

# BMJ Open Similarities and differences in the associations between patient safety culture dimensions and self-reported outcomes in two different cultural settings: a national cross-sectional study in Palestinian and Belgian hospitals

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## ABSTRACT

**Objectives** To investigate the relationships between patient safety culture (PSC) dimensions and PSC self-reported outcomes across different cultures and to gain insights in cultural differences regarding PSC.

**Design** Observational, cross-sectional study.

**Setting** Ninety Belgian hospitals and 13 Palestinian hospitals.

**Participants** A total of 2836 healthcare professionals matched for profession, tenure and working hours.

**Primary and secondary outcome measures** The validated versions of the Belgian and Palestinian Hospital Survey on Patient Safety Culture were used. An exploratory factor analysis was conducted. Reliability was tested using Cronbach's alpha ( $\alpha$ ). In this study, we examined the specific predictive value of the PSC dimensions and its self-reported outcome measures across different cultures and countries. Hierarchical regression and bivariate analyses were performed.

**Results** Eight PSC dimensions and four PSC self-reported outcomes were distinguished in both countries. Cronbach's  $\alpha$  was  $\alpha \geq 0.60$ . Significant correlations were found between PSC dimensions and its self-reported outcome ( $p$  value range  $<0.05$  to  $<0.001$ ). Hierarchical regression analyses showed overall perception of safety was highly predicted by hospital management support in Palestine ( $\beta=0.16$ ,  $p<0.001$ ) and staffing in Belgium ( $\beta=0.24$ ,  $p<0.001$ ). The frequency of events was largely predicted by feedback and communication in both countries (Palestine:  $\beta=0.24$ ,  $p<0.001$ ; Belgium:  $\beta=0.35$ ,  $p<0.001$ ). Overall grade for patient safety was predicted by organisational learning in Palestine ( $\beta=0.19$ ,  $p<0.001$ ) and staffing in Belgium ( $\beta=0.19$ ,  $p<0.001$ ). Number of events reported was predicted by staffing in Palestine ( $\beta=-0.20$ ,  $p<0.001$ ) and feedback and communication in Belgium ( $\beta=0.11$ ,  $p<0.01$ ).

**Conclusion** To promote patient safety in Palestine and Belgium, staffing and communication regarding errors should be improved in both countries. Initiatives to improve hospital management support and establish constructive

## Strengths and limitations of this study

- Our study enables us to draw conclusions regarding the varying associations among patient safety culture (PSC) dimensions and self-reported patient safety outcomes across different cultural settings.
- This is the first study to explore the predictive value of the Hospital Survey on Patient Safety Culture (HSOPSC) in matched samples from two different countries.
- Using a matched samples study design is useful, allowing researchers to establish a good degree of validity and to investigate a rationalised and focused research question.
- Our results verify the international and cross-cultural validity of the HSOPSC; however, more studies are needed to provide further evidence in this regard.
- Our study relied exclusively on subjective self-reported measures; future research on linking actual adverse events data with PSC dimensions objectively is required to clarify this relationship.

learning systems would be especially beneficial for patient safety in Palestine. Future research should address the association between safety culture and hard patient safety measures such as patient outcomes.

## BACKGROUND

Patient safety is a major focus in the improvement of the quality of healthcare.<sup>1–3</sup> This has led to an increased interest in patient safety culture (PSC) assessments in healthcare organisations.<sup>4</sup> Clinical outcomes and adverse event rates have been used as indicators of patient safety in previous studies.<sup>5</sup> Earlier research has demonstrated a link between organisational culture and hospital

outcomes, adverse event rates,<sup>6–8</sup> financial performance<sup>9</sup> or patient satisfaction.<sup>10</sup> The development of a positive PSC may help to integrate the concern for safety into the daily functioning of organisations and into the routines of individuals and teams.<sup>6</sup> In this study, PSC is defined as the presence of values, beliefs, norms, behaviours and attitudes that may contribute to patient safety.<sup>11</sup> Hospitals that invest in PSC may enable staff to prevent and solve safety problems and to learn collectively from problems that occur at the frontline of healthcare delivery.<sup>8 12 13</sup> Several studies have highlighted the perception of patient safety and staff attitudes towards safety.<sup>14–16</sup> Others have reported on the psychometric evaluation of PSC tools.<sup>17–21</sup>

A range of tools has been developed to measure PSC, for example, PSC in healthcare organisations, hospital surveys on patient safety and safety attitude questionnaires.<sup>22 23</sup> These instruments can be used to elicit patient safety-related assessments by healthcare staff at: (1) a hospital level, (2) a unit level and (3) a professional level.<sup>16 24</sup> The original American Hospital Survey on Patient Safety Culture (HSOPSC) was released by the Agency for Healthcare Research and Quality in November 2004. The survey is one of the most commonly applied instruments for the assessment of PSC. Moreover, it has been widely translated and validated in several languages and countries, including Belgium, England, Norway, Scotland, the Netherlands and Palestine.<sup>17–21 25 26</sup> The survey is intended to help hospitals assess the extent to which their cultures emphasise the importance of patient safety, encourage both the reporting and open discussion of errors and create an atmosphere of continuous learning and improvement.

The original HSOPSC consists of 42 items loading on 12 dimensions: 2 outcome dimensions and 10 safety dimensions. The 10 different PSC dimensions are expected to have strong relationships with the two composite outcome dimensions (frequency with events reported and overall perceptions of patient safety (OPS)) and the two single-item outcomes (patient safety grade and number of events reported (NER)).<sup>14 17</sup> The four outcomes are self-reported patient safety outcomes.

Despite efforts to measure PSC in terms of dimensions and outcomes to improve patient safety, few studies have examined the specific predictive value of the dimensions in terms of HSOPSC outcomes.<sup>17 20 27</sup> Research to date has not detailed the relationships between the HSOPSC dimensions and its self-reported outcome measures across countries. Being part of this patient safety collaborative project between Palestinian and Belgian academic institutions allowed us to do this comparison. The two healthcare systems are different, one from developed countries (Belgium), having universal coverage, higher spending per capita, higher human resources ratios and system functioning in stable conditions compared with another system from a developing country (Palestine) that has a national insurance system with high out-of-pocket spending (40%), especially for pharmaceuticals, lower physician density (1.6 in Palestine comparing with

2.96 in Belgium per 1000 inhabitants) and lower density of practising nurses (3.0–9.51 per 1000 population).<sup>28–30</sup> Despite these differences, both countries have ongoing initiatives to improve patient safety of care. The governments of Belgium and Palestine promote the HSOPSC as a tool to support assessing PSC and providing baseline data to support the development of patient safety interventions or initiatives in hospitals. Our study included hospitals that are operated in both governmental and non-governmental sectors in Belgium and Palestine. We assumed that there were no staff-related differences that would influence the PSC between the two countries. Both governments have called for further investigations into the effectiveness of the HSOPSC within and between different cultural contexts.<sup>15</sup> Thus, the first aim of this study was to determine which HSOPSC dimensions are associated with self-reported outcome measures. Second, we aimed to investigate the impact of cultural context on these associations. These findings offer further insights into the similarities and differences regarding associations between the PSC dimensions and outcomes of hospital workers in two very different cultural settings. The results also further attest to the value of the HSOPSC to increase patient safety in a range of settings.

## METHODS

### Design, setting and sample

A cross-sectional study design was used. In total, 90 acute Belgian hospitals and 13 Palestinian hospitals were included in the study. In Belgium, workshops were organised for participating hospitals in which the objectives and survey were explained. The Dutch and French validated versions of the HSOPSC were distributed organisation wide to 90 acute hospitals that participated in a federal patient safety programme between 2007 and 2009 (baseline PSC measurement<sup>15 25 26</sup>). These hospitals comprised 58 Dutch-speaking hospitals, 31 French-speaking hospitals and one that was both Dutch speaking and French speaking. In total, 68 hospitals used a paper-based survey, 15 used an electronic survey and 7 applied a mixed method for survey administration. Technical assistance was available during the periods of data collection. Hospitals were invited to participate in a Belgian comparative study on a voluntary, confidential and free-of-charge basis. A total of 91 852 questionnaires were distributed, of which 47 648 were returned (response rate 51.9%). The comparative database was managed by a neutral academic institution and was not accessible to government authorities.

In Palestine, PSC baseline data were collected from September 2010 to August 2011 in 13 hospitals: 11 public hospitals and 2 general non-governmental hospitals situated in the West Bank. All hospitals were Arabic speaking and used a validated paper-based Arabic language survey.<sup>21</sup> Workshops were organised at the participating hospitals to explain the objectives and survey. A paper version of the questionnaire was distributed, and participants were

informed about the purpose of the study. They were also told that their participation was anonymous, voluntary and confidential. Technical assistance was accessible during the periods of data collection. A total of 3153 questionnaires were distributed, of which 1690 were returned (response rate 53.6%), of which 1418 could be used for this study. The collected database was managed by an independent academic institution.

For both the Belgian and Palestinian samples, the survey was distributed anonymously to all healthcare staff that had direct (physicians, nurses, clinical staff, pharmacists, radiology staff and laboratory staff) or indirect (all hospital supervisors, managers, administrators and support and administrative staff) interaction with patients. The survey was self-administered and then placed in sealed envelopes without any respondent identification. Collection points/boxes were identified for returning the completed questionnaires.

For the purposes of this study, the Belgian sample was matched to the Palestinian sample by selecting a matched subsample based on staff position, years of experience at the hospital and number of hours worked per week. Specifically, we used the Palestinian set (n=1418) to randomly (blind) select 1:1 matching participants regarding position, tenure and working hours from the Belgian sample. When more than one matching participant was identified, we randomly (blind) selected one of the participants that fitted the criteria. The matched sample was selected manually by the data management department.

The Belgian and Palestinian samples consisted of a total of 2836 healthcare staff (1418 respondents from each country). The subsample comprised the following staff categories: nurses (38.6%), head nurses (9.4%), nursing aid staff (5.7%), physicians (17.9%), pharmacists (2.9%) and other healthcare staff (25.5%). The sample hospitals ranged in size from small (fewer than 150 beds) to large (more than 200 beds). The research was fully supported and ethically approved by the Departments of Health of the Belgian and Palestinian governments, and all the hospitals that were approached participated in our study.

### Funding statement

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

### Instruments and measures

The HSOPSC consists of 42 items and is designed to measure 10 PSC dimensions and 4 outcome measures. Items are scored on a 5-point Likert scale ranging from 1='strongly disagree' to 5='strongly agree' or from 1='never' to 5='always'. Respondents were also asked to provide some demographic information (eg, their work area/unit, staff position, whether they have direct interaction with patients).<sup>14</sup> PSC dimensions and self-reported outcomes are shown in [table 1](#).

Using the matched samples from both countries, the relationships between all dimensions and outcomes of

the HSOPSC were assessed. Five-point response scales were used (1='strongly disagree' to 5='strongly agree').

### Independent variables

For both samples, the PSC dimensions shown in [table 1](#) were used. All PSC dimensions consist of multiple items.

### Dependent variables

Four self-reported outcome measures were used as dependent variables ([table 1](#)). Two composite outcomes have multiple items scored on a 5-point Likert scale, of which the labels vary throughout the dimensions as follows: (1) frequency with events reported from 1='strongly disagree' to 5='strongly agree' and (2) overall perceptions of patient safety from 1='never' to 5='always'. Patient safety grade and number of events are ordinal, ranging from 1 to 5 (1='failing' to 5='excellent') and from 1 to 6 (1='no event' to 6='more than 21 events'), respectively; both are single-item measures.

### Control variables

The following controls were measured in both samples: staff position is categorical; years of working experience at the hospital is numerical, ranging from 1 to 6 (1='less than 1 year' to 6='21 years or more'), and number of hours worked per week is numerical, ranging from 1 to 6 (1='less than 20 hours per week to 6='100 hours or more per week'). The control variables were selected based on previous research and/or their significant correlations with the outcomes.<sup>31 32</sup>

### Statistical analysis

A total of 2836 healthcare staff participated in the study. For the purposes of our analysis, negatively worded items were reversed coded so that a higher score reflected a more positive response. First, we conducted exploratory factor analyses (EFAs) using the Palestinian and matched Belgian data to test whether we could detect the same dimension structure in both samples. We aimed for acceptable levels of reliability (Cronbach's  $\alpha \geq 0.60$ ) as recommended in the HSOPSC user guide.<sup>33</sup> Based on the EFA, we optimised the model by defining 10 PSC dimensions instead of the original 12 HSOPSC dimensions in both the Palestinian and Belgian data. Four original dimensions were revealed as two dimensions. One combined 'communication openness' and 'feedback about error' in one dimension and the other combined 'teamwork across hospital units' and 'hospital handoffs and transitions' ([table 2](#)). The other two outcome measures were individual items: 'patient safety grade' and 'number of events reported'. Cronbach's  $\alpha$  values for both the Palestinian and Belgian databases are presented in [table 2](#).

Second, we conducted hierarchical regression analyses for both the Palestinian and Belgian samples using IBM SPSS V.20.0. Regression analyses are particularly suitable for analyses of variance in which we aim to test whether and to what extent the variance on the dependent variables (and as reported by the respondents) can be explained by the independent variables, which is reflected by  $R^2$ . By

**Table 1** Definitions of patient safety culture dimensions and outcomes

	Items
<b>Patient safety culture dimensions</b>	
<i>Communication openness</i> : staff freely speak up if they see something that may negatively affect a patient and feel free to question those with more authority.	<ul style="list-style-type: none"> <li>▶ Staff will freely speak up if they see something that may negatively affect patient care.</li> <li>▶ Staff feel free to question the decisions or actions of those with more authority.</li> <li>▶ Staff are afraid to ask questions when something does not seem right.</li> </ul>
<i>Feedback and communication about errors</i> : staff are informed about errors that happen, given feedback about changes implemented and discuss ways to prevent errors.	<ul style="list-style-type: none"> <li>▶ We are given feedback about changes put into place based on event reports.</li> <li>▶ We are informed about errors that happen in this unit.</li> <li>▶ In this unit, we discuss ways to prevent errors from happening again.</li> </ul>
<i>Hospital handoffs and transitions</i> : important patient care information is transferred across hospital units and during shift changes.	<ul style="list-style-type: none"> <li>▶ Things 'fall between the cracks' when transferring patients from one unit to another.</li> <li>▶ Important patient care information is often lost during shift changes.</li> <li>▶ Problems often occur in the exchange of information across hospital units.</li> <li>▶ Shift changes are problematic for patients in this hospital.</li> </ul>
<i>Hospital management support for patient safety</i> : hospital management provides a work climate that promotes patient safety and shows that patient safety is a top priority.	<ul style="list-style-type: none"> <li>▶ Hospital management provides a work climate that promotes patient safety.</li> <li>▶ The actions of hospital management show that patient safety is a top priority.</li> <li>▶ Hospital management seems interested in patient safety only after an adverse event happens.</li> </ul>
<i>Non-punitive response to error</i> : staff feel that their mistakes and event reports are not held against them and that mistakes are not kept in their file.	<ul style="list-style-type: none"> <li>▶ Staff feel like their mistakes are held against them.</li> <li>▶ When an event is reported, it feels like the person is being written up, not the problem.</li> <li>▶ Staff worry that mistakes they make are kept in their file.</li> </ul>
<i>Organisational learning—continuous improvement</i> : Mistakes have led to positive changes, and changes are evaluated for effectiveness.	<ul style="list-style-type: none"> <li>▶ We are actively doing things to improve patient safety.</li> <li>▶ Mistakes have led to positive changes here.</li> <li>▶ After we make changes to improve patient safety, we evaluate their effectiveness.</li> </ul>
<i>Staffing</i> : there is enough staff to handle the workload and work hours are appropriate to provide the best care for patients.	<ul style="list-style-type: none"> <li>▶ We have enough staff to handle the workload.</li> <li>▶ Staff in this unit work longer hours than is best for patient care.</li> <li>▶ We use more agency/temporary staff than is best for patient care.</li> <li>▶ We work in 'crisis mode', trying to do too much, too quickly.</li> </ul>
<i>Supervisor/manager expectations and actions promoting safety</i> : supervisors/managers consider staff suggestions for improving patient safety, praise staff for following patient safety procedures and do not overlook patient safety problems.	<ul style="list-style-type: none"> <li>▶ My supervisor/manager offers praise when he/she sees a job done according to established patient safety procedures.</li> <li>▶ My supervisor/manager seriously considers staff suggestions for improving patient safety.</li> <li>▶ Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts.</li> <li>▶ My supervisor/manager overlooks patient safety problems that happen repeatedly.</li> </ul>
<i>Teamwork across hospital units</i> : hospital units cooperate and coordinate with one another to provide the best care for patients.	<ul style="list-style-type: none"> <li>▶ There is good cooperation among hospital units that need to work together.</li> <li>▶ Hospital units work well together to provide the best care for patients.</li> <li>▶ Hospital units do not coordinate well with each other.</li> <li>▶ It is often unpleasant to work with staff from other hospital units.</li> </ul>
<i>Teamwork within hospital units</i> : staff support each other, treat each other with respect and work together as a team.	<ul style="list-style-type: none"> <li>▶ People support one another in this unit.</li> <li>▶ When a lot of work needs to be done quickly, we work together as a team to get the work done. In this unit, people treat each other with respect.</li> <li>▶ When one area in this unit gets really busy, others help out.</li> </ul>
<b>Self-reported outcome measures</b>	
<i>Frequency of events reported</i> : mistakes of the following types are reported: (1) mistakes caught and corrected before affecting the patient; (2) mistakes with no potential to harm the patient; and (3) mistakes that could harm the patient but do not.	<ul style="list-style-type: none"> <li>▶ When a mistake is made but is caught and corrected before affecting the patient, how often is this reported?</li> <li>▶ When a mistake is made but has no potential to harm the patient, how often is this reported?</li> <li>▶ When a mistake is made that could harm the patient but does not, how often is this reported?</li> </ul>
<i>Overall perceptions of patient safety</i> : procedures and systems are good for the prevention of errors and there are minimal patient safety problems.	<ul style="list-style-type: none"> <li>▶ Patient safety is never sacrificed to get more work done.</li> <li>▶ Our procedures and systems are good for the prevention of errors.</li> <li>▶ It is just by chance that more serious mistakes do not happen around here.</li> <li>▶ We have patient safety problems in this unit.</li> </ul>
<i>Patient safety grade</i> : overall grade for patient safety for their work area/unit.	<ul style="list-style-type: none"> <li>▶ Please give your work area/unit in this hospital an overall grade for patient safety.</li> </ul>
<i>Number of events reported</i> : the number of events reported over the past 12 months.	<ul style="list-style-type: none"> <li>▶ In the past 12 months, how many event reports have you filled out and submitted?</li> </ul>

**Table 2** Percentage positive scores for patient safety dimensions and Cronbach's alpha of Hospital Survey on Patient Safety Culture (HSOPSC) in Palestine and Belgium

	Per cent positive response Palestine	Per cent positive response Belgium	Cronbach's alpha Palestine	Cronbach's alpha Belgium
<b>Patient safety culture dimensions</b>				
Teamwork within hospital units	75	73	0.80	0.79
Organisational learning–continuous improvement	64	49	0.73	0.61
Supervisor/manager expectations and actions promoting safety	55	58	0.74	0.74
No punitive response to error	17	38	0.63	0.69
Hospital management support for patient safety	42	33	0.76	0.77
Teamwork across hospital units and hospital handoffs and transitions	45	27	0.78	0.75
Staffing (staff)	58	37	0.67	0.61
Feedback and communication openness about errors	49	51	0.76	0.80
<b>Patient safety culture outcomes</b>				
Frequency of event reporting	39	44	0.87	0.86
Overall perceptions of safety	55	47	0.75	0.73
Overall grade of patient safety	49	39	NA	NA
Number of events reported	45	69	NA	NA

including hierarchical analyses, we are able to detect how much extra variance ( $R^2$  change) in the PSC outcomes is explained by introducing the PSC dimension in the analyses on top of the control variables.<sup>34</sup> A composite average score was generated by calculating the average responses to the items within a dimension. As five-point response scales were used, the composite scores generated were any value between 1 and 5. Regression analyses were conducted to determine the extent to which the PSC dimensions (modelled as independent variables) predicted the four self-reported dimensions (modelled as dependent variables). Multiple R ( $R^2$ ) was used to indicate the proportion of variance explained by the model. An indication of the predictive value of the PSC dimensions was confirmed using standardised beta values ( $\beta$ ). A standardised beta coefficient is a standardised partial correlation coefficient that allows us to compare the strength of the effect of each predictor/independent variable in predicting the outcome/dependent variable, with higher absolute values of the beta coefficient indicating a stronger effect. Based on their significant correlation with the four outcomes over the Palestine and Belgian samples, the following controls were used in all regression analyses: experience at hospital (years), working hours (hours) and staff position. The control variables included in both countries were consistent to assure we could compare the results.

#### Data sharing statement

The data that support the findings of this study are available from the correspondent author on reasonable

request and with permission of University of Leuven and University of Hasselt.

#### Patient and public involvement

Patient and public were not involved in the study.

#### Ethical approval

To ensure the privacy of the respondents, the survey was conducted anonymously. The researchers obtained ethical approval from the Departments of Health of the Belgian and Palestinian governments and institutional permits from the participating hospitals. Formal ethical approval and informed patient consent were not necessary for this type of study.

## RESULTS

### Participants' characteristics

Most participants were nurses 761 (53.7%) and 254 (17.9%) were physicians. Most of the participants had between 1 year and 5 years of experience in their current work unit. Details of the matched sample and participants' characteristics for both Palestinian and Belgian respondents are described in table 3.

### Correlation between PSC dimensions and outcomes of the HSOPSC

Table 4 presents the results of two correlation tables; namely, Palestinian correlations shown below the diagonal and Belgian correlations above. Preliminary

**Table 3** Participants' characteristics

Characteristics	Whole sample	Palestinian sample n=1418	Matched Belgian sample n=1418
Direct contact or interaction with patient			
Yes, n (%)	2524 (88.9)	1284 (90.5)	1240 (87.4)
No, n (%)	312 (11.0)	134 (9.4)	178 (12.5)
Experience at current work area/unit			
<1 year	452 (15.9)	218 (15.4)	234 (16.5)
1–5 years	1206 (42.5)	621 (43.8)	585 (41.3)
6–10 years	552 (19.5)	250 (17.6)	302 (21.3)
11–15 years	281 (9.9)	162 (11.4)	119 (8.4)
16–20 years	184 (6.5)	81 (5.7)	104 (7.3)
>21 years	160 (5.6)	86 (6.1)	74 (5.2)
Hospital size (beds)			
Small (< 150), n (%)	700 (24.7)	612 (43.1)	88 (6.2)
Medium (150–249), n (%)	632 (22.3)	546 (38.5)	86 (6.1)
Large (≥250), n (%)	1504 (53.0)	260 (18.4)	1244 (87.7)

Spearman's correlation analyses (table 4) revealed some differences between the Palestinian and Belgian samples. The analyses showed significant positive correlations between overall perceptions of patient safety (OPS) and most of the dimensions in both samples. Regarding the frequency of event reporting (FER), the data also showed a positive correlation with most of the dimensions in both samples. In both samples, most dimensions had a positive association with overall grade for patient safety (OGPS). Regarding the NER, the Palestinian sample had a significant and negative relationship with four dimensions: supervisor/manager expectations and actions promoting safety, non-punitive response to error, staffing and teamwork across hospital units and hospital handoffs and transitions. A negative correlation indicates the existence of an inverse relationship between two variables; that is, an increase in one variable is associated with a decrease in the other variable. This was also the case for the Belgian sample, with the NER found to be associated positively with organisational learning–continuous improvement, and negatively with support from hospital management for patient safety, staffing and teamwork across hospital units and during hospital handoffs and transitions.

#### Hierarchical regression analyses

Regression analyses were used to investigate the predictive value of the PSC dimensions regarding the four self-reported outcome measurements. The detailed results are shown in table 5, and the results are discussed generally below.

#### Overall perceptions of safety

The PSC dimensions explained 16% and 36% of the variance of OPS in the Palestinian and Belgian samples, respectively. OPS outcome was predicted in both countries by teamwork within hospital units, organisational learning–continuous improvement, supervisor/manager

expectations and actions promoting safety, support from hospital management for patient safety, teamwork across hospital units and during hospital handoffs and transitions, and feedback and communication openness regarding errors. The standardised beta ( $\beta$ ) values ranged from 0.06 to 0.24 (p values: <0.05 to <0.001). In addition to the previously mentioned predictors of OPS, staffing was a predictor for the Belgian sample only ( $\beta=0.24$ ,  $p<0.001$ ).

#### Frequency of event reporting

In the Palestinian and Belgian samples, the PSC dimensions explained 22% and 18% of the variance of FER outcome, respectively. This outcome was predicted by teamwork across hospital units and during hospital handoffs and transitions, staffing and feedback and communication openness regarding errors with  $\beta$  values ranging from 0.06 to 0.35 (p values <0.05 to <0.001). Organisational learning–continuous improvement ( $\beta=0.14$ ,  $p<0.001$ ) and hospital management support for patient safety ( $\beta=0.10$ ,  $p<0.001$ ) were also good predictors for the Palestinian sample.

#### Overall grade on patient safety

In total, 20% of the OGPS was predicted by PSC dimensions in the Palestinian sample and 33% in the Belgian sample. The results revealed two similar predictors in the two countries, namely supervisor/manager expectations and actions promoting safety and teamwork across hospital units and during hospital handoffs and transitions, with  $\beta$ -values ranging from 0.12 to 0.17 ( $p<0.001$ ). In addition to the previously mentioned predictors, organisational learning–continuous improvement ( $\beta=0.19$ ,  $p<0.001$ ) and non-punitive response to error ( $\beta=0.09$ ,  $p<0.001$ ) were significant predictors of OGPS in Palestine. Furthermore, teamwork within hospital units ( $\beta=0.11$ ,  $p<0.001$ ), support from hospital management for patient safety

**Table 4** Spearman's correlation matrixes (Belgian sample above the diagonal, Palestinian sample below the diagonal)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Hospital years' experience	–	0.01	-0.05	0.06*	-0.02	-0.03	0.00	-0.06*	-0.09**	-0.00	-0.08**	0.04	-0.06*	0.16**
2. Working hours	0.01	–	0.03	-0.03	-0.02	0.02	-0.09**	-0.07*	-0.11**	0.02	0.00	-0.02	-0.02	0.03
3. TW_units	-0.05	0.05*	–	0.28**	0.35**	0.33**	0.18**	0.21**	0.21**	0.42**	0.29**	0.22**	0.30**	-0.05
4. OrgLearn	0.00	0.09**	0.35**	–	0.40**	0.24**	0.28**	0.17**	0.09**	0.43**	0.29**	0.24**	0.21**	0.10**
5. Sup./Man_actions	-0.01	0.03	0.24**	0.25**	–	0.34**	0.33**	0.22**	0.23**	0.51**	0.41**	0.24**	0.34**	-0.04
6. NPPE	0.03	-0.03	0.07*	0.07**	0.13**	–	0.28**	0.20**	0.29**	0.32**	0.30**	0.18**	0.22**	-0.00
7. HMS	-0.02	0.09**	0.25**	0.28**	0.27**	0.25**	–	0.33**	0.30**	0.35**	0.39**	0.19**	0.39**	-0.07**
8. TWacross_HHT	-0.04	0.02	0.27**	0.23**	0.34**	0.21**	0.33**	–	0.23**	0.24**	0.28**	0.17**	0.34**	-0.11**
9. Staff	-0.04	-0.02	-0.05	-0.04	0.09**	-0.12**	-0.08**	0.01	–	0.20**	0.40**	0.05	0.35**	-0.08**
10. FB&ComE	-0.02	0.06*	0.31**	0.33**	0.32**	0.14**	0.31**	0.24**	-0.03	–	0.36**	0.41**	0.38**	0.05
11. OPS	-0.02	0.06*	0.24**	0.28**	0.29**	0.11**	0.26**	0.24**	0.01	0.26**	–	0.20**	0.51**	-0.15**
12. FER	0.02	0.08**	0.24**	0.32**	0.23**	0.13**	0.27**	0.28**	0.06*	0.37**	0.23**	–	0.21**	0.12**
13. OGPS	0.09**	0.17**	0.22**	0.32**	0.25**	0.16**	0.25**	0.30**	-0.05	0.22**	0.19**	0.25**	–	-0.12**
14. NER	0.00	-0.01	0.01	-0.03	-0.11**	-0.07*	-0.03	-0.08**	-0.16**	0.01	-0.07**	0.05*	-0.09**	–

\*Correlation is significant at the 0.05 level (two tailed).

\*\*Correlation is significant at the 0.01 level (two tailed).

FB&ComE, feedback and communication openness about error; FER, frequency of events reported; HMS, hospital management support for patient safety; NER, number of events reported; NPPE: non-punitive response to error; OGPS, overall grade for patient safety; OPS, overall perceptions of patient safety; OrgLearn, organisational learning-continuous improvement; Staff, staffing; Sup./Man\_actions, supervisor/manager expectations and actions promoting safety; TWacross\_HHT, teamwork across hospital units and hospital handoffs and transitions; TW\_units, teamwork within hospital units.

**Table 5** Summary of the hierarchical regression analyses: predicting the outcomes of the Hospital Survey on Patient Safety Culture (HSOPSC) in matched samples of Palestinian and Belgian hospital workers (β)

Outcome	Palestine (n=1418)						Belgium (n=1418)						
	OPS	FER	OGPS	NER	OPS	FER	OGPS	NER	OPS	FER	OGPS	NER	
<i>Predictors</i>	Step1	Step2	Step1	Step2	Step1	Step2	Step1	Step2	Step1	Step2	Step1	Step2	
Hospital tenure	-0.01	-0.00	0.04	0.09***	0.01	0.01	-0.06**	-0.04*	0.04	0.04	-0.04	-0.02	0.15***
Working hours	0.06**	0.04	0.07**	0.12***	-0.02	-0.02	-0.00	0.04	-0.03	-0.03	-0.02	0.03	0.02
Staff function	0.04	0.00	0.03	0.00	-0.00	0.01	0.09***	0.06**	-0.04	-0.04	0.06	0.04	0.08**
TW_units	0.10***	0.04	0.04	0.03	0.04	0.04	0.06**	0.06**	0.02	0.02	0.11***	-0.07*	
OrgLearn	0.10***	0.14***	0.19***	0.19***	-0.03	-0.03	0.10***	0.10***	0.04	0.04	-0.00	0.09**	
Sup./Man._actions	0.13***	0.00	0.14***	0.14***	-0.16***	-0.16***	0.17***	0.17***	0.00	0.00	0.12***	-0.08*	
NPRE	0.05	0.03	0.09***	0.09***	-0.08**	-0.08**	0.03	0.03	0.04	0.04	-0.03	0.04	
HMS	0.16***	0.10***	0.05	0.05	0.01	0.01	0.19***	0.19***	0.04	0.04	0.17***	-0.07*	
TWacross_HHT	0.07**	0.13***	0.14***	0.14***	-0.05	-0.05	0.08**	0.08**	0.06*	0.06*	0.17***	-0.08**	
Staff	0.02	0.09***	-0.01	-0.01	-0.20***	-0.20***	0.24***	0.24***	-0.07**	-0.07**	0.19***	-0.05	
FB&ComE	0.08**	0.24***	0.01	0.01	0.05*	0.05*	0.06*	0.06*	0.35***	0.35***	0.15***	0.11**	
R <sup>2</sup>	0.00	0.16***	0.00*	0.22***	0.03***	0.20***	0.00***	0.36***	0.00	0.18***	0.00	0.33***	0.02***

The highest absolute values of the standardised beta are shaded. \*P<0.05; \*\*p<0.01; \*\*\*p<0.001.

FB&ComE, feedback and communication openness about error; FER, frequency of events reported; HMS, hospital management support for patient safety; NER, number of events reported; NPRE: non-punitive response to error; OGPS, overall grade for patient safety; OPS, overall perceptions of patient safety; OrgLearn, organisational learning-continuous improvement; Staff, staffing; Sup./Man.\_actions, supervisor/manager expectations and actions promoting safety; TWacross\_HHT, teamwork across hospital units and hospital handoffs and transitions; TW\_units, teamwork within hospital units.



( $\beta=0.17$ ,  $p<0.001$ ), staffing ( $\beta=0.19$ ,  $p<0.001$ ) and feedback and communication openness regarding errors ( $\beta=0.15$ ,  $p<0.001$ ) were significant predictors of OGPS in Belgium.

### Number of events reported

The PSC dimensions predicted only 1% of the NER in Palestine and 5% in Belgium. Supervisor actions promoting safety and communication openness regarding errors were good predictors in both countries ( $\beta$  ranging from 0.05 to 0.16,  $p$  values ranging from  $<0.05$  to  $<0.001$ ). In Palestine, non-punitive response to error ( $\beta=-0.08$ ,  $p<0.01$ ) and staffing ( $\beta=-0.20$ ,  $p<0.001$ ) were also predictors of the NER. Moreover, teamwork within hospital units ( $\beta=-0.07$ ,  $p<0.05$ ), organisational learning–continuous improvement ( $\beta=0.09$ ,  $p<0.01$ ), hospital management support for patient safety ( $\beta=-0.07$ ,  $p<0.05$ ), and teamwork across hospital units and during hospital handoffs and transitions ( $\beta=-0.08$ ,  $p<0.01$ ) were predictors in Belgium.

## DISCUSSION

This study enabled us to draw conclusions regarding the extent to which each HSOPSC safety dimension contributes specifically to outcome dimensions. It is the first study to explore the predictive value of HSOPSC in matched samples from two different countries. As such, it provides information about: (A) the impact of the various PSC dimensions on patient safety outcomes and (B) cross-cultural differences in this respect between Palestinian and Belgian hospitals. Thus, our research provides an improved understanding of the influence of initiatives to improve specific outcome measures on PSC. Overall, our findings emphasise that the HSOPSC is a valid instrument that can be used to improve outcomes related to safe healthcare for patients. The results of our study demonstrate that at least two of the HSOPSC dimensions contribute to one of the self-reported outcome measures in each country. Thus, our findings attest to the value of the PSC dimensions regarding patient safety outcomes. Only one dimension, non-punitive response to error, was found to have no association with any of the outcome measures in Belgium. A possible explanation for this could be that this dimension has a low internal consistency level and, therefore, affected the assessment of its predictive value in the Belgian sample. Despite this finding, only a small number of differences were detected between the two samples.

The results obtained for both the Palestinian and Belgian samples showed that hospitals should focus on investing in interventions that enable feedback and enhance communication openness regarding errors, sustain teamwork within and across hospital units, maintain organisational learning–continuous improvement and improve hospital handoffs and transitions. These interventions will improve OPS. As such, our analyses and results explicitly reveal ‘important’ PSC dimensions in

terms of safety outcomes, and these PSC dimensions are shown to be the same for both the Palestinian and Belgian hospitals. Under such circumstances, implementing strategies and tools such as TeamSTEPPS may improve teamwork within and across units, in addition to strengthening communication and feedback skills regarding errors to enable the establishment of a learning system based on previous mistakes.<sup>33</sup>

Event reporting is fundamental to the detection of patient safety problems and represents a core prerequisite of effective clinical risk management.<sup>27 35</sup> This outcome is of particular importance because these items reflect the frequency of the actual reporting of an act, and the willingness to report unsafe events, with higher error reporting rates leading to a stronger culture of accountability. The results showed that, in both the Palestinian and Belgian samples, this outcome is influenced mainly by maintaining open lines of information and communication in the unit. These observations are consistent with those reported by Pfeiffer and Manser.<sup>27</sup> Moreover, improvements in staffing and teamwork may also influence this outcome. Palestinian respondents found that managers who consider patient safety to be a top priority and build constructive learning systems based on previous mistakes encourage their staff to report adverse events. This result is also commonly reported in the published literature.<sup>1 35</sup>

The OGPS was found to be particularly significant in building a constructive learning system based on previous mistakes in Palestine and in improving staffing levels in Belgium. In other words, although our results revealed many similarities between the matched set of Palestinian and Belgian healthcare professionals, we also found cultural differences regarding OGPS. In accordance with previous studies, having enough staff<sup>36</sup> and opportunities to learn from previous mistakes<sup>6</sup> increased the likelihood of staff reporting good or excellent safety grades in Belgium. Other contributing PSC dimensions are maintaining manager expectations and actions in promoting safety, improving teamwork across hospital units and supporting hospital handoffs and transitions in both countries. Our study also revealed that, in Palestine, a higher score for OGPS relates to greater support regarding non-punitive response to error. Additionally, initiatives to improve teamwork within units, support from hospital management for patient safety, staffing and feedback and communication openness regarding errors may also act to improve OGPS in Belgium.

As PSC dimensions explained only 1% (Palestine) and 5% (Belgium) of the NER, influencing PSC dimensions will have less impact on patient safety outcomes compared with other PSC outcomes ( $R^2_{\text{OPS-Palestine}}=16\%$ ;  $R^2_{\text{OPS-Belgium}}=36\%$ ;  $R^2_{\text{FER-Palestine}}=22\%$ ;  $R^2_{\text{FER-Belgium}}=18\%$ ;  $R^2_{\text{OGPS-Palestine}}=20\%$ ;  $R^2_{\text{OGPS-Belgium}}=33\%$ ). As such, the HSOPSC seems to be particularly effective for the prediction of OPS, FER and OGPS, in both the Belgian and Palestinian samples. It can be speculated that the finding that NER is less well explained through the PSC dimensions is caused by the

broad scope of the HSOPSC PSC dimensions regarding patient safety, which consequently renders this instrument less effective for this very specific outcome. A further explanation could be that our results stem not from a low predictive value but from the under-reporting of adverse events, which would result in a low mean and low variance regarding this outcome dimension. A final explanation could be that respondents found it difficult to answer this question based on experience, as they may not themselves know how many events have been reported. Therefore, hospitals seeking to invest in patient safety must measure NER and should link the PSC dimensions to objective measurements of NER.

To summarise, our results suggest that improved self-reported outcome measures regarding patient safety in both Palestine and Belgium are more likely to be achieved through better teamwork across units and during hospital handoffs and transitions, encouraging feedback and communications regarding errors and implementing actions to promote safety. Furthermore, improving teamwork within hospital units, providing a work climate that promotes the adoption of safety as a top priority by hospital management and resolving staffing problems will also influence most outcome measures in Belgium.<sup>37,38</sup> In Palestine, bringing errors to the attention of managers and other staff and using mistakes as valuable learning opportunities<sup>3</sup> may also have an impact on safety outcome measures.

### Limitations and future research

The current study has some methodological limitations that should be noted. First, the study used a cross-sectional design; therefore, claims of causal relationships are not possible. Second, as the present study relied exclusively on subjective measures that reflect the willingness of respondents to report events, and more specifically, the reporting of near misses, the results may be distorted by the common method bias of these self-reported outcome measures. Future research should examine the relationship between PSC dimensions and actual adverse event rates to clarify this relationship by linking objective data with PSC dimensions. Nevertheless, this study is the first to provide further insights into the value of the HSOPSC in terms of: (A) the impact of the PSC dimensions on patient safety outcomes and (B) in different cultural settings. Third, the associations between the safety and PSC outcomes of the HSOPSC were investigated using a matched sample (to rule out possible bias due to sample differences between the two countries) using linear regression analyses. However, we cannot ignore the limitation of this design, which uses the most influential variables that are, in fact, approximations made from the researchers' perspective. These assumptions might be incorrect and could lead to the introduction of major confounding variables. Despite these methodological restrictions, previous research has shown that matched samples designs are useful, allowing researchers to conduct streamlined and focused research

while maintaining a good degree of validity.<sup>39</sup> Another possible concern is that most respondents were nurses and other health professionals; thus, the results may reflect the personal perceptions of the respondents and affect our association results. However, we should not forget that nurses are the most highly represented staffing group in hospitals and that our sample also included physicians, pharmacists, administrative and quality and safety staff. Finally, the Cronbach's  $\alpha$  values for some of the composite scores measuring PSC were low ( $\alpha < 0.70$ ), which may affect the correlation results, as in the Palestinian sample where all PSC dimensions were positively associated with the OGPS (except staffing). This specific dimension has shown a low internal consistency in most psychometric evaluation studies of the HSOPSC,<sup>21,33</sup> indicating that it is necessary to review and update the items of this dimension to improve its internal consistency. Our results further attest to the international and cross-cultural validity of the HSOPSC. The relationships between the PSC and self-reported outcomes in other countries will provide further evidence in this regard.

### Conclusion

We found that perceptions of staffing and feedback and communication regarding errors were important predictive dimensions of PSC self-reported outcome measures in both countries. However, we also found some contradictory results in our matched sample. Future research should focus on enriching the evidence of the linking of safety culture and hard patient safety outcomes in order to assess the practical validity of safety culture surveys. The divergences of patient safety perceptions in both countries implicate the need of local priority setting and a tailor-made approach for improvement strategies in hospitals. A great challenge lies in the field of implementation science, testing the effectiveness of safety culture strategies.

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WarS participated in the analyses and interpretation of the data and contributed to the preparation of the manuscript. KV and JH were involved in the study design and revised the manuscript critically. JH coordinated the data collection (Belgium). AnV was involved in the study design, manuscript outline and contributed to the manuscript and data preparation (Belgian data). All authors have read and approved the final manuscript.

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