02)	4.18
Momeni (2014)		• 68.25 (68.23, 68.27)	4.18
Hemmat (2015)		• 71.06 (71.04, 71.08)	4.18
Faghihzadeh (2015)		• 68.33 (68.31, 68.35)	4.18
Mohebi Far (2015)		65.00 (37.56, 92.44)	2.10
Saber (2015)		• 68.11 (68.09, 68.13)	4.18
Arshadi Bostanabad (2015)	•	49.83 (49.81, 49.85)	4.18
Almasi (2015)	•	53.00 (52.98, 53.02)	4.18
Rezaean (2016)		63.41 (29.33, 97.49)	1.65
Asefzadeh (2017)	•	49.60 (49.58, 49.62)	4.18
Ghahramanian (2017)	•	63.28 (63.26, 63.30)	4.18
Akbar (2017)	•	65.29 (-0.43, 131.01)	0.62
Farzi (2017)		• 70.60 (70.58, 70.62)	4.18
Kabodi (2017)	•	37.00 (36.98, 37.02)	4.18
Overall (I-squared = 100.0%, p = 0.000)		55.10 (49.47, 60.73)	100.00
NOTE: Weights are from random effects analysis			
-131	1 0	I 131	

Feedback and communication about error

Study ID			Means of positive responses (95% CI)	% Weight
Bahrami (214)		•	48.50 (48.48, 48.52)	4.17
Abdi (2010)	•	T	14.10 (14.08, 14.12)	4.17
Boghaei (2010)	_	•	42.00 (41.98, 42.02)	4.17
Ravaghi (2012)		+ <u> −</u>	40.50 (22.66, 58.34)	3.15
Ebadi fard azar (2012)		•	61.00 (60.98, 61.02)	4.17
Agharahimi (2012)			63.40 (34.78, 92.02)	2.28
Moghri (2012)		•	42.00 (41.98, 42.02)	4.17
Yaghobi Far (2012)			43.66 (37.72, 49.60)	4.02
Adibi (2012)		•	50.33 (50.31, 50.35)	4.17
Arabloo (2012)		•	58.00 (57.98, 58.02)	4.17
Moussavi (2013)	•		33.00 (32.98, 33.02)	4.17
Davoodi (2013)		•	42.85 (21.41, 64.29)	2.84
Izadi (2013)		•	66.00 (65.98, 66.02)	4.17
Moghri (2013)		•	46.00 (45.98, 46.02)	4.17
Momeni (2014)		i •	74.25 (74.23, 74.27)	4.17
Hemmat (2015)		•	61.07 (61.05, 61.09)	4.17
Faghihzadeh (2015)	•		33.33 (33.31, 33.35)	4.17
Mohebi Far (2015)		•	56.00 (22.68, 89.32)	1.96
Saber (2015)			63.90 (63.88, 63.92)	4.17
Arshadi Bostanabad (2015)			37.36 (37.34, 37.38)	4.17
Almasi (2015)		• •	69.80 (69.78, 69.82)	4.17
Rezaean (2016)			60.20 (25.33, 95.07)	1.87
Asefzadeh (2017)		•	41.60 (41.58, 41.62)	4.17
Ghahramanian (2017)		•	56.42 (56.40, 56.44)	4.17
Akbar (2017) –		*	- 51.41 (-32.63, 135.45)	0.51
Farzi (2017)		•	67.40 (67.38, 67.42)	4.17
Kabodi (2017)	•		26.00 (25.98, 26.02)	4.17
Overall (I-squared = 100.0%, p = 0.000)		\diamond	49.53 (43.12, 55.95)	100.00
NOTE: Weights are from random effects analysis				
-135	1 0		l 135	

Frequency of events reported

Name	Year	Participants	City	Sample size
Abdi	2012	Mixed	Tehran	311
Boghaei	2012	Mixed	Uromia	500
Ravaghi	2012	Mixed	Tehran	216
Ebadi fard azar	2012	Mixed	Tehran	145
Agharahimi	2012	Mixed	Isfahan	94
Moghri	2012	Mixed	Tehran	343
Yaghobi Far	2012	Mixed	Sabzevar	207
Adibi	2012	Mixed	Tehran	90
Arabloo	2012	Mixed	Qazvin	145
Moussavi	2013	Mixed	Tehran	175
Davoodi	2013	Mixed	Mashhad	922
Izadi	2013	Mixed	Isfahan	196
Moghri	2013	Mixed	Several city	725
Bahrami	2014	Nurses	Yazd	340
Momeni	2014	Mixed	Tehran	332
Hemmat	2015	Nurses	Isfahan	83
Faghihzadeh	2015	Nurses	Amol	530
Mohebi Far	2015	Mixed	Tehran	312
Saber	2015	Mixed	Kerman	439
Arshadi Bostanabad	2015	Nurses	Tabriz	99
Almasi	2015	Mixed	Kermanshah	872
Rezaean	2016	Mixed	Yasuj	361
Asefzadeh	2017	Nurses	Sari	380
Ghahramanian	2017	Nurses-Physician	Tabriz	401
Akbari	2017	Mixed	Ilam	299
Farzi	2017	Nurses	Isfahan	367
Kabodi	2017	Mixed	Kermanshah	380

Table 1: characteristics of studies

Mixed: Physicians-nurses-other staff

Items	Mean of positive responses on patient safety culture dimensions (%) 95% CI	P value	
Organizational learning and continuous improvement	65.43 (58.62 – 72.24)	100%	0.000
Manager expectations and actions promoting safety	60.76 (55.70 – 65.81)	100%	0.000
Teamwork within units	60.50 (64.66 – 74.34)	100%	0.000
Overall perceptions of patient safety	58.8 (52.46 - 63.69)	100%	0.000
Feedback and communication about error	55.10 (49.47 - 60.73)	100%	0.000
Management support for patient safety	52.71 (46.37 – 59.05)	100%	0.000
Hospital handoffs and transitions	51.62 (44.95 - 58.29)	100%	0.000
Teamwork across hospital units	50.28 (44.82 – 55.75)	100%	0.000
Frequency of events reported	49.53 (43.12 – 55.95)	100%	0.000
Communication openness	49.25 (43.97 – 54.52)	100%	0.000
Staffing	41.25 (33.70 - 48.80)	100%	0.000
Non-punitive response to error	37.79 (30.05 - 45.53)	100%	0.000

Table 2. Mean of 12 dimensions of HSOPSC tool in Iran

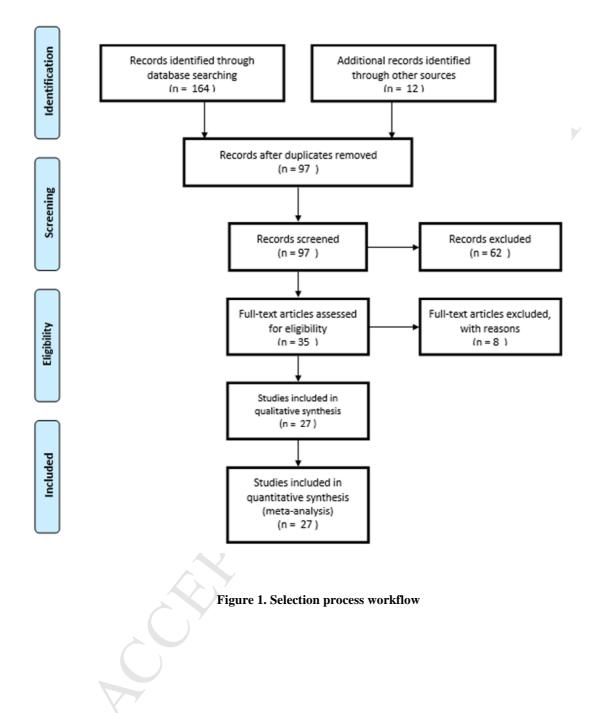
	R R R				
Number of reporting events	Mean (%) 95% CI	\mathbf{I}^2	P value		
1-2	28.59 (22.67 – 34.50)	100%	0.000		
3 – 5	9.73 (7.63 – 11.82)	100%	0.000		
6-10	3.76 (3.07 – 4.45)	100%	0.000		
11 - 20	1 (0.48 – 1.52)	100%	0.000		
>20	1.20(0.22 - 2.18)	100%	0.000		
No event	54.19 (45.56 - 62.81)	100%	0.000		

Table 3. Mean of reporting events of HSOPSC tool in Iran

Items	Mean (%) 95% CI	\mathbf{I}^2	P value	
Excellent	4.74 (2.88 - 6.61)	100%	0.000	
Very good	19.70 (14.40 – 25)	100%	0.000	
Acceptable	55.93 (51.20 - 60.66)	100%	0.000	
Poor	12.48 (8.05 – 16.9)	100%	0.000	
Failing	6.51 (2.44 – 10.57)	100%	0.000	

SCRIPT

Table 4. Mean of graded responses as assessed by means of HSOPSC tool in Iran



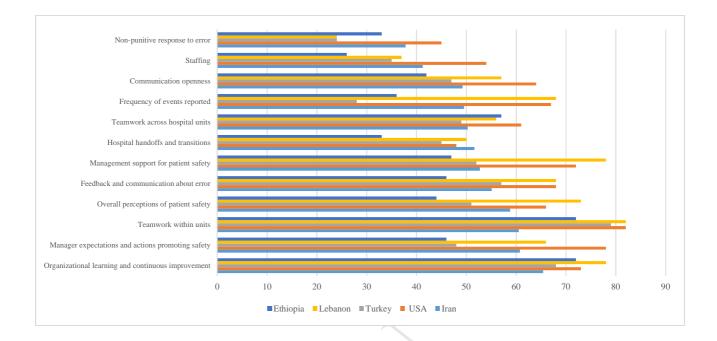


Figure 2. Comparison of mean response in Iran versus other countries

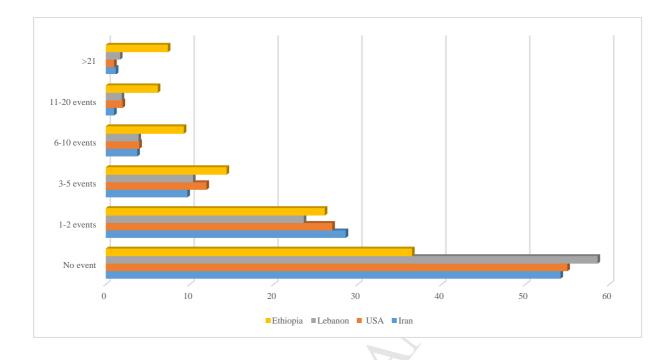


Figure 3. Comparison of mean of reporting events in Iran versus other countries

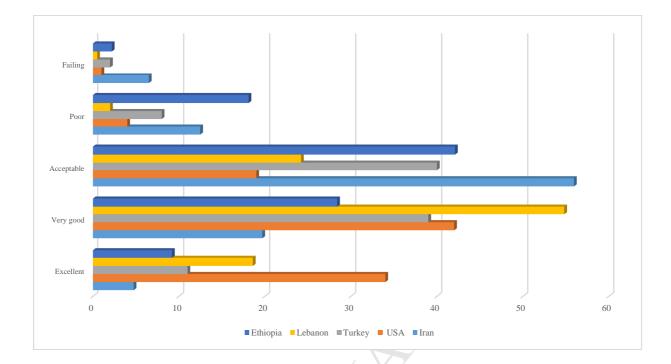


Figure 4. Comparison of mean PSC grade of Iran with other countries