



## Research article

## Nurses' evidence-based practice competence and hospital practice environment after specific training under the Best Practice Spotlight Organization® Programme. A cross sectional study<sup>☆</sup>

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## ABSTRACT

**Background:** Barriers to implementing training strategies for the improvement of evidence-based practice competence of nurses in hospital practice environments still persist.

**Objective:** The aim of the study was to evaluate the impact of a specific training within the framework of the Best Practice Spotlight Organization® programme, on nurses' evidence-based practice competence and the practice environment in two hospitals.

**Design:** This is an observational cross-sectional study assessing evidence-based practice competence and perceptions of Practice Environments.

**Participants:** The study sample were 204 nurses working at medical and surgical inpatient units at two hospitals involved in the Best Practice Spotlight Organization® programme.

**Methods:** The study was conducted from February 2020 to May 2020. Three questionnaires were used to collect data: a sociodemographic/occupational questionnaire, a questionnaire exploring evidence-based practice skills, and a questionnaire exploring nurses' perceptions of their hospital practice environments.

**Results:** A total of 204 nurses participated. They were classified into two groups: those who had received specific training within the framework of the programme, called trained-champions ( $n = 66$ ), and those who had not yet received training, control group ( $n = 138$ ). The trained-champions exhibited better evidence-based practice competence values than the control group in all dimensions ( $p < 0.001$ ), with a higher difference in means in the "Utilisation" dimension ( $-0.80$ ; CI:  $-0.99, -0.60$ ) and the "Knowledge" dimension ( $-0.63$ ; CI:  $-0.88, -0.38$ ). Trained-champions also had a more positive perception of the practice environments than the controls in all dimensions ( $p \leq 0.001$ ). The largest differences in means were in the "Participation" dimension ( $-0.48$ ; CI:  $0.66, -0.31$ ) and in the "Leadership" dimension ( $-0.41$ ; CI:  $-0.59, -0.23$ ).

**Conclusions:** Specific EBP training within the framework of the Best Practice Spotlight Organization® programme has succeeded in nurses (trained-champions) obtaining better EBP competence than others without this training. This could have contributed to increase nurses' abilities to integrate evidence into decision making in their clinical practice, while positively influencing them to perceive their PEs more favorably.

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## 1. Introduction

The implementation of strategies aiming to improve the Evidence-Based Practice (EBP) competence of nurses in hospital settings has been the subject of multiple studies designed to improve patient health outcomes and professional standards among nurses. Successful adoption of EBP rests on the interaction between an appropriate setting or Practice Environment and a culture of innovation and research among nurses (Chan et al., 2017; Leming-Lee and Watters, 2019; Renolen et al., 2019).

EBP has become essential in supporting nurses' practice, contributing to improved quality of care through decreased variability, reduced costs, improved clinical safety, and greater satisfaction with professional growth (Speroni et al., 2020). However, the transfer of knowledge into care practice by nurses is progressing slowly due to a number of barriers: lack of knowledge of EBP and EBP competence, misconceptions or negative attitudes towards research and evidence-based care, lack of time and resources, and organizational constraints, such as lack of support and incentives (Duncombe, 2018; Mathieson et al., 2018; Melnyk et al., 2018; Shayan et al., 2019). Therefore, institutions should recognise the importance of the acquisition of EBP competence by healthcare professionals, as it will have a positive impact on both the institution itself and on patient health outcomes (Pereira et al., 2018; Skela-Savič et al., 2017). Integrating EBP into care delivery is a priority for healthcare organizations worldwide as it is associated with improved efficiency and cost-effectiveness of healthcare delivery, better patient outcomes, and higher quality of care. This has been demonstrated by the Magnet Recognition Program, in which excellence in evidence-based nursing practice is the basic principle for the effective delivery of healthcare services, supporting continuous improvement of Practice Environments (PEs) (Saunders and Vehviläinen-Julkunen, 2016). The implementation of EBP is directly related to more favourable PEs, as these are influenced by factors such as decentralised decision-making, leadership, autonomy, and accountability in care (Ruzafa-Martínez et al., 2020b). The characteristics of the environment play a key role in any strategy aiming to encourage the use of the best available knowledge on care provision (Lu et al., 2019). PEs may be defined as the set of organizational characteristics of a work environment facilitating or hindering professional nursing practice (Lake, 2002). Favourable PEs are characterised by factors such as: support from managers with a multi-faceted management structure and supervisory/coordinating staff who know how to delegate appropriately; good communication and conflict resolution channels between professionals from different disciplines; and highly autonomous nurses, with control over their professional practice and a tendency towards high job satisfaction (Speroni et al., 2020). In addition, relationships between nurses and physicians are more horizontal, because nurses are viewed as the backbone of hospital care, which undoubtedly translates into improved healthcare (Galan et al., 2019; Gunnarsdóttir et al., 2009).

Numerous tools and scales have been validated to assess the different dimensions involved in EBP competence and PEs (Melnyk et al., 2018; Fuentesaz-Gallego et al., 2013; Lake, 2007; Ruzafa-Martínez et al., 2020a; Sheingold et al., 2012; Zangaro and Jones, 2019). According to their results, strategies and avenues for improvement could be implemented in institutions promoting EBP by performing multifactorial analyses so that PEs become as favourable as possible to the development of EBP competence (Sheingold et al., 2012; Zangaro and Jones, 2019). The aim is to foster an atmosphere of job satisfaction that will undoubtedly have a positive impact on patient health outcomes (Martínez-Riera et al., 2020; Mihdawi et al., 2020; Skela-Savič et al., 2017). A number of studies suggest that a strong, sustainable EBP culture and consistent implementation of EBP by nurses can lead to increased job satisfaction and an intention to continue working at their current organizations (Melnyk et al., 2021).

## 2. Background

The Best Practice Spotlight Organization (BPSO®) programme aims to promote the implementation of nursing best practices in any nursing practice setting based on the clinical practice guidelines developed by the Registered Nurses' Association of Ontario (RNAO). These guidelines are tools containing evidence-based recommendations to be implemented at the clinical, organizational, educational, and health system levels. The BPSO® programme is based on the Knowledge to Action theoretical model (Grinspun et al., 2018). The programme was launched in 2003 in Ontario and has since expanded internationally. It was launched in Spain in 2012 with the aim of encouraging adherence to the best available EBP (González-María et al., 2020; Ruzafa-Martínez et al., 2020b; Sharplin et al., 2019). In the Eastern Valladolid Health Area, which is part of the Castile and León Regional Health Service (Spain), the programme was implemented at the Medina del Campo District Hospital since 2012 and in the Clinical University Hospital in Valladolid started to be implemented in 2018.

The relationship between The Best Practice Spotlight Organization (BPSO®) program on the EBP competence of nurses in Spain has been studied recently. The authors used the scale of the EBP-COQ-Prof®. Both publications show that the educational level of the nurses was one of the variables associated with EBP competence, but not in the item regarding the dimension utilisation. They argue that the context is a determining factor for the implementation of EBP and consider the positive influence of the BPSO® program. Nurses working in centers who participate in BPSO® program, work in a systematic way to adapt the knowledge to practice through the implementation of Clinical Practice Guidelines (Ramos-Morcillo et al., 2021; Fernández-Salazar et al., 2021).

Healthcare institutions involved in the BPSO® programme promote attitudes, knowledge, and skills linked to EBP (Ruzafa-Martínez et al., 2020b). Nurses who are motivated to apply the best available evidence to healthcare practice are able to oversee care management and improve the quality of patient care (Grinspun et al., 2018).

The study objective was to evaluate the impact of a specific training within the framework of the BPSO® programme, on nurses' Evidence-Based Practice competence and the Practice Environment in two hospitals.

## 3. Methods

### 3.1. Design

This is a cross-sectional study using validated surveys to assess EBP competence and perceptions of Practice Environments among nurses working at two hospitals in the Eastern Valladolid Health Area that belong to the BPSO® programme. The study was conducted from February 2020 to May 2020.

### 3.2. Sample

The study sample were 204 nurses working in medical and surgical inpatient units at the two hospitals, who participated voluntarily and anonymously.

For a population of 803 nurses working at inpatient units at both hospitals, with a 95 % confidence level, an error of 5 %, and a 3 % level of accuracy, the necessary sample size was estimated to be 162 participants. The sample size adjusted for loss to follow-up with an expected proportion of 15 % loss to follow-up would be 191 participants. About the sample size estimation, Accepting an alpha risk of 0.05 and a beta risk of 0.2 in a two-sided test, 48 subjects are necessary in first group and 96 in the second to recognise as statistically significant a difference greater than or equal to 0.5 units. The common standard deviation is assumed to be 1. The results have been obtained with the GRANMO sample size calculator version 7.12 for the statistical test: comparison of two independent means. The values requested by the program for this

calculation (mean difference and common standard deviation) were obtained from a previous pilot study carried out. With these data, a contrast is obtained with a power of 80 % and a significance level of 0.05.

### 3.3. Variables and instruments

Three questionnaires were used to collect the data, containing the following variables for analysis.

*A sociodemographic/occupational questionnaire:* age, sex, employment status, acting as a mentor for clinical trainees or not being a mentor, training in EBP and/or research methodology not specific to the BPSO® programme within the past five years, number of scientific articles read in the previous month, postgraduate education, and specific EBP training under the BPSO® programme.

*Questionnaire exploring EBP competence:* The validated Spanish version of the Evidence-Based Practice Competency Questionnaire Professional version (EBP-COQ prof©) (Ruzafa-Martínez et al., 2020a) was used to assess the degree of self-perceived EBP competency based on four dimensions: attitudes, knowledge, skills, and utilisation. The questionnaire has 35 questions rated on a 5-point Likert scale ranging from 1 (“Strongly disagree”) to 5 (“Strongly agree”). High mean scores indicate a high level of EBP competency in each dimension and overall. Internal consistency (Cronbach’s  $\alpha$ ) for each scale dimension was 0.888 for factor I (attitude towards EBP), 0.948 for factor II (EBP knowledge), 0.817 for factor III (EBP skills), and 0.840 for factor IV (EBP utilisation).

*Questionnaire exploring nurses’ perceptions of their hospital PEs:* PEs were assessed using the validated Spanish version of the Practice Environment Scale of the Nursing Work Index (PES-NWI) developed by Lake (2002) (Fuentelsaz-Gallego et al., 2013). The survey contains 31 questions grouped into five factors: Nurse Participation in Hospital Affairs (“Participation”); Nursing Foundations for Quality of Care (“Quality of Care”); Nurse Manager Ability, Leadership, and Support of Nurses (“Leadership”); Staffing and Resource Adequacy (“Resources”), and Collegial Nurse–Physician Relationships (“Relationships”). The questions were rated on a 4-point Likert scale: strongly disagree, slightly disagree, slightly agree, strongly agree. As stated by the author in her original study (Lake, 2002), scores  $\geq 2.5$  indicate higher agreement and positive or magnetic environments, while values  $< 2.5$  indicate disagreement and negative environments.

Cronbach’s  $\alpha$  was 0.90 (95 % CI: 0.87–0.93). Cronbach’s  $\alpha$  values for each one of the five factors of the PES-NWI were as follows: 0.81 (“Participation”), 0.73 (“Quality of Care”), 0.81 (“Leadership”), 0.78 (“Resources”), and 0.77 (“Relationships”) (Fuentelsaz-Gallego et al., 2013).

### 3.4. EBP training program

The nurses who participated in the study worked at the two hospitals belonging to the BPSO® programme, they must be staff in active employment at the time that the survey was conducted. The participating hospitals are responsible for coordinating a training programme based on improving EBP competence to promote leadership and implementation of clinical practice guidelines.

In both study hospitals, all phases of the training programme (Grinspun et al., 2018) were completed voluntarily by dedicated nurses development in the implementation of best practices, and who receive continuous training for it, who are referred to as ‘champions’ in the BPSO® programme. In 2019 a specific new plan was implemented. The nurses received specific EBP, on one hand, the BPSO® training methodology consist on a 10 h course following training on the five phases of the Knowledge to Action theoretical model for implementing good practices guidelines: identification of the problem, adaptation to the local context, assessment of facilitators and barriers, monitoring and evaluation of results, and sustainability plan. On the other hand, the nurses received another 25 h divided in four specific training sessions

focusing on: critical reading, literature search, systematic reviews, research projects, database management, and scientific dissemination. The reason for this new plan was to provide nurses with more resources to carry out the implantation of the Good Practice Guidelines, with the development of new protocols, the evaluation of indicators, the feedback with the stakeholders and improving their scientific production in the diffusion of research results.

### 3.5. Data collection

The data collection process took the form of three questionnaires, which were administered to the nurses via the hospital intranet between February 2020 and May 2020. Before completing the questionnaires, the study participants (204 nurses) were asked to give their consent to participate in the study and specify whether they were part of the group of ‘champion nurses’ at either of the two hospitals.

The responses to the questionnaires were classified into ‘trained-champions’ (nurses who had previously received specific EBP and BPSO® methodology training; 66 of the nurses in the sample) and ‘non-trained-champions’ (control group, i.e. nurses who had not previously received specific EBP nor BPSO® methodology training).

### 3.6. Ethical considerations

The confidentiality of the data and the anonymity and privacy of participants were preserved at all times in accordance with the Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 (General Data Protection Regulation) and Spanish Organic Law 3/2018, of the 5th of December, on Personal Data Protection and Guarantee of Digital Rights. The study was approved by the East Valladolid Health Area Research Ethics Committee (reference number PI 20–1607).

### 3.7. Data analysis

Statistical analyses were performed using IBM’s SPSS v.24 software (IBM, Armonk, New York, USA). For the descriptive analysis we used means, standard deviations, minimums, maximums and frequency distribution. Student’s *t*-test was used to compare two groups of quantitative values and ANOVA was used to compare more than two groups of quantitative values. Tests of normality were conducted for the two groups to be compared using the Kolmogorov-Smirnov test. The statistical power of the test is greater when the required conditions of normality and homoscedasticity are met by both samples, irrespective of size. The statistical significance threshold for all tests was set at  $p < 0.05$ .

STROBE has been used to guide the reporting.

## 4. Results

### 4.1. Description of the overall sample

The questionnaire was responded by 204 nurses, with a mean age of 43.64 (SD, 9.21) years (range = 25–63), 86.76 % were female, 13.23 % were male. 50.49 % nurses were permanently employed. Table 1 shows the characteristics of the sample.

### 4.2. Comparative analysis of the two groups: ‘trained-champions’ vs. control group

The differences between the two groups, trained-champions ( $n = 66$ ) versus the control group ( $n = 138$ ), are shown in Table 2. Significant differences were identified only in terms of training in EBP and/or research methodology within the past 5 years and the number of scientific articles read in the previous month in favour of the group of trained-champions ( $p < 0.01$  in both cases).

When comparing the EBP competence of the two study groups, the *t*-

**Table 1**  
Description of the sample.

Variables		Total sample	
		n	%
Sex	Female	177	86.76
	Male	27	13.23
Type of contract	Permanent	103	50.49
	No permanent	101	49.50
Mentor for clinical trainees	No	119	58.33
	Yes	85	41.66
Postgraduate education	No	133	65.19
	Master's degree	46	22.54
	Doctorate	2	0.98
	Specialist	23	11.27
Training in EBP and/or research methodology within the past 5 years. (not specific to the BPSO® programme)	None	38	18.62
	<40 h	65	31.86
	Between 40 and 150 h	64	31.37
	>150 h	37	18.13
Number of scientific articles read in the previous month	None	74	36.27
	Between 1 and 3	74	36.27
	>3	56	27.45

  

Questionnaire	Dimensions	Mean	Standard deviation
(EBP-COQ prof©) <sup>a</sup> (5-point Likert scale)	Attitudes	4.40	0.60
	Knowledge	3.08	0.94
	Skills	3.57	0.66
	Utilisation	3.36	0.75
(PES-NWI) <sup>b</sup> (4-point Likert scale)	Participation	2.40	0.62
	Quality of Care	2.71	0.49
	Leadership	2.96	0.72
	Resources	2.06	0.62
	Relationships	2.40	0.62

<sup>a</sup> The Evidence-Based Practice Competency Questionnaire, Professional version.

<sup>b</sup> The Practice Environment Scale of the Nursing Work Index.

**Table 2**  
Differences between the characteristics of the champions group and the control group.

Variables		Trained-champions group (N = 66)		Control group (N = 138)		p-value
		n	%	n	%	
Sex	Female	57	86.36	118	85.51	>0.05
	Male	9	13.64	20	14.49	
Employment status	Permanent	42	63.64	61	44.20	>0.05
	Non-permanent	24	36.36	77	55.80	
Mentor for clinical trainees	No	38	57.57	81	58.69	>0.05
	Yes	22	42.42	63	45.65	
Postgraduate education	No	42	63.64	91	65.94	>0.05
	Master's degree	16	24.24	30	21.74	
	Doctorate	0		2	1.45	
	Specialist	8	12.12	15	10.87	
Training in EBP and/or research methodology	None	1	1.51	37	26.81	<0.01
	<40 h	15	22.73	50	36.23	
	Between 40 and 150 h	35	53.03	29	21.01	
	>150 h	15	22.73	22	15.94	
Number of scientific articles read in the previous month	None	11	16.66	61	44.20	<0.01
	Between 1 and 3	26	39.39	48	34.78	
	>3	29	43.94	27	19.56	

test for equal means revealed significantly higher values for the group of trained-champions compared to the control group in all four dimensions ( $p < 0.001$  in all cases), with the largest differences in means observed in

the “Utilisation” dimension ( $-0.80$ ;  $CI = -0.99, -0.60$ ) and in the “Knowledge” dimension ( $-0.63$ ;  $CI = -0.88, -0.38$ ). See [Table 3](#).

With regard to perceptions of their PEs, the trained-champions displayed values suggesting that they perceived their PEs more positively than the control group, reaching statistical significance in all dimensions ( $p \leq 0.001$ ), with the exception of the “Relationships” dimension, in which no significant differences were identified between the two groups. The difference in means revealed higher values in the “Participation” dimension ( $-0.48$ ;  $CI = -0.66, -0.31$ ) and in the “Leadership” dimension ( $-0.41$ ;  $CI = -0.59, -0.23$ ). In addition, the group of trained-champions displayed means  $>2.5$  in all dimensions, with the exception of “Resources”. See [Table 3](#).

**4.3. Analysis of the correlations between the dimensions in EBP-COQ prof© version and PES-NWI**

The correlations between the dimensions relating to EBP competence and those relating to the PEs were explored using Pearson’s correlation coefficient. A moderate positive correlation was found between the “Utilisation” dimension, pertaining EBP competence, and the “Nursing Foundations for Quality of Care” ( $r = 0.518$ ), “Nurse Participation in Hospital Affairs” ( $r = 0.489$ ) and “Nurse Manager Ability, Leadership, and Support of Nurses” ( $r = 0.360$ ) dimensions. All other correlations were found to be very weak or non-significant. See [Table 4](#).

**5. Discussion**

Our results suggest that specific training within the framework of the BPSO® project is an effective strategy for improving EBP competence, resulting in more favourable Practice Environments.

On the one hand, this training based on critical reading, literature search, systematic reviews, research projects, database management, and scientific dissemination, complemented and strengthens the BPSO® methodology training. This could facilitate nurses (trained-champions) the implementation of the phases of Knowledge to Action theoretical model to put into practice the best available evidence regarding the recommendations included in the Good Practice Guidelines. This could improve EBP among the nurses actively participating in the BPSO® programme.

On the other hand, trained-champions have a better self-perception of the PE, this training could help them with their capacity to transfer knowledge to the local context, explore the barriers and specific facilitators in each case, take all stakeholders into account and find strategies to adapt it to the needs of the people who are going to use it. This training seems to have improved their perception of their PEs, with the exception of the dimension exploring “Collegial Nurse–Physician Relationships”.

Regarding EBP competence, the group of trained-champions reported receiving more hours of training in EBP and/or research methodology and reading more scientific articles in the previous month than the control group. This may have helped trained-champions to attain better results for EBP competence in the survey than the control group. Previous studies have considered lack of training as a barrier to the implementation of clinical EBP ([Malik et al., 2016](#); [Mathieson et al., 2018](#)). However, knowledge acquisition alone would not suffice to acquire attitudes and skills or to put theoretical knowledge into practice ([Belita et al., 2020](#)). The phases of the Action Cycle proposed in the BPSO® programme include the participation of champions in multi-disciplinary working groups aiming to adapt the programme’s guidelines to their own contexts, assess barriers and facilitators, adapt and implement the proposed interventions, participate in the evaluation and feedback of results, and propose and collaborate on sustainability strategies ([Grinspun et al., 2018](#)). EBP competence could also be influenced by this, especially in the phases of the project involving the implementation of research results, analysing problems based on the results obtained, and disseminating and proposing changes. The use of EBP may

**Table 3**  
EBP skills and perceived Practice Environment comparing ‘champions’ with the control group.

	Control group (n = 138)		Trained-champions (n = 66)		p-value	Difference in means	Effect size Cohen's d	95 % CI for the difference in means	
	Mean	Standard deviation	Mean	Standard deviation				Lower limit	Upper limit
(EBP-COQ prof©) <sup>a</sup> (5-point Likert scale)									
Attitudes	4.30	0.65	4.61	0.43	<0.001	-0.31	Small Effect	-0.46	-0.16
Knowledge	2.87	0.95	3.50	0.78	<0.001	-0.63	Medium Effect	-0.88	-0.38
Skills	3.42	0.66	3.89	0.54	<0.001	-0.47	Small Effect	-0.64	-0.30
Utilisation	3.10	0.67	3.90	0.62	<0.001	-0.80	Large Effect	-0.99	-0.60
(PES-NWI) <sup>b</sup> (4-point Likert scale)									
Participation	2.24	0.59	2.72	0.57	<0.001	-0.48	Small Effect	-0.66	-0.31
Quality of care	2.59	0.48	2.95	0.42	<0.001	-0.36	Small Effect	-0.50	-0.22
Leadership	2.82	0.77	3.23	0.50	<0.001	-0.41	Small Effect	-0.59	-0.23
Resources	1.96	0.61	2.28	0.61	0.001	-0.31	Small Effect	-0.50	-0.13
Relationships	2.41	0.67	2.57	0.76	0.134	-0.16	Small Effect	-0.36	0.05

<sup>a</sup> The Evidence-Based Practice Competency Questionnaire, Professional version.

<sup>b</sup> The Practice Environment Scale of the Nursing Work Index.

**Table 4**  
Correlations between the dimensions of Practice Competency Questionnaire Professional version (EBP-COQ prof©)<sup>a</sup> and the dimensions of the Practice Environment Scale of the Nursing Work Index (PES-NWI)<sup>b</sup>.

			(EBP-COQ prof©) <sup>a</sup>			(PES-NWI) <sup>b</sup>					
			Knowledge	Skills	Utilisation	Participation	Quality of care	Leadership	Resources	Relationships	
(EBP-COQ prof©) <sup>a</sup>	Attitudes	Pearson	0.296	0.410	0.422	0.185	0.174	0.171	0.170	-0.013	
		Correlation									
	Knowledge	p-value	<0.001	<0.001	<0.001	0.008	0.014	0.015	0.018	0.849	
		Pearson		0.668	0.498	0.221	0.137	0.095	0.134	0.046	
(PES-NWI) <sup>b</sup>	Skills	Correlation		<0.001	<0.001	0.002	0.052	0.176	0.063	0.515	
		p-value			<0.001	0.001	0.001	0.005	0.041	0.991	
	Utilisation	Pearson				<b>0.489</b>	<b>0.518</b>	<b>0.360</b>	0.235	0.071	
		Correlation									
Participation	Participation	p-value				<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	0.001	0.313	
		Pearson					0.786	0.572	0.444	0.427	
	Quality of care	Correlation									
		p-value						<0.001	<0.001	0.000	0.000
Leadership	Leadership	Pearson						1	0.570	0.398	0.431
		Correlation									
	Resources	p-value							<0.001	<0.001	
		Pearson								1	0.389
Relationships	Correlation									<0.001	
	p-value										

<sup>a</sup> The Evidence-Based Practice Competency Questionnaire, Professional version.

<sup>b</sup> The Practice Environment Scale of the Nursing Work Index.

be reinforced by trained-champions working together to make EBP part of the institutional culture, making decisions based on scientific evidence rather than habit. The control group exhibited high mean values in the dimension exploring attitudes towards EBP compared to the other dimensions, which suggests that it would be desirable to modify a number of organizational features that could facilitate these nurses' access to specific training, equip them with the appropriate skills, and enable the applicability of EBP. For the duration of this study the BPSO® programme is being implemented. The results obtained by the trained-champions group encourage further implementation of the project, which is expected to be extended to all nurses in all units by 2022.

Other studies have assessed the effectiveness of the BPSO® programme, finding similar results regarding the improvement of EBP competence (González-María et al., 2020; Sharplin et al., 2019), and also regarding its influence over the PE (Fernandez-Salazar et al., 2021; Ramos-Morcillo et al., 2021).

With regard to perceptions of the PEs, the author of the PES-NWI questionnaire states that a hospital may be considered to be “favourable” if all the subscales or four out of the five are awarded average scores exceeding 2.5. The trained-champions in this study considered their hospitals to be favourable PEs, awarding scores above 2.5 to all dimensions, with the exception of the “Resources” dimension. The control group, in turn, awarded scores over 2.5 to only two of the five dimensions of the PES-NWI.

Regarding the dimension exploring leadership, the two groups shown values over 2.5, this could be favoured because centers participating under BPSO® program provide a favourable environment in all the organization. Furthermore, the group of trained-champions viewed nurse managers as leaders with organizational responsibilities who support decisions collectively and are able to recognise individual work and encourage continuous improvement. Other studies identify nurse leadership as one of the PEs factors with the greatest impact on patient

health outcomes (Gasparino et al., 2021). Transformational leadership fosters an empowered working environment with a proactive and participative approach, which undoubtedly results in improved quality of care (Gasparino et al., 2021).

The implementation methodology used in the BPSO® programme encourages champions to adopt a common philosophy based on collaborative networking, reduced variability of care, and application of the best available evidence. Other studies found that the use of EBP promotes advances in nursing as a discipline, results in more favourable hospitals, and improves patient health outcomes (Speroni et al., 2020). In addition, professionals themselves attach great importance to participating in organizational decision-making and policymaking at the hospital level, increasing their levels of job satisfaction (Lu et al., 2019). One of the reasons why trained-champions rated this dimension more positively than the others may be due to the fact that the implementation of the BPSO® project favors active participation in decision-making by champions, leading to increased loyalty and more favourable perceptions of their institutions and organizational culture, as reported in other studies (Ruzafa-Martínez et al., 2020b; Sharplin et al., 2019). Staffing and resource allocation are also a common problem in hospital settings (Anzai et al., 2014; Gaalan et al., 2019; Lu et al., 2019; Mihdawi et al., 2020).

The presence of a positive correlation between the EBP dimension “Utilisation” and the PEs dimensions “Nursing Foundations for Quality of Care”, “Nurse Participation in Hospital Affairs” and “Nurse Manager Ability, Leadership, and Support of Nurses” confirms the reciprocal relationship between providing care based on scientific research and favourable working environments. These relationships are corroborated by other studies (Shuman et al., 2019; Speroni et al., 2020).

Staffing and Resource Adequacy has been the worst valorated dimension in both groups. It would be necessary further studies to determine the specific aspects regarding this. This could help managers to join efforts to resolve these deficiencies as possible.

The implementation of practices based on the best available evidence through the BPSO® programme is a strategy that has generated changes and improvements in nurses' perception of their work environment, as it leads to greater participation of nurses in the organization's affairs, encourages research and autonomy in decision making, and has direct positive impact on quality of care.

## 6. Limitations

The main limitations of the study are the use of convenience rather than random sampling, which makes it difficult to extrapolate the results obtained and some unmeasured confounding variables may have influenced the results. As in any cross-sectional study design, there is no way of discovering whether some participants checked up on relevant information before completing the questions. The fact that nurses had been informed of the aims of the study, necessary for compliance with ethical considerations, might favour a social desirability bias as participants may have responded in a favourable manner to EBP. Finally, it is possible that highly motivated nurses responded to the survey, while those having little interest in the topic did not, leading to a bias. Nevertheless, the results obtained address the study objectives in full.

## 7. Conclusions

Specific EBP training within the framework of the BPSO® programme has succeeded in nurses (trained-champions) obtaining better EBP competence than others without this training, in all dimensions: knowledge, attitudes, skills and utilisation. Specific EBP training complemented and strengthens the BPSO® methodology training making it easier for trained-champions to put into practice the best available evidence. This training also contributed to improve trained-champions self-perception about the PE in the dimensions of: participation, quality of care, leadership and resources. It has contributed to increasing

nurses' abilities to integrate evidence into decision making in their clinical practice, adapting changes in practice to the context, while positively influencing them to perceive their PEs more favorably.

Further studies are needed to assess strategies supporting the acquisition of EBP competence in larger samples of nurses and their impact on PEs and patient health outcomes. Besides new studies to determine aspects regarding Staffing and Resource Adequacy helping to resolve deficiencies as possible.

## 8. Implications for practice

To improve EBP in health services, managers must provide strategies for EBP to become part of the organizational culture. In this direction, participation in programs for the systematic implementation of evidence, favors changes in the climate and the work environment, improving the quality of care and the competency of nurses. BPSO® program, by the implementation of Clinical Practice Guidelines through a systematic method, further invited to step up efforts to improve EBP training and to adapt changes in the context. Progress and results are monitored and evaluated by nurses taking into consideration the infrastructure and in the light of institution's objectives.

Specific EBP training should be part of the continuing education programs for health system professionals, which facilitate decision-making by reducing the variability of care.

Furthermore, it's important the collaboration with the university in the EBP training for undergraduate nursing students when they are undergoing practical training in hospitals or any other health service.

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## CRedit authorship contribution statement

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## Declaration of competing interest

The authors have no conflict of interest to disclose.

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## References

- Anzai, E., Douglas, C., Bonner, A., 2014. Nursing practice environment, quality of care, and morale of hospital nurses in Japan. *Nurs. Health Sci.* 16 (2), 171–178. <https://doi.org/10.1111/nhs.12081>.
- Belita, E., Squires, J.E., Yost, J., Ganann, R., Burnett, T., Dobbins, M., 2020. Measures of evidence-informed decision-making competence attributes: a psychometric systematic review. *BMC Nurs.* 19 (1), 1–28. <https://doi.org/10.1186/s12912-020-00436-8>.
- Chan, R.J., Bowers, A., Barton-Burke, M., 2017. Organizational strategies for building capacity in evidence-based oncology nursing practice: a case report of an Australian tertiary cancer center. *Nurs. Clin. N. Am.* 52 (1), 149–158. <https://doi.org/10.1016/j.cnur.2016.10.001>.
- Duncombe, D.C., 2018. A multi-institutional study of the perceived barriers and facilitators to implementing evidence-based practice. *J. Clin. Nurs.* 27 (5–6), 1216–1226. <https://doi.org/10.1111/jocn.14168>.
- Fernández-Salazar, S., Ramos-Morcillo, A.J., Leal-Costa, C., García-González, J., Hernández-Méndez, S., Ruzafa-Martínez, M., 2021. Competencia en Práctica Basada en la Evidencia y factores asociados en las enfermeras de Atención Primaria en España [Evidence-based practice competency and associated factors among primary care nurses in Spain]. *Aten. Primaria* 53 (7), 102050. <https://doi.org/10.1016/j.aprim.2021.102050>.
- Fuentelsaz-Gallego, C., Moreno-Casbas, M.T., González-María, E., 2013. Validation of the Spanish version of the questionnaire practice environment scale of the nursing work index. *Int. J. Nurs. Stud.* 50 (2), 274–280. <https://doi.org/10.1016/j.ijnurstu.2012.08.001>.
- Gaalan, K., Kunaviktikul, W., Akkadechanunt, T., Wichaiakhum, O.A., Turale, S., 2019. Factors predicting quality of nursing care among nurses in tertiary care hospitals in Mongolia. *Int. Nurs. Rev.* 66 (2), 176–182. <https://doi.org/10.1111/inr.12502>.
- Gasparino, R.C., Mendonça Ferreira, T.D., Ceretta Oliveira, H., dos Santos Alves, D.F., Pазetto Balsaneli, A., 2021. Leadership, adequate staffing and material resources, and collegial nurse–physician relationships promote better patients, professionals and institutions outcomes. *J. Adv. Nurs.* February, 1–9. <https://doi.org/10.1111/jan.14805>.
- González-María, E., Moreno-Casbas, M.T., Albornos-Muñoz, L., Grinspun, D., Grupo de Trabajo del Programa de implantación de buenas prácticas en Centros Comprometidos con la Excelencia en Cuidados®, Grupo metodológico, Grupo de líderes de las instituciones, 2020. The implementation of Best practice guidelines in Spain through the Programme of the Best Practice Spotlight Organizations®. *Implantación de Guías de buenas prácticas en España a través del Programa de Centros Comprometidos con la Excelencia en Cuidados®*. *Enferm. Clin.* 30 (3), 136–144. <https://doi.org/10.1016/j.enfcli.2019.09.018>. English Edition.
- Grinspun, D., Bajnok, I., International, S.T.T., 2018. In: *Transforming Nursing Through Knowledge: Best Practices for Guideline Development, Implementation Science, and Evaluation - OvidDS*. Indianapolis. Retrieved from [https://sacyl.ovidss.com/discover/result?logSearchID=65376175&pubid=solr\\_7176-nlmcatt%3A101721454](https://sacyl.ovidss.com/discover/result?logSearchID=65376175&pubid=solr_7176-nlmcatt%3A101721454).
- Gunnarsdóttir, S., Clarke, S.P., Rafferty, A.M., Nutbeam, D., 2009. Front-line management, staffing and nurse-doctor relationships as predictors of nurse and patient outcomes. A survey of icelandic hospital nurses. *Int. J. Nurs. Stud.* 46 (7), 920–927. <https://doi.org/10.1016/j.ijnurstu.2006.11.007>.
- Lake, E.T., 2002. Development of the practice environment scale of the nursing work index. *Res. Nurs. Health* 25 (3), 176–188. <https://doi.org/10.1002/nur.10032>.
- Lake, E.T., 2007. *The nursing practice environment measurement and evidence*. *Med. Care Res. Rev.* 64 (2), 104S–122S.
- Leming-Lee, T.S., Watters, R., 2019. Translation of evidence-based practice: quality improvement and patient safety. March 1. In: *Nursing Clinics of North America*. W.B. Saunders. <https://doi.org/10.1016/j.cnur.2018.10.006>.
- Lu, H., Zhao, Y., While, A., 2019. Job satisfaction among hospital nurses: a literature review. June 1. In: *International Journal of Nursing Studies*. Elsevier Ltd. <https://doi.org/10.1016/j.ijnurstu.2019.01.011>.
- Malik, G., McKenna, L., Plummer, V., 2016. Facilitators and barriers to evidence-based practice: perceptions of nurse educators, clinical coaches and nurse specialists from a descriptive study. *Contemp. Nurse* 52 (5), 544–554. <https://doi.org/10.1080/10376178.2016.1188017>.
- Martínez-Riera, J.R., Juárez-Vela, R., Díaz-Herrera, M.Á., Montejano-Lozoya, R., Doménech-Briz, V., Benavent-Cervera, J.V., Gea-Caballero, V., 2020. Qualitative analysis by experts of the essential elements of the nursing practice environments proposed by the TOP10 questionnaire of assessment of environments in primary health care. *Int. J. Environ. Res. Public Health* 17 (20), 1–13. <https://doi.org/10.3390/ijerph17207520>.
- Mathieson, A., Grande, G., Luker, K., 2018. Strategies, facilitators and barriers to implementation of evidence-based practice in community nursing: a systematic mixed-studies review and qualitative synthesis. *Prim. Health Care Res. Dev.* 20 (e6), 1–11. <https://doi.org/10.1017/S1463423618000488>.
- Melnik, B.M., Gallagher-Ford, L., Zellefrow, C., Tucker, S., Thomas, B., Sinnott, L.T., Tan, A., 2018. The First U.S. study on nurses' evidence-based practice competencies indicates major deficits that threaten healthcare quality, safety, and patient outcomes. *Worldview Evid.-Based Nurs.* 15 (1), 16–25. <https://doi.org/10.1111/wvn.12269>.
- Melnik, B.M., Tan, A., Hsieh, A.P., Gallagher-Ford, L., 2021. Evidence-based practice culture and mentorship predict EVIDENCE-BASED PRACTICE implementation, nurse job satisfaction, and intent to stay: support for the ARCC© model. *Worldviews Evid.-Based Nurs.* 18 (4), 272–281. <https://doi.org/10.1111/wvn.12524>.
- Mihdawi, M., Al-Amer, R., Darwish, R., Randall, S., Afaneh, T., 2020. The influence of nursing work environment on patient safety. *Workplace Health Saf.* 68 (8), 384–390. <https://doi.org/10.1177/2165079920901533>.
- Pereira, F., Pellaux, V., Verloo, H., 2018. Beliefs and implementation of evidence-based practice among community health nurses: a cross-sectional descriptive study. *J. Clin. Nurs.* 27 (9–10), 2052–2061. <https://doi.org/10.1111/jocn.14348>.
- Ramos-Morcillo, A.J., Fernández-Salazar, S., Leal-Costa, C., Ruzafa-Martínez, M., 2021. Evidence-based practice nurses' competency: Spanish national survey and establishment of a scale of the EBP-COQ-Prof©. *J. Nurs. Manag.* 29 (4), 794–804. <https://doi.org/10.1111/jonm.13220>.
- Renolen, Å., Hjälmhult, E., Høye, S., Danbolt, L.J., Kirkevold, M., 2019. Evidence-based practice integration in hospital wards—the complexities and challenges in achieving evidence-based practice in clinical nursing. *Nurs. Open* 6 (3), 815–823. <https://doi.org/10.1002/nop.2.259>.
- Ruzafa-Martínez, M., Fernández-Salazar, S., Leal-Costa, C., Ramos-Morcillo, A.J., 2020. Questionnaire to evaluate the competency in evidence-based practice of registered nurses (EVIDENCE-BASED PRACTICE -COQ Prof©): development and psychometric validation. *Worldviews Evid.-Based Nurs.* 17 (5), 366–375. <https://doi.org/10.1111/wvn.12464>.
- Ruzafa-Martínez, M., Hernández-Méndez, S., Garcia-Gonzalez, J., Leal-Costa, C., Martínez-González, M.Á., Ramos-Morcillo, A.J., 2020. Changes in nurse job outcomes after 4 years of a Best Practice Spotlight Organization® programme implementation in the Spanish National Health Context. *J. Nurs. Manag.* (October), 1–11. <https://doi.org/10.1111/jonm.13206>.
- Saunders, H., Vehviläinen-Julkunen, K., 2016. Evidence-based practice and job-related nurse outcomes at Magnet®-aspiring, magnet-conforming, and non-magnet university hospitals in Finland: a comparison study. *J. Nurs. Adm.* 46 (10), 513–520. <https://doi.org/10.1097/NNA.0000000000000395>.
- Sharplin, G., Adelson, P., Kennedy, K., Williams, N., Hewlett, R., Wood, J., Eckert, M., 2019. Establishing and sustaining a culture of evidence-based practice: an evaluation of barriers and facilitators to implementing the best practice spotlight organization program in the Australian healthcare context. *Healthcare* 7, 142. <https://doi.org/10.3390/healthcare7040142>.
- Shayan, S.J., Kiwanuka, F., Nakaye, Z., 2019. Barriers associated with evidence-based practice among nurses in low- and middle-income countries: a systematic review. *Worldviews Evid.-Based Nurs.* 16 (1), 12–20. <https://doi.org/10.1111/wvn.12337>.
- Sheingold, B.H., Hofmeyer, A., Woolcock, M., 2012. Measuring the nursing work environment: can a social capital framework add value? *World Med. Health Policy* 4 (1). <https://doi.org/10.1515/1948-4682.1212>.
- Shuman, C.J., Powers, K., Banaszak-Holl, J., Titler, M.G., 2019. Unit leadership and climates for evidence-based practice implementation in acute care: a cross-sectional descriptive study. *J. Nurs. Scholarsh.* 51 (1), 114–124. <https://doi.org/10.1111/jnu.12452>.
- Skela-Savić, B., Hvalič-Touzery, S., Pesjak, K., 2017. Professional values and competencies as explanatory factors for the use of evidence-based practice in nursing. *J. Adv. Nurs.* 73 (8), 1910–1923. <https://doi.org/10.1111/jan.13280>.
- Speroni, K.G., McLaughlin, M.K., Friesen, M.A., 2020. Use of evidence-based practice models and research findings in magnet-designated hospitals across the United States: national survey results. *Worldviews Evid.-Based Nurs.* 17 (2), 98–107. <https://doi.org/10.1111/wvn.12428>.
- Zangaro, G.A., Jones, K., 2019. Practice environment scale of the nursing work index: a reliability generalization meta-analysis. *West. J. Nurs. Res.* 41 (11), 1658–1684. <https://doi.org/10.1177/0193945918823779>.