



## Original Article

# Effectiveness of Evidence-Based Practice (EBP) Education on Emergency Nurses' EBP Attitudes, Knowledge, Self-Efficacy, Skills, and Behavior: A Randomized Controlled Trial

Elina Koota, MNSc, RN  • Maria Kääriäinen, PhD, RN • Helvi Kyngäs, PhD • Mitja Lääperi, MSc • Hanna-Leena Melender, PhD, RNM 

### Key words

evidence-based practice, emergency nursing, education, intervention, randomized controlled trial, attitude, behavior, self-efficacy, skills, knowledge

### ABSTRACT

**Background:** Emergency care clinicians are expected to use the latest research evidence in practice. However, emergency nurses do not always consistently implement evidence-based practice (EBP). An educational intervention on EBP was implemented to promote emergency nurses' use of EBP, and the effectiveness of it was evaluated.

**Aims:** This study aimed to evaluate the effectiveness of an EBP educational intervention on emergency nurses' EBP attitudes, knowledge, self-efficacy, skills, and behavior. The study also examined learners' satisfaction with the EBP educational intervention.

**Methods:** A randomized controlled trial with parallel groups with evaluations before the education, immediately after it, and 6 and 12 months after the education was conducted at four emergency departments in two university hospitals. The experimental group ( $N = 40$ ) received EBP education while the control group ( $N = 40$ ) completed self-directed EBP education. The primary outcomes were emergency nurses' EBP attitudes, knowledge, self-efficacy, skills, and behavior, while the secondary outcome was satisfaction with the EBP education.

**Results:** Thirty-five participants of an experimental and 29 participants of a control group completed the study. There were no statistically significant ( $p < .05$ ) improvements and differences between groups in EBP attitude, self-efficacy, or behavior immediately after the EBP education. At the 6-month measurement point, the experimental group showed significantly better EBP attitudes, behavior, knowledge, and self-efficacy than the control group. At the 12-month measurement point, the improvements began to decrease. The groups also differed significantly in terms of participant satisfaction with how the teacher encouraged learners to ask clinical questions.

**Linking Evidence to Action:** The EBP educational intervention implemented in this study had a positive effect on emergency nurses' EBP attitudes, knowledge, self-efficacy, skills, and behavior. The effects of the education appeared the best 6 months after the education. After this point, the results began to decrease and approached baseline levels. EBP educational interventions designed for emergency nurses should apply various teaching strategies to improve their EBP attitude, knowledge, self-efficacy, skills, behavior, and satisfaction with the education.

### BACKGROUND

Emergency care clinicians are increasingly expected to apply the latest research evidence in practice to provide effective, high-quality care and insure the optimum use of clinical skills and knowledge to improve patient and organizational outcomes (Considine, Curtis, Shaban, & Fry,

2018, 2019). The goal of evidence-based practice (EBP) is to improve patient care outcomes within the context of complex healthcare systems. However, healthcare professionals still do not consistently use EBP on a daily basis, which hinders healthcare organizations from delivering high-quality, evidence-based care (Melnyk, Fineout-Overholt,

© 2021 The Authors. *Worldviews on Evidence-based Nursing* published by Wiley Periodicals LLC on behalf of Sigma Theta Tau International.

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

Gallagher-Ford, & Kaplan, 2012; Saunders, Gallagher-Ford, & Vehviläinen-Julkunen, 2019). Educational interventions on EBP is one strategy to promote EBP use among nurses (Häggman-Laitila, Mattila, & Melender, 2016; Saunders, Vehviläinen-Julkunen, & Stevens, 2016). To assess the impact of EBP education, the Classification Rubric for EBP Assessment Tools in Education (CREATE) framework was developed. Seven categories for assessing the outcomes of EBP education are provided by CREATE (Tilson et al., 2011), namely, learners' reactions to the EBP educational experience, attitudes, self-efficacy, knowledge, skills, behavior, and benefits to the patient. Reaction to the EBP educational experience describes learners' opinions regarding the learning experience and the intervention's efficacy, from here on referred to as learners' satisfaction. Attitudes encompass learners' perceptions of the importance and usefulness of EBP in informing clinical decision-making. Self-efficacy refers to learners' judgments of their ability to perform a given activity, while knowledge describes learners' awareness and understanding of EBP concepts. Skills relate to the application of knowledge and describe an individual's ability to perform the EBP steps in a practical setting. Behavior describes learners' real-life actions, that is, their commitment to following the EBP steps in everyday practice. It includes all the processes used in the application of EBP. Benefits to patients cover how the EBP educational intervention will impact the health of patients and communities. This category is difficult to measure, as the EBP learning process is affected by numerous variables. Effective EBP education clearly addresses all these learning outcomes (Tilson et al., 2011).

Several studies have investigated how an educational intervention affects nurses' general attitudes toward EBP. An online EBP course with a self-paced PowerPoint presentation (Moore, 2017), a multifaceted EBP education for registered nurses (RN) that included mentoring (Friesen, Brady, Milligan, & Christensen, 2017), and an EBP course for Master of Science in Nursing and Doctorate of Nursing Practice students (Moore, Watters, & Wallston, 2019) had positively impacted nurses' EBP attitudes, which subsequently significantly affected EBP implementation (Friesen et al., 2017; Moore et al., 2019). In contrast, Ramos-Morcillo, Fernández-Salazar, Ruzafa-Martínez, and Del-Pino-Casado (2015) reported that a brief, 30 hours of online and 10 hours of face-to-face learning, educational intervention on EBP had no impact on professional nurses' attitudes.

Previous studies have also found that educational interventions positively affect RNs' EBP self-efficacy. A 1-year EBP scholars program for RNs (Royer, Crary, Fayram, & Heidrich, 2018), multifaceted EBP education that included mentoring (Friesen et al., 2017; Saunders et al., 2016), and an EBP course (Moore et al., 2019) all positively affected RNs' EBP self-efficacy in clinical practice.

EBP knowledge and skills are often evaluated together. A brief, 30 hours of online and 10 hours of face-to-face

learning, EBP course (Ramos-Morcillo et al., 2015) for professional nurses and EBP education that included mentoring for RNs (Saunders et al., 2016) significantly improved their knowledge and skills. Moore et al. (2019) found that an EBP course increased only Doctorate of Nursing Practice students' knowledge. On the other hand, an online EBP course did not significantly improve RNs' knowledge or skills (Moore, 2017).

The EBP educational interventions described by Moore et al. (2019) and Snibsøer, Espehaug, Ciliska, and Wammen Nortvedt (2017) improved EBP behavior in clinical practice, while an online EBP course (Moore, 2017), EBP education that included mentoring (Friesen et al., 2017), and a brief EBP course (Ramos-Morcillo et al., 2015) did not affect nurses in general EBP behavior.

Hence, previous research has already extensively studied the effectiveness of EBP educational interventions. However, to the best of our knowledge, no research has focused on the effectiveness of educational interventions for emergency nurses that explicitly include the EBP steps as learning content.

## AIM

This study aimed to evaluate effectiveness of an EBP educational intervention on emergency nurses' EBP attitudes, knowledge, self-efficacy, skills, and behavior. The study also examined learners' satisfaction with the EBP educational intervention.

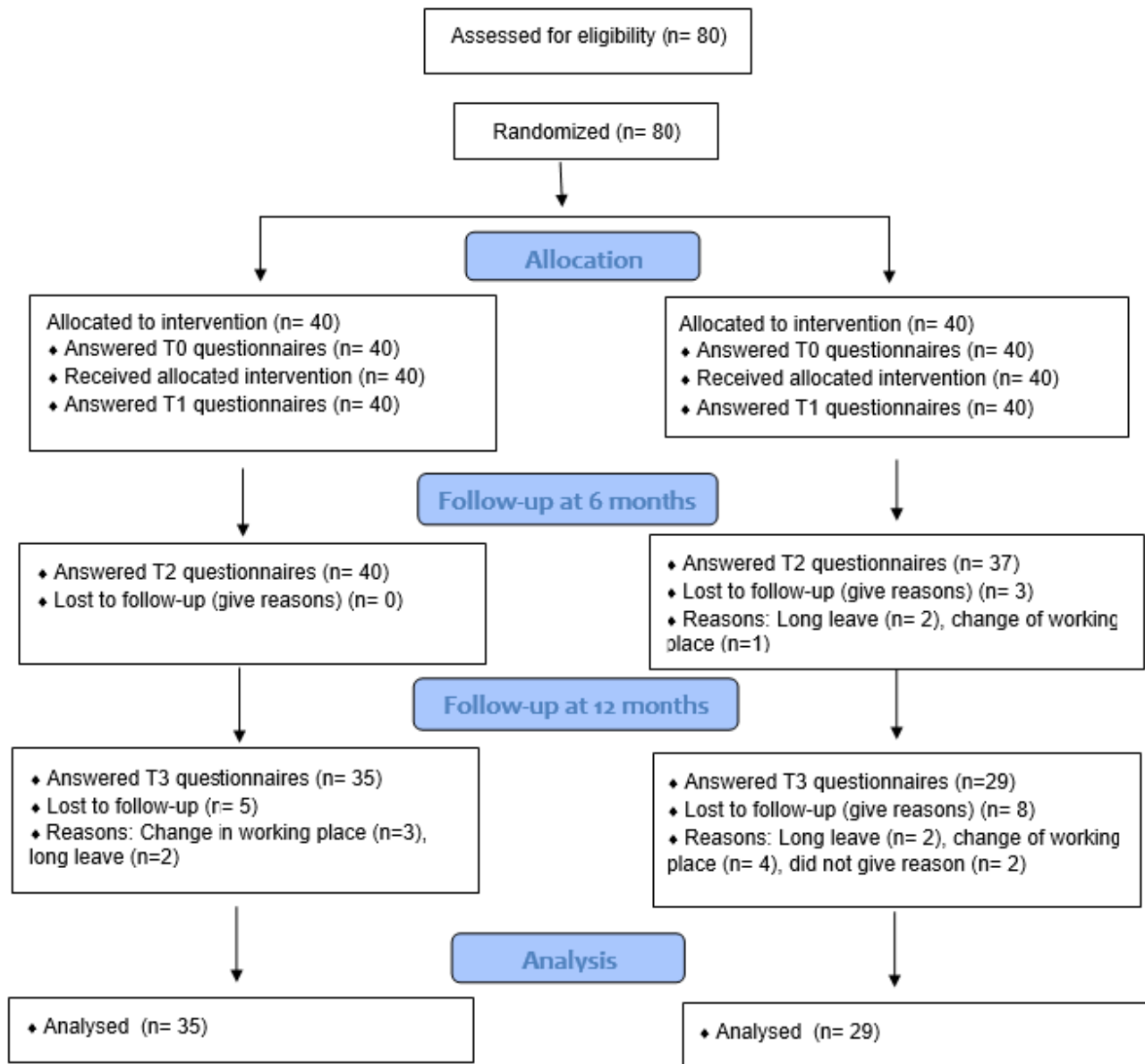
## METHODS

### Study Design

This study employed a randomized controlled trial (RCT) with a parallel group and a 12-month follow-up period. The RCT was conducted in four emergency departments at two university hospitals in Finland, and in the randomization of the units, they were allocated to an experimental group or a control group by an impartial secretary using a simple coin toss.

### Setting and Participants

The first author recruited the study participants. The study population comprised 300 emergency nurses employed in the two university hospitals' emergency departments. Three sets of inclusion criteria were used: (a) working as an RN at a university hospital emergency department; (b) working full- or part-time as an RN at a university hospital emergency department; and (c) ability to understand and read Finnish. The sample size necessary for identifying statistically significant differences was estimated using a simulation approach. Various expected EBP improvements (5% to 20% for a half and a third of the participants) were bootstrapped 1,000 times to produce sample sizes. The power was approximated by



**Figure 1.** The CONSORT diagram: Flow of participants through the study.

the number of significant Mann-Whitney U tests when comparing increases in groups and Wilcoxon signed-rank tests when comparing increases on the individual level. As the study included repeated measurements, drop-out attrition was expected. Assuming a 20% attrition rate, a sample size of 80 participants was required to achieve 80% power and an alpha level of .05. The 20% attrition rate was assumed based on earlier research (Julious, 2010). At the beginning of the study, 80 participants were recruited (40 for the experimental group and 40 for the control group). A total of 35 and 29 participants from the experimental and control groups, respectively, completed the study (Figure 1).

### The Educational Interventions

The experimental group received an intervention named “Evidence-Based Practice Basics for Emergency Nurses” (EBP Basics EmNurs; two European Credit Transfer System [ECTS]), while the control group completed “Self-Directed Learning Module: Evidence-Based Practice Basics for Emergency Nurses” (Self-Dir EBP Basics EmNurs; two ECTS). The main objective for both interventions was to provide emergency nurses with basic EBP competencies. The key differences between the groups were that the EBP education for the experimental group included multifaceted educational strategies, such as didactic lectures and discussions, small group tutorials, database search workshops,

and self-directed learning (i.e., assignments and reading). The education for the control group included self-directed learning (i.e., reading and database searching) as an educational strategy. Descriptions of the educational interventions according to the GREET checklist (i.e., the Guideline for Reporting Evidence-Based practice Educational interventions and Teaching; Phillips et al., 2016) are presented in Table S1.

### Outcomes and Instruments

The primary and secondary outcomes were measured according to the CREATE framework (Tilson et al., 2011). Data were collected using five questionnaires. Three of the five questionnaires had been previously tested and validated: (a) The Evidence-Based Practice Questionnaire-FI (EBPQ-FI; Upton & Upton, 2006); (b) Evidence-Based Practice Beliefs Scale© (EBPB; Melnyk, Fineout-Overholt, & Mays, 2008); and (c) Evidence-Based Practice Implementation Scale© (EBPI; Melnyk et al., 2008). The knowledge test and the course assessment form (i.e., learners' satisfaction) were developed by the researcher, as no validated tests or forms appropriate for the purposes of this study were found. The knowledge test questions were based on the EBP competencies presented by Melnyk, Gallagher-Ford, Long, and Fineout-Overholt (2014) so that there was one question regarding each competency. The course assignment form questions included in the instrument were based on items proposed by Tilson et al. (2011). Both instruments were trialed when piloting the educational intervention. The results were analyzed statistically to examine the measurement properties of the instruments. More details about the instruments are presented in an earlier article (Koota, Kääriäinen, Lääperi, & Melender, 2019).

### Data Collection

Data were collected from participating emergency nurses through an electronic and manual survey, administered at four time points ( $T_0$ – $T_3$ ) during May 2018 through August 2019. The pre-intervention survey ( $T_0$ ) was administered in May 2018, while  $T_1$  was administered immediately after the educational intervention (at the completion of the education). The  $T_2$  was administered after 6 months of  $T_1$ , and  $T_3$  was administered after 12 months of  $T_1$ .

### Data Analysis

EBP attitudes, self-efficacy, knowledge, skills, and behavior sum variables (developed by the researchers) were formed by calculating the means within a category. Scores for the questions "I believe that EBP takes too much time" and "I believe EBP is difficult" were reversed to match the scale (negative-to-positive) of other questions included in the attitude EBP sum variable. Continuous variables are presented as means and medians, while categorical data are presented as frequencies and percentages. The categorical variables

were analyzed with a Chi-squared test. Continuous variables in two different categories were compared using Mann–Whitney U test and Kruskal–Wallis H test when more than two categories were present. Pearson's correlation coefficients were also calculated. Two-tailed  $p$  values  $<.05$  were considered statistically significant. The analyses were performed using R (R Core Team, 2014), and figures were produced using the package ggplot2 (Wickham, 2016).

### Ethical Considerations

The study was approved by the University Hospital Ethical Board (an institutional review board). Permission to conduct the study was also obtained from both university hospitals. Written consent was obtained from every participant after they had received oral and written information about the study. The information encompassed the voluntary and anonymous nature of participation. Participant names were replaced with a code number in all documents.

## RESULTS

Altogether, the emergency nurses ( $N = 80$ ) were randomized into two groups (i.e., the experimental group and the control group). Thirty-five participants in the experimental group and 29 participants in the control group completed the educational intervention (Figure 1). There were no statistically significant between-group differences identified at  $T_0$  in EBP attitudes, self-efficacy, skills, or behavior. However, the knowledge test in the experimental group obtained statistically significant lower values than the control group. Findings concerning the primary outcomes are outlined in Table 1. At each measurement point, between-group differences in the mean value of each sum variable ( $p_{\text{group}}$ ) along with the difference between the baseline and specific measurement point mean value for both groups ( $p_{\text{delta}}$ ) were assessed.

Immediately after the intervention ( $T_1$ ), there was a statistically significant difference between the groups in EBP behavior according to EBPI results, but this difference was not identified from EBPQ results. However, the experimental group showed statistically significant improvements in the knowledge test at all measurement points.

At  $T_2$ , the experimental group significantly differed from the control group in every sum variable. The experimental group showed statistically significant improvements in EBP attitudes (EBPB, EBPQ), behavior (EBPI), knowledge (EBPQ, Knowledge test), skills (EBPQ), and self-efficacy (EBPB) relative to baseline measurements (Table 1). The control group had a statistically significant increase in EBP attitude (EBPB) and self-efficacy. At the same time, EBP behavior (EBPQ) decreased.

A statistically significant difference between the groups in EBP attitudes (EBPB) was identified at  $T_3$ , but this difference was not observed from EBPQ results. The experimental

group had improved more in EBP knowledge (measured with both instruments) and in self-efficacy 12 months after the intervention than the control group (Table 1).

Learners' satisfaction with the educational intervention is summarized in Table 2. The groups differed significantly

in satisfaction with the teacher's ability to encourage nurses to ask clinical questions. Furthermore, the groups significantly differed in satisfaction concerning the usefulness of consideration on how to use research evidence in nursing practice.

**Table 1.** Emergency Nurses' EBP Attitudes, Knowledge, Self-efficacy, Skills, and Behavior in a 12-months Follow-up

Sum variable	Time	Experimental group			Control group			$p_{\text{group}}^a$	$p_{\text{delta}}^b$
		Mean	SD	Median	Mean	SD	Median		
Attitude EBPB	Baseline	3.85	0.49	3.88	3.85	0.42	3.88	.973	
	After	3.86	0.50	3.88	3.89	0.42	4.00	.843	.209
	6 mo.	4.30	0.23	4.38	3.97	0.42	4.00	<.001	<.001
	12 mo.	4.12	0.49	4.25		0.43	3.88	.010	.002
Attitude EBPQ	Baseline	5.22	0.95	5.50	5.13	0.85	5.25	.419	
	After	5.06	1.32	5.38	5.08	0.84	5.25	.403	.546
	6 mo.	5.73	0.58	5.75	5.22	0.68	5.25	.001	.019
	12 mo.	5.36	0.95	5.75	5.14	0.66	5.00	.097	.183
Behavior EBPI	Baseline	1.57	0.37	1.47	1.76	0.63	1.50	.371	
	After	1.52	0.41	1.33	1.77	0.62	1.61	.036	.336
	6 mo.	1.96	0.35	1.83	1.78	0.61	1.61	.003	<.001
	12 mo.	1.46	0.56	1.33	1.36	0.35	1.28	.584	.099
Behavior EBPQ	Baseline	4.63	1.15	4.79	4.62	0.99	4.57	.750	
	After	4.39	1.22	4.57	4.60	0.95	4.57	.644	.121
	6 mo.	5.01	0.75	5.00	4.37	0.81	4.43	<0.001	<.001
	12 mo.	4.44	0.82	4.43	4.14	0.73	4.14	.112	.038
Knowledge EBPQ	Baseline	4.28	1.28	4.50	3.91	0.86	4.00	.101	
	After	4.24	1.35	4.25	3.94	0.92	4.00	.219	.366
	6 mo.	4.99	0.84	5.00	3.89	0.89	4.00	<.001	.005
	12 mo.	4.54	1.26	5.00	3.97	0.76	4.00	.012	.263
Knowledge test	Baseline	7.35	1.58	7.50	8.33	2.48	9.00	.013	
	After	11.65	0.98	12.00	8.65	2.48	9.00	<.001	<.001
	6 mo.	11.78	0.92	12.00	8.16	2.18	8.00	<.001	<.001
	12 mo.	11.80	1.02	12.00	9.52	1.45	9.00	<.001	<.001
Self-efficacy EBPB	Baseline	3.12	0.60	3.13	3.14	0.42	3.19	.831	
	After	3.23	0.60	3.31	3.19	0.44	3.25	.643	.661
	6 mo.	3.87	0.28	3.88	3.35	0.57	3.25	<.001	<.001
	12 mo.	3.51	0.53	3.50	3.31	0.46	3.25	.055	.003
Skills EBPQ	Baseline	4.64	0.76	4.82	4.46	0.45	4.50	.075	
	After	4.44	0.82	4.59	4.40	0.42	4.45	.302	.011
	6 mo.	5.05	0.42	5.05	4.42	0.39	4.45	<0.001	.003
	12 mo.	4.64	0.71	4.73	4.45	0.35	4.45	.037	.585

<sup>a</sup>Between-group comparisons of sum variables at each time point.

<sup>b</sup>Between-group comparisons in the change from baseline.

**Table 2.** Learners' Satisfaction with the EBP Educational Intervention

Question	Scale <sup>a</sup>	Experimental group				Control group				p value*
		n	Mean	SD	Median	n	Mean	SD	Median	
Assess how well the teacher's teaching style encouraged you to ask clinical questions?	1–5	40	3.98	0.62	4	16	2.75	0.93	3	<.001
Assess whether sufficient time was allocated on practicing database searches?	1–5	40	3.43	0.81	3	16	3.00	0.82	3	.13
Assess how deeply the appraisal of research evidence was studied in relation to your learning needs?	1–5	40	3.13	0.99	3	16	2.81	0.91	3	.25
Assess how well the practical examples used in teaching related to your own situation?	1–5	40	3.28	0.96	3	16	2.88	0.85	3	.13
Assess how useful it was for your own learning to consider how to use research evidence in nursing practice?	1–5	40	3.65	1.06	4	16	2.94	0.83	3	.01

<sup>a</sup>1 = lowest grade, 5 = highest grade.  
\*Mann–Whitney U test.

The correlations between participants' background data and the sum variables at T<sub>0</sub> are reported in another article (Koota et al., 2019). These correlations stayed constant throughout the study (Table S2).

## DISCUSSION

To the best of our knowledge, this is the first study that evaluates emergency nurses' EBP attitudes, behavior, knowledge, self-efficacy, and skills before and 12 months after an EBP educational intervention. In addition, learners' satisfaction with the education was analyzed.

### Evidence-Based Practice Attitudes

Both groups showed better than average baseline EBP attitudes. In the control group, EBP attitudes stayed at a constant level throughout the follow-up period according to the results from both EBP attitude instruments. In the experimental group, EBP attitudes improved at T<sub>2</sub>, but then decreased at T<sub>3</sub>, although EBP attitudes were still higher than T<sub>0</sub> (EBPB measurements). Earlier studies (Friesen et al., 2017; Moore et al., 2019; Moore, 2017; Ramos-Morcillo et al., 2015; Snibsoer et al., 2017) have noted a more prominent improvement in EBP attitudes immediately after education, but they did not include a long follow-up period.

### Evidence-Based Practice Behavior

Interestingly, EBP behavior at T<sub>0</sub> was lower than the average level measured with the EBPI instrument but higher than the average measured with the EBPQ instrument in both groups. In the control group, EBP behavior initially stayed constant but decreased below baseline levels by T<sub>3</sub> (measured with both instruments). In the experimental group, EBP behavior had improved at T<sub>2</sub> (measured with both instruments). However, by T<sub>3</sub>, it had decreased (measured with EBPB). Previous research shows conflicting findings with some reporting that EBP behavior decreased following education (Friesen et al., 2017; Moore, 2017; Snibsoer et al., 2017) and another reporting that EBP behavior increased immediately after education (Moore et al., 2019). One reason for the decrease of self-assessed EBP behavior might be that the learners may have been self-critical after better understanding the true essence of EBP during and after the education. Squires et al. (2019) studied different clinical settings and found contextual attributes to affect healthcare professionals' implementation of EBP. Furthermore, resources were found to be highly important to EBP implementation in hospital emergency rooms, which implies that emergency room staff should be provided with the relevant resources if EBP implementation is to be improved.

The better EBP behavior in the experimental group might be explained by the fact that the group received contact learning. During it, there were many discussions



and reflections on EBP. This might have supported the real EBP behavior.

### Evidence-Based Practice Knowledge

The experimental group demonstrated higher levels of self-assessed EBP knowledge than the control group throughout the follow-up period ( $T_0$ – $T_3$ ). In the control group, EBP knowledge stayed constant throughout the follow-up period. In the experimental group, the knowledge level was better at  $T_2$ . The objective EBP knowledge test revealed that the control group had higher EBP knowledge levels at  $T_0$  than the experimental group, with EBP knowledge staying constant throughout the study. In the experimental group, the knowledge test scores improved after the education and stayed at a high level 12 months after the education. This result agrees with what was reported by Ramos-Morcillo et al. (2015), although their measurements represent EBP knowledge at  $T_1$ . Moore (2017) and Saunders et al. (2016) had different results, as they found EBP education to have no observable effect on nurses' EBP knowledge.

Better EBP knowledge in the experimental group might be explained again by the fact that the group received contact learning. During it, there were many discussions and reflections on EBP. This might have supported deep learning (Mezirow, 2003).

### Evidence-Based Practice Self-Efficacy

EBP self-efficacy improved with the control group at  $T_1$ . In the experimental group, EBP self-efficacy increased at  $T_2$  but then decreased to baseline levels by  $T_3$ . A similar trend for self-efficacy (an initial increase followed by a decrease) has also been previously observed (Friesen et al., 2017; Moore et al., 2019; Royer et al., 2018; Snibsoer et al., 2017). Activating learners to self-assess their progress is an ipsative evaluation method that supports learner self-efficacy (Atjonen, 2007), and it was also used in this educational intervention. However, more methods are needed for future research to intentionally support self-efficacy of the learners during the education. For example, giving formative evaluation during the learning process (not only summative at the end) and using other methods of ipsative evaluation. It might be useful for the learners to also receive formal evaluations on their clinical EBP practices after the education (Atjonen, 2007).

### Evidence-Based Practice Skills

In the control group, self-directed EBP education had no effect on emergency nurses' EBP skills. In the experimental group, nurses demonstrated minor improvement by  $T_2$ . Previous educational intervention studies show large variation concerning EBP skills; namely, Ramos-Morcillo et al. (2015) reported that education improves EBP skills, while Moore (2017) reported decreased skill levels following an intervention. Hence, there is a clear need for developing the methods used to teach EBP skills. For example, most

educational approaches have not focused on using a clinical perspective to develop EBP skills (Horntvedt, Nordstein, Fermann, & Severinsson, 2018). This aspect should be carefully considered when developing EBP education.

### Learners' Satisfaction With Education

Few studies have discussed how satisfied emergency nurses are with EBP education (Koota, Kääriäinen, & Melender, 2018). In our study, nurses in both groups evaluated the learner's satisfaction with the education as above average. Jordan and Moore-Nadler (2014) and Habich and Letizia (2015) reported emergency nurses to be satisfied with the EBP education they received. However, the educational interventions of these two studies differed from the approach used in our study; thus, the results are not comparable. In our study, the experimental group, when compared with the control group, provided more positive ratings concerning the teachers' teaching style—for example, encouraging participants to ask clinical questions and to assess the usefulness of consideration on how to use research evidence in nursing practice. This finding is probably explained by the fact that control group participants were only encouraged to ask clinical questions and to consider how to apply research evidence based on written material.

### STUDY LIMITATIONS

There is a lack of higher evidentiary design EBP studies reporting educational interventions in the field of emergency nursing (Koota et al., 2018). The strength of this study was that it applied an RCT with experimental and control groups. However, controlling the confounding outcomes among emergency nurses during a 12-month follow-up period is impossible. Despite an inability to control confounders, the long follow-up period was a strength, as the results provided a unique perspective on emergency nurses' EBP learning outcomes after an educational intervention and how various aspects of EBP changed over 1 year. To insure the reliability of the findings, we performed a power analysis to calculate an adequate sample size; however, there were more dropouts during the 12-month study period than we had anticipated. Due to the large number of dropouts, a sensitivity analysis was performed using only nurses who had participated at the last measurement point. These results did not differ from the results of the full data analysis, which suggested that the dropouts did not bias the results. The CONSORT list was used to insure rigorous reporting of the research.

A further strength was that three validated and reliable instruments (EBPQ, EBPB, and EBPI) were used. Moreover, since they are self-assessment instruments, it is possible that the participants may have exaggerated their EBP attitudes, skills, self-efficacy, behavior, and knowledge, a phenomenon that was reported in an

earlier study (Yost, Ciliska, & Dobbins, 2014). However, the research also applied an objective knowledge assessment instrument.

The results might be generalizable to similar populations. Our study focused on emergency department nurses; hence, the results may not be applicable to nurses working at in-patient wards. The diversity of cultural aspects should always be considered.

## IMPLICATIONS FOR FUTURE RESEARCH

Based on our study, future research should focus on identifying the most effective teaching and learning method(s) for each EBP area. This is most relevant for EBP skills, as previous studies have applied various teaching and learning methods to address this EBP area but only demonstrated minor improvements (e.g., Moore et al., 2019; Snibsoer et al., 2017). Also, more research in the field of emergency nursing should examine the factors that increase EBP behavior and self-efficacy.

## CONCLUSION

The tested EBP educational intervention appeared to provide the best results in the experimental group 6 months after the education. However, after 6 months, the results for most EBP areas began to decrease. By the 12-month measurement point, the results were at the baseline level or, in some cases, even lower. An exception was the knowledge test, as the participants demonstrated high levels across all measurement points.

After the educational intervention, the experimental group outperformed the control group in every measured aspect of EBP. The experimental group also demonstrated above average satisfaction with the education.

Since the results of the intervention were not permanent, future educational interventions should focus on maintaining EBP competence. More specifically, these interventions should concentrate on EBP skills and self-efficacy.

Furthermore, our results demonstrated that self-directed learning, when applied alone, was not as effective as the combination of various teaching methods—for example, didactic lectures and small group discussion. Discussions and reflections during contact learning may have an important role in supporting learners' depth learning.



### LINKING EVIDENCE TO ACTION

- EBP educational interventions designed for emergency nurses should apply various teaching strategies to improve their EBP attitude, knowledge,

self-efficacy, skills, behavior, and satisfaction with the education.

- The effects of this educational intervention were more positive in the experimental group 6 months after the education; after this point the results began to decrease and approached baseline levels.
- Self-directed EBP learning (control group) was not as effective as education that included various teaching strategies (experimental group).
- EBP behavior was not constant. Future educational interventions should address this challenge.

## Author information

Elina Koota, PhD Student, Research Unit of Nursing Science and Health Management, University of Oulu, Oulu, Finland; HUS Joint Resources, Research and Education, Helsinki University Hospital, Helsinki, Finland; ; Maria Kääriäinen, Professor, Consultant, Vice Head of Research Unit of Nursing Science, Health Management, Research Unit of Nursing Science and Health Management, University of Oulu, Oulu, Finland; Oulu University Hospital, Oulu, Finland; ; Helvi Kyngäs, Professor, Head of Research Unit of Nursing Science, Health Management, Research Unit of Nursing Science and Health Management, University of Oulu, Oulu, Finland; Oulu University Hospital, Oulu, Finland; ; Mitja Lääperi, Statistician, Emergency Medicine and Services, Helsinki University Hospital and University of Helsinki, Helsinki, Finland; Hanna-Leena Melender, Adjunct Professor, Research Unit of Nursing Science and Health Management, University of Oulu, Oulu, Finland;

Address correspondence to: Elina Koota, Biomedicum 2 C, 7. krs, Tukholmankatu 8 C, Helsinki, Finland; elina.koota@hus.fi

Accepted 13 June 2020

© 2021 The Authors. Worldviews on Evidence-based Nursing published by Wiley Periodicals LLC on behalf of Sigma Theta Tau International.

## References

- Atjonen, P. (2007). *Hyvä, paha arviointi*. Helsinki, Finland: Tammi.
- Considine, J., Curtis, K., Shaban, R. Z., & Fry, M. (2018). Consensus-based clinical research priorities for emergency nursing in Australia. *Journal of Australasian Emergency Nursing*, 21(2), 43–50. <https://doi.org/10.1016/j.auec.2018.03.001>
- Considine, J., Curtis, K., Shaban, R. Z., & Fry, M. (2019). Effectiveness of nurse-initiated X-ray for emergency department patients with distal limb injuries: A systematic



- review. *European Journal of Emergency Medicine*, 26(5), 314–322. <https://doi.org/10.1097/MEJ.0000000000000604>
- Friesen, M. A., Brady, J. M., Milligan, R., & Christensen, P. (2017). Findings from a pilot study: Bringing evidence-based practice to bedside. *Worldviews on Evidence-Based Nursing*, 14(1), 22–34. <https://doi.org/10.1111/wvn.12195>
- Habich, M., & Letizia, M. (2015). Pediatric pain assessment in the emergency department: A nursing evidence-based practice protocol. *Pediatric Nursing*, 41(4), 198–202.
- Häggman-Laitila, A., Mattila, L.-R., & Melender, H.-L. (2016). Educational interventions on evidence-based nursing in clinical practice: A systematic review with qualitative analysis. *Nurse Education Today*, 43, 50–59. <https://doi.org/10.1016/j.nedt.2016.04.023>
- Horntvedt, M.-E., Nordstein, A., Fermann, T., & Severinsson, E. (2018). Strategies for teaching evidence-based practice in nursing education: A thematic literature review. *BMC Medical Education*, 18, 172. <https://doi.org/10.1186/s12909-018-1278-z>
- Jordan, K. S., & Moore-Nadler, M. (2014). Children at risk of maltreatment identification and intervention in the emergency department. *Journal of Advanced Emergency Nursing*, 36, 97–106. <https://doi.org/10.1097/TME.0000000000000011>
- Julious, S. A. (2010). *Sample sizes for clinical trials*. Boca Raton, FL: Chapman & Hall/CRC Press.
- Koota, E., Kääriäinen, M., Lääperi, M., & Melender, H.-L. (2019). Emergency nurses' evidence-based practice attitudes, self-efficacy, knowledge, skills and behaviors before an educational intervention – Baseline of a randomized controlled trial. *Collegian*, 27(4), 361–369. <https://doi.org/10.1016/j.collegian.2019.11.002>
- Koota, E., Kääriäinen, M., & Melender, H. L. (2018). Educational interventions promoting evidence-based practice among emergency nurses: A systematic review. *International Emergency Nursing*, 41, 51–58.
- Melnik, B. M., Fineout-Overholt, E., Gallagher-Ford, L., & Kaplan, L. (2012). The state of evidence-based practice in US nurses: Critical implications for nurse leaders and educators. *Journal of Nursing Administration*, 42(9), 410–417. <https://doi.org/10.1097/NNA.0b013e3182664e0a>
- Melnik, B. M., Fineout-Overholt, E., & Mays, M. Z. (2008). The evidence-based practice beliefs and implementation scales: Psychometric properties of two new instruments. *Worldviews on Evidence-Based Nursing*, 5(4), 208–216. <https://doi.org/10.1111/j.1741-6787.2008.00126.x>
- Melnik, B. M., Gallagher-Ford, L., Long, L. E., & Fineout-Overholt, E. (2014). The establishment of evidence-based practice competencies for practicing registered nurses and advanced practice nurses in real-world clinical settings: Proficiencies to improve healthcare quality, reliability, patient outcomes, and cost. *Worldviews on Evidence-Based Nursing*, 11(1), 5–15. <https://doi.org/10.1111/wvn.12021>
- Mezirow, J. (2003). Transformative learning as discourse. *Journal of Transformative Education*, 1(1), 58–63.
- Moore, E. R., Watters, R., & Wallston, K. A. (2019). Effect of evidence-based practice (EBP) courses on MSN and DNP students' use of EBP. *Worldviews on Evidence-Based Nursing*, 16(4), 319–326. <https://doi.org/10.1111/wvn.12369>
- Moore, L. (2017). Effectiveness of an online educational module in improving evidence-based practice skills of practicing registered nurses. *Worldviews on Evidence-Based Nursing*, 14(5), 358–366. <https://doi.org/10.1111/wvn.12214>
- Phillips, A. C., Lewis, L. K., McEvoy, M. P., Galipeau, J., Glasziou, P., Moher, D., ... Williams, M. T. (2016). Development and validation of the guideline for reporting evidence-based practice educational interventions and teaching (GREET). *BMC Medical Education*, 16, 237. <https://doi.org/10.1186/s12909-016-0759-1>
- R Core Team (2014). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. <http://www.R-project.org/>
- Ramos-Morcillo, A. J., Fernández-Salazar, S., Ruzafa-Martínez, M., & Del-Pino-Casado, R. (2015). Effectiveness of a brief, basic evidence-based practice course for clinical nurses. *Worldviews on Evidence-Based Nursing*, 12(4), 199–207. <https://doi.org/10.1111/wvn.12103>
- Royer, H., Crary, P., Fayram, E., & Heidrich, S. M. (2018). Five-year program evaluation of an evidence-based practice scholars program. *The Journal of Continuing Education in Nursing*, 49(12), 547–554. <https://doi.org/10.3928/00220124-2018116-05>
- Saunders, H., Gallagher-Ford, L., Kvist, T., & Vehviläinen-Julkunen, K. (2019). Practicing healthcare professionals' evidence-based practice competencies: An overview of systematic reviews. *Worldviews on Evidence-Based Nursing*, 16(3), 176–185. <https://doi.org/10.1111/wvn.12363>
- Saunders, H., Vehviläinen-Julkunen, K., & Stevens, K. R. (2016). Effectiveness of an education intervention to strengthen nurses' readiness for evidence-based practice: A single-blind randomized controlled study. *Applied Nursing Research*, 31, 175–185. <https://doi.org/10.1016/j.apnr.2016.03.004>
- Snibsoer, A. M., Espehaug, B., Ciliska, D., & Wammen Nortvedt, M. (2017). Changes in evidence-based practice beliefs and implementation after postgraduate educational program: A before-and-after study over one year. *Nordic Journal of Nursing Research*, 37(3), 164–171. <https://doi.org/10.1177/2057158517692754>
- Squires, J. E., Aloisio, L. D., Grimshaw, J. M., Bashir, K., Dorrance, K., Coughlin, M., ... Graham, I. D. (2019). Attributes of context relevant to healthcare professionals' use of research evidence in clinical practice: A multi-study analysis. *Implementation Science*, 14, 52. Retrieved from <https://implementationscience.biomedcentral.com/articles/10.1186/s13012-019-0900-8>
- Tilson, J. K., Kaplan, S. L., Harris, J. L., Hutchinson, A., Ilic, D., Niederman, R., ... Zwolsman, S. E. (2011). Sicily statement on classification and development of evidence-based practice learning assessment tool. *BMC Medical Education*, 11(78), <https://doi.org/10.1186/1472-6920-11-78>

Upton, D., & Upton, P. (2006). Development of an evidence-based practice questionnaire for nurses. *Journal of Advanced Nursing*, 53(4), 454–458. <https://doi.org/10.1111/j.1365-2648.2006.03739.x>

Wickham, H. (2016). *ggplot2: Elegant graphics for data analysis*. New York, NY: Springer-Verlag.

Yost, J., Ciliska, D., & Dobbins, M. (2014). Evaluating the impact of an intensive education workshop on evidence-informed decision making knowledge, skills, and behaviours: A mixed methods study. *BMC Medical Education*, 14, 13. <https://doi.org/10.1186/1472-6920-14-13>

---

10.1111/wvn.12485  
WVN 2021;18:23–32

## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article at the publisher's web site:

**Table S1.** Description of the educational intervention “evidence-based practice basics for emergency nurses” (EBP basics EmNurs) and self-directed learning module “evidence-based practice basics for emergency nurses” (EBP Basics EmNurs) according to the GREET checklist (Phillips et al., 2016).

**Table S2.** Correlations between participants' background data and the sum variables.