Original Research Article

A Quasi-Experimental Study of a Basics of Evidence-Based Practice Educational Intervention for Health and Social Care Professionals

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Abstract

Education is one of the central interventions to promote evidence-based practice (EBP) in service organizations. An educational intervention to promote EBP among health and social care professionals was implemented in a Finnish hospital. The aim of this study was to explore the outcomes of an educational intervention, focusing on the basics of EBP for health and social care professionals, using a quasi-experimental study design. The data were collected with a questionnaire before, immediately after, and 6 months after the education ($n = 48$). The data were analyzed with descriptive statistics and nonparametric tests. Immediately after the education, an increase was found in the EBP knowledge of participants, in participants' confidence in their own ability to conduct database searches and read scientific articles, and in the number of participants using databases at work. Six months after the education, improvements were still found between the first and the third measurement in the participants' knowledge and confidence in their own ability to conduct database searches and read scientific articles. The number of those who had made an initiative about a research topic regarding the development of their own work had increased from the first to the third measurement. The educational intervention produced a statistically significant improvement on most of the areas evaluated. Significant improvements were often found even 6 months after the education was finished. However, the low completion rate and a quasi-experimental before and after design limit the conclusions that can be derived from this study.

Keywords

evidence-based practice, staff development, education, intervention, outcomes

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Evidence-based practice (EBP) is "a lifelong problem-solving approach to how healthcare is delivered that integrates the best evidence from high-quality studies with a clinician's expertise and also a patient's preferences and values" (Melnyk, 2017, p. 8). EBP improves the quality and safety of health care and enhances health outcomes, decreases geographic variation in care as well as reduces costs (Melnyk, 2017). Although positive attitudes from nurses toward EBP have been reported, there are also deficiencies associated with the consistent implementation of EBP (Duffy et al., 2015; Melnyk et al., 2012, 2018). One of the main barriers for that is a lack of EBP competencies (Duffy et al., 2015; Fairbrother et al., 2016).

Educational interventions promoting EBP are intended to increase learners' competence concerning EBP and thus support lifelong learning (Ilic & Maloney, 2014). The body of evidence to guide educators on how to teach EBP to health professionals has

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remained quite modest. Therefore, there is a need for further research on the effectiveness of EBP educational interventions for health professionals (Häggman-Laitila et al., 2016; Ilic & Maloney, 2014; Melnyk et al., 2018). It has also been stated that that in further studies, attention should be paid to the detailed descriptions of the interventions and their implementation (Häggman-Laitila et al, 2016; Ilic & Maloney, 2014). This study aimed to address these challenges.

Literature Review

The Classification Rubric for EBP Assessment Tools in Education (CREATE) recommends a common taxonomy to develop an EBP assessment tool. According to this, the assessment of EBP learning should focus on seven areas: knowledge, skills, attitudes, self-efficacy, behaviors, learners' reactions to the educational experience, and benefits to the patient (Tilson et al., 2011). Out of these, the first six were addressed in this study. In the following, earlier research is examined according to these areas.

When implementing educational interventions on EBP for nurses, EBP knowledge has been assessed either with a knowledge test or the participants have been invited to self-evaluate their EBP knowledge. With a test, Saunders et al. (2016) found that after education, nurses' knowledge improved both in the EBP education group and the research utilization education group. In studies by Chang et al. (2013) and Reviriego et al. (2014), a knowledge test showed an improvement of knowledge on critical appraisal after education. In self-evaluations, Mollon et al. (2012) and Moore (2017) did not find any improvements after education, whereas in studies by Allen et al. (2015) and Ramos-Morcillo et al. (2015), self-evaluation of knowledge showed improvement after education.

Evaluations of nurses' EBP skills in educational interventions have been subjective, as the participants have been invited to self-evaluate their skills with a questionnaire. In such evaluations, no improvement in skills was found by Mollon et al. (2012) and Moore (2017). However, in a study by Ramos-Morcillo et al. (2015), the nurses' skills had improved after education, and improvement in most critical appraisal competencies was found by Billingsley et al. (2013).

When evaluating attitudes toward EBP, Mollon et al. (2012), Ramos-Morcillo et al. (2015), Moore (2017), and Friesen et al. (2017) found no statistically significant improvements, whereas Snibsøer et al. (2017) found positive changes in nurses' beliefs about EBP after education. Brown et al. (2011) found that at least 80% of nurses were excited about nursing research, valued reading it, and were interested in using it already before education; after education, there were no changes in attitudes. However, the percentage of nurses who would initiate a nursing research project increased from 26% to 34%.

Self-efficacy as an outcome has been addressed in studies by Chang et al. (2013), Saunders et al. (2016), and Royer et al. (2018), who all found that nurses' confidence in their skills improved after EBP education. However, in the study by Royer et al. (2018), the self-efficacy scores between the end of the program year and 1-year follow-up did not differ significantly.

Nurses' EBP behaviors have been studied by asking nurses about their practices before and after an EBP education. Snibsøer et al. (2017) found a statistically significant improvement for 8 of the 18 items measuring EBP implementation after the educational intervention, while Friesen et al. (2017) found for 6 of the items. In a study by Levin et al. (2011), improvements in EBP implementation in an experimental group compared with a control group were found, whereas Mollon et al. (2012), Ramos-Morcillo et al. (2015), and Moore (2017) did not find any statistically significant improvements in EBP behaviors among nurses after education.

The learners' reactions to the EBP educational experience were evaluated with a questionnaire (Billingsley et al., 2013) or several questionnaires (Reviriego et al. 2014). Both studies showed that nurses were mainly satisfied with their educational experiences. Participants in the program to educate and engage staff in the EBP process (Royer et al., 2018) answered open-ended questions and reported satisfaction with most elements of the education; however, some weaknesses were also identified.

To sum up, evaluations of the outcomes of EBP educational interventions in earlier studies have varied from objective testing to subjective self-evaluations. The studies have shown differing results regarding EBP knowledge, skills, attitudes, self-efficacy, and behavior. The learners have mainly been satisfied with their educational experience.

In a central hospital in Western Finland, the action and economic plan of the hospital for year 2016 included a strategic goal to ensure that the competence of nursing staff would be systematically developed. A new tailored educational intervention regarding EBP for nurses and other professionals within health and social care was chosen for the strategy because the earlier developed interventions were either not suitable for the purposes of the strategy or the reports did not describe them in sufficient detail to support the choosing of them. Moreover, the strategy was to also employ objective evaluation methods and, thus, new evaluation strategies, which were tailored and utilized for the purposes of this study.

Aim of the Study

The aim of this study was to explore the outcomes of an educational intervention, focusing on the basics of EBP for health and social care professionals, using a quasi-experimental study design. The following were the research questions:

1. Does the educational intervention have an effect on the EBP knowledge, attitude, self-efficacy, and behavior of the health and social health professionals participating in the education?
2. What are the participants' reactions to the educational experience after the educational intervention?
3. What are the participants' skills of EBP after the educational intervention?

Methods

Educational Intervention

The educational intervention is described in Table 1, based on the Guideline for Reporting Evidence-based practice Educational interventions and Teaching checklist (Phillips et al., 2016). The educational intervention conformed to the EBP competencies on a bachelor's level (Melnyk et al., 2014). The intervention was designed by the first two authors.

According to the strategy of the hospital, the first group to be educated would be the nurse leaders working as head nurses or assistant head nurses because research has shown that leaders have an important position in the promotion of EBP among nurses (Stetler et al., 2014). All 108 head nurses and assistant head nurses of the hospital were invited to participate in the educational intervention. Information about the education was presented at a meeting of the hospital nurse leaders. Nursing directors individually encouraged the head nurses and assistant head nurses of their own area of responsibility to participate. In case one did not participate, another nurse from the unit could substitute her/him. Moreover, other health-care professionals and social workers had an opportunity to participate. All in all, the number of participants in the education was 83. The education was implemented in two rounds: The first round (32 participants) was implemented in Autumn 2016 and the second (51 participants) in Spring 2017.

Data Collection and Sample

The data were collected at three time points: before the educational intervention ($n = 83$), immediately after the education was finished ($n = 82$; learners' feedback only at this phase), and 6 months after the education was finished ($n = 48$). Ethical questions are presented in Supplemental material.

Instrument

The data were collected by a self-administered questionnaire developed by the researchers. A new instrument was developed because existing instruments did not cover all the topics that were of interest in this study. Such topics were, for example, certain organization-specific topics associated with the strategy of the hospital and some topics included in the knowledge test which were also included in the learning contents of the education. The content of any validated knowledge test did not suit for the purposes of this study. Moreover, validated instruments have many items for each category measured in this study, and we intended to keep the instrument short and simple, to make answering more attractive for the study participants. As a framework for the questionnaire, the CREATE by Tilson et al. (2011) was used. The instrument was pretested among a group of 15 masters' students from the Development and Management of Social and Health-Care Services program at the first author's university. Based on the pretest, the wording of some questions was clarified. The questionnaire was presented on paper.

For assessing knowledge, a 15-question knowledge test was developed. It was possible to get one point for each right answer. The knowledge test points (max. 15) reached by each participant constituted Variable 1 (Table 2). The questions of the knowledge test were related to whether there was any legislation about EBP in Finland; what kind of databases are PubMed, CINAHL, Medic, Cochrane, and Joanna Briggs Institute databases; what do the concepts *keyword*, *subject heading*, *Boolean operator*, and *open access* mean; which organization develops and publishes nursing clinical guidelines in Finland; and whether they are available for free. Moreover, there were items asking about which organization translates the Joanna Briggs Institute Best Practice Recommendations into the Finnish language and whether the respondent's own working organization provides the Joanna Briggs Institute database and the Cochrane database for the use of the staff. There were either two or four answering options for each question, of which one was right.

Attitudes were assessed with one question (Variable 2 in Table 2), asking about the participant's view on the importance of the acquisition of scientific knowledge to constitute the basis of the work on a Likert scale of 1 to 3, options ranging from *no importance* (1) to *high importance* (3). Self-efficacy was evaluated with two questions, asking participants to evaluate her/his own competence on database searching (Variable 3 in Table 2) and on reading a scientific article (Variable 4 in Table 2) on a Likert scale of 1 to 3, options ranging from *poor* (1) to *good competence* (3). The Likert scale was used in the attitude question and in the questions where the

Table 1. Description of the Educational Intervention.

Intervention: Basics of Evidence-Based Practice (Brief name: B-EBP) 2 ECTS (53 hours student work) (1 ECTS = 26.7 hours student work)
Theory: *Pedagogical approaches*: (a) transformative learning (Mezirow, 2009); (b) active learning methods (Zayapragassarazan & Kumar, 2012); (c) evidence from systematic reviews (Melender et al., 2016; Swanberg et al., 2016) on learning and implementing EBP in nursing education.
Content framework: The content planning conformed the EBP competencies on a bachelor's level presented by Melnyk et al. (2014).
Learning objectives: (a) to understand the idea of evidence-based practice; (b) to understand different sources of knowledge; (c) to be able to formulate the PICO question; (d) to be able to search the best evidence in databases; (e) to be able to read a scientific article; (f) to be able to critically appraise the evidence; (g) to be able to find systematic reviews and clinical guidelines in online collections and portals; (h) to be able to disseminate evidence.
EBP learning contents: (a) the idea of EBP (including the EBP steps presented by Melnyk et al., 2014) and the benefits of it; (b) different sources of knowledge; (c) the PICO question; (d) database searching; (e) how to read a scientific article?; (f) critical appraisal of the evidence; (g) online collections and portals including systematic reviews and clinical guidelines; (h) dissemination of the evidence.
Materials: Free access to the Medic, PubMed, and CINAHL databases, a video on database searching in CINAHL (Melender & Maijala, 2018) and another on database searching in PubMed, two videos on how to read a scientific article, a template for the presentation of a scientific article (Sarajärvi et al., 2011), PowerPoint handouts, copies of relevant articles.
Educational strategies: (a) interactive lectures; (b) database-searching practices supported by the teachers (hands-on teaching when needed); (c) self-directed learning supported by the teachers by email or in face-to-face meetings; (d) seminar days where the learners present a scientific article for the workplace representatives.
Incentives: The course was paid for by the hospital. The learners were permitted to participate in all learning activities during their working hours. The learners received a diploma confirming they had passed a 2 ECTS course on the basics of evidence-based practice.
Instructors: *The first instructor* (the first author) was a principal lecturer (working in a University of Applied Sciences, later UAS), PhD, who was the course leader and responsible for interactive lectures, database-searching practices, support during the self-directed learning, and facilitating of the seminar days (the first and the second round); *the second instructor* was a senior lecturer (working in the UAS), PhD, who was responsible for database-searching practices, support during the self-directed learning, and facilitating of the seminar days (the first round); *the third instructor* was a senior lecturer (working in the UAS), MNSc, who was responsible for database-searching practices, support during the self-directed learning, and facilitating of the seminar days (the second round).
Delivery: 53 hours, including 32 hours face-to-face contact learning and 21 hours self-directed learning as follows: (a) contact learning on three 8-hour days, including interactive lectures at 8 to 12 and database search practices at 12 to 16 (24 hours in total); (b) self-directed learning including database searching, selection of an article, and preparing to present it in a seminar (21 hours) (a given assignment done individually, with a pair or in a small group with 3 members); (c) contact learning in a seminar where the articles are presented. Seminars are held during three different days and participation in 1 day (8 hours) is mandatory for all.
Environment: The first three contact learning days were held at the UAS. Self-directed learning and the seminar days took place at the hospital.
Schedule: 53 hours, including 32 hours face-to-face contact learning and 21 hours self-directed learning as follows: (a) contact learning at the UAS on three 8-hour days with 1-week intervals; (b) self-directed learning lasting 9 weeks during which the students could decide when to work for 21 hours; (c) contact learning in three seminars (8 hours each) with 1-week intervals.
Face-to-face contact with instructors: 32 hours.
Self-directed learning: 21 hours.
Adaptation for the learners: no.
Modifications during the course of the study: no.
Attendance: The learners attended all three contact days at the UAS and at least one of the three seminar days at the hospital. The instructors collected the signatures of the participants on a list during each session.
Processes used to determine whether the materials and the educational strategies were delivered as originally planned: continuous monitoring by the course leader.
The extent to which the sessions were delivered as scheduled: The sessions were delivered as scheduled.

Note. ECTS = European Credit Transfer System; PICO = Patient population, Intervention, Comparison, Outcome.

respondents self-evaluated their own competence, as it is a suitable scale for questions measuring attitudes and evaluations (Polit & Beck, 2012).

Behaviors were assessed with seven questions (Variables 5 to 11 in Table 2), asking whether the participant had taken different actions regarding the implementation or promotion of EBP at work on a dichotomous scale (yes/no). The dichotomous scale was used in the measurement of behaviors, as we were more interested in the facts (Polit & Beck, 2012) regarding whether the respondent had done something that presents an action of EBP rather than how often or how much it had been done. Learners' reactions to the educational experience were evaluated immediately after the education with five questions on a Likert scale (Polit & Beck, 2012) of 1 to 3 (Table 3).

Table 2. Repeated Measurement Test Results (unadjusted p-values significant at 5% after Bonferroni adjustment are provided in bold letters).

Variables	Mean	Test	Test measurement (M) points	*p*
Variable 1 (knowledge): Knowledge test		Friedman test $p = \mathbf{.000}$	Wilcoxon signed-rank test	
Measurement 1	5.44		M 1 – M 2	**0.001**[a]
Measurement 2	7.24		M 1 – M 3	**0.000**[a]
Measurement 3	7.75		M 2 – M 3	0.387
Variable 2 (attitude): View on the importance of the acquisition of scientific knowledge to constitute the basis of the work		Friedman test $p = .662$		
Measurement 1	2.73		–	–
Measurement 2	2.77			
Measurement 3	2.71			
Variable 3 (self-efficacy): View on one's own competence on database searching		Friedman test $p = \mathbf{.000}$	Wilcoxon signed-rank test	
Measurement 1	1.57		M 1 – M 2	**0.000**[a]
Measurement 2	2.32		M 1 – M 3	**0.000**[a]
Measurement 3	2.00		M 2 – M 3	**0.000**[a]
Variable 4 (self-efficacy): View on one's own competence on reading a scientific article		Friedman test $p = \mathbf{.000}$	Wilcoxon signed-rank test	
Measurement 1	1.79		M 1 – M 2	**0.000**[a]
Measurement 2	2.27		M 1 – M 3	**0.000**[a]
Measurement 3	2.25		M 2 – M 3	0.796
Variable 5 (behavior): Has used Medic database at work		Cochran test $p = \mathbf{.000}$	McNemar test	
Measurement 1	0.28		M 1 – M 2	**0.000**[a]
Measurement 2	0.64		M 1 – M 3	**0.000**[a]
Measurement 3	0.60		M 2 – M 3	0.791
Variable 6 (behavior): Has used PubMed database at work		Cochran test $p = \mathbf{.000}$	McNemar test	
Measurement 1	0.38		M 1 – M 2	**0.001**[a]
Measurement 2	0.69		M 1 – M 3	**0.002**[a]
Measurement 3	0.65		M 2 – M 3	0.774
Variable 7 (behavior): Has used CINAHL database at work		Cochran test $p = \mathbf{.000}$	McNemar test	
Measurement 1	0.27		M 1 – M 2	**0.000**[a]
Measurement 2	0.67		M 1 – M 3	0.021
Measurement 3	0.48		M 2 – M 3	0.035
Variable 8 (behavior): Has used scientific articles at work		Cochran test $p = .651$		
Measurement 1	0.90		–	–
Measurement 2	0.88			
Measurement 3	0.92			
Variable 9 (behavior): Has made an initiative about a research topic regarding the development of own work in own working unit		Cochran test $p = \mathbf{.001}$	McNemar test	
Measurement 1	0.29		M 1 – M 2	0.065
Measurement 2	0.44		M 1 – M 3	**0.000**[a]

(continued)

Table 2. Continued.

Variables	Mean	Test	Test measurement (M) points	*p*
Measurement 3	0.56		M 2 – M 3	0.109
Variable 10 (behavior): Has given a database-searching task to a student during her/his clinical practice		Cochran test $p = .846$		
Measurement 1	0.42		–	–
Measurement 2	0.40			
Measurement 3	0.44			
Variable 11 (behavior): Has given a topic of a thesis to a student		Cochran test $p = .420$		
Measurement 1	0.52		–	–
Measurement 2	0.60			
Measurement 3	0.58			

[a]A value of $p < .0167$ was considered statistically significant at alpha = .05 (Bonferroni adjustment).

Benefits to the patient were not evaluated because the participants of the study represented many different units of the hospital, and it was not possible to organize the measurement of any patient outcomes.

EBP skills were evaluated separately by means of a given assignment in which the participants formulated a clinical question, searched for research evidence in databases, presented their search strategies, and prepared a PowerPoint presentation to be used in a public seminar in the hospital where they presented the evidence found (see Table 1). As for searching for research evidence, the participants' skills in all the steps of the search were evaluated. The steps were as follows: (a) finding the suitable main concepts in Finnish and translating them into English, (b) choosing the corresponding subject headings, (c) using Boolean operators, (d) limiting the search, (e) examining the matches, and (f) obtaining the full texts (Melender & Maijala, 2018). The instructors evaluated the assignments. The grades were *passed* or *failed*.

Data Analysis

Statistical analyses were performed using SPSS for Windows, Release 23.0. To describe the data, frequency and percentage distributions of the learners' feedback variables and means of the other variables were calculated. The standard tool for statistical analysis in this setup with more than two dependent responses from the same respondents over time would have been an analysis of variance for repeated measurements. However, because analysis of variance requires the observations to be normally distributed at all time points and ours were not, we had to resort to nonparametric tests as described later and presented in Table 2.

We first assessed overall significance with the Friedman test for Likert scale items and the Cochran test for dichotomous data, which are generally the most frequently used nonparametric tests in the analysis of repeated measurements. When a significant difference was found, we followed up with pairwise Wilcoxon signed-rank tests for Likert scale items and McNemar tests for dichotomous data. Again, we had to refrain from using pairwise t tests, as our observations were not normally distributed. In addition, because multiple testing inflates the risk of finding spurious significant results (type I error rates), we applied a Bonferroni correction by dividing the conventional significance level of 5% by the number of possible tests between 3 time points. Hence, we deemed differences between measurements significant only when the p value for the corresponding test fell below 1.67%.

Results

Follow-Up Data

The final follow-up data reported in this article consisted of the responses of the 48 participants who completed and returned the questionnaire at all data collection points. Of the participants, 43 were head nurses or assistant head nurses, and five were other health and social care professionals. The flow diagram of participants through the study is presented in Figure 1.

Effects of the Educational Intervention on the EBP Knowledge, Attitude, Self-Efficacy, and Behavior

Table 2 shows the means of the variables and the statistical tests applied. Immediately after the education was finished, the results of the knowledge test (Variable 1) were statistically significantly better, on average, than before the education. The mean at the third

measurement point was also significantly better than before the education.

As for self-efficacy (Variable 3 and 4 in Table 2), the Cronbach's alpha value for the section was .832. The confidence that the participants had in their ability to conduct database searches (Variable 3) had significantly increased, on average, from the first measurement to the second and the third measurement, whereas it had significantly decreased from the second to the third measurement. In addition, the confidence that the participants had in their ability to read scientific articles (Variable 4) had significantly increased, on average, from the first measurement to the second and the third measurement.

Behaviors were measured with Variables 5 to 11 (Table 2), and the Cronbach's alpha value for the section was .641. The percentage of participants using the Medic database at work (Variable 5) had statistically significantly increased from the first measurement (28%) to the second (64%) and the third measurement (60%). The number of participants using the PubMed database at work (Variable 6) had significantly increased from the first measurement (38%) to the second (69%) and the third measurement (65%). The number of participants using the CINAHL database at work (Variable 7) had significantly increased from the first measurement (27%) to the second (67%); at the third measurement point (48%), it had significantly decreased, however, and the difference between the first and the third measurement points was no longer significant. The percentage of those who had made an initiative about a research topic regarding the development of their own work in their own working unit (Variable 9) had significantly increased from the first (29%) to the third measurement (56%). There were no statistically significant differences between the measurement points in how important the participants found the acquisition of scientific knowledge to constitute the basis of their work on a scale of 1 to 3 (Variable 2); if scientific articles were used at work (Variable 8) (the percentages of the users in corresponding measurement points were 90%, 88%, and 92%); if students were commissioned to conduct database searches during their clinical practice (Variable 10) (the percentages of those who had commissioned were 42%, 40%, and 44% in corresponding measurement points); and if students were given topics for the thesis (Variable 11) (the percentages of those who had given topics were 52%, 60%, and 58% in corresponding measurement points).

Participants' Reactions to the Educational Experience After the Educational Intervention

As for learners' reactions to the educational experience (Table 3), the Cronbach's alpha value for the section was .639. Of the respondents, slightly more than one third

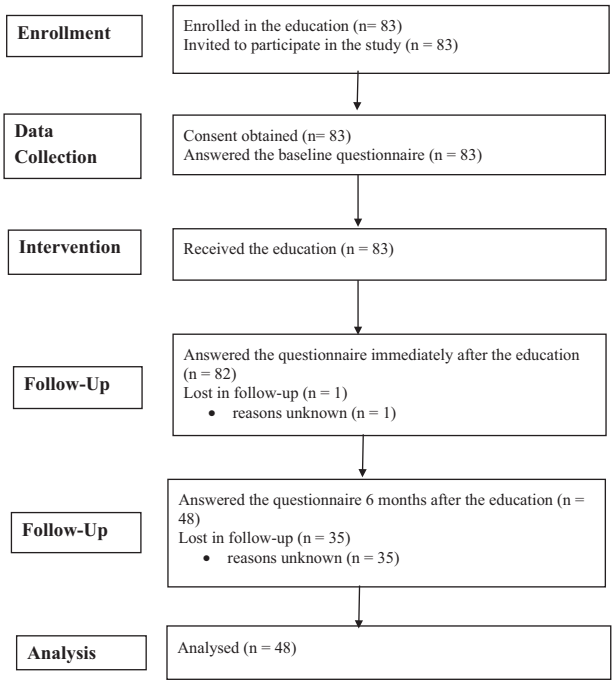

Figure 1. Flow diagram of Participants.

Table 3. Learners' Reactions to the Educational Experience.

Questions/Numerical alternatives	1 *f* (%)	2 *f* (%)	3 *f* (%)	Missing data
How significant was the education from the point of view of your professional development?	*Not at all significant* 0 (0)	*Somewhat significant* 30 (62.5)	*Clearly significant* 17 (35.4)	1 (2.1%)
How relevant were the contents of the education?	*Not at all relevant* 0 (0)	*Somewhat relevant* 10 (20.8)	*Clearly relevant* 37 (77.1)	1 (2.1%)
How well did the interactive lectures support your learning?	*Not at all* 0 (0)	*Somewhat well* 11 (22.9)	*Well* 36 (75.0)	1 (2.1%)
How well did the database-searching practices support your learning?	*Not at all* 0 (0)	*Somewhat well* 9 (18.8)	*Well* 38 (79.2)	1 (2.1%)
How well did the given assignment support your learning?	*Not at all* 0 (0)	*Somewhat well* 8 (16.7)	*Well* 39 (81.3)	1 (2.1%)

found the education clearly significant from the point of view of their professional development, and two thirds found it somewhat significant. The contents of the education had been found to be clearly relevant by three quarters. Three quarters stated that the interactive lectures had supported their learning well. As for database-searching practices, almost four of five stated that they had supported learning well. Slightly more than four of five stated that the given assignment had supported their learning well.

Participants' Skills of EBP After the Educational Intervention

EBP skills were evaluated by means of a given assignment. All the participants passed it; all were able to show an acceptable level of skills in formulating a clinical question, searching for research evidence in databases, presenting their search strategies, and presenting the evidence found.

Discussion

Consideration of the Findings

The first research question focused on the effects of the educational intervention on the EBP knowledge, attitude, self-efficacy, and behavior. The knowledge test results had statistically significantly improved. Improvements in EBP knowledge after the education have been found also in many other educational interventions (Allen et al., 2015; Chang et al., 2013; Ramos-Morcillo et al. 2015; Reviriego et al., 2014; Saunders et al., 2016).

There were no statistically significant differences regarding attitudes between the means of the responses at different data collection points. This was not, however, surprising because the attitudes were so positive already at the first data collection point. A similar result was found also by Brown et al. (2011). However, there were many dropouts in this study, and it is possible that those who responded to all data collection points may have had a more positive attitude compared with the dropouts.

The assessment of self-efficacy showed an improvement of confidence among the participants, from the first data collection point to the second one, in their own ability to conduct database searches and to read scientific articles. An interesting result is that participants' confidence in their own ability to conduct database searches had statistically significantly decreased from the second data collection point to the third one. A quite similar result was found by Royer et al. (2018). A possible explanation for the result of our study is that after the end of the education, during the 6 months before the last data collection point, the participants may not have conducted as many database searches as they did during the education. Because they had not practiced for a long time, they might have been unsure if their abilities had remained. They also might have become more self-critical over time. Based on the results of this study and the results of Royer et al.'s (2018) study, it can be stated that the retaining of professionals' self-efficacy in EBP after education is a future challenge when implementing educational interventions aiming to promote EBP in health and social care organizations.

As for EBP behaviors, the number of participants using databases at work had increased. For Medic and PubMed, improvement since the first data collection point occurred during the whole follow-up. However, the amount of CINAHL use had decreased up to the last data collection. In earlier research, Levin et al. (2011) found improvements in EBP implementation, whereas Mollon et al. (2012), Ramos-Morcillo et al. (2015), and Moore (2017) did not find any statistically significant improvements in EBP behaviors among nurses after education.

The number of participants who had made an initiative about a research topic regarding the development of their own work had increased. Quite similarly, in a study by Brown et al. (2011), the number of nurses who would initiate a nursing research project increased after EBP education. Snibsøer et al. (2017) found that the participants of an EBP education read and critically appraised a clinical research study more often after education. In this study, there were no statistically significant differences between the measurement points regarding whether scientific articles were used at work. This was not surprising because the percentage of the users was already high at the starting point.

There were no differences regarding whether students were commissioned to conduct database searches during their clinical practice and if they were given topics for their thesis. The percentage of the former was less than 50%, and the percentage of the latter was 60% or less in all measurement points. Earlier research has shown that when nursing students' learning has been connected with the development of EBP at clinics, the results have been positive for both (Dobalian et al., 2014). These actions are important in the promotion of EBP and those who have competencies in EBP are in the frontline to do these actions. This could mean, for example, giving database searching tasks to student nurses when mentoring them during their clinical education.

The second research question focused on the participants' reactions to the educational experience. The participants were quite satisfied with the education, as has been found also in earlier studies (Billingsley et al., 2013; Reviriego et al., 2014; Royer et al., 2018). Most of the participants in this study found the education only

somewhat significant for their professional development. However, most of them found the content of the education clearly relevant (also Royer et al., 2018), which implies that the content met the learning needs of most participants well. In addition to nurses, there were also representatives of some other health and social care professional groups among the participants of this educational intervention, as has also been in the study by Royer et al. (2018), where the participants were mainly satisfied with the program. Interdisciplinary educational interventions on EBP are recommendable to ensure that all parts of the health and social services are based on the best evidence and because the patient care is carried out as interdisciplinary teamwork.

The third research question focused on the participants' skills of EBP. All participants passed the given assignment by which EBP skills were evaluated. Because we did not conduct a pretest on skills before the education, it was not possible to evaluate how much their skills had averagely improved during the education. In future, a pretest on skills including numerical grading could be useful to show the development of EBP skills during the education. Mollon et al. (2012), Billingsley et al. (2013), Ramos-Morcillo et al. (2015), and Moore (2017) reported self-evaluations by nurses of their EBP skills in educational interventions, which are subjective and, as such, are not comparable with this study where the evaluation was made by instructors.

Benefits to the patient were not evaluated in this study, although it has been recommended by Tilson et al. (2011). This was because the participants presented many different units of the hospital. Organizing an evaluation of benefits to the patient would not have been possible in this study and conducting such studies can be seen as another future challenge of educational interventions aiming to promote EBP, as has been stated also by Häggman-Laitila et al. (2016). Organizing such evaluation could be easier in a study setting of, for example, only one clinic with a specialty of its own.

Validity and Reliability of the Study

The educational intervention conformed to the EBP competencies on a bachelor's level (Melnyk et al., 2014), which strengthened the intervention. Häggman-Laitila et al. (2016) found in their review that the contents of the EBP educational interventions for nurses had not always included all the steps of EBP. In our intervention, all the EBP steps presented by Melnyk et al. (2014) were included. The use of the Guideline for Reporting Evidence-based practice Educational interventions and Teaching checklist in the reporting of the intervention enhances validity, as it is a specific validated reporting guideline designed to provide a framework for the consistent and transparent reporting of educational interventions regarding EBP (Phillips et al., 2016).

The data were compiled by a new instrument that had not been used in previous studies, which is a limitation of this study. As a strength, the instrument was structured using the CREATE taxonomy, which has been developed by a specialist group (Tilson et al., 2011) and which covers seven areas of evaluation of EBP educational interventions, out of which five were used as a framework for the questionnaire and one was addressed with a given assignment. The content of the questionnaire was partly based on a literature review and was pretested, which strengthened its validity.

As for reliability, Cronbach's alpha values were calculated for the self-efficacy, behavior, and learners' reactions to the educational experience section. For the first mentioned, the value was acceptable (Field, 2009).

The sample size of this study was small, which is a limitation. There were many dropouts, despite the participants of the education being informed about the follow-up study and the importance of it at several stages. Moreover, reminders about responding were sent to all. It may be possible that after a 6-month period since the end of the education, answering the query was no longer deemed important, or in busy working environments, some simply might have forgotten to answer.

A further limitation is that this was a quasi-experimental before and after design, and there was no control group in this study. Use of such a control group would have strengthened the study design.

Conclusion

The educational intervention produced statistically significant improvement on most of the areas evaluated. Significant improvements were often found even 6 months after the education was finished. However, the low completion rate and a quasi-experimental before and after design will limit any conclusions that can be derived from this study. Challenges for future research are using strong study designs, such as randomized controlled trials, and measuring benefits to the patient. Moreover, the retaining of professionals' self-efficacy in EBP after an EBP education has finished is a challenge in the development of future educational interventions aiming to promote EBP in health and social care organizations.

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Supplemental material

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