

Review article

Physicians' perceptions of patient safety factors: a systematic review and narrative synthesis

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Background: Patient safety (PS) is a global issue that affects both developed and developing countries. Physicians play a key role in overcoming this common healthcare issue.

Objective: To understand the physicians' perceptions of factors contributing to PS incidents in secondary care.

Methods: Covering a period from 1999 to 2011, three electronic databases were used to identify potential studies for inclusion. Individual searching of selected journals and reference scanning of identified studies were also conducted. To summarize and synthesize the findings, we adopted a narrative synthesis approach, and used a content analysis method directed by Vincent's framework.

Results: Of 1,405 potentially relevant citations identified, 14 studies ultimately met the inclusion criteria, and were divided into trainee and non-trainee physician studies. Quality scores of included studies ranged from 6 to 12.5 (possible range 1–16). In total, 158 patient safety factors (PSFs) were identified and categorized into seven safety levels and 22 corresponding themes. In all the studies, the rank order of safety levels by frequency of PSFs was: individual = team > work environment > organizational and management > task and technology > contextual > patient. There was an almost similar result in the trainee studies, whereas in the non-trainee studies, the result was almost the reverse.

Conclusion: Overall, the results show a clear tendency for physicians to focus on the proximal causes of PS incidents. This suggests the need for safety skills training. The next research generation would provide a holistic view of physicians' perceptions of PSFs by moving toward more sophisticated designs, such as mixed-methods.

Keywords: Medical errors, patient safety, physicians, secondary care

The most influential healthcare publication in the last two decades, "To Err is Human", identified patient safety (PS) as a major global issue. PS is defined by the IOM as "freedom from accidental injury" [1]. This simple definition refers to this problem. At this moment, about 10% of patients in hospitals experience a treatment-related injury, at least half of which are preventable [2]. Despite this and widespread international attention to PS, it is believed that progress in improving PS has been unacceptably slow [3-6].

Current evidence suggests that, paying little attention to the key role of healthcare professionals, may be the main reason for the slow progress in PS [7-10]. This deficit is at least partly because of lack of understanding the views and preferences of physicians about PS [5, 7, 11-14]. Nevertheless, it

seems that physicians' participation is the keystone of any efforts to improve the safety of care [15]. In line with this idea are findings of Steiger [16], who reported lack of physician participation as the most fundamental obstacle for effective implementation of safety initiatives. It is also recommended that healthcare organizations consider the unique experiences of hospital residents as an investment to identify failures in PS [17]. Vincent et al. [18] acknowledge that comprehensive understanding of accidents in healthcare needs the adoption of a systems approach. On this basis, the accident sequence begins from the latent (distal) organizational failures to the active (proximal) human failures. They therefore presented a "broad framework of factors affecting clinical practice" by modifying Reason's model of human error theory [19]. According to Vincent's framework, the ultimate outcome of care is affected by seven levels of safety consisting of patient, individual (staff), task and technology, team, work environment, organizational and management, and

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contextual levels. However, there are claims that such a framework is faced with restrictions because of its lack of empirical basis in healthcare environments [19, 20].

In a recent review commissioned by WHO for identifying the underlying factors of unsafe care, it was concluded that there is not enough knowledge about factors affecting PS yet [21]. To our knowledge, there are limited published studies on physicians' perceptions of patient safety factors (PSFs), the factors that contribute to PS incidents, but results have not been synthesized so far. Thus, the purpose of this study was to understand better the physicians' perceptions of PSFs in secondary care. More specifically, the objectives were to identify and categorize PSFs, compare the perceptions of trainee and non-trainee physicians, and to underline themes related to the physicians' perceptions of PSFs. Since the Vincent framework was used as a priori in this review, another objective was to validate the framework.

Methods

Search strategy

Covering a period from January 1999 to December 2011, we systematically searched Ovid MEDLINE, EBSCO CINAHL, and SciVerse Scopus citation databases using a combination of free text and MeSH terms. The search was augmented by hand searching of six selected journals in the same period and reference lists of identified studies. The complete search strategy and the list of journals that were hand-searched are available upon request from the corresponding author.

Eligibility criteria

According to the review objectives, we included any empirical studies that focused on physicians' perceptions of PSFs in secondary care. Exclusion criteria were: (1) non-English studies; (2) studies before 1999, because the current widespread interest in PS research has been initiated after the IOM's 1999 report [22, 23]; and (3) studies focusing on one particular aspect of PS such as physicians' working hours, fatigue, and report and disclosure of errors.

Study quality assessment

To assess the quality of included studies, we used the checklist compiled by Rosenberg et al. [24], which allowed the assessment of both qualitative and

quantitative studies in a single scale. This system addressed four main criteria: study type, sample size, internal validity, and reporting transparency. On this basis, the quality scores of studies ranging from a minimum score of 1 to a maximum of 16.

Data extraction and analysis

Using two structured forms, the characteristics and results of included studies were extracted and recorded. Because of the heterogeneity of included studies, a narrative synthesis approach was adopted [25]. Accordingly, PSFs were categorized using a directed content analysis [26] in which the initial coding scheme is guided by the Vincent framework [19]. As the analysis proceeded, the initial scheme was revised and refined, and emerging themes were identified at the safety levels of the framework. The resulting framework was compared with the initial one. The study subgroups, trainee and non-trainee, were also compared for any differences in their categorization.

Results

Identification of relevant studies

Figure 1 shows a literature search and study selection process. Of 1,405 potentially relevant citations identified, 14 studies finally met the inclusion criteria. Articles were mainly excluded for two reasons: either they did not focus on secondary care [27, 28], physicians [29], and PSFs [6, 30], or they focused on the report and disclosure of errors [31-34], educational programs, experience and knowledge of PS [35-37].

Overview of included studies

The characteristics of the studies are summarized in **Table 1**. All 14 included studies were based on empirical data, and in half of these a quantitative approach and cross-sectional survey design were employed [7, 13, 14, 16, 38-40]. Three other studies used a qualitative approach [11, 12, 41] and the rest used a mixed approach, a combination of survey and focus group discussion [5, 8, 42] or interview [43]. As it appears in **Table 1**, the participants in 9 studies were trainee physicians [8, 11-14, 38, 39, 42, 43], and in 5 remaining studies [5, 7, 16, 40, 41], they were non-trainee physicians. All the studies were conducted in the US between 2002 and 2011. **Table 1** also shows the quality assessment results of included studies. Quality scores for the studies ranged from 6 [41] to 12.5 [8, 43] with an average score of 10.3 (possible range 1-16). The overall agreement between the two

independent reviewers (AK and AH) was 85.7% and interrater reliability analysis indicated an almost perfect agreement between the reviewer (Cohen's kappa $r = 0.82$, $p < 0.001$).

Safety levels and themes

We extracted 158 PSFs from the included studies ($n = 14$). Content analysis of PSFs yielded seven safety categories and 22 corresponding themes, as presented in **Tables 2** and **3**. These safety categories are consistent with, and similar to, the seven safety levels of Vincent's framework [19]. However, four new themes were added to the three levels of this framework, namely professionalism, change management, purchasers' behavior, and administrative culture. A table of all extracted PSFs and their categories is available upon request.

Table 2 shows the rank order of safety categories/levels based on the frequency of PSFs at

each level. In all included studies, both the individual and team levels ranked first, and the patient level last. In the trainee studies, the rank order was almost similar to all included studies, whereas in the non-trainee studies, the order was almost the reverse.

The emerging safety themes and their frequency of occurrence are listed in **Table 3**. In all the studies, the most frequent theme was competency, and the least frequent were physical environment, change management, and administrative culture. In the trainee studies, there was an almost similar pattern of themes to all the studies. While in the non-trainee studies, regulations/legislation was the most frequent theme and supports the least one. As seen in **Table 3**, there are four themes related specifically to the trainee studies and five to the non-trainee studies. The majority of themes (13 of 22; 60%) are common to both subgroups.

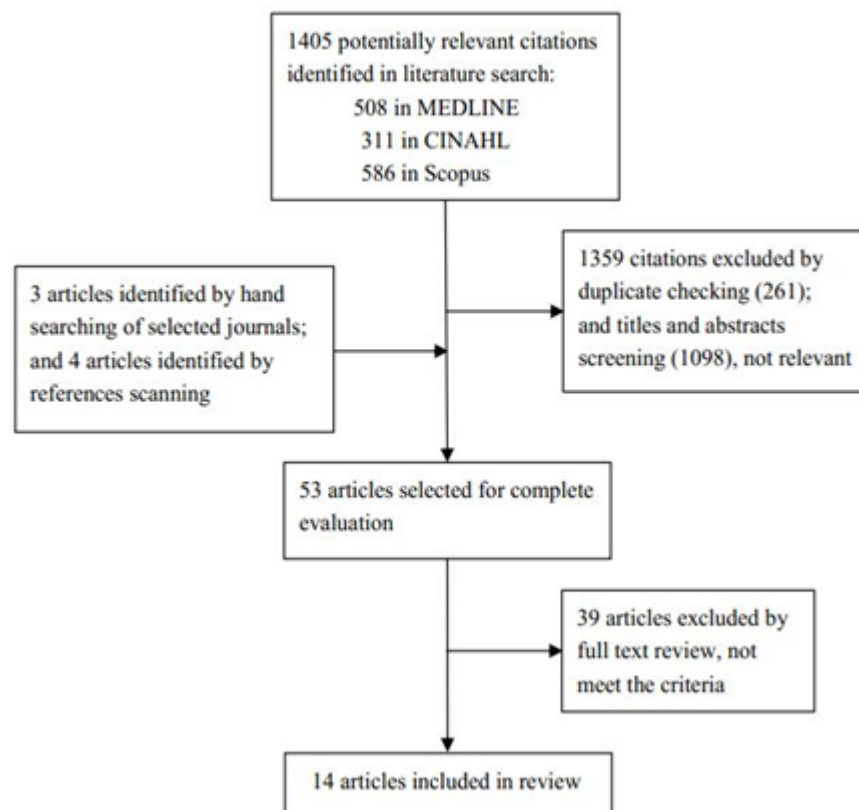


Figure 1. Literature search and study selection process

Table 1. Characteristics and quality assessment sum-score (QAS) of included studies (n = 14)

Study	Purpose/Objectives	Participants and setting	QAS (1-16)
Qualitative studies			
Schenkel et al. 2003 [11]	To evaluate residents' perceptions of medical errors	26 residents from a teaching hospital of Michigan University, USA	10
Cox et al. 2011 [12]	To identify outcomes, timing and contributing factors of errors	36 residents from 4 teaching hospitals of Indiana University, USA	8
Hansen et al. 2003 [41]	To identify system characteristics influencing PS care leaders, USA	3 professional groups (8 physicians, 6 pharmacists and 8 nurses) of Iowa secondary	6
Quantitative studies			
Blendon et al. 2002 [7]	To identify causes and solutions of preventable medical errors	831 physicians and 1207 public members, USA	10
Sorokin et al. 2005 [13]	To study trainees' attitudes of medical errors	225 residents and 93 fourth-year medical students from an academic institution, USA	11.5
Sorokin et al. 2011 [14]	To study trainees' attitudes of medical errors and evaluate changes in PS attitudes over time	265 residents and 173 fourth-year medical students from a University Hospital in Philadelphia, USA	10
Steiger 2007 [16]	To explore quality and safety issues and identify obstacles to PS	1155 physicians or executive physicians working in different secondary care organizations, USA	8
Wu et al. 2003 [38]	To study residents' mistake types and their perceptions of error causes	114 interns and residents from 3 academic hospitals, USA	11
Hobgood et al. 2005 [39]	To determine residents' responses to medical errors	43 residents from 2 residency programs, USA	11
Sklar et al. 2010 [40]	To rate various areas of concern and risk for PS	2507 emergency physicians, USA	10
Mixed studies			
Durbin et al. 2006 [5]	To assess providers' perceptions regarding the impact of multiple parts of the healthcare system on PS	22 physicians, pharmacists and nurses in focus groups, and 2388 physicians, pharmacists and nurses of Iowa in a survey, USA	12
Menachemi et al. 2005 [8]	To study residents' perceptions of medical errors	9 residents in a focus group, and 195 residents in a survey from 4 academic medical centers, USA	12.5
Jagsi et al. 2005 [42]	To explore trainees' experiences with adverse events and the potential causes	821 residents and fellows from 15 residency programs of 2 teaching hospitals, USA	11.5
Vohra et al. 2007 [43]	To study trainees' attitudes toward medical errors and adverse events	7 residents in interviews, 77 residents and 37 fourth-year medical students in a survey from a teaching hospital, USA	12.5

Table 2. Rank order of safety levels by frequency of PSFs in study subgroups

Safety levels	PSFs		
	Trainee studies No (%), Rank*	Non-trainee studies No (%), Rank*	Total studies No (%), Rank*
Individual	27 (30), 1	4 (6), 6	31 (20), 1
Team	23 (25), 2	8 (12), 5	31 (20), 1
Work environment	15 (16), 3	11 (16), 3	26 (16), 2
Organizational and Management	8 (9), 5	17 (25), 1	25 (16), 3
Task and Technology	9 (10), 4	9 (13), 4	18 (11), 4
Contextual	1 (1), 6	14 (21), 2	15 (9), 5
Patient	8 (9), 5	4 (6), 6	12 (8), 6

*Ranked from 1 (the greatest number of PSFs) to 6 (the least number of PSFs)

Table 3. Emerging safety themes (N=22) at seven safety levels and their frequency in study subgroups

Safety levels and themes	Frequency of themes [References]		
	Trainee studies	Non-trainee studies	Total studies
Patient			
Patient characteristics	4 [8, 11, 13, 14]	4 [5, 16, 40]	8
Disease characteristics*	4 [8, 11, 38, 39]	—	4
Individual			
Competency	16 [8, 11-14, 38, 39, 43]	2 [5, 7]	18
Employees' health	8 [8, 11, 13, 14, 38, 39, 43]	2 [7, 16]	10
Professionalism*	3 [8, 39]	—	3
Task and technology			
Decision making	6 [8, 11, 12]	5 [5, 7, 16, 40]	11
Technology	3 [8, 12]	4 [5, 40, 41]	7
Team			
Communication	10 [8, 11-14, 38, 39, 42]	3 [7, 16, 40]	13
Teamwork	5 [8, 11, 13, 14]	4 [5, 7, 16]	9
Support	8 [11, 13, 14, 38, 39, 42, 43]	1 [40]	9
Work environment			
Workload	8 [8, 11-14, 38, 39, 42]	5 [7, 40, 41]	13
Staffing	1 [8]	6 [5, 7, 40, 41]	7
Work hours*	4 [8, 13, 14, 42]	—	4
Physical environment*	2 [11, 12]	—	2
Organizational and management			
Safety culture	7 [11, 13, 14, 16]	6 [5, 7, 16]	13
Organizational priorities	1 [8]	6 [5, 7, 16]	7
Financial resources †	—	3 [16, 41]	3
Change management †	—	2 [5, 16]	2
Contextual			
Regulation/Legislation	1 [12]	7 [5, 16, 41]	8
Purchasers' behavior †	—	3 [5, 16]	3
Care continuity †	—	3 [5, 40]	3
Administrative culture †	—	2 [7, 16]	2

*Themes specific to trainee studies, †Themes specific to non-trainee studies

Discussion

We included 14 empirical studies that focused on physicians' perceptions of PSFs in secondary care. One hundred fifty-eight PSFs were extracted from the studies at seven safety levels and 22 themes, adopting a narrative synthesis approach and a directed content analysis method. In what follows, the main findings of the review are discussed in the context of the available evidence.

The claim that the Vincent framework is restricted because of its reliance on non-healthcare settings [19, 20] was not supported by this review. Because all reported PSFs in the studies were categorized into seven safety levels of the framework. There were some changes in the safety themes, but these changes were merely an extension of the framework. Therefore, our results supported the Vincent framework generally.

This review showed that in the trainee studies, the most frequent PSFs and themes were at the individual safety level and the least ones at the contextual level. An almost identical pattern of results was observed in all the studies. This means that more attention was given to the proximal causes of PS incidents compared with the distal causes—that is, more emphasis was placed on human failures than on systems failures [44]. This echoes the results of several previous studies [20, 45, 46]. For instance, a systematic review reported that the frequency of identified PSFs has decreased from the proximal to distal causes of PS incidents in hospital settings [20]. In another study conducted to investigate the reasons of prescribing errors of residents, similar results were reported [46]. One explanation is that there is a ubiquitous tendency to focus on the proximal factors

during analysis of PS incidents [20]. Another possible explanation is related to the presence of professional ethos of personal responsibility. In a study, for example, 44% of residents expressed physicians' vigilance as the best way of supporting PS [13]. Because most of the trainee physicians' errors are related to system-level problems, engaging them in a systems approach to PS is beneficial [17, 47]. This could then lead to a better understanding of the underlying causes of PS events.

By contrast with the results from the trainee studies, the non-trainee studies emphasize on distal causes of PS incidents. Indeed, in the non-trainee studies, not only half of PSFs were at the organizational or contextual level, but also the themes such as administrative culture that is indicative of the distal causes of PS incidents, were related to this study subgroup. This is not in line with the findings of previous studies suggesting physicians do not consider PS incidents from a systems perspective and consider people, not organizations and systems, accountable [5, 7, 48, 49]. A possible explanation for this discrepancy may be related to individuals gaining experience over time. There is a belief that even in the healthcare field, in which safety skills are not explicitly trained, the skills would eventually be acquired by individuals working in such environments [50]. Given the various costs associated with trial-and-error methods, this explanation highlights the importance of gaining safety skills by healthcare professionals, as it has been emphasized previously [1, 21, 29, 49, 50].

To explore themes related to the physicians' perceptions of PSFs, we compared our results with two recent systematic reviews [20, 21]. These reviews examined empirical data from healthcare settings to categorize PSFs in general, not limited to views of a particular group of providers. In summary, the majority of our themes were comparable to those identified by Lawton et al. [20] and Jha et al. [21]. However, three of our themes, namely professionalism, purchasers' behavior and administrative culture, could not be found in both the aforementioned reviews [20, 21]. We thus assumed that they are probably a reflection of the physicians' perceptions of PSFs, and termed them 'physician-driven safety metafactor'. This is because first, medical professionalism is a major force for improving PS [51]. Second, physicians' behavior influences and are influenced by the behavior of healthcare purchasers [1], and almost all actions

in healthcare are derivative of their decisions and recommendations [52]. Taken together, as underscored by the IOM's landmark report [1], the metafactor also reflects the leading role of physicians in PS efforts. Clearly, further studies are needed to investigate the possible differences among healthcare professionals in their perceptions of PSFs to draw definitive conclusions.

The reported findings should be treated with caution for three reasons. First, although a comprehensive search approach was employed, data in this review were limited to the US. Hence, the possible influence of contextual factors on our results is the main limitation of this study, reflecting the need for replication studies in other healthcare contexts. Second, most included studies were cross-sectional attitudinal surveys while the link between physicians' perceptions and their performances are not clear [13, 17]. To meet the challenge, researchers will need to use more sophisticated designs, such as mixed-methods. Finally, while directed content analysis was used for categorization of PSFs, it does not mean that it is definitive. This is because some PSFs may be categorized at different safety levels and/or different themes. However, to our knowledge, despite these limitations, this is the first systematic review focusing on the physicians' perceptions of PSFs.

Conclusion

This systematic review presents a synthesis of the limited empirical literature on physicians' perceptions of PSFs in secondary care. Generally, our data support the Vincent framework and extend it. The results show that, overall, the physicians pay more attention to the proximal causes of PS incidents than distal causes, suggesting the need for safety skills training, especially for the physicians-in-training. The authors also introduce a new concept called 'physician-driven safety metafactor' that reflects the leading role that physicians play in PS efforts. However, further work is required to determine whether these results can be generalized to other healthcare contexts.

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