



UNIVERSIDADE DE  
COIMBRA

Daniela Filipa Batista Cardoso

EVIDENCE BASED PRACTICE IN THE NURSING EDUCATION  
PROCESS IN PORTUGAL

Tese no âmbito do Programa de Doutoramento Em Ciências da Saúde – Ramo Enfermagem orientada pelos Professores Doutores João Luís Alves Apóstolo, Catarina Isabel Neno Resende Oliveira e Manuel Alves Rodrigues e apresentada à Faculdade de Medicina da Universidade de Coimbra.

Fevereiro de 2020





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“Tell me and I will forget.  
Show me and I will remember.  
Involve me and I will understand.  
Step back and I will act.”  
Old Chinese Proverb



This work was held in the Health Sciences Research Unit: Nursing (UICISA: E), hosted by the Nursing School of Coimbra (ESEnfC) in association with the Faculty of Medicine of University of Coimbra.





## Publications

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The current thesis was mainly grounded on work published or submitted for publication in international peer-reviewed journals, posters and published Conference abstracts as well as full papers presented at national and international meetings.

### **Publications in International Peer-Reviewed Journals**

- Cardoso, D., Santos, E., Cardoso, M. L., Oliveira, C. R., Rodrigues, M. A., & Apóstolo, J. (2017). Instruments for measuring undergraduate nursing students' knowledge, attitudes and skills in evidence-based practice: a systematic review protocol. *JBISRIR database of systematic reviews and implementation reports*, 15(8), 1979-1986. doi: 10.11124/JBISRIR-2016-003218
- Cardoso, D., Coelho, A., Louçano, C., Parola, V., Rodrigues, M. A., Fineout-Overholt, E., & Apóstolo, J. (2019). Translation and cross-cultural adaptation of evidence-based practice instruments for Portuguese nursing students. *Revista de Enfermagem Referência*, 4(23), 141-152. doi: 10.12707/RIV19058
- Cardoso, D., Fineout-Overholt, E., Pereira, R., Ferraz, L., Rodrigues, M. A., & Apóstolo, J. (2020). Translation, cross-cultural adaptation and preliminary validation of instruments for Portuguese nursing educators regarding evidence based practice. *Revista Electrónica Enfermería Actual en Costa Rica*, (38), 1979-1986. doi: 10.15517/revenf.v0i38.38255

### **Poster**

- Cardoso, D., Oliveira, C., Rodrigues, M., Apóstolo, J. (2017). Evidence based Practice (EBP) in the nursing education process in Portugal". *Encontro Ciência 2017*, 3-5 July, Lisbon, Portugal.
- Cardoso, D., Rodrigues, M., Coelho, A., Parola, V., Coutinho, V., Rodrigues, R., & Apóstolo, J. (2018). The effectiveness of an evidence based practice (EBP) educational program in undergraduate nursing students: A randomized control trial protocol. *10<sup>th</sup> Biennial Joanna Briggs Institute Colloquium 2018 - Successful implementation of evidence-based practice: Hard work or good luck?*, 2-4 May, Antwerp, Belgium.

- Cardoso, D., Rodrigues, M., Cardoso, M., Santos, E., & Apóstolo, João. (2018). Instruments for measuring undergraduate nursing students' knowledge, attitudes and skills in evidence based practice: Preliminary results of a systematic review. 10<sup>th</sup> Biennial Joanna Briggs Institute Colloquium 2018 - Successful implementation of evidence-based practice: Hard work or good luck?, 2-4 May, Antwerp, Belgium.

### **Published Conference Abstracts and Full Papers**

- Cardoso, D., Rodrigues, M., & Apóstolo, J. (2018). Evidence-based practice educational program. *International Journal of Evidence-Based Healthcare*, 17(Suppl 1), S72-S74. doi: 10.1097/xeb.0000000000000193
- Cardoso, D., Rodrigues, M., Coelho, A., Parola, V., Coutinho, V., Rodrigues, R., & Apóstolo, J. (2018). The effectiveness of an evidence based practice (EBP) educational program in undergraduate nursing students A randomized control trial protocol. *Book of Abstracts of the 10th Biennial Joanna Briggs Institute Colloquium 2018*, p.96.
- Cardoso, D., Rodrigues, M., Cardoso, M., Santos, E., & Apóstolo, João. (2018). Instruments for measuring undergraduate nursing students' knowledge, attitudes and skills in evidence based practice: Preliminary results of a systematic review. *Book of Abstracts of the 10th Biennial Joanna Briggs Institute Colloquium 2018*, p.95.

### **Prize**

- Best poster award EJBC 2017 student workshops - Robert Gordon University, Aberdeen - Portugal - Cardoso, D., Santos, E., Cardoso, M. L., Oliveira, C. R., Rodrigues, M. A., & Apóstolo, J. Instruments for measuring undergraduate nursing students' knowledge, attitudes and skills in evidence-based practice: a systematic review protocol.

### **Others**

- Finalist of the 3 Minute-Thesis Competition (3MT) of the University of Coimbra – 2019-2020.

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## Resumo

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**Introdução:** A prática baseada em evidências (PBE) evita a insegurança/ineficiência e melhora a qualidade dos cuidados de saúde. No entanto, a implementação e a sustentabilidade da PBE são um desafio para as organizações de saúde tendo em conta as lacunas entre investigação e prática. Uma preparação educacional dos futuros profissionais de saúde pode minimizar estas lacunas. Assim, é imperativo que os currículos dos cursos de licenciatura em ciências da saúde, nomeadamente em enfermagem, promovam uma cultura de PBE para que futuros profissionais de saúde a utilizem na sua prática clínica.

**Objetivo:** Sintetizar a realidade atual portuguesa das instituições de ensino de enfermagem sobre: predisposição para a integração da PBE; crenças relativas à PBE de professores de enfermagem e o seu nível de implementação; crenças relativas à PBE dos estudantes de licenciatura em enfermagem e o seu nível de implementação. Desenvolver um programa educacional de PBE e avaliar a sua efetividade nos conhecimentos e competências em PBE dos estudantes do quarto ano de licenciatura em enfermagem.

**Metodologia:** O estudo foi realizado em sete fases: (i) revisão sistemática da literatura sobre instrumentos de medida; (ii) tradução e adaptação transcultural para a população portuguesa dos instrumentos “EBP Beliefs Scale for Educators” (EBPB-E), “EBP Implementation Scale for Educators” (EBPI-E) e “Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey” (OCRSIEP-E) para professores; (iii) tradução e adaptação transcultural para a população portuguesa da “EBP Beliefs Scale” (EBPB), da “EBP Implementation Scale for Students” (EBPI-S) e da “Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey” (OCRSIEP-ES) para estudantes; (iv) tradução e adaptação transcultural para a população portuguesa e para os estudantes de licenciatura em enfermagem do teste Fresno; (v) análise da predisposição para a integração da PBE nas instituições de ensino de enfermagem; das crenças relativamente à PBE de professores de enfermagem e o seu nível de implementação da PBE; das crenças relativamente à PBE dos estudantes de licenciatura em enfermagem e o seu nível de implementação da PBE; (vi) desenvolvimento de um programa educacional estruturado sobre PBE; (vii) avaliação da efetividade do programa educacional de PBE nos conhecimentos e competências em PBE dos estudantes de licenciatura em enfermagem.

**Resultados:** Os professores e os estudantes apresentaram fortes crenças relativamente à PBE, mas baixos níveis de implementação desta, e as escolas mostraram um movimento moderado para uma cultura de PBE. Um programa educacional de PBE foi desenvolvido para 17 semanas, com um total de 18 horas (12 horas de aulas em sala de aula mais 6 horas de orientação) e implementado numa escola de

enfermagem portuguesa. Esta implementação contribuiu para a melhoria dos conhecimentos e competências em PBE de estudantes de licenciatura em enfermagem do quarto ano, especificamente ao nível da formulação de questões de revisão.

**Conclusões:** O programa educacional sobre PBE é o primeiro programa estruturado para estudantes de licenciatura em enfermagem desenvolvido de acordo com a “Guideline for Reporting Evidence-based practice Educational interventions and Teaching checklist” para o ensino da PBE em Portugal. Este programa mostrou potencial para ser implementado nos currículos de enfermagem de forma a promover uma cultura de PBE, incluindo o uso crítico das melhores evidências disponíveis em contextos clínicos como estudante e futuro profissional de saúde.

**Palavras-chave:** Enfermagem; Prática baseada na evidência; Educação; Ciências da Saúde; Curriculum.

## Abstract

---

**Introduction:** Evidence-based practice (EBP) prevents unsafety/inefficiency and improves healthcare quality. However, EBP implementation and sustainment are challenging for healthcare organizations and providers considering gaps between research and practice. An educational preparation of the future healthcare professionals can minimise these gaps. Thus, it is mandatory that undergraduate curricula in health sciences, namely in nursing, promote an EBP culture so that future health professionals use it into their clinical practice.

**Objectives:** To synthesize the current Portuguese reality of nursing education institutions about: readiness of EBP integration; nurse educators' EBP beliefs and the extent of their EBP implementation; undergraduate nursing students' EBP beliefs and the extent of their EBP implementation. To develop an educational EBP program and evaluate its effectiveness in fourth-year undergraduate nursing students' EBP knowledge and skills.

**Methodology:** The study was performed in seven phases: (i) systematic literature review of outcome measurement instruments; (ii) translation and cross-cultural adaptation to the Portuguese population the EBP Beliefs Scale for Educators" (EBPB-E), the "EBP Implementation Scale for Educators" (EBPI-E) and the "Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey" (OCSIEP-E) for educators; (iii) translation and cross-cultural adaptation to the Portuguese population the "EBP Beliefs Scale" (EBPB), the "EBP Implementation Scale for Students" (EBPI-S) and the "Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey" (OCSIEP-ES) for students.; (iv) translation and cross-cultural adaptation to the Portuguese population and to the undergraduate nursing students the Fresno test; (v) analysis of readiness of EBP integration of the nursing education institutions; nurse educators' EBP beliefs and the extent of their EBP implementation; undergraduate nursing students' EBP beliefs and the extent of their EBP implementation; (vi) development of a structured educational EBP program; (vii) evaluation of the effectiveness of the educational EBP program in undergraduate nursing students' EBP knowledge and skills.

**Results:** Educators and students had strong EBP beliefs, but low levels of EBP implementation and schools have shown a moderate movement to a culture of EBP. An educational EBP program was designed for 17 weeks with a total of 18 hours (12 hours of classroom lessons plus 6 hours of mentorship) and implemented in a Portuguese nursing school. This implementation contributed to the improvement of EBP knowledge and skills of fourth-year undergraduate nursing students, specifically at the level of review questions formulation.

**Conclusions:** The educational EBP program is the first structured program developed according to the Guideline for Reporting Evidence-based practice Educational interventions and Teaching checklist in Portugal for undergraduate nursing students. This program showed potential to be implemented in nursing curricula to promote an EBP culture, including the critical use of the best available evidence in clinical contexts as student and future health professional.

**Keywords:** Nursing; Evidence-Based Practice; Education; Health Sciences; Curriculum.



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## Introduction

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Evidence-Based Practice (EBP), also referred to as Evidence-Informed Practice (Melnyk & Newhouse, 2014), is defined as “clinical decision-making that considers the best available evidence; the context in which the care is delivered; client preference; and the professional judgment of the health professional” (Pearson, Wiechula, Court, & Lockwood, 2005, p. 209).

EBP promotes high-value health care, improves the patient experience and health outcomes, and reduces health care costs (Melnyk, Gallagher-Ford, Long, & Fineout-Overholt, 2014). Therefore, the adoption, implementation and sustainment of EBP in healthcare organizations are becoming increasingly important (Apóstolo, Cardoso, & Rodrigues, 2016). Additionally, national and international organizations, such as the World Health Organization (WHO, 2004, 2015), the International Council of Nurses (ICN, 2012), the Institute of Medicine (IoM, 2000, 2001, 2009), the Directorate-General of Health with the Portuguese National Health Plan 2012-2016 (Ministry of Health, 2012) and the National Council of Nursing (Ordem dos Enfermeiros, 2006) recommend EBP implementation. These organizations claim that decision-making is simplified; uncertainty, risk and variability are reduced; and quality of care is improved. Also, the “Sicily statement on evidence-based practice” pointed out that “all health care professionals need to understand the principles of EBP, recognize EBP in action, implement evidence-based policies, and have a critical attitude to their own practice and to evidence” (Dawes et al, 2005).

However, EBP is not the standard of care in the world (Melnyk et al., 2014), since there is a gap between research and practice, and with policies. This is often described as a problem (Oliver, Innvar, Lorenc, Woodman, & Thomas, 2014).

In fact, education emerged from some studies as a strategy to close this gap (Asokan, 2012; Black, Balneaves, Garossino, Puyat, & Qian, 2015; Mohsen, Safaan, & Okby, 2016). In 2003, the Committee on the Health Professions Education Summit had already recommended the development of competencies regarding the EBP use in all health professional educational programs. Therefore, it is important that undergraduate nursing curricula are based on EBP principles in order to educate the future nurses to use EBP into clinical practice. Consequently, this will improve health outcomes with a positive impact in patients’ safety, costs and health systems. Regardless of the above recommendation, some international studies reported that the nursing curricula still provide traditional nursing research contents

instead of integrating the EBP content and process (Melnyk, Fineout-Overholt, Gallagher-Ford, & Kaplan, 2012; Oh et al., 2010).

Likewise, in Portugal, the current Nursing Degree Courses curricula of the nursing schools include research courses, exception made for one institution. Nonetheless, by analyzing the contents of the research courses of some of these curricula, we find that in many there is already an attempt to introduce the EBP approach. However, only three curricula plans have a specific EBP course.

Actually, within the Portuguese context, there are no studies about the current reality of nursing education institutions on the additional value of the EBP integration in nursing education curricula. Due to the lack of research in this field in Portugal, we conducted this thesis:

- To characterize and understand the Portuguese reality of nursing education institutions about readiness of EBP integration; the nurse educators' EBP beliefs and the extent of their EBP implementation; the undergraduate nursing students' EBP beliefs and the extent of their EBP implementation.
- To assess the effectiveness of an educational EBP program in undergraduate nursing students' knowledge and skills in EBP.

In order to recognize the contributions of supervisors and co-authors, this thesis is written in the first-person plural. Nevertheless, I am responsible for the preparation of all the materials; the management of the persons involved; the recruitment of the students and educators to be enrolled into different tasks; the data analyses and interpretation; and the dissemination of findings.

This thesis is organized in 11 chapters. Chapter 1 is the Background, and Chapter 10 a joint Discussion. As for Chapters 2, 4, 5 and 8, they comprise the papers already published. Chapters 3, 6, 7 and 9 include the papers in submission process for publication in journals with peer-review policy.

We would like to call your attention to the fact that we used different references styles in chapters 2, 3, 4, 5, 6, 7, 8 and 9 because we followed up the standards of the journals where the papers were published or submitted. In chapters 1, 10 and 11, we used the American Psychological Association (APA) style, 6th edition, to format citations and list the references.

In Chapter 1, we provide the background to the problematic of EBP in education. More specifically, we present the history and definition of the EBP Concept; the EBP Importance and Recommendations to EBP Implementation; EBP as a Process – EBP Models (Advancing Research & Clinical Practice through Close Collaboration and Education and Joanna Briggs Institute model of evidence-based healthcare); Barriers and Facilitators to EBP; and EBP in Undergraduate Nursing Education. At the end of this chapter, we present the aims of this thesis.

In Chapters 2 and 3, we present respectively the systematic review protocol and the systematic review report regarding the instruments to measure undergraduate nursing students' knowledge, attitudes and skills in EBP. Originally, one of the aims of this Ph.D. project was to perform this systematic review to synthesize the available and validated instruments to assess undergraduate nursing students' attitudes, knowledge and skills in EBP. This would have allowed (1) the identification of the best instrument to measure undergraduate nursing students' knowledge, attitudes and skills in EBP and (2) its validation to the Portuguese population. Nevertheless, during the project development, after some preliminary searches and direct contact with authors of the instruments for educators, we realized that the Advancing Research & Clinical Practice through Close Collaboration and Education (ARCC-E) model included not only three instruments to apply to educators but also three instruments to apply to students. Thus, in order to identify strengths and opportunities for the development of an EBP culture that would use similar instruments for both educators and students, we decided to use all the instruments of the ARCC-E model.

In Chapter 4, we describe the results of the translation, cross-cultural adaptation and preliminary validation for Portuguese nursing educators of the following instruments: Evidence Based Practice Beliefs for educators (EBPB-E), Evidence Based Practice Implementation for educators (EBPI-E) and Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey for Educators (OCRSIEP-E).

In Chapter 5, we present the results of the translation, cross-cultural adaptation and preliminary validation for Portuguese undergraduate nursing students of the following instruments: Evidence Based Practice Beliefs (EBPB), Evidence Based Practice Implementation for students (EBPI-S) and Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey for students (OCRSIEP-ES). The research works from Chapters 4 and 5 were crucial for the development of the research study presented in Chapter 7.

In Chapter 6, we report the results of the translation and adaptation of the Fresno Test, which measures EBP knowledge and skills for Portuguese undergraduate nursing students. The Fresno Test is an essential tool to assess the effectiveness of an EBP Educational Program in undergraduate nursing students (results included in Chapter 9).

In Chapter 7, we present the results of an exploratory cross-sectional study conducted in nine Portuguese nursing schools through an online questionnaire. This study aimed to describe the undergraduate nursing students' and nursing educators' EBP beliefs and extent of EBP implementation; to describe the nursing educators' and the undergraduate nursing students' perspectives regarding organizational culture and readiness for EBP; and to determine whether some relationships exist among these variables.

In Chapter 8, we describe the development of an EBP Educational Intervention designed to prepare the undergraduate nursing students to define a clinical question, search for evidence in databases, select the relevant studies, and synthesize the evidence. Additionally, we describe the opinion of students who received the intervention. The work that constitutes this Chapter was a requirement for the development of the cluster randomized control trial included in Chapter 9.

In Chapter 9, we report the results of a cluster randomized control trial. This trial aimed to assess the effectiveness of the EBP Educational Program (described in Chapter 8) in undergraduate nursing students' EBP knowledge and skills through the adapted Fresno Test, and in 18 randomized monographs (nine from the intervention group and nine from the control group) through a qualitative assessment.

Chapter 10 covers an integration of the discussion of all studies, taking into account the strengths and limitations of the research results, and an overview of the findings of this Ph.D. Project, their potential implications for nursing education as well as the identification of potential areas for additional research.

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# Chapter I

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Background



## Chapter 1. Background

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### **History and Definition of the Evidence-Based Practice Concept**

The evidence-based practice (EBP) concept has evolved rapidly over the past decades. However, it is not a new concept. Much literature reports that it was first used in the field of medicine, using the terminology evidence-based medicine.

James Lind, a Scottish naval surgeon, is recognized as the pioneer of clinical trials. In 1747, he performed in sailors with scurvy six different daily treatments for a period of fourteen days (Milne, 2012; Milne & Chalmers, 2004). His book “A treatise of the scurvy”, first published in 1753, contains a description of his trial and an early example of a systematic review about the literature on the diagnosis, prognosis, prevention and treatment of scurvy (Clarke & Chalmers, 2018; Milde, 2012; Milne & Chalmers, 2004). Nevertheless, the evidence-based medicine is strongly connected with Dr. Archie Cochrane, a British physician and epidemiologist (White & Dudley-Brown, 2012). In 1972, Cochrane, in his book “Effectiveness and Efficiency: Random Reflections on Health Services”, stated that “It is surely a great criticism of our profession that we have not organized a critical summary, by specialty or subspecialty, updated periodically, of all randomized controlled trials” (Cochrane as cited in White & Dudley-Brown, 2012, p. 3). This physician identified a gap in medical evidence, a non-existence of critical summaries of randomized controlled trials (RCT) (Cochrane as cited in Clarke, 1999), and encouraged his colleagues to use RCT as the source of evidence to provide effective interventions (Gillenwater & Gray, 2003).

Based on the criticisms of Dr. Archie Cochrane regarding the no application of evidence generated by research, Chalmers and colleagues organized a series of systematic reviews and published them in the book “Effective Care in Pregnancy and Childbirth” (Chalmers, Enkin & Keirse, 1989; Sakala, 1995). Moreover, Chalmers and colleagues created a system (Oxford Database of Perinatal Trials) to summarize RCT on pregnancy and childbirth (Gillenwater & Gray, 2003; Chalmers et al., 1986). In 1986, Chalmers et al. (1986) reported that “The Oxford Database of Perinatal Trials currently consists of a register of over 2500 published reports of controlled trials in perinatal medicine. It is being further developed to comprise registers of unpublished and ongoing trials, as well as data derived from pooled overviews of subject-specific subgroups of trials.” (p. 308). In order to extend Chalmers et al.’s work to other areas, the UK Cochrane Centre was created in 1992 in Oxford. The Cochrane Collaboration began a year after (Sakala, 1995).

Another important figure of the EBP movement in the last decades is Professor David Lawrence Sackett, the first chair of the Cochrane Collaboration's steering group in 1993 (Cassels, 2013; Smith, 2015; Thoma & Eaves, 2015). His work is acknowledged in the area of clinical epidemiology and evidence-based medicine (Cohen, 1996; Dreier & Löhler, 2016). Sackett, Rosenberg, Gray, Haynes, and Richardson (1996), in an editorial entitled "Evidence based medicine: What it is and what it isn't", defined evidence-based medicine as: "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research." (p. 71). In this definition, the authors proceeded to: "the proficiency and judgment that individual clinicians acquire through clinical experience and clinical practice" (Sackett et al., 1996, p. 71) when they referred to the individual clinical expertise. Moreover, they considered the best available external clinical evidence as "clinically relevant research, often from the basic sciences of medicine, but especially from patient centred clinical research into the accuracy and precision of diagnostic tests (including the clinical examination), the power of prognostic markers, and the efficacy and safety of therapeutic, rehabilitative, and preventive regimens" (Sackett et al., 1996, p. 71-72). Almost simultaneously, Rosenberg and Donald (1995) defined evidence-based medicine as "the process of systematically finding, appraising and using contemporaneous research findings as the basis for clinical decisions." (p. 1122). This evidence-based medicine description added to the definition of Sackett et al. (1996) the idea that evidence-based medicine must include a systematic approach to assess the evidence derived from research studies (Scott & McSherry, 2009).

Although the concept originated in the 18th century with James Lind, it was developed by Cochrane, Sackett, among others, the term "evidence-based medicine" was used the first time in 1991 by Gordon Guyatt, a former student and a later colleague of Sackett at the McMaster University of Hamilton (Dreier & Löhler, 2016; Thoma & Eaves, 2015). In the editorial entitled "Evidence-based medicine", Guyatt stated that "Evidence-based medicine uses additional strategies, including quickly tracking down publications of studies that are directly relevant to the clinical problem, critically appraising these studies, and applying the results of the best studies to the clinical problem at hand." (Guyatt, 1991, p. A16).

In 1992, the Evidence-Based Medicine Working Group, chaired by Gordon Guyatt, claimed that evidence-based medicine was emerging as a new paradigm for medical practice and for this reason the physicians required that new skills should be trained in the educational programs (Guyatt et al., 1992).

Afterwards, Sackett, Straus, Richardson, Rosenberg, and Haynes (2000) reviewed the evidence-based medicine definition to include the patients' values as follows: "the integration of best research evidence with clinical expertise and patient values." (p. 3). This definition of evidence-based medicine remains valid nowadays.

Due to the widespread acceptance of the importance of evidence to all types of healthcare decision-making, the term evidence-based medicine evolved beyond its use in medicine and practical medicine field to embrace other healthcare professions (Dawes et al., 2005). Therefore, terms such as evidence-based practice, evidence-based health care (EBHC) and evidence-based nursing (EBN) emerged.

Although, a lot of researchers endorse the idea that the EBP was born in the field of medicine, it has been applied in others disciplines, namely in nursing. The renowned founder of modern nursing, Florence Nightingale, is also a pioneer in using research into practice (Karimi & Alavi, 2015; Titler, 2008). Her work demonstrates the use of EBN; she developed: systematic data collection; study of the differential mortality among population subgroups; care by trained or untrained nurses; study of the excess mortality after childbirth; and use of evidence to guide policy decisions (McDonald, 2001).

EBN and EBP have been the terms used by nurses. Indeed, there has been some debate regarding the EBN and EBP concepts. In an attempt to distinguish these two terms, Scott and McSherry (2009) performed a review entitled “Evidence-based nursing: clarifying the concepts for nurses in practice”, where they analysed 13 definitions of EBN and EBP and identified their main components and elements. These 13 definitions and their elements are presented in Table 1 (reprinted from the Scott & McSherry, 2009). In the fourth column of this table, Scott and McSherry (2009) identified the following 11 elements: Identification of research; Evaluate research; Application of research; Use of best evidence; Evaluate care; Problem solving; Decision making; Clinical/professional expertise; Theory driven; Patient involvement; and Process.

Table 1.

*Definitions of EBP/EBN and elements*

<b>Definition</b>	<b>EBP or EBN</b>	<b>Author and year</b>	<b>Elements: 1=identify research, 2=evaluate research, 3=apply research to practice, 4=best evidence, 5=evaluate care, 6=problem solving, 7=decision making, 8=use of clinical/professional expertise, 9=theory driven, 10=patient involvement, 11=process.</b>
EBP is the combination of individual, clinical or professional expertise with the best available external evidence to produce practice that is most likely to lead to a positive outcome for a client or patient	EBP	The Joanna Briggs Institute (2004)	4, 8
EBP involves the application of the best available evidence often from research findings into the	EBP	Grimmer et al. (2004)	1, 3, 4

<b>Definition</b>	<b>EBP or EBN</b>	<b>Author and year</b>	<b>Elements: 1=identify research, 2=evaluate research, 3=apply research to practice, 4=best evidence, 5=evaluate care, 6=problem solving, 7=decision making, 8=use of clinical/professional expertise, 9=theory driven, 10=patient involvement, 11=process.</b>
clinical setting to ensure best practice			
The integration of the best evidence available, nursing expertise and the values and preferences of the individuals, families and communities who are served	EBN	Sigma Theta tau (2004)	1, 2, 3, 4, 5, 8, 9, 10
A process designed as a means of combating biases that arise from uninformed decision-making and does this by steering nurses towards the best form of evidence	EBN	Thompson (2003)	3, 4, 7, 9, 11
EBP incorporates theory, clinical decision-making, and judgement and research knowledge to arrive at the application of best and most effective and most useful evidence to specific elements of practice	EBP	Windell (2003)	3, 4, 7, 8, 9
The conscientious, explicit and judicious use of theory derived, research based information in making decisions about care delivery systems and in consideration of internal and external consumer needs and preferences	EBN	Ingersoll (2000)	2, 3, 7, 8, 9, 10, 11
EBP is about integrating best available research evidence with information about patient preferences, clinical skill level and available resources to make decisions about care	EBP	Ciliska et al. (2001)	3, 4, 7, 8, 10
The process of making clinical decisions based on the most valid and relevant information currently available	EBP	Pearson (2001)	4, 7, 11
A process by which nurses make clinical decisions using the best available research evidence, their	EBN	Di Censor et al. (1998)	4, 7, 10, 11

<b>Definition</b>	<b>EBP or EBN</b>	<b>Author and year</b>	<b>Elements: 1=identify research, 2=evaluate research, 3=apply research to practice, 4=best evidence, 5=evaluate care, 6=problem solving, 7=decision making, 8=use of clinical/professional expertise, 9=theory driven, 10=patient involvement, 11=process.</b>
clinical expertise and patient preferences			
A process, which encompasses the use of best available evidence alongside clinical expertise and the patients' perspective, to plan care as well as evaluating the performance through a process of self-reflection or peer assessment	EBN	Flemming (1998)	3, 4, 5, 8, 10, 11
The incorporation of evidence from research, clinical expertises and patient preferences into decisions about the health of individual patients	EBN	Mulhall (1998)	1, 2, 3, 8, 10, 11
An approach to decision making in which the clinician uses the best evidence available in consultation with the patient, to decide upon the option, which suits the patient best	EBP	Muir-Gray (1997)	4, 7, 10
... Method of problem solving which involves identifying the clinical problem, searching the literature, evaluating the research evidence and deciding on the intervention	EBP	White (1997)	1, 2, 3, 6, 8

Reprinted from Scott, K., & McSherry, R. (2009). Evidence-based nursing: clarifying the concepts for nurses in practice. *Journal of clinical nursing*, 18(8), 1085-1095. doi: 10.1111/j.1365-2702.2008.02588.x with permission from John Wiley and Sons.

As identified by Scott and McSherry (2009), the use of best evidence and the use of clinical/professional expertise are frequently mentioned in both EBN and EBP definitions. Moreover, the promotion of patient involvement in clinical decision-making is also identified in 7 of the 13 definitions presented, in most cases linked to EBN definitions.

Actually, the use of best evidence, the use of clinical/professional expertise and the patient involvement are recurring elements in current EBP and EBHC definitions. But some other ones, such as the research identification, the research evaluation, the research application, the problem solving, and the decision-making can also be found. For example, Melnyk and Fineout-Overholt (2011) defined EBP as “a

paradigm and life-long problem solving approach to clinical decision-making that involves the conscientious use of the best available evidence (including a systematic search for and critical appraisal of the most relevant evidence to answer a clinical question) with one's own clinical expertise and patient values and preferences to improve outcomes for individuals, groups, communities, and systems." (p. 575). One year later, Pearson, Jordan, and Munn (2012) stated that EBP is a "clinical decision making that considers the best available evidence; the context in which the care is delivered; client preference; and the professional judgment of the health professional." (p. 2). Besides, Pearson et al. (2012) also put forward a definition for EBHC: "a cyclical process that derives questions, concerns, or interests from the identification of global healthcare needs by clinicians or patients/consumers and then proceeds to address these questions by generating knowledge and evidence to effectively and appropriately meet these needs in ways that are effective, feasible, and meaningful to specific populations, cultures, and settings." (p. 2). The International Council of Nurses (ICN, 2012) described EBP as "a problem solving approach to clinical decision making that incorporates a search for the best and latest evidence, clinical expertise and assessment, and patient preference values within a context of caring." (p. 6).

Recently, some authors argued that the term *based* should be replaced by the term *informed*. They claim that the latter is more appropriate because the practice is not exclusively based on evidence, but it is informed by evidence considering also the patients' values and preferences and the clinical expertise (Joanna Briggs Institute, 2015; Nevo & Slonim-Nevo, 2011).

Melnyk and Newhouse (2014) found 327 abstracts through a PubMed search with the keyword "evidence-informed practice". They concluded that, in several papers, the terms Evidence-Informed Practice (EIP) and Evidence-Based Practice (EBP) present the same meaning. Notwithstanding, most of EBP definitions show a strong commitment with patients' values and preferences as well as with the health professional expertise within the decision-making process. It is uncertain, though, which percentage of a clinical decision should be based on (1) evidence from research findings or (2) clinical expertise or (3) patients' values and preferences (Melnyk, & Newhouse, 2014). Therefore, and considering that most of EBP definitions incorporate patients' values and preferences, and health professional expertise, some authors argued that both concepts, EBP and EIP, are the same and a change in the terminology could lead to more misunderstanding inside the clinical community (Jordan, Lockwood, Munn, & Aromataris, 2018; Melnyk, & Newhouse, 2014).

With this in mind, for the purpose of the present thesis, we adopt the evidence based practice term.



### **EBP Importance and Recommendations to EBP Implementation**

The importance of EBP in clinical practice has been highly increased due to different concomitant factors. Dawes et al. (2005) and White and Dudley-Brown (2012) point out four factors: (1) the huge proliferation of new primary research produced, (2) the well-known delay in incorporating new evidence into clinical practice, (3) the health care quality and safety movement, and (4) the pressure of consumers with rapid access to health information.

Bastian, Glasziou, and Chalmers (2010) reported that in 1865 there were 1,600 references indexed to the US National Library of Medicine (NLM) index; this number raised to nearly 10 million in 2006. There was a continuous growing movement and in 2010 the MEDLINE indexed 5,511 journals (4,893 indexed in the Index Medicus and 618 non-Index Medicus journals; White & Dudley-Brown, 2012). According to the Summary Indexing Statistics: 1965-2017 of the MEDLINE (*Detailed Indexing Statistics: 1965-2017*, 2018), the total number of references indexed in MEDLINE grew significantly since 2000 (from 10,796,185 in 2000 to 24,335,332 in 2017). In 2018, MEDLINE gathered 5,251 journals with more than 25 million of references (*MEDLINE PubMed Production Statistics*, 2019). Besides, the Cumulative Index to Nursing and Allied Health Literature (CINAHL) Database also grew considerably and in August 2019 indexed approximately 6 million records from more than 5,300 journals (*CINAHL Database*, 2019).

Already in 1995, Davidoff, Haynes, Sackett, and Smith (1995) reported that the clinicians had lack of time to read all the journals from their areas of interest. Using the example of adult internal medicine, they advised that a clinician needed to read around 17 papers per day every day of the year to keep up to date (Davidoff et al., 1995). Later, Bastian et al. (2010) confirmed this uncontrolled grow of health care papers and stated that “Every day there are now 11 systematic reviews and 75 trials, and there are no signs of this slowing down: but there are still only 24 hours in a day.” (p. 6).

The huge proliferation of new primary research produced, factor 1, leads undoubtedly to the factor 2: the well-known delay in incorporating new evidence into clinical practice. Schuster, Elizabeth, McGlynn, and Brook (1998) performed a review study on the quality of health care in the United States of America. They analysed the published studies considering three categories based on the type of care (preventive, acute, and chronic). The main conclusion of their study was the existence of a large gap between the research and practice in all three types of care. Using simple averages of the included studies' findings, they reported that in preventive care, only 50% of individuals received the recommended care; in acute care, 70% of patients received the recommended care, whereas, 30% received contraindicated care; and in chronic care, 60% of people received recommended care, but 20% received contraindicated care (Schuster et al., 1998). Notwithstanding the limitations of this review study, its results were supported by a primary study published in 2003 by McGlynn and colleagues, whose aim was to evaluate the performance on 439 indicators of quality of care for 30 acute conditions,

chronic conditions, and preventive care. For this purpose, they held interviews by telephone to a random sample of adults of 12 metropolitan areas in the United States and checked their medical records. McGlynn et al. (2003) concluded that in overall 54.9% of the participants received the recommended care; 54.9% received the recommended preventive care; 53.5% the recommended acute care; and 56.1% the recommended care for chronic conditions.

Later, Runciman et al. (2012) performed a study in Australia following the similar methodology of McGlynn et al. (2003). Considering 522 expert consensus indicators that represented the appropriate care for 22 common conditions in Australia, Runciman et al. (2012) concluded that the adults received appropriate care in only 57% of eligible health care encounters in 2009 and 2010. They verified that the percentage of encounters with appropriate care varied from 13% for alcohol dependence condition to 90% for coronary artery disease condition. In a more recent study, in Australia as well, Braithwaite et al. (2018), using 479 quality indicators from 17 conditions, estimated the quality of health care for children in both inpatient and ambulatory health care settings. Their findings revealed that the overall estimated adherence was 59.8%, but there was a substantial difference between conditions, from 43.5% for tonsillitis to 88.8% for autism.

Moreover, Balas and Boren (2000) reinforced the existence of a gap between the production of evidence and its integration in clinical practice. They claimed that an average of 14% of the new scientific evidence takes 17 years to be embedded in daily clinical practice. The Figure 1 (reproduced from Green, 2008, p. i22) represents clearly the path of evidence from its production to its implementation in clinical practice as estimated by Balas and Boren (2000).

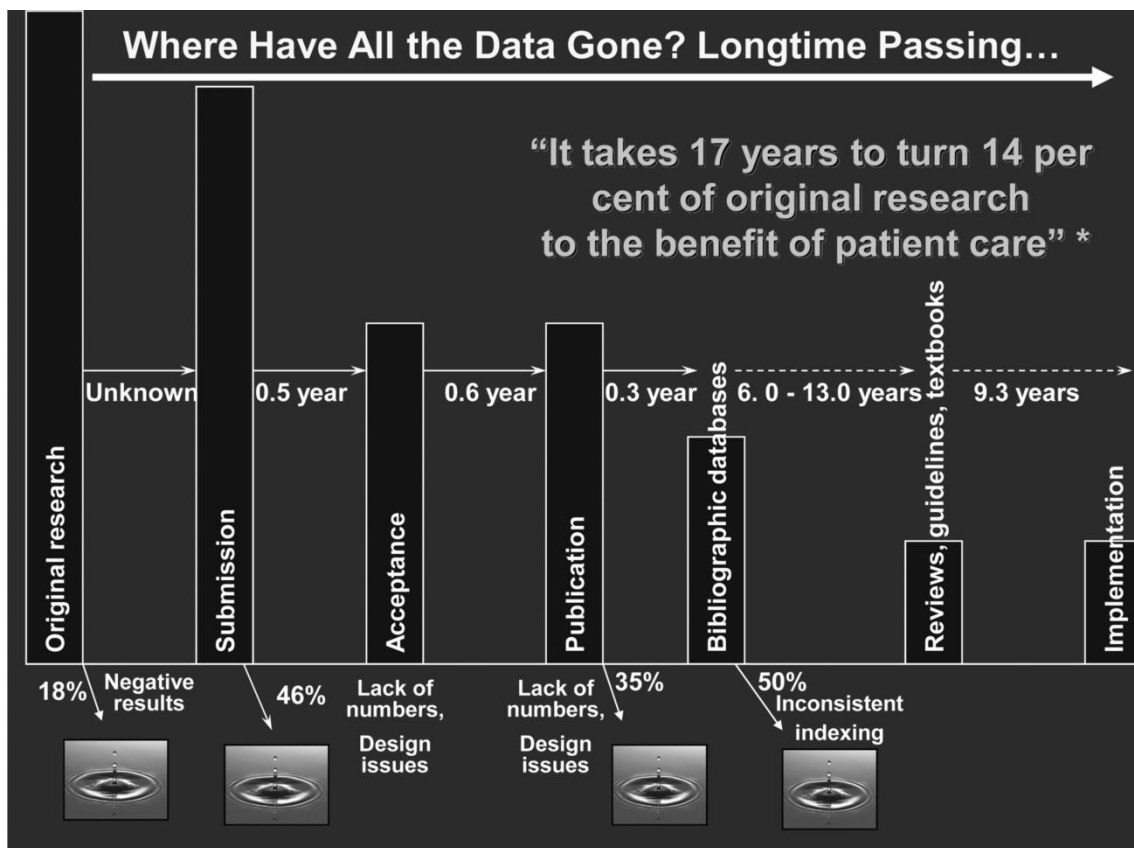


Figure 1. The path between the production of evidence and its implementation in clinical practice as estimated by Balas and Boren (2000) from a variety of sources. Reprint From: Making research relevant: if it is an evidence-based practice, where's the practice-based evidence? *Fam Pract.* 2008;25(suppl\_1):i20-i24. doi:10.1093/fampra/cmn055 *Fam Pract* | © The Author 2008. Published by Oxford University Press. All rights reserved. With permission of Oxford University Press.

Factor 3, the health care quality and safety movement, highly contributed to the increase of the importance of use EBP in clinical practice. A strong driving force behind this movement was the publication of the report “To Err is Human: Building a Safer Health System” by the Institute of Medicine (IoM, 2000). In June 1998, IoM Quality of Health Care in America Committee was created aiming the development of a strategy to reach a threshold improvement in health care quality in the coming ten years. IoM Quality of Health Care in America Committee, through the report “To Err is Human: Building a Safer Health System”, underlined several issues regarding patient safety. For example, they warned, according to an extrapolation of the results of a study in Colorado and Utah to more than 33.6 million admissions to U.S. hospitals in 1997, that 44,000 Americans die due to medical error each year (Cook, 1998 as cited by IoM, 2000). This number seems to be higher (98,000 Americans) considering the New York study (Senders, 1994 as cited by IoM, 2000). In addition, IoM advised that there were

more people dying due to medical errors by year than due to motor vehicle accidents (43,458), breast cancer (42,297), or AIDS (16,516; Van Cott, 1994 as cited by IoM, 2000). Besides, MacCormack (as cited by IoM, 2000) highlighted that “total national costs (lost income, lost household production, disability and health care costs) of preventable adverse events (medical errors resulting in injury) are estimated to be between \$17 billion and \$29 billion, of which health care costs represent over one-half.” (p. 1-2). MacCormack (as cited by IoM, 2000) also highlighted that there were costs that could not be measured directly as the loss of confidence in the health care system by patients and the reduced of patients and health care professionals’ satisfaction. The IoM Quality of Health Care in America Committee pointed out that “To err is human, but errors can be prevented. Safety is a critical first step in improving quality of care.” (IoM, 2000, p. 5). In “To Err Is Human: Building a Safer Health System” report, the committee presented a model that shows how the environment influences quality. This model has two primary dimensions: domains of quality and forces in the external environment. The first dimension included the practice consistent with current medical knowledge (best practices, incorporating evidence-based medicine; IoM, 2000). Later, the IoM Quality of Health Care in America Committee published a new report in 2001, entitled “Crossing the Quality Chasm: A New Health System for the 21st Century” (IoM, 2001). With this new report, the IoM Quality of Health Care in America Committee intended to reveal quality of health care problems that “To Err is Human: Building a Safer Health System” report did not. Its intention was also to be a call for action in order to increase the quality of care in all dimensions and for all Americans. In the “Crossing the Quality Chasm: A New Health System for the 21st Century”, one of the problems of the health care quality reported was the growing complexity of science and technology. Due to larger investments in biomedical research, the medical and technology knowledge increased considerably, which challenged the health care professionals in the management of all the necessary evidence to support the decision-making (IoM, 2001). Both IoM Quality of Health Care in America Committee’s reports are important driving forces of health care quality and safety movement; therefore, they played a role in the increase of the importance of use EBP in clinical practice.

Finally, the pressure of consumers with rapid access to health information is another unquestionably factor (4) that contributes to the EBP development and use. Through the incredible growth of the internet during the last decades, the health consumers gained access to a lot of information that was extremely difficult to access before (Calabretta, 2002). Health consumers have now access to a significant amount of health information through the electronic sources such as websites and mobile phone health apps (Seçkin, Yeatts, Hughes, Hudson, & Bell, 2016), which, consequently, gave them the opportunity of acquire much knowledge concerning their health conditions (Calabretta, 2002). Two studies performed in United States of America in 2002-2003 and 2012 reported, respectively, that 63.7% and 72% of the internet users searched online for health information (Fox & Duggan, 2013; Hesse et al., 2005). A study of seven European countries (Norway, Denmark, Germany, Poland, Latvia, Greece, and Portugal),

which occurred from October to November 2005 showed that 71% of the Internet users used the internet for health-related searches (Andreassen et al., 2007). A more recent survey (September 2014), which was carried out by TNS Political & Social network within the 28 Member States of the European Union, showed that 59% of the 26,566 respondents said that they have used the Internet to search for health-related information in the last 12 months (the 25-34 years age group registered the higher percentage; European Commission, 2014). This rapid access to health information by citizens is a great challenge for all health professionals. Nowadays, the citizens have the possibility to gather a lot of information about health care (Online Consumer Health Information<sup>1</sup>) and, therefore, they not only have now more ability to communicate with health care professionals but also show a greater readiness to participate in the decision-making process regarding their health (Luciano, Cumming, Wilkinson, & Kahana, 2013; El Sherif, Pluye, Thoër, & Rodriguez, 2018). One of the negative outcomes associated with health information online search is the breakdown of trust in the relationship between the patient and the healthcare professional: when, for example, the consumers finds information that is contradictory to the information provided by the health care professionals (El Sherif et al., 2018). To avoid this negative outcome, the health professionals need to acquire skills to support the consumers while they access health information on the internet. The health professionals need (1) to be aware of the best evidence; (2) to be prepared to inform consumers about reliable and reviewed websites; (3) to teach consumers to assess the Online Consumer Health Information; and (4) to discuss with consumers about the information that they have found (El Sherif et al., 2018).

Besides the above four factors, one can add that the adoption, implementation and sustainment of EBP in healthcare organizations are becoming increasingly important (Apóstolo, Cardoso, & Rodrigues, 2016). Moreover, in 2014, Melnyk, Gallagher-Ford, Long, & Fineout-Overholt advocated that EBP promotes high-value health care, improves the patient experience and health outcomes, and reduces health care costs.

Hitherto, we presented why it is important to use the EBP in healthcare contexts. Henceforth, we introduce the recommendations for the EBP use not only in clinical contexts but also in educational ones as provided by several organizations at national and international level.

Due to EBP positive impact in health care and safety outcomes, several national and international organizations have been stressing the importance of EBP use and have been strongly recommending EBP implementation in clinical settings. Moreover, another point that has been emphasized by some national and international organizations is that the best way to strengthen the EBP implementation in

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<sup>1</sup> Online Consumer Health Information can be defined as generic information about health and diseases that is generated for the general public (El Sherif et al., 2018).

clinical settings is through the EBP integration into the graduation curricula of health professional students.

First, we present an overview of the international recommendations.

In 1990, in United States of America, the American Nurses Credentialing Center (ANCC) created the Magnet Recognition Program® to distinguish the excellence of nursing services (History of the Magnet Program, n.d.). One of the main criteria for obtaining this Magnet Recognition is the EBP implementation in the health care services (Eligibility Requirements, n.d.).

In the early 2000s, the World Health Organization (WHO) recommended that special attention should be given on translating knowledge into action aiming to reduce the gap between the research and practice (WHO, 2004). In this regard, the WHO proposed an action plan which included three action items and initiatives to bridge the gap between knowledge and action. Two of them (evidence-informed policy and practice, and use of evidence by national policy-makers in decision-making) are closely related to the integration of EBP in clinical settings. As far as evidence-informed policy and practice are concerned, there were suggestions that the skills in evidence synthesis should be developed and that the evidence-informed policy and practice initiatives should be reinforced. Some evidence-informed policy and practice initiatives examples are: the Cochrane Collaboration, the GRADE (Grading of Recommendations Assessment, Development and Evaluation) Working Group, the United Kingdom's National Institute for Clinical Excellence (NICE). Regarding the use of evidence by national policy-makers in decision-making, the WHO encouraged all countries in using evidence to create health policies (WHO, 2004).

In 2005, in order to guarantee that health care is evidence-based, the “Sicily statement on evidence-based practice”<sup>2</sup> (Dawes et al., 2005, p. 1) recommended that:

- Health professionals incorporate knowledge, skills and attitudes of EBP into their training;
- Curricula should include the training of EBP competences in accordance with the "five-step model"<sup>3</sup>;
- More research is necessary regarding the methods for teaching each step;
- Tools for assessment of each step should be developed, validated, and made freely internationally;

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<sup>2</sup> The “Sicily statement on evidence-based practice” is a consensus statement based on the literature and integrated experience of participants of the second international conference of Evidence-Based Health Care Teachers and Developers held in Sicily in September 2003. This statement was made up involved eighteen professions allied to health from 18 countries (Dawes et al, 2005).

<sup>3</sup> The “five-step model” included the following steps: “1. Translation of uncertainty to an answerable question; 2. Systematic retrieval of best evidence available; 3. Critical appraisal of evidence for validity, clinical relevance, and applicability; 4. Application of results in practice; 5. Evaluation of performance” (Dawes et al, 2005, p. 3).

- EPB courses should have effective methods for teaching and evaluating all the steps.

This consensus statement pointed out that “All health care professionals need to understand the EBP principles, recognise it in action, implement evidence-based policies, and have a critical attitude to their own practice and to evidence. Without these skills professionals will find it difficult to provide 'best practice'” (Dawes et al., 2005, p. 4). Moreover, it highlighted that EBP teaching “should, as far as possible, be integrated into the clinical setting and routine care so that students not only learn the principles and skills, but learn how to incorporate these skills with their own life-long learning and patient care.” (Dawes et al., 2005, p. 4).

In 2009, the Institute of Medicine’s Roundtable on Evidence-Based Medicine<sup>4</sup> aimed a healthcare system that would use the best evidence to deliver the most appropriate care to each patient. Therefore, it established the following goal: “by the year 2020, 90 percent of clinical decisions will be supported by accurate, timely, and up-to-date clinical information, and will reflect the best available evidence.” (IoM, 2009, p. ix).

In 2012, the ICN, in its commemorative document of the International Nurses Day entitled *Closing the Gap: From Evidence to Action*, sustained that the EBP integration in clinical practice is extremely necessary in order to promote high quality and cost-effective health care. Moreover, it underlined the importance of working closely with educational facilities to encourage the EBP integration into the nursing curricula (ICN, 2012). In its position statement, the ICN declared that “To enhance nursing research and research-based practice, the International Council of Nurses (ICN): [...] Promotes the use of research to inform evidence-based practice.” (ICN, 2012, p. 39).

In 2015, the WHO Regional Office for Europe published a technical guide for Member States<sup>5</sup> presenting a framework which outlined 12 objectives, four priority action areas and four enabling mechanisms to allow and improve the contribution of nurses and midwives to achieve the Health 2020<sup>6</sup> goals (WHO, 2015). Within this framework, two of the four priority action areas promoted the EBP (*Scaling up and transforming education and training*, and *Promoting evidence-based practice and innovation*). The priority action area “*Scaling up and transforming education and training*” highlighted the importance of training the EBP competence in nurses and midwives’ professional education. In the

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<sup>4</sup> The Institute of Medicine’s Roundtable on Evidence-Based Medicine involved senior private- and public-sector leaders that represent the key stakeholders for shape health care in America, including patients, healthcare professionals, healthcare delivery organizations, healthcare product developers, clinical investigators-evaluators, regulators, insurers, employers-employees, and information technology. This Roundtable, convened in 2006, offered a place for discussion and collaborative action aiming to change how evidence is generated and used to improve the American’s health (IoM, 2009).

<sup>5</sup> The title of this technical guide is “European strategic directions for strengthening nursing and midwifery towards Health 2020 goals” and provides the first strategic framework for action from WHO European Region in order to support Member States to strengthen nursing and midwifery within their context (WHO, 2015).

<sup>6</sup> Health 2020 is the policy framework for health and well-being in the WHO European Region.

same line, the priority action area “*Promoting evidence-based practice and innovation*” emphasised that Member States should support nurses and midwives to use a daily EBP approach in their clinical practice in order to deliver health care informed by the best available evidence (WHO, 2015).

In 2017, the WHO Regional Office for Europe published a guide<sup>7</sup> for Member States to improve the contribution of nurses and midwives in promoting EBP and innovation in nursing and midwifery (Jylhä, Oikarainen, Perälä, & Holopainen, 2017). In order to support the improvement of EBP in nursing and midwifery, this guide provided the following recommendations:

- Define national and local structures that support evidence synthesis;
- Identify necessary roles and competencies for the EBP process;
- Ensure a shared understanding of EBP in organizations;
- Ensure that EBP principles form the foundation of education and training in nursing and midwifery;
- Integrate EBP in the organizational culture;
- Establish continuous evaluation of care outcomes (Jylhä et al., 2017, p. 27-28).

The recommendation “Ensure that EBP principles form the foundation of education and training in nursing and midwifery” underlines the role of education in the development of EBP, emphasizing that nursing students must have a basic understanding of EBP and must understand their own role in EBP. It also advises that the nursing curricula should incorporate the best available evidence into teaching, and should facilitate students to reflect about their own clinical practice, which would stimulate their critical thinking (Jylhä et al., 2017).

We now present an overview of recommendations in Portugal.

In 2006, the National Council of Nursing, in a position paper regarding nursing research, stated that the EBP is a prerequisite for health care excellence and care safety as well as for the optimization of nursing outcomes (Ordem dos Enfermeiros, 2006a).

In 2011, the National Council of Nursing established, in the Regulation of Common Skills of the Nurse Specialist (Regulamento das Competências Comuns do Enfermeiro Especialista), that Nurses Specialists should: evaluate the quality of nursing care in terms of structure, process and outcomes; support their clinical practice in research and knowledge in the area of specialty; and base their specialized clinical

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<sup>7</sup> The title of this guide is “Facilitating evidence-based practice in nursing and midwifery in the WHO European Region”. It aimed “to support health policy-makers, managers, health-care professionals and other relevant stakeholders in facilitating the culture of EBP in nursing and midwifery. This can in turn promote the effectiveness of health-care services, contribute to the utilization of evidence in clinical care and strengthen the nursing and midwifery knowledge base. Examples are provided throughout the text to highlight key elements of EBP as it relates to nursing and midwifery.” (Jylhä et al., 2017, p. 1).



praxis in sound and valid knowledge standards (Regulamento n.º 122/2011 de 18 de Fevereiro de 2011).

In 2012, this council determined that a competence criterion of a general care nurse should be to be able to incorporate valid and relevant research findings in practice as well as other evidence (Ordem dos Enfermeiros, 2012).

In a like manner, the 2012-2016 Portuguese National Health Plan considered the decision-making process based in scientific evidence a value and a principle. This plan was organized in Strategic Axes, being one of them the “Health Quality”. Within this axis, it is recommended that, at an organizational level, the institutions should “Promote training sessions on Quality in Health in healthcare organisations, focusing on the use of standards and guidelines according to the most recent scientific evidence.” (Directorate-General of Health, Ministry of Health, 2013, p. 49). In addition, the health professionals’ training was one of the points of the vision of the “Health Quality” Strategic Axis for 2016. The health professionals’ training should promote the development of skills to: (1) critique scientific evidence; (2) engage the patient in the decision-making process; (3) audit and prepare studies/clinical evaluations; and (4) participate in research, among others (Directorate-General of Health, Ministry of Health, 2012). In 2015, this National Health Plan was extended for 2016-2020 to reinforce the importance of development, dissemination and implementation of best practices in all healthcare contexts (Directorate-General of Health, Ministry of Health, 2015).

## EBP as a Process – EBP Models

During the last decades, several conceptual models were developed with the purpose to guide the EBP implementation and sustainability in healthcare, for example: Stetler Model of Evidence-Based Practice; ACE Star Model of Knowledge Transformation; Iowa Model of Evidence-Based Practice to Promote Quality Care; Johns Hopkins Nursing Evidence-Based Practice Model; Promoting Action on Research Implementation in Health Services (PARIHS) Model; Advancing Research and Clinical Practice through Close Collaboration (ARCC©) Model; Joanna Briggs Institute (JBI) model of evidence-based healthcare (Greenhalgh, 2018; Jordan et al., 2018).

These EBP models have a key role “in assisting leaders, educators, and clinicians in their strategies to advance EBP within individual point-of-care providers as well as throughout organizations, especially if there has been sufficient evidence generated to support them” (Melnyk, 2017, p. 255).

According to the different models’ proposals, the translation of science should take place in several steps from clinical problem identification to the implementation of a change in practice and the evaluation of its impact. Generally, the models recommend the following steps: the production and critical synthesis of knowledge, its dissemination, its adoption and implementation in the point-of-care and, finally, the evaluation of the implementation impact on users and organizations (Apóstolo, 2017; Melnyk, 2017).

For the development of this thesis, we used the Advancing Research & Clinical Practice through Close Collaboration and Education (ARCC-E) Model and the JBI model of evidence-based healthcare, which we summarised hereinafter.

### *Advancing Research & Clinical Practice through Close Collaboration and Education (ARCC-E)*

The Advancing Research & Clinical Practice through Close Collaboration (ARCC) model was original conceptualized by Bernadette Melnyk in 1999 (Melnyk, & Fineout-Overholt, 2011). Based on a nurses’ survey on barriers to and facilitators of EBP, on control theory<sup>8</sup> and cognitive behavioural theory<sup>9</sup>, Dr. Fineout-Overholt formulated the key constructs of the ARCC© model (Melnyk & Fineout-Overholt, 2011). This is a system-wide model to improve and sustain EBP in healthcare systems to reach quality outcomes. (Melnyk, Fineout-Overholt, Giggelman, & Choy, 2017; Dang et al., 2015). The ARCC model

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<sup>8</sup> Control Theory is a general approach to understand the self-regulating systems (Carver & Scheier, 1982). Carver and Scheier (1982) argued that “If a discrepancy is perceived between the present state and the reference value, a behavior is performed (output function).” (p. 112). According to Melnyk and Fineout-Overholt (2011), the control theory guides the ARCC model based on the principle that “a discrepancy between a standard or goal (e.g., systemwide implementation of EBP) and a current state (e.g., the extent to which an organization is implementing EBP) should motivate behaviors in individuals to reach the goal.” (p. 258).

<sup>9</sup> The cognitive behavioral theory highlights the significant role of individual, social, and environmental factors that can affect cognition, learning, emotions, and behavior (Beck et al., 1979 and Lam, 2005 as cited by Melnyk & Fineout-Overholt, 2011). In line with this, the ARCC model argues that the more positive the health professionals' beliefs about EBP are, the more evidence-based healthcare will be implemented (Melnyk & Fineout-Overholt, 2011).

involves key strategies to promote change at the individual and organizational levels for the use of best practices (Melnyk & Fineout-Overholt, 2011).

Subsequently, the original authors of this model adapted it to the education field, creating the Advancing Research & Clinical Practice through Close Collaboration and Education (ARCC-E) Model which is represented by Figure 2. The ARCC-E is an EBP teaching framework to increase student assimilation of the EBP paradigm, and, consequently, to prepare students to make clinical decisions based on an EBP approach.

Similar to the ARCC model, the ARCC-E model starts with the assessment of Organizational Culture and Readiness for School-wide integration of EBP to identify strengths and barriers to EBP teaching (Fineout-Overholt, Stillwell, Williamson, Cox, & Robbins, 2015). The ARCC-E model comprises two assessment facilitator instruments: Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey for educators (OCRSIEP-E) and Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey for Students (OCRSIEP-ES; Fineout-Overholt et al., 2015). After the assessment of the strengths and barriers to EBP teaching, EBP mentors within the academic setting should be appointed. An EBP mentor assists students and educators to understand and integrate the EBP in educational settings (schools and clinical contexts). The EBP mentors have the responsibility to provide educators with information allowing them to ensure the best evidence-based education. Apart from this responsibility, they have to provide students with information which allows them to implement the best possible care. The relationship between mentor and mentee enables the latter to think over the level of achievement of their training goals on EBP. This mentorship is essential to increase students' and educators' EBP beliefs, and their level of EBP implementation alongside (Fineout-Overholt et al., 2015).

In the ARCC-E model, the EBP Beliefs Scale for educators (Evidence Based Practice Beliefs for educators – EBPB-E) measures the educators' beliefs regarding EBP and the confidence in their capacity to teach and implement EBP while the EBP Beliefs Scale for students (Evidence Based Practice Beliefs for students – EBPB-S) measures the students' beliefs regarding EBP and the confidence in their capacity to implement EBP. Additionally, there are two instruments to assess the EBP implementation: the Evidence Based Practice Implementation for educators (EBPI-E) and the Evidence Based Practice Implementation for students (EBPI-S). Both instruments consider educators' and students' engagement in expected EBP behaviours. These instruments allow to identify strengths and opportunities to develop an EBP culture on the one hand and to measure the impact of implementation of strategies for EBP enhancement in academic settings on the other (Fineout-Overholt et al., 2015).

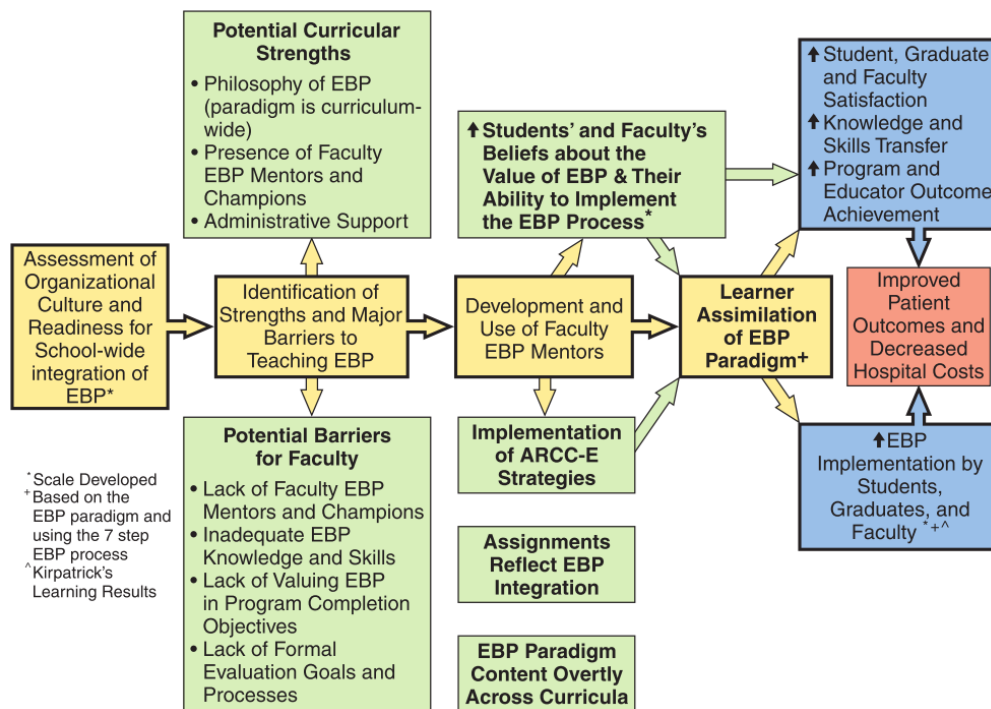


Figure 2. Advancing Research & Clinical Practice through Close Collaboration and Education (ARCC-E) Model by Melnyk, B., & Fineout-Overholt, E. (2015). Reprint From: Evidence-Based Practice in Nursing & Healthcare: A Guide to Best Practice (3rd edition ed.): Wolters Kluwer/Lippincott, Williams & Wilkins. With permission of Wolters Kluwer Health, Inc.

Due to the importance of raise EBP awareness, and as recommended by the ARCC-E model, we assessed the organizational culture and readiness for EBP's school-wide integration of nursing schools of Portugal with the OCSIEP-E and OCSIEP-ES. The outcome of such assessment was the identification of the strengths and barriers to EBP teaching. Besides, we also assessed the EBP beliefs and implementation in both students and educators with the EBPB-E, EBPI-E, EBPB, and EBPI-S instruments. The assessment results allowed the identification of the strengths and opportunities for the development of an EBP culture in academic settings. The studies performed using these instruments are presented in Chapters 4, 5 and 7.

### Joanna Briggs Institute (JBI) model of evidence-based healthcare (EBHC)

The JBI Model of EBHC, which is based on the experience of the JBI and its partners around the world, was initially published in 2005 (Pearson, Wiechula, Court, & Lockwood, 2005). It provides a framework for the JBI's organization and operationalization. According to this model, the EBP is the "clinical decision-making that considers the best available evidence; the context in which the care is delivered; client preference; and the professional judgement of the health professional" (Pearson et al., 2005, p. 209). It represents the four major components of EBHC: evidence generation, evidence synthesis, evidence transfer and evidence utilization. According to the JBI Model of EBHC, the "Evidence-based

healthcare is represented as a cyclical process that derives questions, concerns or interests from the identification of global healthcare needs by clinicians or patients/consumers and then proceeds to address these questions by generating knowledge and evidence to effectively and appropriately meet these needs in ways that are feasible and meaningful to specific populations, cultures and settings.” (Pearson et al., 2005, p. 209-210). The cycle proceeds to the appraisal, the synthesis and the transfer of the generated evidence to healthcare contexts and professionals, to the evidence implementation and, finally, to the evaluation of the implementation impact on health outcomes, health organisations and professional practice (Pearson et al., 2005).

In 2015, a working group at the JBI developed a project aiming the assessment of the relevance of the JBI Model of EBHC and the determination of whether updates were required. This project was carried out in two phases: citation analysis and model revision (Jordan et al., 2018). The results indicated that the model required an update, namely the use of more internationally appropriated language (Jordan et al., 2018).

The revision of JBI’s Model was described on a paper by Jordan, Lockwood, Munn, and Aromataris in 2019. On the Figure 3, which presents the revised model, the inner circle, denominated as *pebble of knowledge*, is the central element because it illustrates the JBI’s conceptualization of EBHC. Within this model, the EBHC is defined as the “clinical decision-making that considers the feasibility<sup>10</sup>, appropriateness<sup>11</sup>, meaningfulness<sup>12</sup> and effectiveness<sup>13</sup> of healthcare practices. The feasibility, appropriateness, meaningfulness and effectiveness of healthcare practices may be informed by the best available evidence, the context in which the care is delivered, the individual patient, and the professional judgment and expertise of the health professional.” (Jordan, Wiechula, Court, & Lockwood, 2019, p. 62).

The ‘inner segments’ symbolize the Institute’s conceptualization of the major steps of an evidence-based approach to clinical decision-making: Global Health; Evidence Generation; Evidence Synthesis; Evidence Transfer; and Evidence Implementation. The ‘outer segments’ operationalize the component parts of the model. The arrows show the flow of the model. The bigger ones flow clockwise and represent the movement between the major steps of an evidence-based approach to clinical decision-making. The smaller ones flow in the opposite direction and symbolize the ‘feedback cycle’.

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<sup>10</sup> Feasibility is defined as the “extent to which an activity or intervention is practical or viable in a context or situation – including cost-effectiveness” (Jordan et al. 2019, p. 62).

<sup>11</sup> Appropriateness is defined as “the extent to which an intervention or activity fits with a context or situation” (Jordan et al. 2019, p. 62).

<sup>12</sup> Meaningfulness “refers to how an intervention or activity is experienced by an individual or group and the meanings they ascribe to that experience” (Jordan et al. 2019, p. 62).

<sup>13</sup> Effectiveness is “the extent to which an intervention achieves the intended result or outcome” (Jordan et al. 2019, p. 62).

According to the JBI Model, the *Global Health* wedge is defined as “collaborative transnational research and action that places priority on improving health and achieving health equity for all people worldwide” (Jordan et al., 2019, p. 63). This wedge includes the following components: sustainable impact, engagement and knowledge need. The *sustainable impact* refers to the fact that research production is necessary and should derive from the community’s need for knowledge. The *engagement* characterizes the collaboration across all stakeholders that is crucial to achieve success in delivering evidence-informed healthcare. The *knowledge need* operationalizes the role of the evidence to address the knowledge needs of the community.

The following wedge, the *Evidence Generation*, represents the well-designed research studies based in any methodology, anecdotes or opinion, and experience. Indeed, according to the JBI Model for EBHC, any kind of knowledge generation (such as, discourse or narrative, experience/expertise and research) is understood as a legitimate source of knowledge. Therefore, one can say that *research*<sup>14</sup>, *expertise (and experience)*<sup>15</sup> and *discourse*<sup>16</sup> are the three component parts of the *Evidence Generation* wedge.

The analysis of research and opinion evidence in a particular topic, which guides the decision-making in healthcare, is illustrated in the *Evidence Synthesis* wedge. This wedge consists of three main components: *systematic reviews*, *evidence summaries* and *guidelines*. The *systematic reviews*, the gold standard of evidence synthesis, embraces, nowadays, several methodologies for developing reviews, such as reviews of effects, umbrella reviews, scoping reviews, qualitative reviews, etc. The *evidence summaries* appeared as a way of performing synthesis in a timely manner. The guidelines include not only recommendations to optimize patient care based on a systematic review, but also an assessment of the benefits and harms of alternative care options (Institute of Medicine (US) Committee on Standards for Developing Trustworthy Clinical Practice Guidelines et al., 2011; Jordan et al., 2019).

The *Evidence Transfer* includes the *active dissemination*, *systems integration* and *education* components for its operationalization. This wedge attempts to comprise a coactive and participatory process to facilitate the access and use of evidence in local contexts. The *active dissemination*, as the name suggests, is the application of active methods (email, social media) and formats (info-graphics) and the use of individuals (knowledge spreaders, such as champions, leaders) to disseminate and promote the utilization of evidence. The *systems integration* covers the use of clinical decision support systems,

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<sup>14</sup> Within this model, *research* embraces the production of new knowledge by primary or secondary research (Jordan et al., 2019, p. 65).

<sup>15</sup> The *expertise* means clinician judgment and the term *experience* means patient preferences and values (Jordan et al., 2019).

<sup>16</sup> Here the *discourse* is defined as a “written communication or debate based on personal anecdote or experience” (Jordan et al., 2019, p. 65)

electronic medical records or the use of quality systems to promote the easy access to evidence by clinicians at the point-of-care. The *education* is also effective to encourage the evidence transfer.

The last but not the least wedge is *Evidence Implementation*. Jordan et al. proposed a definition: “a purposeful and enabling set of activities designed to engage key stakeholders with research evidence to inform decision-making and generate sustained improvement in the quality of healthcare delivery” (2019, p. 67). To operationalize this step, the model recommends the following elements: *context analysis*; *facilitation of practice change*; and *evaluation of process and outcome*. The *context analysis* is useful to identify issues which are important for practice change within local contexts. It also identifies factors capable of influencing the proposed change. Consequently, once the information is identifying, the *facilitation of practice change* at the point of care is easier. Additionally, any change process to a current practice must be monitored and evaluated. Therefore, the Evidence Implementation comprises a third element: the *evaluation of process and outcome* (Jordan et al., 2019, p. 67).

According to Pearson et al. (2012), there are three gaps on Evidence-Based Healthcare and translation of research into action: (1) From Knowledge Need to Discovery (Gap between the “knowledge needs” identified by patients, community, clinicians, governments, and organizations, and the discovery of that new knowledge); (2) From Discovery to Clinical Application (Gap between “discovery research” [theoretical, epidemiological, or “bench” style research] and “clinical research” [experimental trials including but not limited to drug trials]); and (3) From Clinical Application to Action (Gap between the clinical application and the inclusion of the knowledge in routine clinical actions or policy).

At the base of the JBI Model of EBHC, there are four overarching principles: culture, capacity, communication, and collaboration. These principles reflect the reality of healthcare, i.e., the healthcare context is a multifaceted and unique environment: rather than having one linear way to incorporate evidence in practice, this process of incorporation can be strongly influenced by the specific context, the stakeholders, and the location of the evidence.



*Figure 3.* New Joanna Briggs Institute Model of Evidence-Based Healthcare. by Jordan, Zoe; Lockwood, Craig; Munn, Zachary; Aromataris, Edoardo (2019). Reprint From: The updated Joanna Briggs Institute Model of Evidence-Based Healthcare. *International Journal of Evidence-Based Healthcare*17(1):58-71, March 2019. With permission of Wolters Kluwer Health, Inc..

Based on the JBI Model of EBHC, we designed, implemented and evaluated an EBP educational program. The study on EBP educational program design is presented in Chapter 8 and the study on its implementation and assessment is presented in Chapter 9.



Following the presentation of these two models (ARCC-E and JBI Model of EBHC), and considering that the use of EBP in clinical and educational contexts falls short of expectation, the next section is dedicated to the barriers to and facilitators of EBP in both clinical and educational contexts. Indeed, in addition to the three gaps on Evidence-Based Healthcare and translation of research into action, there are, on one hand, barriers that can prevent the EBP integration and therefore the identification of such barriers is paramount; on the other hand, facilitators that can promote the EBP integration, so their recognition is also essential.

### Barriers to and Facilitators of Evidence-Based Practice

Over the past few years, researchers in the area of EBP have developed studies to identify the barriers to and facilitators of the integration of EBP from the perspective of nurses, nursing students and nursing educators.

Table 2 shows the barriers and facilitators to the EBP use, reported by nurses, nursing students and nursing educators, retrieved from primary and secondary research studies.

The analysis of these studies indicated that the most common identified barriers are: the lack of time; the lack of leadership support; the organizational culture and a philosophy of “that is the way we have always done it here”; the lack of EBP knowledge (for example the lack of searching skills, the difficulties in interpreting statistics); the lack of confidence; the lack of resources (namely lack of access to evidence); the managers/leaders’ and co-workers’ resistance to practices change; and the heavy workload.

As for facilitators, the most frequently identified are: education (for examples training in research methods and EBP); the organizational support/awareness; the availability of EBP mentors; the availability of time; the availability of resources (i.e. resources to access evidence).

Table 2.

#### *Barriers to and Facilitators of Evidence-Based Practice in clinical practice and educational contexts*

Study Citation	Study Sample and Context	Barriers	Facilitators
<b>Solomons and Spross (2011)</b>	United States or Canada, and samples that included practicing nurses.	<ul style="list-style-type: none"> <li>- The lack of time;</li> <li>- The inability to access research (lack of information-seeking skills; lack of online research databases understanding, such as CINAHL and MEDLINE);</li> <li>- The difficulties comprehending the statistics and research language;</li> <li>- The inability to change practice (resistance to practice changing from co-workers and managers);</li> <li>- The leaders and managers’ goals with higher priority than EBP;</li> <li>- The difficulty in recruiting and retaining staff;</li> </ul>	<ul style="list-style-type: none"> <li>- Time granting, during the workday, to read and develop practice change activities;</li> <li>- Leadership commitment;</li> <li>- Nursing presence on hospital-wide committees;</li> <li>- Time allocation for research and implementation of practice changes;</li> <li>- Training in EBP and its promotion based on EBP competencies demonstration;</li> <li>- EBP champions<sup>17</sup>;</li> <li>- Health science library staff with a strength relationship with nursing staff.</li> </ul>

<sup>17</sup> EBP Champions are “clinicians who believe so strongly in the EBP paradigm that they will do what it takes to facilitate it in their daily practice and their organizational culture” (Melnik & Fineout-Overholt, 2015, p. 16)

Study Citation	Study Sample and Context	Barriers	Facilitators
<b>Stichler, Fields, Kim, and Brown (2011)</b>	Nursing faculty from two nursing schools with baccalaureate's and master's degree programs in southwestern United States.	<ul style="list-style-type: none"> <li>- The lack of resources;</li> <li>- The heavy workload;</li> <li>- The lack of authority to change practice;</li> <li>- The lack of respect for research;</li> <li>- Nurses' lack of confidence in their own ability to assess the research quality;</li> <li>- The use of Google or Yahoo! for a literature search rather than the scientific research databases;</li> <li>- The sources of evidence: the most common used by nurses were patient information; individual clinical experience and interactions with others. Journals and the internet were used to a lesser extent;</li> <li>- The nurses' feeling that research is overwhelmed;</li> <li>- The hospital's access impediment to online bibliographic databases and other online resources;</li> <li>- The lack of online access for the research;</li> <li>- Diffuse Information.</li> </ul>	- Continuing education for faculty on the EBP process.
<b>Pereira, Cardoso, and Martins (2012)</b>	Nurses  Community contexts	<ul style="list-style-type: none"> <li>- The lack of confidence and experience in research;</li> <li>- The lack of training;</li> <li>- Time limitations;</li> <li>- Patient noncompliance.</li> </ul>	-

Study Citation	Study Sample and Context	Barriers	Facilitators
	Portugal		
<b>Melnik et al. (2012)</b>	Nurses who belong to the American Nurses Association  United States	<ul style="list-style-type: none"> <li>- Time;</li> <li>- The organizational culture, including policies and procedures, politics, and a philosophy of “that is the way we have always done it here”;</li> <li>- The lack of EBP knowledge/education;</li> <li>- The lack of access to evidence/information;</li> <li>- The managers’/leaders’ resistance;</li> <li>- The workload/staffing, including patient ratios;</li> <li>- Nurses’ resistance;</li> <li>- The physicians’ resistance;</li> <li>- Budgets/payors;</li> <li>- The lack of resources;</li> <li>- The lack of available evidence;</li> <li>- Patient resistance/noncompliance.</li> </ul>	<ul style="list-style-type: none"> <li>- Education;</li> <li>- Access to information;</li> <li>- Time</li> <li>- Clearinghouses of evidence-based information (online);</li> <li>- The organizational support/awareness;</li> <li>- The managers’ support;</li> <li>- Mentors’ availability in units;</li> <li>- Knowledge;</li> <li>- Written EBP practice standards;</li> <li>- Resources;</li> <li>- Staff in clinical units;</li> <li>- Peers’ support;</li> <li>- Tools;</li> <li>- Money to support EBP initiatives;</li> <li>- An increased awareness of the EBP importance.</li> </ul>
<b>DeBruyn, Ochoa-Marín, and Semenic (2014)</b>	Nursing researchers’, educators’, and graduate students  Medellín, Colombia.	<ul style="list-style-type: none"> <li>- The lack of recognition of the nursing profession autonomy;</li> <li>- The lack of incentives for nurses to pursue advanced education or to engage in research;</li> <li>- Limited availability and utility of nursing evidence;</li> <li>- The lack of communication between academic and clinical practice environments.</li> </ul>	<ul style="list-style-type: none"> <li>- More nurses pursuing advanced education programs;</li> <li>- The access to international research and research collaborations;</li> <li>- Clinical and research partnerships between universities and clinical institutions.</li> </ul>
<b>Tacia, Biskupski, Pheley, and Lehto (2015)</b>	Advanced practice nurses, nursing managers and/or administrators and staff nurses.  Community hospital.  Mid-western region of the United States.	<ul style="list-style-type: none"> <li>- Institutional and/or cultural barriers;</li> <li>- The lack of knowledge;</li> <li>- The lack of motivation;</li> <li>- Time management;</li> <li>- Physician and patient factors;</li> <li>- Limited access to up-to-date user-friendly technology and computer systems.</li> </ul>	<ul style="list-style-type: none"> <li>- Interdisciplinary communication and collaboration;</li> <li>- Mentorship;</li> <li>- The access to professional activities and networks;</li> <li>- A supportive management;</li> <li>- Conference attendance, training sessions, and the organizational support for education (conference costs reimbursement, incentives).</li> </ul>

Study Citation	Study Sample and Context	Barriers	Facilitators
<b>Khammarnia, Haj Mohammadi, Amani, Rezaeian, and Setoodehzadeh (2015)</b>	Nurses from teaching hospitals.  Zahedan City, South East of Iran,	<ul style="list-style-type: none"> <li>- Organizational aspects;</li> <li>- The lack of human resources;</li> <li>- The heavy workload;</li> <li>- The lack of access to a rich library with nursing journals;</li> <li>- The lack of internet access at work;</li> <li>- No cooperation by physicians;</li> <li>- Individual aspects;</li> <li>- The lack of time to read literature;</li> <li>- Insufficient proficiency in the English language;</li> <li>- The lack of computer skills;</li> <li>- The lack of autonomy to change practice;</li> <li>- The lack of knowledge.</li> </ul>	
<b>Upton, Scurlock-Evans, Williamson, Rouse, and Upton (2015)</b>	Nurse educators working in academic and clinical contexts in the US and UK.	<ul style="list-style-type: none"> <li>- The lack of access to appropriate research/evidence;</li> <li>- The quality of evidence available;</li> <li>- Time;</li> <li>- Resources;</li> <li>- The lack of power to change practices and to persuade others to adopt new methods;</li> <li>- The lack of cohesion between academic and clinical teaching contexts;</li> <li>- The difficulty in teaching students the EBP and research usefulness and validity.</li> </ul>	<ul style="list-style-type: none"> <li>- Relevant evidence accessibility</li> <li>- Confidence in one's own skills.</li> </ul>
<b>Jordan, Bowers, and Morton (2016)</b>	Nurses in a private intensive care unit.  Nelson Mandela Bay municipality, Eastern Cape.	<ul style="list-style-type: none"> <li>- The lack of familiarity with EBP;</li> <li>- Individual perceptions that underpin clinical decision-making;</li> <li>- The lack of access to information required for EBP;</li> <li>- Inadequate sources to access evidence;</li> <li>- The inability to synthesize the literature;</li> <li>- Resistance to change;</li> <li>- The lack of EBP mentor or champion;</li> </ul>	

Study Citation	Study Sample and Context	Barriers	Facilitators
		<ul style="list-style-type: none"> <li>- The lack of authority to change practice;</li> <li>- Insufficient time to implement changes</li> <li>- The lack of available research reports;</li> <li>- A high workload.</li> </ul>	
<b>Malik, McKenna, and Griffiths (2016)</b>	Academics from Australian universities.	<ul style="list-style-type: none"> <li>- Heavy workloads;</li> <li>- Limited time;</li> <li>- The lack of commitment within their schools;</li> <li>- The lack of confidence with EBP teaching;</li> <li>- Complexity of EBP implementation.</li> </ul>	<ul style="list-style-type: none"> <li>- Faculty clinical practice;</li> <li>- Committed academics;</li> <li>- The workload management;</li> <li>- Continuing education.</li> </ul>
<b>Fiset, Graham, and Davies (2017)</b>	<p>Nursing faculty members and/or undergraduate nursing students.</p> <p>Any clinical setting.</p>	<p><b>Students:</b></p> <ul style="list-style-type: none"> <li>- Negative attitudes towards EBP;</li> <li>- The lack of EBP knowledge and skills;</li> <li>- Clinical staff's and managers' resistance to the use of research findings;</li> <li>- The lack of time for EBP;</li> <li>- The excess of information when searching for evidence on the Internet;</li> <li>- The difficulty to understand and ascertain the relevance of research finding;</li> <li>- Challenges when accessing research reports.</li> </ul> <p><b>Educators:</b></p> <ul style="list-style-type: none"> <li>- The lack of EBP knowledge and skills;</li> <li>- The lack of power that students had in the clinical setting to influence practice;</li> <li>- Curricular issues;</li> <li>- The lack of resources for faculty training and infrastructure for EBP;</li> </ul>	<p><b>Students:</b></p> <ul style="list-style-type: none"> <li>- A course on EBP or the participation in education related to EBP;</li> <li>- More EBP knowledge;</li> <li>- A positive attitude towards EBP;</li> <li>- Interest in a particular area of research;</li> <li>- The participation in scientific activities;</li> <li>- The support from managers, other professionals, and students;</li> <li>- Accessible, high-quality, and relevant research with a user-friendly format presentation in the students' language of choice.</li> </ul> <p><b>Educators:</b></p> <ul style="list-style-type: none"> <li>- The confidence and skills to engage in EBP and positive attitudes towards EBP.</li> </ul>
<b>Gifford et al., (2018)</b>	Staff nurses, head nurses and directors from tertiary and	<ul style="list-style-type: none"> <li>- The lack of evidence written in Chinese language;</li> <li>- The lack of guidelines;</li> </ul>	<ul style="list-style-type: none"> <li>- The understanding that EBP improves patient care;</li> <li>- The belief that EBP improves nursing credibility;</li> <li>- Education and training;</li> </ul>

Study Citation	Study Sample and Context	Barriers	Facilitators
	community hospitals.	<ul style="list-style-type: none"> <li>- The fear of patients and families caused by something new or non-traditional;</li> </ul>	<ul style="list-style-type: none"> <li>- Leadership promotion and support of EBP;</li> </ul>
	China.	<ul style="list-style-type: none"> <li>- The lack of awareness, knowledge and skills;</li> <li>- Negative attitudes and beliefs towards EBP;</li> <li>- Patients' lack of money;</li> <li>- Patients' lack of trust.</li> <li>- The lack of leadership support;</li> <li>- Little/no opportunities for EBP education and training;</li> <li>- Limited resources (physical and human).</li> </ul>	<ul style="list-style-type: none"> <li>- The presence of an EBP team;</li> <li>- Mechanisms to access evidence.</li> </ul>
<b>Duncombe (2018)</b>	Registered nurses, Psychiatric and geriatric, hospital and community settings in the Bahamas.	<ul style="list-style-type: none"> <li>- The lack of resources;</li> <li>- The lack of support;</li> <li>- Insufficient staffing;</li> <li>- The lack of interest;</li> <li>- Work overload.</li> </ul>	<ul style="list-style-type: none"> <li>- Training in research methods;</li> <li>- More EBP knowledge.</li> <li>- Evidence-based organisational policies/protocols;</li> <li>- Mentorship by nurses with experience in research methods;</li> <li>- The concession of official time to conduct evidence-based projects;</li> <li>- More authority to implement changes based on research findings;</li> <li>- Supervisors' support;</li> <li>- Improved access to research reports.</li> </ul>
<b>Lizarondo, Lockwood, and McArthur (2019)</b>	Health practitioners. African healthcare settings.	<ul style="list-style-type: none"> <li>- Political leaders' lack of knowledge about best practice guidelines;</li> <li>- A heavy workload;</li> <li>- The lack of or an inadequate supervision;</li> <li>- The lack of equipment/supplies/tools/other resources;</li> <li>- The lack of access to best practice guidelines, up-to-date information, educational resources or professional development training for health staff;</li> <li>- The lack of acute pain service;</li> </ul>	<ul style="list-style-type: none"> <li>- The support from hospital managers;</li> <li>- The presence of relevant policies;</li> <li>- Positive attitudes to change in practice;</li> <li>- Proper documentation practices;</li> <li>- The collaboration with stakeholders external to the organization</li> </ul>

Study Citation	Study Sample and Context	Barriers	Facilitators
		<ul style="list-style-type: none"> <li>- The lack of informational resources for consumers (the patients and their carers);</li> <li>- The lack of in place policies;</li> <li>- The lack of standard protocols for care processes.</li> </ul>	
<b>Shayan, Kiwanuka, and Nakaye (2019)</b>	Nurses in low- and middle-income countries.	<ul style="list-style-type: none"> <li>- The lack of access to information required for EBP;</li> <li>- The lack of incentives for nurses to pursue advanced education or to engage in research;</li> <li>- The inability to implement recommendations of research studies into clinical practice;</li> <li>- Insufficient resources (e.g., equipment, materials) to implement EBP;</li> <li>- Insufficient time at workplace to implement changes in their current practice;</li> <li>- The difficulty in finding time at workplace to search for and to read research articles and reports;</li> <li>- The lack of support;</li> <li>- Inadequate facilities to conduct research;</li> <li>- Nurse feels the results are not extensible to the organization;</li> <li>- The non-observance in Nurse's job description of their role as researchers;</li> <li>- The lack of communication between academic and clinical practice environments;</li> <li>- The lack of consistency between education and practice in nursing discipline;</li> <li>- The absence of teamwork;</li> <li>- The long-established (decades) public's negative image about the nursing profession;</li> <li>- Non-supportive colleagues with respect to implementation;</li> <li>- The limited availability and utility of nursing evidence;</li> </ul>	-



Study Citation	Study Sample and Context	Barriers	Facilitators
		<ul style="list-style-type: none"> <li>- The lack of recognition of nursing profession autonomy;</li> <li>- Nurses' powerlessness feeling about changing patient care procedures based on evidence;</li> <li>- The lack of time to read research results and to implement new ideas;</li> <li>- No previous EBP training;</li> <li>- Profusion of research data to make change;</li> <li>- The lack of clear guidelines to develop research;</li> <li>- A low rate of publication/research reports;</li> <li>- Inconsistent results from research reports;</li> <li>- The nurses' unawareness of research;</li> <li>- The inadequate understanding of technical jargon used in research articles;</li> <li>- The lack of nursing research courses;</li> <li>- The difficulty in judging the quality of research articles and reports;</li> <li>- The lack of familiarity with EBP;</li> <li>- Individual perceptions that underpin clinical decision-making;</li> <li>- The difficulty in understanding research articles and in translating the findings to practice;</li> <li>- The resistance to change;</li> <li>- The inability to evaluate the quality of the research;</li> <li>- The lack of interest;</li> <li>- The lack of computer skills;</li> <li>- Insufficient proficiency in the English language;</li> <li>- The lack of trust in EBP;</li> <li>- The lack of EBP mentors;</li> <li>- The adjustment to a specific structure;</li> </ul>	

Study Citation	Study Sample and Context	Barriers	Facilitators
		<ul style="list-style-type: none"><li>- The nurses' isolation from knowledgeable colleagues with whom to discuss the research;</li><li>- The lack of nurses in seeing benefit for themselves;</li><li>- The domination of routines in providing nursing care;</li><li>- Nurse's idea/belief that research is a worthless action.</li></ul>	

## **EBP in Undergraduate Nursing Education**

The starting point for formal nurses' training happened only 160 years ago. In the mid-1800s, Florence Nightingale, the pioneer in the recognition of nursing as a profession, stated that the nursing knowledge had a unique focus and thus it differentiated itself from the medical knowledge (Alligood, 2014). Therefore, in 1860, she founded the first Nursing School at the St. Thomas' Hospital in London-England (McDonald, 2010). Her school served as a model of nursing education worldwide during many years (Alligood, 2014). However, only in the 1920s, the first known university-based education program for nurses was established in New Zealand. Likewise, other countries relocated their nursing education programs to universities (World Health Organization, 2009).

Portugal followed the worldwide developments in the nursing discipline and education. As a matter of fact, the undergraduate training and the nursing profession's increasing complexity and recognition underwent important steps forward. The first school for nurses was created in 1881 in Coimbra (Pereira, Cardoso, & Rodrigues, 2013). However, it was but one hundred and seven years later, in 1988, that the nursing education was integrated in the Portuguese education system (Decreto-Lei n.º 480/88, Diário da República n.º 295/1988, Série I de 1988-12-23). The first master's degrees in nursing sciences began in 1991 and the first doctorate's degrees in nursing sciences in 2001 (Fonseca, 2015).

In 1999, the Ministry of Science and Higher Education approved the creation of the Nursing Degree<sup>18</sup> (four years) which increased significantly nurses' skills in health services management, training and nursing research. This change led to three kinds of adjustments: (1) many schools became part of the Polytechnic Institutes; (2) others joined the Universities; and (3) some suffered processes of fusion and became non-integrated Schools (like the schools of Lisbon, Oporto and Coimbra; Mendes, & de Fátima Mantovani, 2009).

In June 19<sup>th</sup> 1999, Portugal joined the group of 29 countries that signed the Bologna declaration, a Joint declaration of the European Ministers of Education (European Ministers of Education, 1999). The Bologna Declaration, also known as European Higher Education Area (EHEA), proposed the creation and adoption of a common system of higher education in Europe.

In Portugal, with the implementation of the Bologna Process in Nursing and in line with Decree-Law No. 74/2006 of 24 March and subsequent position of the Portuguese Council of Nursing (Ordem dos Enfermeiros, 2006b), Nursing was considered as a profession that requires a longer education. Thus, the

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<sup>18</sup> In Portugal, the Nursing Degree is the necessary training for a person to become a registered nurse. This Nursing training, taught over four years, offers a degree that corresponds to the first cycle of the higher education studies in Portugal.

first cycle of nursing studies in Portugal kept its four years duration, more precisely 8 semesters, corresponding to 240 ECTS.

Additionally, considering that Nursing is a regulated profession<sup>19</sup> by the European parliament (Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications), one could say that the nurses' training is regulated at a European level.

According to the Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications, the training of nurses responsible for general care should include the acquisition of: (I) the knowledge of the sciences on which general nursing is based; (II) the knowledge of the nature and ethics of the profession as well as of the general principles of health and nursing; (III) clinical experience; (IV) the ability to participate in the training of health staff and experience of working with such personnel; (V) experience of working with other health professions.

In Portugal, the Regulation of Common Skills of the General Care Nurse (our translation of Regulamento das Competências Comuns do Enfermeiro de Cuidados Gerais) was established based on the International Council of Nurses Framework of Competencies for the Generalist Nurse. That regulation identified the domains of competence of the general care nurses which are: the professional, ethical and legal responsibility, the care delivery and management, and the professional development (Regulamento n.º 190/2015 Diário da República, 2.ª série — N.º 79 — 23 de abril de 2015). Within the care delivery and management domain, the incorporation of valid and relevant research findings in practice as well as other evidence is a competence criteria (Regulamento n.º 190/2015 Diário da República, 2.ª série — N.º 79 — 23 de abril de 2015).

In order that nurses can incorporate valid and relevant research findings in practice, the undergraduate nursing curricula should include courses, teaching strategies and training that focuses on the development of research and EBP skills. Indeed, it is critical to prepare the future nurses to, not only, conduct research, but also to read and use research already disseminated to inform their clinical decision-making (Ertug & Önal, 2014; Slattery et al. 2016).

Nevertheless, to teach research and EBP to undergraduate nursing students is a challenging task. Some studies reported that undergraduate students have negative attitudes/beliefs towards research and EBP, in particular towards the statistical components of the research courses and the complex terminology. Moreover, undergraduate students' negative attitudes/beliefs towards research and EBP is reinforced

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<sup>19</sup> “Regulated profession: a professional activity or group of professional activities, access to which, the pursuit of which, or one of the modes of pursuit of which is subject, directly or indirectly, by virtue of legislative, regulatory or administrative provisions to the possession of specific professional qualifications; in particular, the use of a professional title limited by legislative, regulatory or administrative provisions to holders of a given professional qualification shall constitute a mode of pursuit.” (Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications Article 3, number 1, paragraph a).

because they do not understand the research practice link (Al Furaikh, Al Omairi, & Ganapathy, 2017; Burkhart, & Hall, 2015; Halcomb & Peters, 2009). Actually, as we mention in section “Barriers and Facilitators to Evidence-Based Practice”, nurses and nursing students identify as barriers the lack of EBP and research knowledge, namely the difficulties in interpreting statistics and the misunderstanding of the research terminology. In addition, Ramis (2017) found that nursing and paramedicine students’ EBP beliefs have direct influence on their intention to use EBP after graduation. Therefore, it is imperative to provide the future nurses with research and EBP skills in order to promote more positive attitudes regarding research and EBP, and to overcome the barriers to the EBP use in clinical settings.

Two important conferences on “Evidence-Based Healthcare Teachers and Developers” held in 2003 and 2009 led to the writing of the two Sicily statements (Dawes et al., 2005; Tilson et al., 2011) that relate to the demand for developing educational interventions on EBP in healthcare. These statements offered recommendations for EBP competencies, curricula and design of EBP learning assessment tools.

As we stated in subsection “EBP Importance and Recommendations to EBP Implementation”, Dawes et al., 2005 claimed that all health students must understand the EBP principles, must have positive attitudes towards EBP and must implement it. Besides, they recommended that Curricula that seek to deliver knowledge, skills and attitudes of EBP should follow the five steps of EBP: 1. Translation of uncertainty into an answerable question; 2. Search for and retrieval of evidence; 3. Critical appraisal of evidence for validity and clinical importance; 4. Application of appraised evidence to practice; and 5. Evaluation of performance.

Tilson et al., 2011 established principles for the design of EBP learning assessment tools, where they suggest the following assessment categories: Benefit to patients; Behaviors; Skills; Knowledge; Self-efficacy; Attitudes; and Reaction to the educational experience. The ‘Benefit to patients’ category refers to the assessment of health outcomes of patients and communities. The ‘Behaviors’ category could be very useful for the identification of students’ learning needs regarding the EBP use. The ‘Skills’ category is related with the knowledge application through the performance of a task related with EBP. The ‘Knowledge’ category refers to the retention of EBP facts and concepts concerning by learners. The ‘Self-efficacy’ category includes people’s self-judgments regarding their ability to perform a certain activity. The ‘Attitudes’ category refers to the values that students concede to the EBP importance and usefulness in the process of clinical decision-making. The last one, the ‘Reaction to the educational experience’ category represents the learners’ perceptions regarding the learning experience, including aspects such as the organization that could influence the effectiveness of an educational intervention (Tilson et al., 2011).

### Evidence on EBP educational interventions in undergraduate health students

Taking the recommendations proposed by the two Sicily statements into account, several studies have been developed to evaluate the impact of different interventions and pedagogical strategies to teach EBP to undergraduate health students.

In 2016, Kyriakoulis and colleagues developed a systematic review whose aim was to identify the best teaching strategy for EBP teaching to undergraduate health students. They found 20 studies that reported numerous different educational interventions about EBP teaching, with diverse duration (ranged from 2 hours to 1 year), frequency and using several methods, such as lectures, tutorials, workshops, conferences, journal clubs, and online sessions. From those 20 studies, 18 were performed in medical students and two were performed in nursing students. Generally, the systematic review results revealed an improvement of students' EBP competence, EBP knowledge and EBP skills after the implementation of the educational strategies (Kyriakoulis et al., 2016).

Three years later, Larsen, Terkelsen, Carlsen, and Kristensen (2019) published a scoping review to map EBP teaching methods for undergraduate healthcare students. One of the inclusion criteria was that the teaching methods had to use the Sicily Statement's steps of teaching and conducting EBP. This scoping review included 81 primary and secondary studies published between 2010 and 2018. Forty were developed in USA, eight in Canada, seven in Norway, six in Australia, six in England, three in Sweden, two in China, two in Finland, two in Spain, one in Greece, one in Iran, one in Lebanon, one in Scotland, and one in Taiwan. In 72 studies, the included participants were nursing students. The remaining nine studies included nursing students and students from other healthcare disciplines (n=5), nursing and physiotherapy students (n=1), physiotherapy students and students from other healthcare disciplines (n = 1), occupational and physiotherapy students (n = 1), and physiotherapy students (n = 1). The studies were developed in classroom contexts (n = 52); combination of classroom and clinical practice (n = 20); and clinical practice (n = 9).

This scoping review identified the seven methods for teaching EBP: Research courses and workshops; Collaboration with clinical practice; information technology; Assignments; Participation in research projects; Journal clubs; Embedded librarians. Regarding the Sicily Statement's five steps of teaching and conducting EBP, 11 studies mentioned all five steps, 31 studies three or four steps, 17 studies two steps, and 10 studies one step. In 12 studies, there are no description of the steps. Steps two ("Collect the most relevant evidence"), three ("Critically appraise the evidence"), and four ("Integrate the evidence with one's clinical expertise, patient preferences, and values to make practice decision") were the most frequently trained (step two in 58 studies, step three in 55 studies and step four in 51 studies). Step one ("Ask a clinical question") was mentioned in 26 studies and step five ("Evaluate change or outcome") in 14 studies.

### Evidence on EBP educational interventions in undergraduate nursing students

As far as undergraduate nursing students population is concerned, there are several studies that evaluated the impact of different interventions and pedagogical strategies to teach EBP on multiple outcomes, such as: EBP knowledge, attitudes towards EBP, EBP skills, EBP implementation/use, EBP competence, EBP behavior, capability beliefs regarding EBP skills, perceived knowledge of critical appraisal skills, attitudes toward statistics, attitudes toward research and frequency of EBP use (Ashktorab, Pashaeypoor, Rassouli, & Alavi-Majid, 2013; Brown & McCrorie, 2015; Elsborg Foss, Kvigne, Wilde Larsson, & Athlin, 2014; Florin, Ehrenberg, Wallin, & Gustavsson, 2012; Gray, 2010; Henoch et al., 2014; Hickman, Kelly, & Phillips, 2014; Jalali-Nia, Salsali, Dehghan-Nayeri, & Ebadi, 2011; Jones, Crookes, & Johnson, 2011; Keib, Cailor, Kiersma, & Chen, 2017; Kiekkas et al., 2015; Kim, Brown, Fields, & Stichler, 2009; Laaksonen, Paltta, von Schantz, Ylönen, & Soini, 2013; Leach, Hofmeyer, & Bobridge, 2016; Liou, Cheng, Tsai, & Chang, 2013; Mattila, Rekola, Koponen, & Eriksson, 2013; McCurry & Martins, 2010; Morris, 2016; Reid, Briggs, Carlisle, Scott, & Lewis, 2017; Roberts & Ousey, 2011; Ruzafa-Martínez, López-Iborra, Armero Barranco, & Ramos-Morcillo, 2016; Scurlock-Evans, Upton, Rouse, & Upton, 2017; Whalen & Zentz, 2015; Wonder & Otte, 2015; Yu, Zhang, Xu, Wu, & Wang, 2013; Zhang, Zeng, Chen, & Li, 2012).

Bellow, we provide more details on six of the previously cited studies.

A study using an EBP-focused interactive teaching intervention showed that undergraduate nursing students improved their EBP knowledge and use (Kim et al., 2009). This intervention was based on the diffusion of innovation model and the self-efficacy theory and included a 2-hour initial lesson and a clinically integrated EBP group projects. The lesson content comprised the importance of EBP, the definition of EBP, the steps of EBP, and the resources to EBP. The EBP group projects were developed by groups of 4-5 students in three phases: the identification of nursing practice problems and the synthesization of evidence; the planning of EBP implementation strategies; and the dissemination of the proposed changes through a slide presentation to nurses at the clinical context (Kim et al., 2009, p. 1220).

Another study revealed a significant improvement in undergraduate nursing students' EBP knowledge, attitudes, and beliefs after participating in a two-phases intervention: a Self-Directed Learning Process and a Workshop for Critical Appraisal of Literature (Zhang et al., 2012). The Self-Directed Learning Process was a four-weeks phase during which students integrated in groups independently performed searches (online and library) to find information on topics. Afterwards, the students shared the information they considered important, discussed it and decided which piece of information is necessary to accomplish learning objectives. Furthermore, they prepared an EBP topic and an implementing plan. Over the course of the workshop for Critical Appraisal of Literature phase, the students initially read

and commented on one paper and discussed it within the group. Then, the students participated in workshops to share their critical appraisal achievements (Zhang et al., 2012).

Based on the Rogers' diffusion of innovation model, an EBP Education teaching strategy showed positive results in improving knowledge, attitude and adoption of EBP in undergraduate nursing students (Ashktorab et al., 2013). This strategy followed the five steps of the Rogers' diffusion of innovation model: 1) knowledge, 2) persuasion, 3) decision, 4) implementation, and 5) confirmation.

A study of Ruzafa-Martínez et al. (2016) indicated that a 15-week educational intervention in undergraduate nursing students (second- and third-year) significantly improved their EBP competence, attitudes towards EBP, and EBP knowledge and skills. This intervention focus was the first four steps of EBP as defined by Melnyk, Fineout-Overholt, Stillwell, and Williamson (2010) and it included 90 hours of student autonomous work besides 60 hours in class. Several learning strategies (theoretical classes, practical classes with access to computers, peer group discussions in small groups, individual work, teamwork, and oral presentation of a final project) were used to develop knowledge and skills regarding the formulation of clinical questions, the search of databases, and the statistical interpretation (Ruzafa-Martínez et al., 2016).

Keib et al. (2017) revealed that a research and EBP course increased undergraduate nursing students' perceptions of and confidence in research and EBP. The course aimed to make students aware of the research process as well as to offer the basis for the development of EBP skills, through lectures, seminar assignments and discussions, and small group work. The course comprised contents such as statistics, research designs, evaluation of research articles and clinical practice guidelines (CPGs) for use on nursing practice. Additionally, the students prepared an EBP project that they presented at an interprofessional poster session.

One more study showed that an educational initiative had positive impact on EBP beliefs and implementation (Reid et al., 2017). The educational intervention, proposed by Reid et al. (2017), used a combined learning approach, which included lectures, small group teaching, and an online Resource. This intervention, with 24 hours of tutorials and 48 hours of lectures, was delivered in year one of the undergraduate nursing education program.

### *EBP in Undergraduate Nursing Education in Portugal*

Currently, in Portugal, there are 39 higher education institutions, which provide the Nursing Degree Course. In a brief review of the current curriculum programs of their Nursing Degree Course, we can discern that all curricula comprise research courses, except for one, and that only three curriculum plans have a specific EBP course. Then we analyzed study plans of some research courses and we realized that there were signs of introduction attempts of the EBP approach.



In this regard, the national existing study plans require a heavy investment as far as the integration of EBP in nurses' initial training is concerned. The processes of building new curricular plans should consider this need and should not only promote the inclusion of specific curricular units on EBP basic principles but also the use of EBP in the most diverse courses, namely in the clinical training courses. The EBP integration would facilitate the teaching of undergraduate nursing students and would make them think systematically and critically about their clinical practice. The students would consequently: (1) formulate clinical questions; (2) search scientific evidence to answer them; and (3) implement this evidence into clinical contexts, considering their clinical experience and the patient's values/preferences. As we mentioned before, this integration is fundamental for general care nurses to develop their own competence to incorporate valid and relevant research results into clinical practice, as set out in the Regulation of Common Skills of the General Care Nurse proposed by the National Council of Nursing (Regulamento n.º 190/2015 Diário da República, 2.ª série — N.º 79 — 23 de abril de 2015).

## Aims

The research work reported in this thesis was intentionally designed to contribute to the EBP integration in undergraduate nursing curricula of nursing education institutions.

In order to reach this aim, we outlined the following specific objectives:

- To synthesise the instruments used to assess undergraduate nursing students' attitudes, knowledge and skills in EBP.
- To adapt to the Portuguese population the "EBP Beliefs Scale for Educators" (EBPB-E), the "EBP Implementation Scale for Educators" (EBPI-E) and the "Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey" (OCRSIEP-E) for educators.
- To adapt to the Portuguese population the "EBP Beliefs Scale" (EBPB), the "EBP Implementation Scale for Students" (EBPI-S) and the "Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey" (OCRSIEP-ES) for students.
- To adapt to the Portuguese population and to the undergraduate nursing students the Fresno test.
- To describe the undergraduate nursing students' and nursing educator's beliefs about and confidence in their ability to teach and implement EBP.
- To describe the EBP implementation by the nursing educators and the undergraduate nursing students.
- To describe the organizational culture and readiness for EBP in the perspective of the nursing educators and undergraduate nursing students.
- To determine whether associations exist among EBP Beliefs, Implementation and Organizational Culture of the nursing educators
- To determine whether associations exist among EBP Beliefs, Implementation and Organizational Culture of the undergraduate nursing students
- To develop an educational EBP program.
- To evaluate the effectiveness of an educational EBP program in undergraduate nursing students' EBP knowledge and skills.

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# Chapter 2

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Instruments for measuring undergraduate nursing students' knowledge, attitudes and skills in evidence-based practice: a systematic review protocol

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Cardoso, D., Santos, E., Cardoso, M. L., Oliveira, C. R., Rodrigues, M. A., & Apóstolo, J. (2017).

Instruments for measuring undergraduate nursing students' knowledge, attitudes and skills in evidence-based practice: a systematic review protocol. *Journal of Evidence-Based Practice*, 15(8), 1979-1986. Retrieved from:

[https://journals.lww.com/jbisrir/Fulltext/2017/08000/Instruments\\_for\\_measuring\\_undergraduate\\_nursing.2.aspx](https://journals.lww.com/jbisrir/Fulltext/2017/08000/Instruments_for_measuring_undergraduate_nursing.2.aspx)

## Chapter 2. Instruments for measuring undergraduate nursing students' knowledge, attitudes and skills in evidence based practice: a systematic review protocol

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**Review question/objective:** The objective of this systematic review is to identify and assess the properties of instruments for measuring undergraduate nursing students' knowledge, attitudes and skills in evidence-based practice (EBP).

More specifically, the review questions are as follows:

- What are the measurement properties of the available instruments for measuring undergraduate nursing students' knowledge, attitudes and skills in EBP?
- What is the most valid and reliable instrument for measuring undergraduate nursing students' knowledge, attitudes and skills in EBP?

Keywords Attitudes; evidence-based practice; knowledge; skills; undergraduate nursing students

### Background

Evidence-based practice (EBP), also referred to as evidence-informed practice,<sup>1</sup> is defined as “clinical decision-making that considers the best available evidence; the context in which the care is delivered; client preference; and the professional judgment of the health professional”.<sup>2(p.209)</sup>

Several studies have indicated the multiple benefits of using EBP in clinical practice, such as high-value health care, improved patient outcomes, decreased health care costs and, consequently, increased quality of care.<sup>3-5</sup> Therefore, the adoption, implementation and sustainment of EBP in healthcare organizations is becoming increasingly important due to this impact on health care quality.<sup>6-8</sup>

Several organizations, such as the World Health Organization,<sup>9</sup> the International Council of Nurses<sup>10</sup> and the Agency for Healthcare Research and Quality<sup>11</sup> have recommended the implementation of EBP. These organizations claim that decision-making is simplified, uncertainty, risk and variability are reduced and quality of care is improved. In addition, the Sicily statement on EBP has pointed out that “all health care professionals need to understand the principles of EBP, recognize EBP in action, implement evidence-based policies, and have a critical attitude to their own practice and to evidence”.<sup>12(p.4)</sup> However, due to the gap between research and practice, EBP is not up to the standard of care worldwide,<sup>3</sup> which is often described as a problem.<sup>13</sup>

Indeed, the literature reveals several barriers to EBP implementation, such as time limitations, an organizational culture and philosophy of “that is the way we have always done it here”, leader resistance and inadequate knowledge or training to access or critically appraise evidence.<sup>3(p.6)</sup> Moreover, Aarons *et al.*<sup>14</sup> pointed out that personal characteristics of frontline staff, including age, level of education, training, the level of professional experience, knowledge and attitudes toward EBP are essential to successfully implement EBP.

Studies have identified education as a strategy to promote EBP implementation, that is, to close the gap between research and practice.<sup>15-17</sup> Furthermore, the report of the Institute of Medicine Committee on the Health Professions Education Summit in 2003 stated<sup>18</sup> that all professional education programs in the health area should promote the development of EBP skills. Undergraduate nursing curricula should also be based on EBP principles with a view to educating future nurses on EBP use in clinical practice and, consequently, improving their acquisition and further development of knowledge, attitudes and skills regarding EBP.<sup>19</sup> Therefore, good quality instruments are required to assess the impact of the educational programs on undergraduate nursing students’ attitudes, knowledge and skills regarding EBP.

According to the Classification Rubric for EBP Assessment Tools in Education (CREATE), attitudes refer to “the values ascribed by the learner to the importance and usefulness of EBP to inform clinical decision-making”,<sup>20(p.4)</sup> knowledge refers to “learners’ retention of facts and concepts about EBP”<sup>20(p.5)</sup> and skills refer to “the application of knowledge, ideally in a practical setting” (Freeth *et al.* cited by Tilson *et al.*).<sup>20(p.5)</sup>

Instruments such as the EBP Evaluation Competence Questionnaire<sup>21</sup> and the Student EBP Questionnaire<sup>22</sup> are already used to assess undergraduate nursing students’ knowledge, attitudes and skills regarding EBP. Nonetheless, information about other instruments available to measure undergraduate nursing students’ knowledge, attitudes and skills regarding EBP has not yet been gathered, as well as information about their measurement properties, including internal consistency, reliability, measurement error, content validity, structural validity, hypothesis testing, cross-cultural validity, criterion validity, responsiveness and interpretability according to the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) definitions.<sup>23</sup>

A systematic review has been conducted to identify instruments available for measuring nurses’ EBP knowledge, skills and attitudes (59 studies met the inclusion criteria in a total of 24 self-report instruments).<sup>24</sup> However, no attempt has yet been made to synthesize the instruments available for undergraduate nursing students. An initial search of the *JBIC Database of Systematic Reviews and Implementation Reports*, the Cochrane Database of Systematic Reviews, PROSPERO, MEDLINE and CINAHL found no systematic review (published or in progress) on the measurement properties of the

instruments available for measuring undergraduate nursing students' EBP knowledge, attitudes and skills. Therefore, there is a clear need to identify and assess the properties of these instruments and, consequently, determine the most valid and reliable one. The findings of this systematic review will help in planning the validation of promising instruments or deciding on the need to develop a new instrument.

### **Inclusion Criteria**

#### **Types of participants**

The current systematic review will consider studies that focus on undergraduate nursing students, aged 18 years or over. In this systematic review, we will consider undergraduate nursing students as students who are not yet licensed as registered nurses.

#### **Constructs of interest**

The current systematic review will consider studies that explore the following constructs: attitudes, knowledge and skills in EBP. This systematic review will consider the definition of these constructs according to CREATE, as presented below:

- Attitudes – “the values ascribed by the learner to the importance and usefulness of EBP to inform clinical decision-making”<sup>20(p.4)</sup>
- Knowledge – “learners’ retention of facts and concepts about EBP”<sup>20(p.5)</sup>
- Skills – “the application of knowledge, ideally in a practical setting” (Freeth *et al.* cited by Tilson *et al.*)<sup>20(p.5)</sup>

#### **Type of measurement instrument of interest**

The current systematic review will include any type of measurement instrument, including, but not limited to, self-report questionnaires.

### **Outcomes**

The current systematic review will include studies that consider at least one of the measurement properties (or aspects of measurement properties) of the instruments according to the operationalization and conceptualization of COSMIN.<sup>23</sup>

The COSMIN taxonomy includes three quality domains: reliability, validity and responsiveness. The reliability and validity domains contain three measurement properties each: reliability encompasses internal consistency, reliability and measurement error; and validity encompasses content validity, construct validity and criterion validity. The domain responsiveness encompasses the measurement property responsiveness.<sup>23</sup> For more details, please see the table extracted from Noben *et al.*<sup>25</sup> in Appendix I.

### **Types of studies**

The current systematic review will consider validation studies or studies with other designs on the development of a measurement instrument or the assessment of one or more of its measurement properties.

### **Search strategy**

The search strategy aims to find both published and unpublished studies. A three-step search strategy will be utilized in this review. An initial limited search of MEDLINE and CINAHL will be undertaken followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe the article. A second search using all identified keywords and index terms will then be undertaken across all included databases. Third, the reference lists of all identified reports and articles will be searched for additional studies. Studies published in English, Spanish and Portuguese will be considered for inclusion in this review. Studies published after 1996 (date when EPB first emerged) will be considered for inclusion in this review.<sup>26,27</sup>

The databases to be searched include: PubMed, CINAHL, Scopus, Academic Search Complete, SciELO (Scientific Electronic Library Online) and ERIC.

The search for unpublished studies will include: Banco de teses da CAPES (Brazil), RCAAP (Repositório Científico de Acesso Aberto de Portugal), OpenGrey (System for Information on Grey Literature in Europe) and Virginia Henderson Global Nursing e-Repository.

Initial keywords to be used will be:

- “undergraduate nursing students”
- “attitudes, knowledge and skills regarding EBP”
- “self-report questionnaires”
- “measurement instrument”
- “validity”
- “reliability”
- “measurement properties”
- “psychometric properties”

### **Assessment of methodological quality**

Due to the lack of JBI tools for assessing the methodological quality of the measurement properties of instruments, the papers selected for retrieval will be assessed for methodological validity prior to inclusion in the review by two independent reviewers, using the COSMIN checklist with a four-point

rating scale.<sup>28,29</sup> Using a four-step process, the reviewers will: (i) identify the measurement properties assessed in the paper; (ii) verify if the statistical methods used in the paper are based on the Classical Test Theory or on the Item Response Theory; (iii) assess the methodological quality of the studies on the properties identified in step 1; and (iv) analyze the generalizability of the results of the studies on the properties identified in step 1. Four response options were defined for each COSMIN item (excellent, good, fair and poor). The reviewers will rate the methodological quality of each measurement property based on the principle of “worst score counts” (the lowest rating of any item in the corresponding box), as suggested by Terwee *et al.*<sup>29</sup>

Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer.

### **Data extraction**

According to the COSMIN protocol for systematic reviews of measurement properties,<sup>30</sup> the data extracted will include the following specific details:

- General characteristics of the instruments (construct, subscales, number of items, version, etc.).
- Characteristics of the study populations in which the measurement properties were assessed (age, gender, setting, country, language, graduation year – information mentioned in items 1 to 6 from the COSMIN box generalizability).
- Results of the measurement properties.
- Evidence on the interpretability of the included questionnaires (distribution of scores, floor and ceiling effect and minimal important change – information described in items four to eight of the COSMIN box interpretability).

Data will be directly extracted into tables by two independent reviewers. Authors of primary studies will be contacted to provide missing or additional data. Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer.

### **Data synthesis**

Data will be synthesized by two independent reviewers through the creation of overview tables with descriptive summaries of: details of included studies, details of included instruments, methodological quality assessment of each included study and measurement properties assessed per instrument.

Whenever the studies are similar in terms of study population, setting, instrument version (e.g. language) and form of administration (assessed through the generalizability box of the COSMIN

checklist), their results on a measurement property of an instrument will be synthesized through a best-evidence synthesis.<sup>30</sup> Two independent reviewers will rate the results of the measurement properties for each study as *positive*, *indeterminate* or *negative* (Appendix II)<sup>31</sup> and assign a level of evidence (strong, moderate, limited, conflicting, unknown) as proposed by the Cochrane Collaboration Back Review Group<sup>32</sup> (Appendix III). Furthermore, if the studies are of at least fair quality, statistical pooling will be performed for reliability and correlation coefficients.

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## Appendices

### Appendix I: Description of the measurement domains, properties, aspects, and statistics and methods<sup>25</sup>

Domains	Properties	Aspects	Statistics/Methods	
<b>Reliability</b>	Internal consistency		Cronbach's alpha or Kuder-Richardson formula (KR-20) to determine relevance	
			Factor analysis or principal component analysis to determine whether items form one or more than one scale	
	Reliability		Intraclass correlation coefficient (ICC) or Cohen's kappa	
	Measurement error			Standard error of measurement (SEM)
			Smallest detectable change (SDC)	
			Change beyond measurement error	
			Limits of agreement (LoA)	
<b>Validity</b>	Content validity	Face validity	Assessment of relevance of all items for the construct, aim and target group	
			Assessment of important missing items	
	Construct validity		Structural validity	Factor analysis to confirm the number of subscales present
			Hypotheses testing	Assessment of a priori hypotheses, clearly indicating both direction and magnitude of the correlation or difference
			Cross-cultural validity	Assessment of adequate reflection of the performance of the items of the original instrument
			Criterion validity	Correlation
			Area under the receiver operator characteristics curve (AUC)	
		Sensitivity and specificity		
<b>Responsiveness</b>	Responsiveness		Assessment of a priori hypotheses focussing on the change score of an instrument in the hypotheses	
			Area under the receiver operator characteristic curve (AUC)	

Appendix II: Quality criteria for the measurement property<sup>29</sup>

Property	Rating <sup>†</sup>	Quality Criteria
<b>Reliability</b>		
Internal consistency	+	Cronbach's alpha(s) $\geq 0.70$
	?	Cronbach's alpha not determined or dimensionality unknown
Reliability	-	Cronbach's alpha(s) $< 0.70$
	+	ICC / weighted Kappa $\geq 0.70$ OR Pearson's r $\geq 0.80$
	?	Neither ICC / weighted Kappa, nor Pearson's r determined
Measurement error	-	ICC / weighted Kappa $< 0.70$ OR Pearson's r $< 0.80$
	+	MIC $>$ SDC OR MIC outside the LOA
	?	MIC not defined
Validity	-	MIC $\leq$ SDC OR MIC equals or inside LOA
	<b>Validity</b>	
Content validity	+	All items are considered to be relevant for the construct to be measured, for the target population, and for the purpose of the measurement AND the questionnaire is considered to be comprehensive
	?	Not enough information available
	-	Not all items are considered to be relevant for the construct to be measured, for the target population, and for the purpose of the measurement OR the questionnaire is considered not to be comprehensive
Construct validity - Structural validity	+	Factors should explain at least 50% of the variance
	?	Explained variance not mentioned
	-	Factors explain $< 50\%$ of the variance
- Hypothesis testing	+	Correlations with instruments measuring the same construct $\geq 0.50$ OR at least 75% of the results are in accordance with the hypotheses AND correlations with related constructs are higher than with unrelated constructs
	?	Solely correlations determined with unrelated constructs
	-	Correlations with instruments measuring the same construct $< 0.50$ OR $< 75\%$ of the results are in accordance with the hypotheses OR correlations with related constructs are lower than with unrelated constructs
- Cross-cultural validity	+	No differences in factor structure OR no important DIF between language versions
	?	Multiple group factor analysis not applied AND DIF not assessed
	-	Differences in factor structure OR important DIF between language versions
Criterion validity	+	Convincing arguments that gold standard is "gold" AND correlation with gold standard $\geq 0.70$
	?	No convincing arguments that gold standard is "gold"
	-	Correlation with gold standard $< 0.70$
<b>Responsiveness</b>		
Responsiveness	+	Correlation with changes on instruments measuring the same construct $\geq 0.50$ OR at least 75% of the results are in accordance with the hypotheses OR AUC $\geq 0.70$ AND correlations with changes in related constructs are higher than with unrelated constructs
	?	Solely correlations determined with unrelated constructs
	-	Correlations with changes on instruments measuring the same construct $< 0.50$ OR $< 75\%$ of the results are in accordance with the hypotheses OR AUC $< 0.70$ OR correlations with changes in related constructs are lower than with unrelated constructs

MIC = minimal important change, SDC = smallest detectable change, LoA = limits of agreement, ICC = intraclass correlation coefficient, DIF = differential item functioning, AUC = area under the curve

<sup>†</sup> + = positive rating, ? = indeterminate rating, - = negative rating

Appendix III: Levels of evidence for the quality of the measurement property<sup>30</sup>

Level	Rating <sup>†</sup>	Criteria
strong	+++ or ---	Consistent findings in multiple studies of good methodological quality OR in one study of excellent methodological quality
moderate	++ or --	Consistent findings in multiple studies of fair methodological quality OR in one study of good methodological quality
limited	+ or -	One study of fair methodological quality
conflicting	+/-	Conflicting findings
unknown	?	Only studies of poor methodological quality

(..) = reference number,

<sup>†</sup> + = positive rating, ? = indeterminate rating, - = negative rating

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# Chapter 3

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Instruments for measuring undergraduate nursing students' knowledge, attitudes and skills in evidence-based practice: a systematic review

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## Chapter 3. Instruments for measuring undergraduate nursing students' knowledge, attitudes and skills in evidence-based practice: a systematic review

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### **Abstract**

**Objective:** To identify and assess the properties of instruments for measuring undergraduate nursing students' knowledge, attitudes, and skills regarding evidence-based practice (EBP).

**Introduction:** It is known that using EBP in clinical practice has multiple benefits and studies have identified education as a strategy to promote EBP implementation. Thus, undergraduate nursing curricula should be based on EBP principles with a view to educating future nurses on EBP use in clinical practice and it is required good quality instruments to assess the impact of the educational programs on undergraduate nursing students' attitudes, knowledge, and skills regarding EBP. Consequently, there is a clear need to identify and assess the properties of these instruments and, therefore, determine the most valid and reliable one.

**Inclusion criteria:** Participants: undergraduate nursing students. Constructs of interest: attitudes, knowledge or skills regarding EBP. Outcomes: measurement properties according to the operationalization of COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN). Types of studies: validation studies or others on the development/assessment of measurement properties.

**Methods:** This review followed the Joanna Briggs Institute (JBI) and COSMIN methodologies. A three-step search was undertaken to find published/unpublished studies (from 1996 until July 2018) in Portuguese, English and Spanish. Two independent reviewers analyzed the title/abstract and the full-text to verify the eligibility criteria. Two independent reviewers assessed the methodological quality using the COSMIN Checklist and a third reviewer analysed the disagreements. The data extraction was made by two reviewers and include details of general characteristics of the instruments; characteristics of the study populations in which the measurement properties were assessed; and the results of the measurement properties. Data was synthesized through the creation of overview tables and descriptive summaries of: details of included studies; details of included instruments; methodological quality assessment of each included study; and measurement properties assessed per instrument.

**Results:** From the 1942 records found, eleven papers evaluating the following five instruments were included in this review: Evidence Based Practice Questionnaire; Student Evidence-based Practice Questionnaire; Evidence-based Practice Knowledge Assessment in Nursing; Evidence Based Practice Evaluation Competence Questionnaire; and Evidence-based practice profile questionnaire. Two studies presented the PROM development. Only the internal consistency was assessed by all studies. The content validity and structural validity was assessed by eight studies, the hypotheses testing for construct validity was measured in five studies, and the reliability in four studies. Only one study addressed the cross-cultural validity/measurement invariance and other the responsiveness. None of the studies evaluated measurement error and criterion validity.

**Conclusions:** Five instruments were found to measure undergraduate nursing students' knowledge, attitudes, and skills regarding evidence-based practice. Only two instruments measured the three constructs of interest. The measurement properties assessed by the five instruments are content validity, structural validity, internal consistency, cross-cultural validity, reliability, construct validity and responsiveness.

**Keywords:** attitudes; evidence-based practice; knowledge; skills; undergraduate nursing students; systematic review; measurement properties

### **Introduction**

Evidence-Based Practice (EBP), also referred to as Evidence-Informed Practice<sup>1</sup>, was defined by Pearson and colleagues as the “clinical decision-making that considers the best available evidence; the context in which the care is delivered; client preference; and the professional judgment of the health professional”.<sup>2, p. 209</sup>

A lot of benefits of using EBP in clinical practice have been pointed out by several studies, such as high-value health care, improved patient outcomes, decreased health care costs, and, consequently, increased quality of care.<sup>3-5</sup> Due to this impact on health care quality, the adoption, implementation, and sustainment of EBP in health care organizations is becoming increasingly important.<sup>6-8</sup>

Organizations, such as the World Health Organization<sup>9</sup>, the International Council of Nurses<sup>10</sup>, and the Agency for Healthcare Research and Quality<sup>11</sup> have recommended the implementation of EBP claimed that decision-making is simplified, uncertainty, risk, and variability are reduced, and quality of care is improved. Moreover, the delegates of the second international conference of Evidence-Based Health Care Teachers and Developers has pointed out in the Sicily statement on evidence-based practice that “all health care professionals need to understand the principles of EBP, recognize EBP in action, implement evidence-based policies, and have a critical attitude to their own practice and to evidence”.<sup>12</sup>

Nevertheless, EBP is not the standard of care in the world because of the gap between research and practice,<sup>5</sup> and this is often described as a problem.<sup>13</sup>

Indeed, some evidence reveals some barriers to EBP implementation, such as time limitations, an organizational culture and philosophy of “that is the way we have always done it here”, leader resistance, and inadequate knowledge or training to access or critically appraise evidence.<sup>5</sup> Additionally, the personal characteristics of front-line staff, as age, level of education, training, amount of professional experience, and knowledge and attitudes toward EBP are crucial to the success of EBP implementation.<sup>14</sup>

Some studies pointed out that education is a strategy to promote EBP implementation, i.e. to close the gap between research and practice.<sup>15-17</sup> Besides, the report of the Institute of Medicine Committee on the Health Professions Education Summit in 2003 claimed that all professional education programs in the health area should promote the development of EBP skills.<sup>18</sup> In this regard, undergraduate nursing curricula should be based on EBP principles in order to educate future nurses on EBP use in clinical practice and, consequently, improving their acquisition and further development of knowledge, attitudes, and skills regarding EBP.<sup>19</sup> Thus, good quality instruments are required to assess the impact of the educational programs on undergraduate nursing students’ attitudes, knowledge, and skills regarding EBP.

The Classification Rubric for EBP Assessment Tools in Education (CREATE) defined attitudes as “the values ascribed by the learner to the importance and usefulness of EBP to inform clinical decision-making”<sup>20, p. 4</sup>; knowledge as “learners’ retention of facts and concepts about EBP”<sup>20, p. 5</sup>; and skills as “the application of knowledge, ideally in a practical setting (Freeth et al. cited by Tilson et al.<sup>20, p. 5</sup>).

Instruments such as the Evidence Based Practice Evaluation Competence Questionnaire (EBP-COQ)<sup>(21)</sup> and the Student Evidence-based Practice Questionnaire (S-EBPQ)<sup>22</sup> are already used to assess undergraduate nursing students’ knowledge, attitudes, and skills regarding EBP. Nonetheless, information about other instruments available to measure undergraduate nursing students’ knowledge, attitudes, and skills regarding EBP has not yet been gathered, as well as information about their measurement properties, including internal consistency, reliability, measurement error, content validity, structural validity, hypotheses testing, cross-cultural validity, criterion validity, responsiveness, and interpretability according to the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) definitions.<sup>23</sup>

The instruments available for measuring nurses’ EBP knowledge, skills, and attitudes (59 studies met the inclusion criteria, in a total of 24 self-report instruments) were identified already in a systematic review.<sup>24</sup> Nevertheless, no attempt has yet been made to synthesize the instruments available for undergraduate nursing students. An initial search of the JBI Database of Systematic Reviews &

Implementation Reports, the Cochrane Database of Systematic Reviews, PROSPERO, MEDLINE, and CINAHL found no systematic review (published or in progress) on the measurement properties of the instruments available for measuring undergraduate nursing students' EBP knowledge, attitudes, and skills. Therefore, there is a real need to identify and assess the properties of these instruments and, consequently, determine the most valid and reliable one. The findings of this systematic review will help planning the validation of promising instruments or deciding on the need to develop a new instrument.

This systematic review follows the methodology previously described in the protocol published at Joanna Briggs Institute Database of Systematic Reviews and Implementation Reports.<sup>25</sup>

### **Review question**

The objective of this systematic review is to identify and assess the properties of instruments for measuring undergraduate nursing students' knowledge, attitudes, and skills regarding evidence-based practice.

More specifically, the review will focus on the following questions:

- What are the measurement properties of the available instruments for measuring undergraduate nursing students' knowledge, attitudes, and skills regarding evidence-based practice?
- What is the most valid and reliable instrument for measuring undergraduate nursing students' knowledge, attitudes, and skills regarding evidence-based practice?

### **METHODS**

This systematic review was conducted in line with CONsensus-based Standards for the selection of health Measurement INstruments (COSMIN) methodology.<sup>27</sup> This review was conducted in accordance with an *a priori* published protocol<sup>25</sup> and it is register at PROSPERO under the registration number CRD42017074920.

### **Inclusion criteria**

#### *Types of participants*

The current systematic review considered studies that focus on undergraduate nursing students, aged 18 years or more. In this systematic review, we considered undergraduate nursing students as students who are not yet licensed as registered nurses.

#### *Construct of interest*

The current systematic review considered studies that explore at least one of the following constructs: attitudes, knowledge, and skills regarding EBP. This systematic review considered the definition of

these constructs according to the CREATE, as presented below:

- Attitudes – “the values ascribed by the learner to the importance and usefulness of EBP to inform clinical decision-making”<sup>20, p. 4</sup>;
- Knowledge – “learners’ retention of facts and concepts about EBP”<sup>20, p. 5</sup>;
- Skills – “the application of knowledge, ideally in a practical setting (Freeth et al. cited by Tilson et al.<sup>20, p. 5</sup>).

Originally, at the *a priori* published protocol<sup>25</sup>, we aimed to include instruments that assessed simultaneously the three constructs of interest. However, to have a more inclusive approach, we decided to include studies that reported the measurement properties of instruments that assess at least one of the constructs of interest.

#### *Type of measurement instrument of interest*

The current systematic review included any type of measurement instrument, including, but not limited to, self-report questionnaires.

#### *Outcomes*

The current systematic review included studies that consider at least one of the measurement properties (or aspects of measurement properties) of the instruments according to the operationalization and conceptualization of COSMIN.<sup>23</sup>

The COSMIN taxonomy includes three quality domains: reliability, validity, and responsiveness. The reliability and validity domains contain three measurement properties each: reliability contains internal consistency, reliability, and measurement error; and validity contains content validity, construct validity, and criterion validity. The domain responsiveness contains the measurement property responsiveness.<sup>23</sup> For more details see the table extracted from Noben et al.<sup>26</sup> in Appendix I of this Chapter.

#### *Types of studies*

The current systematic review considered validation studies or studies with other designs on the development of a measurement instrument or the assessment of one or more of its measurement properties. As recommended by COSMIN, studies that only use instruments as an outcome measurement instrument and assessed only the internal consistency were excluded.<sup>27</sup>

Studies published in English, Spanish, and Portuguese were considered for inclusion in this review. Studies published after 1996 (date when EBP first emerged) were considered for inclusion in this review.<sup>28, 29</sup>

### **Search strategy**

The search strategy aimed to find both published and unpublished studies. A three-step search strategy was utilized in this review. An initial limited search of MEDLINE and CINAHL was undertaken followed by analysis of the text words contained in the title and abstract and the index terms used to describe the articles. A second search using all identified keywords and index terms was undertaken on 2018 July<sup>20</sup> across the following databases: PubMed, CINAHL, Scopus, Academic Search Complete, SciELO - Scientific Electronic Library Online and ERIC. The search for unpublished studies and gray literature included the Banco de teses da CAPES (Brazil); RCAAP – Repositório Científico de Acesso Aberto de Portugal; OpenGrey - System for Information on Grey Literature in Europe; and Virginia Henderson Global Nursing e-Repository. Finally, the reference lists of all reports and articles selected for critical appraisal were searched for additional studies. The full search strategy is provided in Appendix II of this Chapter.

### **Study selection**

Following the search, all identified citations were loaded into EndNote X7.4 and duplicates removed. Titles and abstracts were screened by two independent reviewers (DC and MC) for assessment against the inclusion criteria for the review. The full text of potentially eligible studies was retrieved and assessed in detail against the inclusion criteria by two independent reviewers (DC and MC). Full text studies that did not meet the inclusion criteria were excluded and reasons for their exclusion are provided in Appendix III of this Chapter. The disagreements that arose between the reviewers were resolved through discussion.

### **Assessment of methodological quality**

Two independent reviewers (DC and DR) using the CONsensus-based Standards for the selection of health Measurement INstruments (COSMIN) Risk of Bias checklist<sup>23, 30, 31</sup> critically appraised the eligible studies.

Using a 2-step process, the two independent reviewers: 1) identified the measurement properties assessed in the paper; and 2) assessed the methodological quality of the studies on the properties identified in step 1. The reviewers rated the methodological quality of each measurement property based on the principle of “worst score counts” (the lowest rating of any item in the corresponding box), as suggested by Mokkink and colleagues.<sup>30, 31</sup>

The disagreements that arose between the reviewers were resolved with a third reviewer (MS). All studies, regardless of their methodological quality, were included and the methodological fragilities presented by the studies were discussed.

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<sup>20</sup> This search strategy will be updated before submitted this paper to a scientific journal.

### Data extraction

According to the COSMIN methodology for systematic reviews of measurement properties<sup>30, 31</sup>, the data extracted included the following specific details:

- General characteristics of the instruments (construct, subscales, number of items, etc.);
- Characteristics of the study populations in which the measurement properties were assessed (age, gender, setting, country, language, graduation year);
- Results of the measurement properties;

Data were directly extracted into tables by one independent reviewer and confirmed by another<sup>21</sup>. Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer. Authors of papers were contacted to request missing or additional data.

### Data synthesis

Data were synthesized through the creation of overview tables with descriptive summaries of: details of included studies; details of included instruments; methodological quality assessment of each included study; and measurement properties assessed per instrument.

The studies were not similar in terms of instrument version (e.g., language) and the only two studies performed with the same instrument version (same language) were performed in different contexts (one in United Kingdom<sup>22</sup> and one in Australia<sup>32</sup>). Therefore, we did not synthesize the data through a best-evidence synthesis.<sup>30</sup>

## Results

### *Study inclusion*

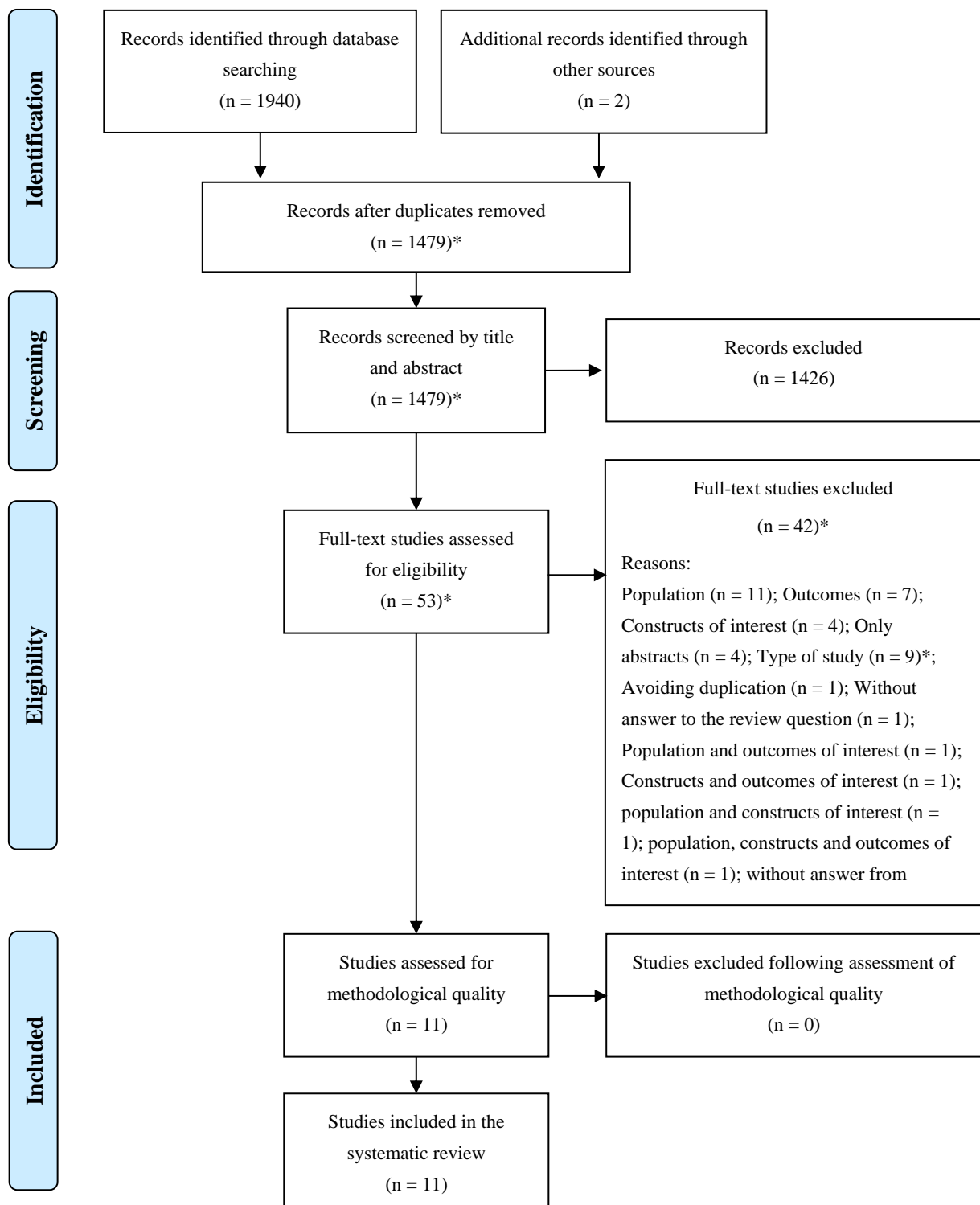
Through the databases search, 1940 records were found. Additionally, 2 records were identified through other sources (one was identified through the reference list of a study assessed for relevance in full-text phase and another was sent by the author after a request of a full-text of a conference presentation). From the 1942 records, 463 were excluded as duplicates. Two of the studies present the same data (one paper published in a scientific journal and one thesis), but both were included for analysis against the inclusion criteria in order to complement the information. The title and abstract of 1479 records were screened and by this analysis 1426 records were excluded. The full-texts of the remaining 53 references were assessed for relevance. Of this analysis, 42 records were excluded. The detailed reasons for exclusion of full-text articles are presented in Appendix III of this Chapter. The critical appraisal of the remaining 11 studies was performed and all these studies were included in this review. Figure 1 shows the process described above. The included studies reported data regarding five instruments: EBP Questionnaire developed by Rubin and Parrish<sup>33-35</sup>; Student Evidence-based Practice Questionnaire (S-

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<sup>21</sup> This is a limitation of the study that will be addressed before the submission for a scientific journal.

EBPQ)<sup>22, 32, 36</sup>; Evidence-based Practice Knowledge Assessment in Nursing (EKAN)<sup>37, 38</sup>; Evidence Based Practice Evaluation Competence Questionnaire (EBP-COQ)<sup>21, 39</sup>; and Evidence-based practice profile (EBP2) questionnaire.<sup>40</sup>





\* Two of these studies present the same data (one paper published in a scientific journal and one thesis), but both were included for analysis against the inclusion criteria in order to complement the information.

**Figure 1: Search results and study selection and inclusion process.** From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097.

*Methodological quality*

Eleven papers evaluating five instruments were included in this review. From these 11 papers, three<sup>33-35</sup> reported the same results regarding the measurement properties. Therefore, the methodological quality of these three studies was assessed as only one study.

Only the internal consistency was assessed by all studies.<sup>21, 22, 32-40</sup> The structural validity was assessed by eight studies,<sup>21, 22, 32, 36-40</sup> the content validity by eight studies,<sup>21, 33-36, 38-40</sup> the hypotheses testing for construct validity by five studies<sup>21, 22, 37, 38, 40</sup>, the reliability by four studies<sup>33-36</sup>, and the PROM development by two studies.<sup>21, 38</sup> Only one study<sup>37</sup> addressed the cross-cultural validity/measurement invariance and other<sup>40</sup> the responsiveness. None of the studies evaluated measurement error and criterion validity.

The methodological quality for each instrument is outlined below, along with a brief description of the purpose and the content of the instrument. Four out of five instruments assessed at least 50% of the measurement properties. Table 1 shows the results of the methodological quality of the PROM development and Table 2 presents the methodological quality of each study per measurement property.

EBP Questionnaire

The EBP Questionnaire, developed by Rubin and Parrish (2010), originally has five subscales. However, in the context of studies<sup>33-35</sup> included in this systematic review, only three subscales were considered to assess EBP Knowledge, attitude and adoption in a total of 34 items (knowledge= 10 items, attitude= 14 items and adoption=10 items). The instrument is measured on a 5-point Likert's scale ranging from 1 (I completely disagree) to 5 (I completely agree).<sup>33-35</sup>

The content validity, internal consistency and reliability of the EBP questionnaire were reported by three studies. However, the methodological quality of these three studies was assessed as only one study once they reported the same results regarding the measurement properties.

**Content Validity**

Regarding the content validity, the studies assessed the relevance and the comprehensiveness of the instrument by professionals, showing a *Doubtful* quality in both criteria.<sup>33-35</sup>

Within the relevance criteria, the following two items "Were at least two researchers involved in the analysis?" and "Was each item tested in an appropriate number of professionals?" was grading as *Doubtful*, because there is no enough information on the papers regarding those questions. Indeed, the paper informed that it was included 14 nursing faculty members, however it is unclear the number of other 'experts' in the field included. The items "Was an appropriate approach used to analyse the data?" and "Was an appropriate method used to ask professionals whether each item is relevant for the construct

of interest?” were graded with “Adequate”, as the authors reported the use of the Scale-Content Validity Index that is a widely recognized approach. However, it was unclear what approach was used to calculate the score, since there are multiple different ways to perform this analysis. The only item scored with *Very Good* was “Were professionals from all relevant disciplines included?”.<sup>33-35</sup>

Concerning the comprehensiveness, all the items was grading as *Doubtful*, exception made for item “Were professionals from all relevant disciplines included?” that was grading as *Very Good*.<sup>33-35</sup>

### **Internal consistency**

The papers presented a *Very Good* methodological quality on internal consistency.<sup>33-35</sup>

### **Reliability**

Regarding the reliability, the studies shows a *Doubtful* methodological quality. Even though the authors calculated intraclass correlation coefficients for continuous scores, it was unclear if participants were stable in the interim period of the measurement and if the time interval was appropriate.<sup>33-35</sup>

### **Student Evidence-based Practice Questionnaire (S-EBPQ)**

The Student Evidence-Based Practice Questionnaire (S-EBPQ) has 21 items that are measured on 7-point Likert scales. It has four subscales: Practice (how often the student performed EBP behaviours) – 6 items; Attitude – 3 items; Retrieving and reviewing evidence (students' perception of their EBP knowledge) – 7 items; Sharing and applying EBP (EBP skills) – 5 items.<sup>22</sup>

Three studies<sup>22, 32, 36</sup> reported results on five measurement properties regarding the S-EBPQ.

### **Content Validity**

Only the study of Zhang et al.<sup>36</sup> assessed content validity. Overall, the methodological quality on this measurement property is *Doubtful*.

About the assessment of the comprehensibility by participants, we assumed that the method used was appropriate but it is not clearly described. Nevertheless, they included 25 undergraduate nursing students, which is a *Very Good* number of patients for performed a qualitative analysis (structured interview). The remaining items were rated as *Doubtful*, because there is no clear information about them.<sup>36</sup>

In the assessment of the relevance by professionals, the item “Was an appropriate method used to ask professionals whether each item is relevant for the construct of interest?” and “Were professionals from all relevant disciplines included?” were rated with *Adequate*, as only quantitative method was used and

it is not clearly described if professionals from all required disciplines were included. The item “Was an appropriate approach used to analyse the data?” has a Very Good rating as the authors clearly informed that they used the content validity index. The others items were graded as *Doubtful*, once the number of professionals included for the analysis of relevance was less than 30 and it was unclear if two researchers were included in the analysis.<sup>36</sup>

In the assessment of the comprehensiveness by professionals, all the item were graded with a *Doubtful*, because it is unclear information regarding the methods and analysis approach used, professionals included and involved researchers.<sup>36</sup>

### **Structural validity**

Three studies reported results on structural validity.<sup>22, 32, 36</sup> Beccaria et al. has a *Doubtful* methodological quality on this measurement property, because the attitude scale was negatively skewed which is considered a violation of assumptions in factor analysis, although authors cited that it is still a robust approach regardless.<sup>32</sup>

Upton et al. has an *Adequate* methodological quality on structural validity. The authors conducted Principal Component Analysis, which is a form of exploratory factor analysis, explaining their decisions.<sup>22</sup>

Zhang et al.<sup>36</sup> has a Very Good methodological quality on structural validity. They used exploratory factor analysis and confirmatory factor analysis to assess the structural validity with an adequate sample size (190 participants for Exploratory factor analysis and 210 for confirmatory factor analysis).

### **Internal consistency**

The methodological quality of the internal consistency was *Very Good* for the three studies reporting this outcome.<sup>22, 32, 36</sup> Within these studies, the internal consistency statistic was calculated for each subscale of the S-EBPQ using the Cronbach’s alpha.

### **Reliability**

Zhang et al. has an *Adequate* methodological quality on reliability because we can assume that patients were stable, test conditions were similar and intraclass correlation coefficient was calculated but the authors did not provide sufficiently clear information on these issues.<sup>36</sup>

### **Hypotheses testing for construct validity**

Within hypotheses testing for construct validity measurement properties, the study of Upton et al. assessed the discriminative or known-groups validity (comparison between subgroups). The

methodological quality for this property was *Doubtful* because there was no description of the important characteristics of the subgroups.<sup>22</sup>

### Evidence-based Practice Knowledge Assessment in Nursing (EKAN)

The Evidence-based Practice Knowledge Assessment in Nursing (EKAN) is a multiple-choice test with 20 items that aims to assess the EBP knowledge.

Two studies<sup>37, 38</sup> reported results on six measurement properties regarding the EKAN.

#### **Content Validity (including PROM Development)**

The PROM development, more specifically the general design requirements, was reported by Spurlock et al.<sup>38</sup> In this study, the authors clearly described the construct and its origin as well as the target population and context of the instrument use. However, we assumed that the study was performed in a sample representing the target population, but this was not clearly described. Additionally, the authors provided data on the assessment of the relevance by professionals. Overall, it has a *Doubtful* methodological quality, considering the low number of professionals included for the analysis of relevance and the information unclear about the researchers included in the analysis.<sup>38</sup>

#### **Structural validity**

Spurlock et al.<sup>38</sup> and Nick et al.<sup>37</sup> assessed the structural validity. The overall rating of the methodological quality of that measurement property was *Very Good*<sup>38</sup> and *Adequate*.<sup>37</sup> This Adequate score is justified by the number of participants included in the Rasch Analysis and by the lack of information regarding the reasons behind the choice of the analysis model.<sup>37</sup>

#### **Internal consistency**

The methodological quality of the internal consistency was *Very Good* for study of Nick et al.<sup>37</sup> and Spurlock et al.<sup>38</sup> Within these studies, the internal consistency statistic was calculated for each subscale of the S-EBPQ using the Cronbach's alpha.

#### **Cross-cultural validity/measurement invariance**

The cross-cultural validity/measurement invariance of the EKAN was assessed only in one study. Within this study,<sup>37</sup> the methodological quality for this property was *Doubtful* because the sample size and the unclear information concerning the similarity for relevant characteristics between the groups.

#### **Hypotheses testing for construct validity**

Spurlock et al.<sup>38</sup> and Nick et al.<sup>37</sup> assessed the discriminative or known-groups validity (comparison between subgroups) within hypotheses testing for construct validity measurement properties. The methodological quality for this property was *Adequate* considering that there was an adequate description of the most important characteristics of the subgroups.

#### Evidence Based Practice Evaluation Competence Questionnaire (EBP-COQ)

Evidence Based Practice Evaluation Competence Questionnaire (EBP-COQ) has 25 items with a 5-point Likert-type scale, ranging from 1 “Strongly disagree” to 5 “Strongly agree”. It aims to assess the attitudes toward EBP, skills in EBP and Knowledge in EBP.

Two studies<sup>21,39</sup> reported results on five measurement properties regarding the EBP-COQ.

#### **Content Validity (including PROM Development)**

Content validity was measured by Ruzafa-Martinez et al.<sup>21</sup> and Yildiz, & Güngörmüş.<sup>39</sup> Overall, the quality of this measurement property was *Doubtful* for both studies.

The PROM development was reported by Ruzafa-Martinez et al.<sup>21</sup> Regarding the general design requirements, the authors provided clear information regarding construct to be measured, the target population of the instrument and the context of use. However, they did not present information on construct origin, i.e. the theory, conceptual model or other rationale to define the construct to be measured. Additionally, in the concept elicitation (relevance and comprehensiveness), it was not clear if group moderators/interviewers were trained and if the data saturation was reached. The pilot study conducted by Ruzafa-Martinez et al.<sup>21</sup> was performed in a sample representing the target population (undergraduate nursing students). The assessment of methodological quality of comprehensibility showed that all the items applicable were scored as *Doubtful*. Only the item “Were problems regarding the comprehensibility of the PROM instructions, items, response options, and recall period appropriately addressed by adapting the PROM?” was scored as *Adequate*. About the assessment of the comprehensibility by participants, we assumed that the method used was appropriate but it is not clearly described. Nevertheless, the remaining items were rated as *Doubtful*, because there is no clear information about them which is the reason for an overall rating of *Doubtful*.<sup>21</sup>

In the assessment of the relevance by professionals, the item “Was an appropriate method used to ask professionals whether each item is relevant for the construct of interest?” and “Were professionals from all relevant disciplines included?” were rated with *Adequate*, as we assume that the method was appropriate but they was not clearly described and we did not find clearly information to decide if professionals from all required disciplines were included. The item “Was an appropriate approach used to analyse the data?” has a *Very Good* rating. The others items were graded as *Doubtful*, once the number

of professionals included for the analysis of relevance was less than 30 and it was unclear if two researchers were included in the analysis.<sup>21</sup>

Within the study of Yildiz and Güngörmüş,<sup>39</sup> the methodological quality on content validity, particularly on assessment of the comprehensiveness and relevance of the instrument by professionals, is *Doubtful*. In relation to the assessment of the relevance, the items 24 (“Was each item tested in an appropriate number of professionals?”) and 26 (“Were at least two researchers involved in the analysis?”) were graded as *Doubtful*, because only eight experts were included to test the items and there is not enough information on the paper regarding the number of researchers involved in the analysis. The items “Were professionals from all relevant disciplines included?” and “Was an appropriate method used to ask professionals whether each item is relevant for the construct of interest?” were graded with *Adequate*. The only item scored with *Very Good* was “Was an appropriate approach used to analyse the data?”.<sup>39</sup>

### **Structural validity**

Ruzafa-Martinez et al.<sup>21</sup> and Yildiz and Güngörmüş<sup>39</sup> assessed the structural validity. The overall rating of the methodological quality of that measurement property was *Adequate*<sup>21</sup> and *Very Good*.<sup>39</sup> The Adequate score is due to the use of a Principal Component Analysis, whereas while different from exploratory factor analysis, it is considered a way of performing exploratory factor analysis.<sup>21</sup>

Yildiz, & Güngörmüş<sup>39</sup> used confirmatory factor analysis to assess the structural validity with an adequate sample size (199 participants).

### **Internal consistency**

The methodological quality of the internal consistency was *Very Good* for the two studies reporting this outcome.<sup>21, 39</sup> The internal consistency was calculated for each subscale of the EBP-COQ using the Cronbach’s alpha.

### **Hypotheses testing for construct validity**

Within hypotheses testing for construct validity measurement properties, the study of Ruzafa-Martinez et al.<sup>21</sup> assessed the convergent validity (comparison with other outcome measurement instruments) and discriminative or known-groups validity (comparison between subgroups). Regarding convergent validity, the methodological quality was *Inadequate*. Visual analogue scales, the instrument used to test the convergent validity, are not clearly presented in the study. The authors did not provide details about the constructs measured and the measurement properties of the visual analogue scales.<sup>21</sup>

Discriminative validity was measured through the comparison of nursing students with previous EBP training and research methodology and those without. The methodological quality of the discriminative

validity was Adequate, because the authors provide an adequate description of most of the important characteristics of the subgroups and we can assume that statistical method used was appropriate.<sup>21</sup>

### Evidence-based practice profile (EBP<sup>2</sup>) questionnaire

The Evidence-based practice profile (EBP<sup>2</sup>) questionnaire has 74 items (58 domain items and 16 non-domain). The 58 domain items are organized in five subscales: Relevance (14 items), Sympathy (7 items), Terminology (17 items), Practice (9 items) and Confidence (11 items). Relevance subscale refers to the value, emphasis and importance placed on EBP. Sympathy subscale refers to the individual's perception of the compatibility of EBP with professional work. Terminology subscale refers to the understanding of common research terms. Practice subscale refers to the use of EBP in clinical situations. Confidence subscale refers to the perception of an individual's ability with EBP skills. The type of response used by the instrument was a 5-point Likert scale.

Only one study<sup>40</sup> reported results on five measurement properties regarding the EBP<sup>2</sup>.

### **Content Validity**

The methodological quality on content validity, particularly on assessment of the comprehensibility by participants, is *Doubtful*.<sup>40</sup> From the seven items, only two were rated as *Very Good* (item "Was each item tested in an appropriate number of patients?" and item "Was an appropriate approach used to analyse the data?"). The item "Was an appropriate method used for assessing the comprehensiveness of the PROM?" was graded as *Adequate* once we assume that the method was appropriate, but it is not clearly described. The others items were graded as *Doubtful*, because the authors did not clarify if group moderators/interviewers were trained or not, if a topic guide was used, if all group meetings or interviews were recorded and transcribed verbatim, and if two researchers were included in the analysis.

### **Structural validity**

Titlestad et al.<sup>40</sup> has a *Inadequate* methodological quality on structural validity, because they used an insufficient sample size, i.e. they included less than five times the number of items. The reimagining items we graded with a *Very Good* score, as the authors used a confirmatory factor analysis performed without any other important flaws.

### **Internal consistency**

The methodological quality of the internal consistency was *Very Good*.<sup>40</sup> The internal consistency was calculated for each subscale of the EBP<sup>2</sup> using the Cronbach's alpha.

### **Hypotheses testing for construct validity**



Within hypotheses testing for construct validity measurement property, the study of Titlestad et al. assessed the discriminative or known-groups validity (comparison between subgroups). The methodological quality for this property was *Doubtful* because there was no description of the important characteristics of the subgroups.<sup>40</sup>

### **Responsiveness**

The responsiveness, more specifically the construct approach (i.e. hypotheses testing: before and after intervention), is of inadequate methodological quality because the authors<sup>40</sup> used a paired t-test, which is an inappropriate measure of responsiveness as stated by COSMIN.<sup>30</sup> Moreover, the authors provided a poor description of the intervention applied.<sup>40</sup>

Table 1. Quality of the PROM development

PROM	PROM design					Cognitive interview (CI) study <sup>2</sup>				TOTAL PROM DEVELOPMENT
	General design requirements					Total PROM design	General design requirements	Comprehensibility	Comprehensiveness	
	Clear construct	Clear origin of construct	Clear target population for which the PROM was developed	Clear context of use	PROM developed in sample representing the target population					Concept elicitation <sup>1</sup>
Spurlock et al. 38	V	V	V	V	A	-	-	-	-	A
Ruzafa-Martinez et al. 21	V	D	V	V	V	D	V	D	D	D

Legend: D – Doubtful; A – Adequate; V – Very Good.

Table 2. Overall results of methodological quality of each study per measurement property

Measurement properties	Content validity				Structural validity	Internal consistency	Cross-cultural validity	Reliability	Measurement error	Criterion validity	Construct validity		Responsiveness			
	Asking patients		Asking experts								Convergent validity	Known groups validity	Comparison with gold standard	Comparison with other instruments	Comparison between subgroups	Comparison before and after intervention
	Relevance	Comprehensiveness	Comprehensibility	Relevance												
Ashktorab et al. <sup>33</sup>	-	-	-	D	-	V	-	D	-	-	-	-	-	-	-	
Ashktorab et al. <sup>34</sup>	-	-	-	D	-	V	-	D	-	-	-	-	-	-	-	
Pashaeypoor et al. <sup>35</sup>	-	-	-	D	-	V	-	D	-	-	-	-	-	-	-	
Beccaria et al. <sup>32</sup>	-	-	-	D	D	V	-	A	-	-	-	-	-	-	-	
Upton et al. <sup>22</sup>	-	-	-	D	A	V	-	-	-	D	-	-	-	-	-	
Zhang et al. <sup>36</sup>	-	-	-	D	V	V	-	A	-	-	-	-	-	-	-	
Spurlink et al. <sup>38</sup>	-	-	-	D	V	V	-	-	-	-	A	-	-	-	-	
Nick et al. <sup>37</sup>	-	-	-	D	A	V	D	-	-	-	A	-	-	-	-	
Ruzafa-Martinez et al. <sup>21</sup>	-	-	-	D	A	V	-	-	-	-	A	-	-	-	-	
Yildiz, & Güngörmüçü <sup>39</sup>	-	-	-	D	V	V	-	-	-	-	-	-	-	-	-	
Tiftelstad et al. <sup>40</sup>	-	-	-	D	I	V	-	-	-	-	D	-	-	-	I	

Legend: I- Inadequate; D – Doubtful; A – Adequate; V – Very Good.

### **Findings of the Review**

Eleven papers evaluating five instruments were included in this review. The characteristics of the 11 included studies are presented in Appendix IV of this Chapter.

Three studies were conducted in Iran<sup>33-35</sup>, one in Australia<sup>32</sup>, one in United Kindom<sup>22</sup>, one in China<sup>36</sup>, one in United States of America<sup>38</sup>, one in Dominican Republic<sup>37</sup>, one in Spain<sup>21</sup>, one in Turkey<sup>39</sup> and one in Norway.<sup>40</sup> From the three studies conducted in Iran<sup>33-35</sup>, two studies<sup>34, 35</sup> are with the same sample and the other one have a different sample. Nevertheless, the three studies reported the same results regarding the measurement properties. Therefore, in the presentation of measurement properties results these three studies are reported as only one study.

The 11 included studies were published between 2013 and 2018. This systematic review included one randomized control trial<sup>33</sup>, five cross-sectional studies<sup>32, 34-37</sup>, three instrument development studies<sup>21, 22, 38</sup>, and two translation and validation studies.<sup>39, 40</sup>

### ***Instruments, Language and Constructs of Interest***

This review included five different instruments: EBP Questionnaire developed by Rubin and Parrish<sup>33-35</sup>; Student Evidence-based Practice Questionnaire (S-EBPQ)<sup>22, 32, 36</sup>; Evidence-based Practice Knowledge Assessment in Nursing (EKAN)<sup>37, 38</sup>; Evidence Based Practice Evaluation Competence Questionnaire (EBP-COQ)<sup>21, 39</sup>; and Evidence-based practice profile (EBP2) questionnaire.<sup>40</sup>

The languages of the instruments are Persian<sup>33-35</sup>, English<sup>22, 32, 38</sup>, Mandarin Chinese<sup>36</sup>, Spanish<sup>21, 37</sup>, Turkish<sup>39</sup> and Norwegian.<sup>40</sup>

Only two instruments assess all the constructs of interest: Student Evidence-based Practice Questionnaire (S-EBPQ)<sup>22, 32, 36</sup> and Evidence Based Practice Evaluation Competence Questionnaire (EBP-COQ)<sup>21, 39</sup>.

Table 3 shows the instruments included, as well as, the constructs of interest that each instrument assess.

Table 3. Instruments included in the review, the constructs of interest that each instrument assess and instruments language.

Instrument	Instrument language	Study	Constructs		
			Knowledge	Attitudes	Skills
EBP Questionnaire developed by Rubin and Parrish (2010)	Persian	Ashktorab et al. <sup>33</sup>	x	x	
		Ashktorab et al. <sup>34</sup>			
		Pashaeypoor et al. <sup>35</sup>			
Student Evidence-based Practice Questionnaire (S-EBPQ)	English	Beccaria et al. <sup>32</sup>	x	x	x
	English	Upton et al. <sup>22</sup>			
	Mandarin chinese	Zhang et al. <sup>36</sup>			
Evidence-based Practice Knowledge Assessment in Nursing (EKAN)	English	Spurlock et al. <sup>38</sup>	x		
	Spanish	Nick et al. <sup>37</sup>			
Evidence Based Practice Evaluation Competence Questionnaire (EBP-COQ)	Spanish	Ruzafa-Martinez et al. <sup>21</sup>	x	x	x
	Turkish	Yildiz, & Güngörmüş <sup>39</sup>			
Evidence-based practice profile questionnaire (EBP <sup>2</sup> )	Norwegian	Titlestad et al. <sup>40</sup>	x	x	

#### *Subscales, Number of items and Type of response by instrument*

In the five instruments included in the review, the number of items ranges between 20 items and 74 items. Only one instrument assessed only one construct and, so, it does not have subscales. Three from the five instruments are scored on a 5-point Likert-type scale. The other two used a scale of 1 to 7 and a multiple-choice test.

Table 4 shows detail information on subscales, number of items and type of response of the instruments included in current review.

Table 4. Subscales, number of items and type of response of the instruments included in the review.

<b>Instrument</b>	<b>Subscales</b>	<b>Number of items</b>	<b>Type of response</b>
<b>EBP Questionnaire developed by Rubin and Parrish</b> <sup>33-35</sup>	5 subscales but only the following 3 were used: - EBP Knowledge; - Attitude; - Adoption.	34 items: - knowledge= 10 items; - attitude= 14 items; - adoption=10 items	5-point Likert's scale ranging from 1 (I completely disagree) to 5 (I completely agree).
<b>Student Evidence-based Practice Questionnaire (S-EBPQ)</b> <sup>22, 32, 36</sup>	4 subscales: - Practice; - Attitude; - Retrieving and reviewing evidence; - Sharing and applying EBP.	21 items: - Practice – 6 items - Attitude – 3 items - Retrieving and reviewing evidence – 7 items - Sharing and applying EBP – 5 items	Scale of 1 to 7, with a higher score indicating a more positive attitude toward clinical effective, use, knowledge, and skills.
<b>Evidence-based Practice Knowledge Assessment in Nursing (EKAN)</b> <sup>37, 38</sup>	Without subscales	20 items	Multiple choice test
<b>Evidence Based Practice Evaluation Competence Questionnaire (EBP-COQ)</b> <sup>21, 39</sup>	3 subscales: - Attitude toward EBP; - Skills in EBP; - Knowledge in EBP.	25 items: - Attitude toward EBP – 13 items; - Skills in EBP – 6 items; - Knowledge in EBP – 6 items.	The 5-point Likert-type scale (1 = Strongly Disagree, 2 = Somewhat Disagree, 3 = Neither Disagree nor Agree, 4 = Somewhat Agree, 5 = Strongly Agree)
<b>Evidence-based practice profile questionnaire</b> <sup>40</sup>	5 subscales: - Relevance; - Sympathy; - Terminology; - Practice; - Confidence.	74 items: - Relevance (14 items) - Sympathy (7 items) - Terminology (17 items) - Practice (9 items) - Confidence (11 items)	5-point Likert scale

### Measurement Properties Results by Instrument

Due to heterogeneity between studies in terms of instrument version (e.g., language and context), we did not synthesize the data through a best-evidence synthesis.<sup>30</sup> Therefore, we present the synthesized results of measurement properties by instruments and study in table 5.

Table 5. Results of measurement properties by instruments and study.

Instrument	Instrument language	Study	Results on measurement properties	Overall results of methodological quality
EBP Questionnaire developed by Rubin and Parrish (2010)	Persian	Ashktorab et al. <sup>33</sup>	<b>Content Validity</b> 14 nursing faculty members and EBP experts evaluated the face and content validity.	<b>Doubtful</b>
		Ashktorab et al. <sup>34</sup>	Scale-Content Validity Index = 0.98.	
		Pashaeypoor et al. <sup>35</sup>	<b>Internal Consistency</b> Cronbach's alpha > 0.80, with $\alpha = 0.82$ for knowledge subscale, $\alpha = 0.80$ for attitude subscale and $\alpha = 0.75$ for adoption subscale	<b>Very Good</b>
			<b>Reliability</b> ICC = 0.94 for Knowledge subscale, ICC = 0.94 for the attitude subscale and ICC = 0.74 for the adoption subscale.	<b>Doubtful</b>
Student Evidence-based Practice Questionnaire (S-EBPQ)	English	Beccaria et al. <sup>32</sup>	<b>Structural Validity</b> The initial Confirmatory Factor Analysis (CFA) resulted in a poor fitting model, where $\chi^2/(df) = 4.875$ , a CFI = 0.873, and a RMSEA = 0.106 (CI90 = 0.099–0.113). After some modification, the CFA resulted in a reasonable fitting model, where $\chi^2/(df) = 2.57$ , a CFI = 0.951, and a RMSEA = 0.068 (CI90 = 0.060–0.076). All standardised path coefficients were significant with the smallest being the path to question 1= 0.4 and the largest was the path to question 14= 0.89	<b>Doubtful</b>
			<b>Internal Consistency</b> Cronbach alpha = 0.92 for Practice subscale, 0.52 for Attitude subscale, 0.94	<b>Very Good</b>

Instrument	Instrument language	Study	Results on measurement properties	Overall results of methodological quality
			for Retrieving and Reviewing subscale, and 0.91 for Sharing and Applying subscale.	
English		Upton et al. <sup>22</sup>	<p><b>Structural Validity</b></p> <p>Principal Component Analysis (PCA) was performed again after the exclusion of three items (items 7, 12 and 13). Based on Kaiser's criterion, four factors were extracted, explaining 65% of the variance. Factor 1 had 7 items, factor 2 comprised 6 items, factor 3 had 6 items, and factor 4 comprised 3 items.</p>	<b>Adequate</b>
			<p><b>Internal Consistency</b></p> <p>This measurement property was calculated for each subscale of the S-EBPQ. The Cronbach's alpha and split-half reliability were &gt; 0.7.</p> <p>Cronbach's alpha if item deleted was calculated and these estimates indicated that all items were contributed in a meaningful way and were retained.</p>	<b>Very Good</b>
			<p><b>Construct Validity</b></p> <p>The MANOVA revealed a statistically significant main effect of study year (Wilks' lambda = .90, F(8476)= 3.28, p = .001, <math>\eta^2 = .05</math>).</p> <p>The Bonferroni correction was applied (resulting in a new alpha of .013) and statistically significant differences were identified separately on the practice subscale (F(2241) = 7.14, p = .001, <math>\eta^2 = .06</math>) and the retrieval and reviewing of evidence subscale (F(2241) = 8.20, p &lt; .001, <math>\eta^2 = .06</math>). However, no significant differences were identified on the attitude subscale (F(2241)=1.09, p = .337, <math>\eta^2 = .01</math>) or the sharing and applying subscale (F(2241) = 3.34, p = .037, <math>\eta^2 = .03</math>).</p> <p>Post-hoc comparisons were performed on the practice subscale, and retrieval and</p>	<b>Doubtful</b>



Instrument	Instrument language	Study	Results on measurement properties	Overall results of methodological quality
			<p>reviewing evidence subscale scores for students in their 1st, 2nd and 3rd years of study. Significant differences were identified (based on a Bonferroni corrected alpha of 0.17) between students in years 1 and 3 (<math>p = .001</math>) and years 2 and 3 (<math>p = .007</math>) on the practice subscale and between students in years 1 and 3 (<math>p = .012</math>) and years 2 and 3 (<math>p &lt; .001</math>) on the retrieval and reviewing evidence subscale.</p> <p>Examining the means for each year revealed patterns broadly in the direction anticipated; for example, the third-year scores were higher than first year scores on all subscales.</p>	
Mandarin chinese		Zhang et al. <sup>36</sup>	<p><b>Content Validity</b></p> <p>Content validity index = 0.986</p>	<b>Doubtful</b>
			<p><b>Structural Validity</b></p> <p>Principal component analysis resulted in a 4-factor structure explaining 68.285% of the total variance.</p> <p>From the CFA, CFI = 0.927; root mean squared error of approximation = 0.072</p>	<b>Very Good</b>
			<p><b>Internal Consistency</b></p> <p>Cronbach's alpha = 0.934 for the entire scale. Cronbach alpha = 0.857 for Practice subscale, 0.699 for Attitude subscale, 0.921 for Retrieving and Reviewing subscale, and 0.894 for Sharing and Applying subscale.</p>	<b>Very Good</b>
			<p><b>Reliability</b></p> <p>Split-half reliability = 0.858. In the Bland-Altman agreement analysis, the mean differences between test and retest for “practice” = 1.0, “attitude” = 0.4, for “retrieving and reviewing evidence” = -0.7 and “sharing and applying EBP” = 0.6. The 95% limits of agreement of differences for “practice” was from -8.2 to 10.2, for “attitude” was from -4.7 to</p>	<b>Adequate</b>

Instrument	Instrument language	Study	Results on measurement properties	Overall results of methodological quality
			<p>5.4, for “retrieving and reviewing evidence” was from -11.7 to 10.6, and for “sharing and applying EBP” was from -7.0 to 8.1. All the 4 subscales obtained a Bland-Altman index of 4%.</p> <p>For the overall scale, ICC = 0.821. For the four subscales, the ICC varied between 0.781 and 0.844.</p>	
<b>Evidence-based Practice Knowledge Assessment in Nursing (EKAN)</b>	English	Spurlock et al. <sup>38</sup>	<p><b>Content Validity</b></p> <p>Content validity index = 0.94 for the 75 candidate items of the EKAN.</p> <p>Using Rasch analysis for selecting items for a knowledge scale is an iterative process, where item and scale analysis data inform theory-based judgments on the selection of items for a final scale.</p>	<b>Doubtful</b>
			<p><b>Structural Validity</b></p> <p>For the final, 20-item EKAN measure, mean item difficulty was <math>M = 0.19</math> (range = -2.0 to 2.8), weighted mean square infit was <math>M = 1.01</math> (range = 0.95 to 1.06), standardized weighted mean square infit was <math>M = 0.33</math> (range = -0.7 to 1.6), unweighted mean square outfit was <math>M = 1.02</math> (range = 0.93 to 1.14), and standardized unweighted mean square outfit was <math>M = 0.34</math> (range = -1.08 to 2.00).</p>	<b>Very Good</b>
			<p><b>Internal Consistency</b></p> <p>The item separation index was 7.05; the person separation index was 1.66.</p> <p>Item reliability was 0.98; person reliability was 0.66.</p>	<b>Very Good</b>
			<p><b>Construct Validity</b></p> <p>To test for known-groups prior exposure or educational effects, participants who had not yet completed a nursing research/EBP course (a combination of participants not yet enrolled in a course or</p>	<b>Adequate</b>

Instrument	Instrument language	Study	Results on measurement properties	Overall results of methodological quality
			<p>those currently enrolled in the first week of class) were compared with those who completed the course between 6 months and 1 year ago. An almost 2-point difference in mean EKAN scores between groups was noted (10.01 versus 11.47; <math>t = -2.53</math>, <math>p = .01</math>). A similar effect was seen in relation to the statistics course; those not having completed a statistics course scored statistically significantly worse on the EKAN than those who completed the course between 6 months and 1 year ago (<math>M = 8.8</math> versus <math>10.9</math>, <math>t = -2.53</math>, <math>p = .015</math>). To further demonstrate this, the top and bottom decile of participants by EKAN score (<math>M = 6.5</math> versus <math>14.1</math>) were compared.</p> <p>Eighty percent of the top decile scorers had completed 75% or more of their educational programs, whereas only 20% of the bottom decile scorers had completed as much (<math>\chi^2(4,1) = 12.47</math>, <math>p = .01</math>).</p>	
Spanish		Nick et al. <sup>37</sup>	<p><b>Structural Validity</b></p> <p>Using Rasch model analytics, validity indices of the EKAN produced a difficulty index ranging from <math>\Theta = -1.78</math> to <math>2.22</math>. Mean infit and outfit statistics narrowly centered on 1.0 (WMS <math>M = .978</math>; UMS <math>M = .988</math>) indicating strong evidence of trait unidimensionality.</p>	<b>Adequate</b>
			<p><b>Internal Consistency</b></p> <p>The EKAN-Spanish item separation was robust at 4.27 but person separation was somewhat limited at .38.</p> <p>Item reliability was .94 and person reliability was .13, indicating trait (EBP knowledge) restriction among the study sample.</p>	<b>Very Good</b>
			<b>Cross-Cultural Validity</b>	<b>Doubtful</b>

Instrument	Instrument language	Study	Results on measurement properties	Overall results of methodological quality
			<p>Differential item functioning (DIF) analysis produced no evidence of language-related concern on any of the EKAN's 20 items, supporting translational accuracy.</p>	
			<p><b>Construct validity - Known groups validity</b></p>	<b>Adequate</b>
			<p>For baseline knowledge assessment, the mean EKAN EBP knowledge score for the group was 6.52 (SD = 2.03) out of 20 possible points, with scores ranging from 2-12 points. No statistically significant differences in mean EKAN scores were found when comparing subjects by level of completion of the nursing program (<math>F = 1.81</math>, <math>df = 5</math>, <math>117</math>, <math>p = .117</math>) or whether subjects had completed a special EBP course or not (<math>F = .302</math>, <math>df = 4</math>, <math>117</math>, <math>p = .876</math>). Current enrollment in a statistics course however was associated with higher scores on the EKAN when compared to subjects having not yet taken or having previously taken the course (<math>F = 4.51</math>, <math>df = 2</math>, <math>119</math>, <math>p = .013</math>).</p>	
			<p>While subjects' self-rated competence to deliver evidence-based care on a scale from 1 = strongly disagree to 5 = strongly agree was quite high (<math>M = 4.16</math>, <math>SD = .80</math>), the correlation between self-reported confidence and objectively measured EBP knowledge was small, negative, and statistically nonsignificant (<math>r = -.041</math>, <math>p = .654</math>).</p>	
<p><b>Evidence Based Practice Evaluation Competence Questionnaire (EBP-COQ)</b></p>	Spanish	Ruzafa-Martinez et al. <sup>21</sup>	<p><b>Content Validity</b></p> <p>The questionnaire was developed by item generation through a review of scientific literature and focus groups. The instrument was validated in terms of content validity through an expert review. The EBP-COQ was administered to a cohort of nursing students (<math>n = 100</math>) to</p>	<b>Doubtful</b>

Instrument	Instrument language	Study	Results on measurement properties	Overall results of methodological quality
			<p>evaluate test reliability and select the best items.</p> <p>Six experts evaluated the level of relevance of each item for its corresponding dimension of competence in EBP. The items were classified according to three categories: 3 “essential”, 2 “interesting but not essential” and 1 “irrelevant”. The statistical mean for each item was calculated and those, which had a mean over 2.5, were kept on the scale (relevance of 83.3%). The following version of the questionnaire was reduced to 62 items in a proportion that was the equivalent of items edited in a positive and negative sense.</p> <p>In addition, 20 undergraduate nursing students were selected in order to assess the comprehension and feasibility of the reviewed pool of items and format response. They were selected with a socio-demographic and work profile that was similar to that of the study population.</p> <p>The second phase and after modifying the items according the nursing students’ suggestions, first draft of the EBP-COQ (62 items) was administered to a convenience sample of second- and third-year nursing students enrolled at Faculty of Nursing in Spain. The day that the instrument was administered 148 students attended to class and 100 of them completed the questionnaire. The aims of this were to evaluate the quality of generated items and eliminate those proving to be inadequate.</p>	
			<b>Structural Validity</b>	<b>Adequate</b>
			<p>Finally, the factorability of the 25 items was examined. Several well-recognised criteria for the factorability of a correlation were used. Firstly, the 25 items correlated at least 0.3 with at least one</p>	

Instrument	Instrument language	Study	Results on measurement properties	Overall results of methodological quality
			<p>other item, suggesting reasonable factorability. Secondly, the Kaiser–Meyer–Olkin measure of sampling adequacy was 0.933 (<math>p &lt; 0.001</math>), suggesting that factor analysis was appropriate for this data set. Barlett’s test of sphericity was significant (<math>\chi^2(300) = 3037.995, p &lt; 0.001</math>). The diagonals of the anti-image correlation matrix were all over 0.5, supporting the inclusion of each item in the factor analysis. Finally, the communalities were all above 0.3 further confirming that each item shared some common variance with other items. Given these overall indicators, factor analysis was conducted with all 25 items.</p> <p>The exploratory factor analysis (principal components) of the remaining 25 items, using varimax rotation to account for the relationship among the factors, yielded a three-factor structure that explained 55.55% of the variance of the data.</p> <p>Factor 1 (13 items): “Attitude toward EBP” consisted of items A2, A3, A4, A5, A6, A8, A9, A10, A11, A12, A14, A15 and A16 explained 33,46% of the total variance (eigenvalue 8.36);</p> <p>Factor 2 (6 items): “Skills in EBP” consisted of items C1, C2, C4, C5, C6 and C7 explained 17,07% of the variance (eigenvalue 4.27); and</p> <p>Factor 3 (6 items): “Knowledge in EBP” consisted of items C8, C9, C11, C12, C13 and C14 explained 5,03% of the total variance (eigenvalue 1.26).</p>	
			<b>Internal Consistency</b>	<b>Very Good</b>
			<p>Cronbach's alpha = 0.888 for the entire scale. Cronbach alpha = 0.940 for Attitude toward EBP subscale, 0.756 for Skills in EBP subscale, and 0.800 for Knowledge in EBP subscale.</p>	

Instrument	Instrument language	Study	Results on measurement properties	Overall results of methodological quality
			<p><b>Construct Validity</b></p> <p>External construct validity was also established by exploring the correlation between questionnaire scores and other variables that have been supposed are related to the competence in EBP concept. A positive and high relationship was found between “attitude toward research” and EBP competence (global score) and factor 1: “attitude toward EBP”. However, there is not relationship with factor 3: “knowledge in EBP” and the correlation with the factor 2: “skills in EBP” is moderate.</p> <p>A sizable and significant positive correlation is present between factor 2 and 3 and the perception of knowledge level and skills level measured through a visual analogue scale. Other correlations are smaller, even though some are significant. However, we should notice that factor 1 only correlates with self reported attitude toward EBP scale.</p> <p>Discriminant validity was assessed by comparing those nursing students with previous training in EBP and research methodology and those without. The results of the Student’s t-test used to compare independent means indicated that those who have receive formal education in EBP and research methodology had a better self perception of Knowledge and Skills in EBP. The attitude toward EBP is also higher at those nursing students with training in EBP and Research although the different are only near significant.</p>	<b>Inadequate</b>
Turkish		Yildiz and GÜNGÖRMÜŞ, 39	<p><b>Content Validity</b></p> <p>Eight team members evaluated the scale items, and the CVI of the items were found to be between 0.87 and 1.00. The</p>	<b>Doubtful</b>

Instrument	Instrument language	Study	Results on measurement properties	Overall results of methodological quality
			CVI for all items in the scale was found to be 0.93.	
			<b>Structural Validity</b>	<b>Doubtful</b>
			<p>Explanatory factor analysis was used for testing the construct validity of the scale. Bartlett's sphericity test and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy were performed to ensure that the characteristics of the data were suitable for factor analysis. In testing the sample adequacy, KMO value was found to 0.856, and the Bartlett's test result was <math>X^2=2174.93</math>, <math>df=300</math> <math>p=0.000</math>. The scale has three subscales.</p>	
			<p>The exploratory factor analysis implied a three-factor structure, explaining 50.93% of the variance in the data. Factor 1 (13 items), attitudes towards EBP, consisted of items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13. Factor 2 (6 items), skills in EBP, consisted of items 14, 15, 16, 17, 18 and 19. Factor 3 (6 items), knowledge of EBP consisted of items 20, 21, 22, 23, 24 and 25. Factor analysis showed that factor 1 explains 26.29% of the total variance (eigenvalue 6.321), factor 2 explains 15.31% of the total variance (eigenvalue 3.82), and factor 3 explains 9.33% of the total variance (eigenvalue 2.33).</p>	
			<p>To test the structure validity of the scale, confirmatory factor analysis was done. The maximum likelihood estimation technique was used in this study. As a result of the analysis, the ratio of chi-square statistic to degrees-of-freedom (<math>X^2/df</math>) was found to be 2.416 (<math>\chi^2=657.364</math> <math>df=272</math>). The RMSEA was 0.076. The TLI was 0.902, and the CFI value was 0.926. Having higher CFI and TLI values over 0.90 means that model has a good fit.</p>	



Instrument	Instrument language	Study	Results on measurement properties	Overall results of methodological quality
			<p><b>Internal Consistency</b></p> <p>Cronbach's alpha = 0.826 for the entire scale. Cronbach alpha = 0.850 for Attitude toward EBP subscale, 0.516 for Skills in EBP subscale, and 0.587 for Knowledge in EBP subscale.</p>	<b>Very Good</b>
<p><b>Evidence-based practice profile (EBP<sup>2</sup>) questionnaire</b></p>	Norwegian	Titlestad et al. <sup>40</sup>	<p><b>Content Validity</b></p> <p>Eighteen participants (including nine experts in EBP) from five different health and social professions participated in the pilot test. All participants completed a questionnaire and, after that, they were interviewed to reformulated items or answers options that were unclear. The authors used “The Problem Respond Matrix” to organize and summarized the data from the interviews. Through the analysis of this matrix, the authors recognized that 11 items were unclear or difficult to understand and, thus, they were re-worded. The nine participants with EBP expertise established face validity. The expert panel (a professor in EBP, an assistant professor and a master student) measured the content validity and concluded that the questionnaire, questions and rating scale were reasonable and relevant to the area of applicability.</p>	<b>Doubtful</b>
			<p><b>Structural Validity</b></p> <p>The CFI of the entire model was 0.59 on the first test and 0.69 on the second test. Its RMSEA was 0.090 (95% CI 0.085–0.094) and 0.089 (95% CI 0.084–0.094) while the SRMR was 0.098 and 0.095.</p>	<b>Inadequate</b>
			<p><b>Internal Consistency</b></p> <p>First test: Cronbach's alpha = 0.88 for the Relevance subscale, 0.49 for the Sympathy subscale, 0.92 for the Terminology subscale, 0.82 for the Practice subscale, 0.91 for the Confidence subscale.</p>	<b>Very Good</b>

Instrument	Instrument language	Study	Results on measurement properties	Overall results of methodological quality
			<p>Second test: Cronbach's alpha = 0.91 for the Relevance subscale, 0.66 for the Sympathy subscale, 0.94 for the Terminology subscale, 0.90 for the Practice subscale, 0.94 for the Confidence subscale.</p>	
			<b>Construct Validity</b>	<b>Doubtful</b>
			<p>There was a significant mean difference between exposure and no exposure to EBP for the domains Relevance, Terminology and Confidence.</p>	
			<b>Responsiveness</b>	<b>Inadequate</b>
			<p>To assess the questionnaire responsiveness, the authors of this study defined the following a priori hypotheses on Effect Size and Paired t test results (P value): Effect Sizes will be larger than moderate at Relevance, larger than small at Sympathy, larger than moderate at Terminology, less than small at Practice and larger than small at Confidence. The study results showed statistically significant mean differences between pre- and post-test for all domains except Sympathy. In addition, effect size values were as estimated or better for all the domains, except for Sympathy.</p>	

ICC = Interclass Correlation Coefficient; CFA = Confirmatory Factor Analysis; CFI = Comparative Fit Index; PCA = Principal Component Analysis; RMSEA = Root Mean Square Error of Approximation; CI = Confidence Interval; EBP = Evidence Based Practice; CVI = Content Validity Indices; KMO = Kaiser-Meyer-Olkin; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual

## Discussion

The objective of this review was to identify and assess the properties of instruments for measuring undergraduate nursing students' knowledge, attitudes, and skills regarding EBP.

Eleven studies including five instruments were identified. Only two instruments measured the three constructs of interest and none of the studies evaluated measurement error and criterion validity. The measurement properties assessed by the five instruments were content validity, structural validity, internal consistency, cross-cultural validity, reliability, construct validity and responsiveness.

Two studies presented the PROM development.<sup>21, 38</sup> Only the internal consistency was assessed by all studies<sup>21, 22, 32-40</sup> and the methodological quality was very good. The structural validity was assessed by eight studies<sup>21, 22, 32, 36-40</sup> and the methodological quality varied across studies from inadequate to very good. The methodological quality of the eight papers<sup>21, 33-36, 38-40</sup> that assessed the content validity was doubtful. The hypotheses testing for construct validity was evaluated by five studies<sup>21, 22, 37, 38, 40</sup>, which have a methodological quality ranged from inadequate to adequate. The four studies<sup>33-36</sup> presented data on reliability had a doubtful or inadequate methodological quality. Only one study<sup>37</sup> with a doubtful methodological quality addressed the cross-cultural validity/measurement invariance and other<sup>40</sup> with a inadequate methodological quality assessed the responsiveness.

## Validity

Within this review, the studies that reported data on content validity<sup>21, 22, 32-40</sup> had doubtful methodological quality. The content validity is a very important measurement property as it represented "the degree to which the content of a PROM is an adequate reflection of the construct to be measured".<sup>30, p. 37</sup> Further studies with instruments to assess undergraduate nursing students' knowledge, attitudes, and skills regarding evidence-based practice should be developed and should assess their content validity, namely "that the items of the PROM are relevant, comprehensive, and comprehensible with respect to the construct of interest and study population"<sup>30, p. 37</sup>, with more robust methods.

This review included eight studies that assessed the construct validity through the structural validity, the hypotheses testing and cross-cultural validity. The methodological quality of the structural validity varied across studies from inadequate to very good.<sup>21, 22, 32, 36-40</sup> The methodological quality of hypotheses testing for construct validity ranged from inadequate to adequate.<sup>21, 22, 37, 38, 40</sup> The cross-cultural validity/measurement invariance presented a doubtful methodological quality.<sup>37</sup> Bearing in mind that the construct validity is the "degree to which the scores of a PROM are consistent with hypotheses ... based on the assumption that the PROM validly measures the construct to be measured"<sup>30, p. 12</sup>, more studies with high quality should addressed this measurement property to make sure that we have instruments that reflect adequately the dimensionality of the construct to be measured and when they are translated or culturally adapted that they reflect adequately the performance of original version.

Any study assessed the criterion validity which is understandable, because there is no gold standard available for assessing the undergraduate nursing students' knowledge, attitudes, and skills regarding EBP

### Reliability

Within the reliability domain, the measurement error was the only measurement property that any study included in this review assessed.

In the other side, the internal consistency was assessed by all studies<sup>21, 22, 32-40</sup> with a very good methodological quality and all the instruments presented a good “the degree of the interrelatedness among the items”<sup>30, p. 12</sup>

The measurement property reliability, i.e., “The proportion of the total variance in the measurements which is due to ‘true’ differences between patients”<sup>30, p. 12</sup>, was assessed with a doubtful or inadequate methodological quality in four studies.<sup>33-36</sup> Thus, although the results reported in this measurement property are good, they should be considered with caution due to methodological weaknesses.

### Responsiveness

Regarding the responsiveness, considering that only one study<sup>40</sup> with a inadequate methodological quality assessed it, which means assessed “The ability of a PROM to detect change over time in the construct to be measured”<sup>30, p. 12</sup>, the results on this measurement property should be interpreted with caution.

The instruments included in this review are diverse regarding the constructs of interest assessed by instrument, the instrument language and the context. Only two instruments (Student Evidence-based Practice Questionnaire<sup>22, 32, 36</sup> and Evidence Based Practice Evaluation Competence Questionnaire<sup>21, 39</sup>) measure all the constructs of interest (knowledge, attitudes, and skills regarding EBP). The EBP Questionnaire<sup>33-35</sup> and Evidence-based practice profile questionnaire<sup>40</sup> measure EBP knowledge and attitudes, while the Evidence-based Practice Knowledge Assessment in Nursing<sup>37, 38</sup> measures only the EBP knowledge. Concerning the languages of the instruments included, we have instruments in Persian<sup>33-35</sup>, English<sup>22, 32, 38</sup>, Mandarin Chinese<sup>36</sup>, Spanish<sup>21, 37</sup>, Turkish<sup>39</sup> and Norwegian.<sup>40</sup> Additionally, also the contexts where the studies were developed were very different: three studies were conducted in Iran<sup>33-35</sup>, one in Australia<sup>32</sup>, one in United Kingdom<sup>22</sup>, one in China<sup>36</sup>, one in United States of America<sup>38</sup>, one in Dominican Republic<sup>37</sup>, one in Spain<sup>21</sup>, one in Turkey<sup>39</sup> and one in Norway.<sup>40</sup> These differences between the studies hinder the data synthesis through a best-evidence synthesis and, consequently, hinder the possibility to answer to the review question *what is the most valid and reliable instrument for*

*measuring undergraduate nursing students' knowledge, attitudes, and skills regarding evidence-based practice?.*

The lack of studies with the same instrument, the same version (including the same language) and in the same context may be related to the fact that this is a new area of study. Indeed, the EBP concept emerged in 1996<sup>28, 29</sup> and although the EBP use is being recognized as having multiple benefits in clinical practice, only in 2005 Committee on the Health Professions Education Summit recommended that all health professional educational programs should include the development of EBP competencies<sup>18</sup> and in 2011 the Classification Rubric for EBP Assessment Tools in Education (CREATE) proposed the main principles for development of instrument to assess the EBP learning.<sup>20</sup>

#### *Review Limitations*

The low number of studies per instrument version are a significant limitation of this review. Indeed, the included studies were not similar in terms of instrument version (e.g., language) and the only two studies performed with the same instrument version (same language) were completed in different contexts (one in United Kingdom<sup>22</sup> and one in Australia<sup>32</sup>). This prevented the data synthesis through a best-evidence synthesis.<sup>30</sup>

Moreover, we included only studies published in three languages (English, Portuguese and Spanish), which is a potential limitation because there may be studies written in other languages that may have been excluded.

#### **Conclusions**

There are five instruments included in this review: EBP Questionnaire; Student Evidence-based Practice Questionnaire; Evidence-based Practice Knowledge Assessment in Nursing; Evidence Based Practice Evaluation Competence Questionnaire; and Evidence-based practice profile questionnaire.

Only the Student Evidence-based Practice Questionnaire and Evidence Based Practice Evaluation Competence Questionnaire measure all the constructs of interest (knowledge, attitudes, and skills regarding EBP). The EBP Questionnaire and Evidence-based practice profile questionnaire measure EBP knowledge and attitudes. The Evidence-based Practice Knowledge Assessment in Nursing measures only the EBP knowledge.

The measurement properties assessed by the five instruments are content validity, structural validity, internal consistency, cross-cultural validity, reliability, construct validity and responsiveness. Two studies presented the PROM development. Only the internal consistency was assessed by all studies. The content validity and structural validity was assessed by eight studies, the hypotheses testing for

construct validity was measured in five studies, and the reliability in four studies. Only one study addressed the cross-cultural validity/measurement invariance and other the responsiveness. None of the studies evaluated measurement error and criterion validity.

Due to the low number of studies per instrument version (e.g., language and context) a best-evidence synthesis was not possible and, consequently, it was not possible to know what is the most valid and reliable instrument for measuring undergraduate nursing students' knowledge, attitudes and skills in EBP.

### **Recommendations for practice**

The results of this systematic review showed that the instruments found have potential for use in educational contexts to describe the undergraduate nursing students' attitudes, knowledge, and skills regarding EBP as well as to assess the impact of the educational programs. Moreover, they are also appropriate for research purposes. The instrument selection should be in line with the purpose of assessment, i.e., the Student Evidence-based Practice Questionnaire and Evidence Based Practice Evaluation Competence Questionnaire should be used for assessing knowledge, attitudes, and skills regarding EBP, the EBP Questionnaire and Evidence-based practice profile questionnaire for assessing EBP knowledge and attitudes and the Evidence-based Practice Knowledge Assessment in Nursing for assessing EBP knowledge.

### **Recommendations for research**

More studies with the same version of instrument and in the same context are needed in order to perform data synthesis through a best-evidence synthesis. In addition, the instruments found in this review have partial evidence of validity and reliability, which indicated that more studies are required to provide more complete information concerning the measurement properties of the instruments.

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### **Conflicts of interest**

The authors declare no conflict of interest

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## Appendices

### Appendix I: Description of the measurement domains, properties, aspects, and statistics and methods(26)

Domains	Properties	Aspects	Statistics/Methods
<b>Reliability</b>	Internal consistency		Cronbach's alpha or Kuder-Richardson formula (KR-20) to determine relevance
			Factor analysis or principal component analysis to determine whether items form one or more than one scale
	Reliability		Intraclass correlation coefficient (ICC) or Cohen's kappa
<b>Validity</b>	Measurement error		Standard error of measurement (SEM)
			Smallest detectable change (SDC)
		Change beyond measurement error	
		Limits of agreement (LoA)	
		Minimal important change to determine the adequacy of measurement error	
	Content validity	Face validity	Assessment of relevance of all items for the construct, aim and target group
			Assessment of important missing items
	Construct validity	Structural validity	Factor analysis to confirm the number of subscales present
		Hypotheses testing	Assessment of a priori hypotheses, clearly indicating both direction and magnitude of the correlation or difference
		Cross-cultural validity	Assessment of adequate reflection of the performance of the items of the original instrument
Criterion validity		Correlation	
		Area under the receiver operator characteristics curve (AUC)	
		Sensitivity and specificity	
<b>Responsiveness</b>	Responsiveness		Assessment of a priori hypotheses focussing on the change score of an instrument in the hypotheses
			Area under the receiver operator characteristic curve (AUC)

**Appendix II: Search strategy****PubMed**Search conducted on July 13<sup>th</sup> 2018

Search	Query	Results
<b>#19</b>	Search (((Students, Nursing[MeSH Terms]) OR (“Nursing students”[Title/Abstract] OR “Nursing student”[Title/Abstract] OR “student nurses”[Title/Abstract] OR “student nurse”[Title/Abstract] OR “pupil nurses”[Title/Abstract] OR “pupil nurse”[Title/Abstract]))) AND ((Evidence-Based Practice[MeSH Terms]) OR ((evidence-based[Title/Abstract] OR “evidence based”[Title/Abstract] OR “Evidence informed”[Title/Abstract] OR Evidence-informed[Title/Abstract]))) AND (Surveys and Questionnaires[MeSH] OR Validation Studies[pt] OR Comparative Study[pt] OR “psychometrics”[MeSH] OR psychometr*[tiab] OR clinimetr*[tw] OR clinometr*[tw] OR “outcome assessment (health care)”[MeSH] OR outcome assessment[tiab] OR outcome measure*[tw] OR “observer variation”[MeSH] OR observer variation[tiab] OR “Health Status Indicators”[Mesh] OR “reproducibility of results”[MeSH] OR reproducib*[tiab] OR “discriminant analysis”[MeSH] OR reliab*[tiab] OR unreliab*[tiab] OR valid*[tiab] OR coefficient[tiab] OR homogeneity[tiab] OR homogeneous[tiab] OR “internal consistency”[tiab] OR (cronbach*[tiab] AND (alpha[tiab] OR alphas[tiab])) OR (item[tiab] AND (correlation*[tiab] OR selection*[tiab] OR reduction*[tiab])) OR agreement[tiab] OR precision[tiab] OR imprecision[tiab] OR “precise values”[tiab] OR test–retest[tiab] OR (test[tiab] AND retest[tiab]) OR (reliab*[tiab] AND (test[tiab] OR retest[tiab])) OR stability[tiab] OR interrater[tiab] OR inter-rater[tiab] OR intrarater[tiab] OR intra-rater[tiab] OR intertester[tiab] OR inter-tester[tiab] OR intratester[tiab] OR intra-tester[tiab] OR interobserver[tiab] OR inter-observer[tiab] OR intraobserver[tiab] OR intra-observer[tiab] OR intertechnician[tiab] OR inter-technician[tiab] OR intratechnician[tiab] OR intra-technician[tiab] OR interexaminer[tiab] OR inter-examiner[tiab] OR intraexaminer[tiab] OR intra-examiner[tiab] OR interassay[tiab] OR inter-assay[tiab] OR intraassay[tiab] OR intra-assay[tiab] OR interindividual[tiab] OR inter-individual[tiab] OR intraindividual[tiab] OR intra-individual[tiab] OR interparticipant[tiab] OR inter-participant[tiab] OR intraparticipant[tiab] OR intra-participant[tiab] OR kappa[tiab] OR kappa’s[tiab] OR kappas[tiab] OR repeatab*[tiab] OR ((replicab*[tiab] OR repeated[tiab]) AND (measure[tiab] OR measures[tiab] OR findings[tiab] OR result[tiab] OR results[tiab] OR test[tiab] OR tests[tiab])) OR generaliza*[tiab] OR generalisa*[tiab] OR concordance[tiab] OR (intraclass[tiab] AND correlation*[tiab]) OR discriminative[tiab] OR “known group”[tiab] OR factor analysis[tiab] OR factor analyses[tiab] OR dimension*[tiab] OR subscale*[tiab] OR (multitrait[tiab] AND scaling[tiab] AND (analysis[tiab] OR analyses[tiab])) OR item discriminant[tiab] OR interscale correlation*[tiab] OR error[tiab] OR errors[tiab] OR	253

Search	Query	Results
	<p>“individual variability”[tiab] OR (variability[tiab] AND (analysis[tiab] OR values[tiab])) OR (uncertainty[tiab] AND (measurement[tiab] OR measuring[tiab])) OR “standard error of measurement”[tiab] OR sensitiv*[tiab] OR responsive*[tiab] OR ((minimal[tiab] OR minimally[tiab] OR clinical[tiab] OR clinically[tiab]) AND (important[tiab] OR significant[tiab] OR detectable[tiab])) AND (change[tiab] OR difference[tiab])) OR (small*[tiab] AND (real[tiab] OR detectable[tiab])) AND (change[tiab] OR difference[tiab])) OR meaningful change[tiab] OR “ceiling effect”[tiab] OR “floor effect”[tiab] OR “Item response model”[tiab] OR IRT[tiab] OR Rasch[tiab] OR “Differential item functioning”[tiab] OR DIF[tiab] OR “computer adaptive testing”[tiab] OR “item bank”[tiab] OR “cross-cultural equivalence”[tiab])) Filters: Publication date from 1996/01/01; English; Portuguese; Spanish</p>	
<b>#18</b>	Search (Students, Nursing[MeSH Terms]) OR ((“Nursing students”[Title/Abstract] OR “Nursing student”[Title/Abstract] OR “student nurses”[Title/Abstract] OR “student nurse”[Title/Abstract] OR “pupil nurses”[Title/Abstract] OR “pupil nurse”[Title/Abstract]))	27679
<b>#17</b>	Search (Evidence-Based Practice[MeSH Terms]) OR ((evidence-based[Title/Abstract] OR “evidence based”[Title/Abstract] OR “Evidence informed”[Title/Abstract] OR Evidence-informed[Title/Abstract]))	145100
<b>#15</b>	Search Evidence-Based Practice[MeSH Terms]	80785
<b>#11</b>	Search Students, Nursing[MeSH Terms]	21772
<b>#10</b>	Search (“Nursing students”[Title/Abstract] OR “Nursing student”[Title/Abstract] OR “student nurses”[Title/Abstract] OR “student nurse”[Title/Abstract] OR “pupil nurses”[Title/Abstract] OR “pupil nurse”[Title/Abstract])	14910
<b>#9</b>	Search (evidence-based[Title/Abstract] OR “evidence based”[Title/Abstract] OR “Evidence informed”[Title/Abstract] OR Evidence-informed[Title/Abstract])	95420
<b>#8</b>	Search Surveys and Questionnaires[MeSH] OR Validation Studies[pt] OR Comparative Study[pt] OR “psychometrics”[MeSH] OR psychometr*[tiab] OR clinimetr*[tw] OR clinometr*[tw] OR “outcome assessment (health care)”[MeSH] OR outcome assessment[tiab] OR outcome measure*[tw] OR “observer variation”[MeSH] OR observer variation[tiab] OR “Health Status Indicators”[Mesh] OR “reproducibility of results”[MeSH] OR reproducib*[tiab] OR “discriminant analysis”[MeSH] OR reliab*[tiab] OR unreliab*[tiab] OR valid*[tiab] OR coefficient[tiab] OR homogeneity[tiab] OR homogeneous[tiab] OR “internal consistency”[tiab] OR (cronbach*[tiab] AND (alpha[tiab] OR alphas[tiab])) OR (item[tiab] AND (correlation*[tiab] OR selection*[tiab] OR reduction*[tiab])) OR agreement[tiab] OR precision[tiab] OR imprecision[tiab] OR “precise values”[tiab] OR test–retest[tiab] OR (test[tiab] AND retest[tiab]) OR (reliab*[tiab] AND (test[tiab] OR retest[tiab])) OR stability[tiab] OR interrater[tiab] OR inter-rater[tiab] OR intrarater[tiab] OR intra-rater[tiab] OR intertester[tiab] OR inter-tester[tiab] OR intratester[tiab] OR intra-	6894616

Search	Query	Results
	<p>tester[tiab] OR interobserver[tiab] OR inter-observer[tiab] OR intraobserver[tiab] OR intra-observer[tiab] OR intertechnician[tiab] OR inter-technician[tiab] OR intratechnician[tiab] OR intra-technician[tiab] OR interexaminer[tiab] OR inter-examiner[tiab] OR intraexaminer[tiab] OR intra-examiner[tiab] OR interassay[tiab] OR inter-assay[tiab] OR intraassay[tiab] OR intra-assay[tiab] OR interindividual[tiab] OR inter-individual[tiab] OR intraindividual[tiab] OR intra-individual[tiab] OR interparticipant[tiab] OR inter-participant[tiab] OR intraparticipant[tiab] OR intra-participant[tiab] OR kappa[tiab] OR kappa's[tiab] OR kappas[tiab] OR repeatab*[tiab] OR ((replicab*[tiab] OR repeated[tiab]) AND (measure[tiab] OR measures[tiab] OR findings[tiab] OR result[tiab] OR results[tiab] OR test[tiab] OR tests[tiab])) OR generaliza*[tiab] OR generalisa*[tiab] OR concordance[tiab] OR (intraclass[tiab] AND correlation*[tiab]) OR discriminative[tiab] OR "known group"[tiab] OR factor analysis[tiab] OR factor analyses[tiab] OR dimension*[tiab] OR subscale*[tiab] OR (multitrait[tiab] AND scaling[tiab] AND (analysis[tiab] OR analyses[tiab])) OR item discriminant[tiab] OR interscale correlation*[tiab] OR error[tiab] OR errors[tiab] OR "individual variability"[tiab] OR (variability[tiab] AND (analysis[tiab] OR values[tiab])) OR (uncertainty[tiab] AND (measurement[tiab] OR measuring[tiab])) OR "standard error of measurement"[tiab] OR sensitiv*[tiab] OR responsive*[tiab] OR ((minimal[tiab] OR minimally[tiab] OR clinical[tiab] OR clinically[tiab]) AND (important[tiab] OR significant[tiab] OR detectable[tiab]) AND (change[tiab] OR difference[tiab])) OR (small*[tiab] AND (real[tiab] OR detectable[tiab]) AND (change[tiab] OR difference[tiab])) OR meaningful change[tiab] OR "ceiling effect"[tiab] OR "floor effect"[tiab] OR "Item response model"[tiab] OR IRT[tiab] OR Rasch[tiab] OR "Differential item functioning"[tiab] OR DIF[tiab] OR "computer adaptive testing"[tiab] OR "item bank"[tiab] OR "cross-cultural equivalence"[tiab])</p>	

## CINAHL via EBSCO

Search conducted on July 13<sup>th</sup> 2018

Search ID#	Search Terms	Results
S14	S6 AND S7 AND S13 Limiters - Published Date: 19960101-20170631; Language: English, Portuguese, Spanish	424
S13	S1 OR S8 OR S9 OR S10 OR S11 OR S12	1,749,091
S12	(MH "Instrument Construction+")	13,213
S11	(MH "Surveys+")	184,802
S10	(MH "Questionnaires+")	331,008
S9	(MH "Validation Studies")	85,409

Search ID#	Search Terms	Results
S8	(MH "Instrument Validation")	29,813
S7	S2 OR S4	38,253
S6	S3 OR S5	60,524
S5	(MH "Nursing Practice, Evidence-Based+")	12,238
S4	(MH "Students, Nursing+")	31,443
S3	TI ( evidence-based OR "evidence based" OR "Evidence informed" OR Evidence-informed ) OR AB ( evidence-based OR "evidence based" OR "Evidence informed" OR Evidence-informed )	53,142
S2	TI ( "Nursing students" OR "Nursing student" OR "student nurses" OR "student nurse" OR "pupil nurses" OR "pupil nurse" ) OR AB ( "Nursing students" OR "Nursing student" OR "student nurses" OR "student nurse" OR "pupil nurses" OR "pupil nurse" )	20,236
S1	TI psychometr* OR TI observer variation OR TI reproducib* OR TI reliab* OR TI unreliab* OR TI valid* OR TI coefficient OR TI homogeneity OR TI homogeneous OR TI "internal consistency" OR AB psychometr* OR AB observer variation OR AB reproducib* OR AB reliab* OR AB unreliab* OR AB valid* OR AB coefficient OR AB homogeneity OR AB homogeneous OR AB "internal consistency" OR ( TI cronbach* OR AB cronbach* AND ( TI alpha OR AB alpha OR TI alphas OR AB alphas )) OR ( TI item OR AB item AND ( TI correlation* OR AB correlation* OR TI selection* OR AB selection* OR TI reduction* OR AB reduction* )) OR TI agreement OR TI precision OR TI imprecision OR TI "precise values" OR TI test-retest OR AB agreement OR AB precision OR AB imprecision OR AB "precise values" OR AB test-retest OR ( TI test OR AB test AND TI retest OR AB retest ) OR ( TI reliab* OR AB reliab* AND ( TI test OR AB test OR TI retest or AB retest )) OR TI stability OR TI interrater OR TI inter-rater OR TI intrarater OR TI intra-rater OR TI intertester OR TI inter-tester OR TI intratester OR TI intra-tester OR TI interobserver OR TI inter-observer OR TI intraobserver OR TI intra-observer OR TI intertechnician OR TI inter-technician OR TI intratechnician OR TI intra-technician OR TI interexaminer OR TI inter-examiner OR TI intraexaminer OR TI intra-examiner OR TI interassay OR TI inter-assay OR TI intraassay OR TI intra-assay OR TI interindividual OR TI inter-individual OR TI intraindividual OR TI intra-individual OR TI interparticipant OR TI inter-participant OR TI intraparticipant OR TI intra-participant OR TI kappa OR TI kappa's OR TI kappas OR TI repeatab* OR AB stability OR AB interrater OR AB inter-rater OR AB intrarater OR AB intra-rater OR AB intertester OR AB inter-tester OR AB intratester OR AB intra-tester OR AB interobserver OR AB inter-observer OR AB intraobserver OR AB intra-observer OR AB intertechnician OR AB inter-technician OR AB intratechnician OR AB intra-technician OR AB interexaminer OR AB inter-examiner OR AB intraexaminer OR AB intra-examiner OR AB interassay OR AB inter-assay OR AB intraassay OR AB intra-assay OR AB interindividual OR AB inter-individual OR AB intraindividual OR AB intra-individual OR AB interparticipant OR AB inter-participant OR AB intraparticipant OR AB intra-participant OR AB kappa OR AB kappa's OR AB kappas OR AB repeatab* OR (( TI replicab* OR AB replicab* OR TI repeated OR AB repeated ) AND ( TI measure OR AB measure OR TI measures OR AB measures OR TI findings OR AB findings OR TI result OR AB result OR TI results OR AB results OR TI test OR AB test OR TI tests OR AB tests )) OR TI generaliza* OR TI generalisa* OR TI concordance OR AB generaliza* OR AB generalisa* OR AB concordance OR ( TI intraclass OR AB	1,529,646

Search ID#	Search Terms	Results
	intraclass AND TI correlation* or AB correlation* ) OR TI discriminative OR TI "known group" OR TI fact or analysis OR TI fact or analyses OR TI dimension* OR TI subscale* OR AB discriminative OR AB "known group" OR AB fact or analysis OR AB fact or analyses OR AB dimension* OR AB subscale* OR ( TI multitrait OR AB multitrait AND TI scaling OR AB scaling AND ( TI analysis OR AB analysis OR TI analyses OR AB analyses ) ) OR TI item discriminant OR TI interscale correlation* OR TI error OR TI errors OR TI "individual variability" OR AB item discriminant OR AB interscale correlation* OR AB error OR AB errors OR AB "individual variability" OR ( TI variability OR AB variability AND ( TI analysis OR AB analysis OR TI values OR AB values ) ) OR ( TI uncertainty OR AB uncertainty AND ( TI measurement OR AB measurement OR TI measuring OR AB measuring ) ) OR TI "standard error of measurement" OR TI sensitiv* OR TI responsive* OR AB "standard error of measurement" OR AB sensitiv* OR AB responsive* OR ( ( TI minimal OR TI minimally OR TI clinical OR TI clinically OR AB minimal OR AB minimally OR AB clinical OR AB clinically ) AND ( TI important OR TI significant OR TI detectable OR AB important OR AB significant OR AB detectable ) AND ( TI change OR AB change OR TI difference OR AB difference ) ) OR ( TI small* OR AB small* AND ( TI real OR AB real OR TI detectable OR AB detectable ) AND ( TI change OR AB change OR TI difference OR AB difference ) ) OR TI meaningful change OR TI "ceiling effect" OR TI "floor effect" OR TI "Item response model" OR TI IRT OR TI Rasch OR TI "Differential item functioning" OR TI DIF OR TI "computer adaptive testing" OR TI "item bank" OR TI "cross-cultural equivalence" OR TI outcome assessment OR AB meaningful change OR AB "ceiling effect" OR AB "floor effect" OR AB "Item response model" OR AB IRT OR AB Rasch OR AB "Differential item functioning" OR AB DIF OR AB "computer adaptive testing" OR AB "item bank" OR AB "cross-cultural equivalence" OR AB outcome assessment	

## Scopus

Search conducted on July 13<sup>th</sup> 2018

Search Terms	Results
( TITLE-ABS-KEY ( evidence-based OR "evidence based" OR "Evidence informed" OR evidence-informed ) ) AND ( TITLE-ABS-KEY ( "Nursing students" OR "Nursing student" OR "student nurses" OR "student nurse" OR "pupil nurses" OR "pupil nurse" ) ) AND ( TITLE-ABS-KEY ( "assessment tool" OR scale* OR instrument* OR questionnaire* OR survey* OR inventory OR test* OR psychometr* OR measur* ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) OR LIMIT-TO ( LANGUAGE , "Spanish" ) ) OR ( LIMIT-TO ( LANGUAGE , "Portuguese" ) )	373



## Academic Search Complete via EBSCO

Search conducted on July 13<sup>th</sup> 2018

<u>Search ID#</u>	<u>Search Terms</u>	<u>Results</u>
S4	S1 AND S2 AND S3 Limiters - Published Date: 19960101-; Language: English, Portuguese, Spanish	76
S3	TI ( evidence-based OR “evidence based” OR “Evidence informed” OR Evidence-informed ) OR AB ( evidence-based OR “evidence based” OR “Evidence informed” OR Evidence-informed )	57,766
S2	TI ( “Nursing students” OR “Nursing student” OR “student nurses” OR “student nurse” OR “pupil nurses” OR “pupil nurse” ) OR AB ( “Nursing students” OR “Nursing student” OR “student nurses” OR “student nurse” OR “pupil nurses” OR “pupil nurse” )	8,762
S1	TI psychometr* OR TI observer variation OR TI reproducib* OR TI reliab* OR TI unreliab* OR TI valid* OR TI coefficient OR TI homogeneity OR TI homogeneous OR TI “internal consistency” OR AB psychometr* OR AB observer variation OR AB reproducib* OR AB reliab* OR AB unreliab* OR AB valid* OR AB coefficient OR AB homogeneity OR AB homogeneous OR AB “internal consistency” OR ( TI cronbach* OR AB cronbach* AND ( TI alpha OR AB alpha OR TI alphas OR AB alphas ) ) OR ( TI item OR AB item AND ( TI correlation* OR AB correlation* OR TI selection* OR AB selection* OR TI reduction* OR AB reduction* ) ) OR TI agreement OR TI precision OR TI imprecision OR TI “precise values” OR TI test-retest OR AB agreement OR AB precision OR AB imprecision OR AB “precise values” OR AB test-retest OR ( TI test OR AB test AND TI retest OR AB retest ) OR ( TI reliab* OR AB reliab* AND ( TI test OR AB test OR TI retest or AB retest ) ) OR TI stability OR TI interrater OR TI inter-rater OR TI intrarater OR TI intra-rater OR TI intertester OR TI inter-tester OR TI intratester OR TI intra-tester OR TI interobserver OR TI inter-observer OR TI intraobserver OR TI intra-observer OR TI intertechnician OR TI inter-technician OR TI intratechnician OR TI intratechnician OR TI interexaminer OR TI inter-examiner OR TI intraexaminer OR TI intra-examiner OR TI interassay OR TI inter-assay OR TI intraassay OR TI intra-assay OR TI interindividual OR TI inter-individual OR TI intraindividual OR TI intra-individual OR TI interparticipant OR TI inter-participant OR TI intraparticipant OR TI intra-participant OR TI kappa OR TI kappa’s OR TI kappas OR TI repeatab* OR AB stability OR AB interrater OR AB inter-rater OR AB intrarater OR AB intra-rater OR AB intertester OR AB inter-tester OR AB intratester OR AB intra-tester OR AB interobserver OR AB inter-observer OR AB intraobserver OR AB intra-observer OR AB intertechnician OR AB inter-technician OR AB intratechnician OR AB intra-technician OR AB interexaminer OR AB inter-examiner OR AB intraexaminer OR AB intra-examiner OR AB interassay OR AB inter-assay OR AB intraassay OR AB intra-assay OR AB interindividual OR AB inter-individual OR AB intraindividual OR AB intra-individual OR AB interparticipant OR AB inter-participant OR AB intraparticipant OR AB intra-participant OR AB kappa OR AB kappa’s OR AB kappas OR AB repeatab* OR (( TI replicab* OR AB replicab* OR TI repeated OR AB repeated ) AND ( TI measure OR AB measure OR TI measures OR AB	8,133,622

measures OR TI findings OR AB findings OR TI result OR AB result OR TI results OR AB results OR TI test OR AB test OR TI tests OR AB tests )) OR TI generaliza\* OR TI generalisa\* OR TI concordance OR AB generaliza\* OR AB generalisa\* OR AB concordance OR ( TI intraclass OR AB intraclass AND TI correlation\* or AB correlation\* ) OR TI discriminative OR TI “known group” OR TI fact or analysis OR TI fact or analyses OR TI dimension\* OR TI subscale\* OR AB discriminative OR AB “known group” OR AB fact or analysis OR AB fact or analyses OR AB dimension\* OR AB subscale\* OR ( TI multitrait OR AB multitrait AND TI scaling OR AB scaling AND ( TI analysis OR AB analysis OR TI analyses OR AB analyses )) OR TI item discriminant OR TI interscale correlation\* OR TI error OR TI errors OR TI “individual variability” OR AB item discriminant OR AB interscale correlation\* OR AB error OR AB errors OR AB “individual variability” OR ( TI variability OR AB variability AND ( TI analysis OR AB analysis OR TI values OR AB values )) OR ( TI uncertainty OR AB uncertainty AND ( TI measurement OR AB measurement OR TI measuring OR AB measuring )) OR TI “standard error of measurement” OR TI sensitiv\* OR TI responsive\* OR AB “standard error of measurement” OR AB sensitiv\* OR AB responsive\* OR (( TI minimal OR TI minimally OR TI clinical OR TI clinically OR AB minimal OR AB minimally OR AB clinical OR AB clinically) AND ( TI important OR TI significant OR TI detectable OR AB important OR AB significant OR AB detectable) AND ( TI change OR AB change OR TI difference OR AB difference )) OR ( TI small\* OR AB small\* AND ( TI real OR AB real OR TI detectable OR AB detectable ) AND ( TI change OR AB change OR TI difference OR AB difference )) OR TI meaningful change OR TI “ceiling effect” OR TI “floor effect” OR TI “Item response model” OR TI IRT OR TI Rasch OR TI “Differential item functioning” OR TI DIF OR TI “computer adaptive testing” OR TI “item bank” OR TI “cross-cultural equivalence” OR TI outcome assessment OR AB meaningful change OR AB “ceiling effect” OR AB “floor effect” OR AB “Item response model” OR AB IRT OR AB Rasch OR AB “Differential item functioning” OR AB DIF OR AB “computer adaptive testing” OR AB “item bank” OR AB “cross-cultural equivalence” OR AB outcome assessment

## ERIC via EBSCO

Search conducted on July 13<sup>th</sup> 2018

Search ID#	Search Terms	Results
S10	S7 AND S8 AND S9 Limiters - Date Published: 19960101-; Language: English, Portuguese, Spanish; Castilian	21
S9	S3 OR S4	7,205
S8	S2 OR S6	1,985
S7	S1 OR S5	563,502
S6	DE "Nursing Students"	1,058
S5	(DE "Validity" OR DE "Test Validity" OR DE "Accuracy" OR DE "Reliability" OR DE "Interrater Reliability" OR DE "Test Reliability")	39,676

Search ID#	Search Terms	Results
S4	DE "Evidence Based Practice"	1,627
S3	TI ( evidence-based OR "evidence based" OR "Evidence informed" OR Evidence-informed ) OR AB ( evidence-based OR "evidence based" OR "Evidence informed" OR Evidence-informed )	6,515
S2	TI ( "Nursing students" OR "Nursing student" OR "student nurses" OR "student nurse" OR "pupil nurses" OR "pupil nurse" ) OR AB ( "Nursing students" OR "Nursing student" OR "student nurses" OR "student nurse" OR "pupil nurses" OR "pupil nurse" )	1,741
S1	TI psychometr* OR TI observer variation OR TI reproducib* OR TI reliab* OR TI unreliab* OR TI valid* OR TI coefficient OR TI homogeneity OR TI homogeneous OR TI "internal consistency" OR AB psychometr* OR AB observer variation OR AB reproducib* OR AB reliab* OR AB unreliab* OR AB valid* OR AB coefficient OR AB homogeneity OR AB homogeneous OR AB "internal consistency" OR ( TI cronbach* OR AB cronbach* AND ( TI alpha OR AB alpha OR TI alphas OR AB alphas ) ) OR ( TI item OR AB item AND ( TI correlation* OR AB correlation* OR TI selection* OR AB selection* OR TI reduction* OR AB reduction* ) ) OR TI agreement OR TI precision OR TI imprecision OR TI "precise values" OR TI test-retest OR AB agreement OR AB precision OR AB imprecision OR AB "precise values" OR AB test-retest OR ( TI test OR AB test AND TI retest OR AB retest ) OR ( TI reliab* OR AB reliab* AND ( TI test OR AB test OR TI retest OR AB retest ) ) OR TI stability OR TI interrater OR TI inter-rater OR TI intrarater OR TI intrarater OR TI intertester OR TI inter-tester OR TI intratester OR TI intra-tester OR TI interobserver OR TI inter-observer OR TI intraobserver OR TI intra-observer OR TI intertechnician OR TI inter-technician OR TI intratechnician OR TI intra-technician OR TI interexaminer OR TI inter-examiner OR TI intraexaminer OR TI intra-examiner OR TI interassay OR TI inter-assay OR TI intraassay OR TI intra-assay OR TI interindividual OR TI inter-individual OR TI intraindividual OR TI intra-individual OR TI interparticipant OR TI inter-participant OR TI intraparticipant OR TI intra-participant OR TI kappa OR TI kappa's OR TI kappas OR TI repeatab* OR AB stability OR AB interrater OR AB inter-rater OR AB intrarater OR AB intra-rater OR AB intertester OR AB inter-tester OR AB intratester OR AB intra-tester OR AB interobserver OR AB inter-observer OR AB intraobserver OR AB intra-observer OR AB intertechnician OR AB inter-technician OR AB intratechnician OR AB intra-technician OR AB interexaminer OR AB inter-examiner OR AB intraexaminer OR AB intra-examiner OR AB interassay OR AB inter-assay OR AB intraassay OR AB intra-assay OR AB interindividual OR AB inter-individual OR AB intraindividual OR AB intra-individual OR AB interparticipant OR AB inter-participant OR AB intraparticipant OR AB intra-participant OR AB kappa OR AB kappa's OR AB kappas OR AB repeatab* OR ( ( TI replicab* OR AB replicab* OR TI repeated OR AB repeated ) AND ( TI measure OR AB measure OR TI measures OR AB measures OR TI findings OR AB findings OR TI result OR AB result OR TI results OR AB results OR TI test OR AB test OR TI tests OR AB tests ) ) OR TI generaliza* OR TI generalisa* OR TI concordance OR AB generaliza* OR AB generalisa* OR AB concordance OR ( TI intraclass OR AB intraclass AND TI correlation* OR AB correlation* ) OR TI discriminative OR TI "known	558,560

Search ID#	Search Terms	Results
	group” OR TI fact or analysis OR TI fact or analyses OR TI dimension* OR TI subscale* OR AB discriminative OR AB “known group” OR AB fact or analysis OR AB fact or analyses OR AB dimension* OR AB subscale* OR ( TI multitrait OR AB multitrait AND TI scaling OR AB scaling AND ( TI analysis OR AB analysis OR TI analyses OR AB analyses )) OR TI item discriminant OR TI interscale correlation* OR TI error OR TI errors OR TI “individual variability” OR AB item discriminant OR AB interscale correlation* OR AB error OR AB errors OR AB “individual variability” OR ( TI variability OR AB variability AND ( TI analysis OR AB analysis OR TI values OR AB values )) OR ( TI uncertainty OR AB uncertainty AND ( TI measurement OR AB measurement OR TI measuring OR AB measuring )) OR TI “standard error of measurement” OR TI sensitiv* OR TI responsive* OR AB “standard error of measurement” OR AB sensitiv* OR AB responsive* OR (( TI minimal OR TI minimally OR TI clinical OR TI clinically OR AB minimal OR AB minimally OR AB clinical OR AB clinically) AND ( TI important OR TI significant OR TI detectable OR AB important OR AB significant OR AB detectable) AND ( TI change OR AB change OR TI difference OR AB difference )) OR ( TI small* OR AB small* AND ( TI real OR AB real OR TI detectable OR AB detectable ) AND ( TI change OR AB change OR TI difference OR AB difference )) OR TI meaningful change OR TI “ceiling effect” OR TI “floor effect” OR TI “Item response model” OR TI IRT OR TI Rasch OR TI “Differential item functioning” OR TI DIF OR TI “computer adaptive testing” OR TI “item bank” OR TI “cross-cultural equivalence” OR TI outcome assessment OR AB meaningful change OR AB “ceiling effect” OR AB “floor effect” OR AB “Item response model” OR AB IRT OR AB Rasch OR AB “Differential item functioning” OR AB DIF OR AB “computer adaptive testing” OR AB “item bank” OR AB “cross-cultural equivalence” OR AB outcome assessment	

## SciELO

Search conducted on July 13<sup>th</sup> 2018

Search strategy	Results
(ab:(evidence-based OR “evidence based” OR “evidence informed” OR evidence-informed) OR ti:(evidence-based OR “evidence based” OR “evidence informed” OR evidence-informed)) AND (ab:(“nursing students” OR “nursing student” OR “student nurses” OR “student nurse” OR “pupil nurses” OR “pupil nurse”) OR ti:(“nursing students” OR “nursing student” OR “student nurses” OR “student nurse” OR “pupil nurses” OR “pupil nurse”)) AND year_cluster:(“2015” OR “2016” OR “2013” OR “2010” OR “2014” OR “2011” OR “2006” OR “2009” OR “2012” OR “2008” OR “2007” OR “2005” OR “2004” OR “1998” OR “2001” OR “2002” OR “2000” OR “2003” OR “2017” OR “1997” OR “1999” OR “1996”)	332

**CAPES**

Search conducted on July 13<sup>th</sup> 2018

Search strategy	Results
evidence based practice AND nursing students AND questionnaire	84

**RCAAP**

Search conducted on July 13<sup>th</sup> 2018

Search strategy	Results
Full-text: (evidence-based OR "evidence based" OR "Evidence informed" OR Evidence-informed) AND ("Nursing students" OR "Nursing student" OR "student nurses" OR "student nurse" OR "pupil nurses" OR "pupil nurse")	45

**OpenGrey**

Search conducted on July 13<sup>th</sup> 2018

Search strategy	Results
(evidence-based OR "evidence based" OR "Evidence informed" OR Evidence-informed) AND ("Nursing students" OR "Nursing student" OR "student nurses" OR "student nurse" OR "pupil nurses" OR "pupil nurse")	9

**Virginia Henderson Global Nursing e-Repository**

Search conducted on July 13<sup>th</sup> 2018

Search strategy	Results
Abstract : Contains : "evidence based practice"	323
Abstract : Contains : "students"	

*Appendix III: Studies excluded on full text*

1. Rospendowski, K. Adaptação cultural para o Brasil e desempenho psicométrico do instrumento "Evidence-Based Practice Questionnaire" (EBPQ)' [Cultural adaptation for Brazil and the psychometric performance of the instrument "Evidence-Based Practice Questionnaire" (EBPQ)] [Internet]. Brazil: Universidade Estadual de Campinas; 2014 [cited 2017 Oct 15]. Available from: [http://repositorio.unicamp.br/bitstream/REPOSIP/283868/1/Rospendowski\\_Karina\\_M.pdf](http://repositorio.unicamp.br/bitstream/REPOSIP/283868/1/Rospendowski_Karina_M.pdf)

**Reason for exclusion:** This study does not meet the inclusion criteria (type of population).

2. André B, Aune AG, Brænd JA. Embedding evidence-based practice among nursing undergraduates: Results from a pilot study. *Nurse Education in Practice*. 2016;18:30-5. doi: 10.1016/j.nepr.2016.03.004

**Reason for exclusion:** This study does not meet the inclusion criteria (outcomes of interest).

3. Ashktorab T, Pashaeypoor S, Rassouli M, Alavi-Majd H. The effectiveness of evidence based practice education in nursing students based on Rogers's diffusion of innovation model. *Middle - East Journal of Scientific Research*. 2014;19(10):1388-95.

**Reason for exclusion:** The data included in this study are also included in Ashktorab et al. (2013).<sup>33</sup> To avoid duplication, this study was excluded.

4. Belowska J, Panczyk M, Zarzeka A, Gotlib J. Knowledge and attitudes of nursing students towards evidence-based medicine and evidence-based nursing practice. *Polish Journal of Public Health*. 2015;125(4):201-4.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of population – students of level II studies of Nursing).

5. Blackman IR, Giles T. Psychometric Evaluation of a Self-Report Evidence-Based Practice Tool Using Rasch Analysis. *Worldviews on Evidence-Based Nursing*. 2015;12(5):253-64.

**Reason for exclusion:** This study does not meet the inclusion criteria (construct of interest).

6. Camargo FC, Iwamoto HH, Monteiro DAT, Lorena LT, Pereira GdA. Avaliação de intervenção para difusão da enfermagem baseada em evidências em hospital de ensino [Assessment of an intervention for the diffusion of evidence-based nursing in a teaching hospital]. *Revista Gaúcha de Enfermagem*. 2017;37(spe). doi: 10.1590/1983-1447.2016.esp.68962

**Reason for exclusion:** This study does not meet the inclusion criteria (type of population – nurse managers).

7. Cruz JP, Colet PC, Alquwez N, Alqubeilat H, Bashtawi MA, Ahmed EA, et al. Evidence-based practice beliefs and implementation among the nursing bridge program students of a Saudi University. *International Journal of Health Science*. 2016;10(3):405-14.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of population – nurses).

8. Culpa-Bondal FA, Greene D, Doss J. Assessment and Curricular Framework Development of Undergraduate Research in the School of Nursing. *Research in Academia*. Sigma Theta Tau International's 28th International Nursing Research Congress in Dublin, Ireland. In July 2017

**Reason for exclusion:** This is only an abstract. The review authors contacted the paper authors to ask the full-text. Dr. Culpa-Bondal did not reply.

9. Dawley K, Bloch JR, Suplee PD, McKeever A, Scherzer G. Using a pedagogical approach to integrate evidence-based teaching in an undergraduate women's health course. *Worldviews on Evidence-Based Nursing*. 2011;8(2):116-23. doi: 10.1111/j.1741-6787.2010.00210.x

**Reason for exclusion:** This study does not meet the inclusion criteria (type of study – it is a qualitative study that do not assess any outcome of interest).

10. Finotto S, Carpanoni M, Turrone EC, Camellini R, Mecugni D. Teaching evidence-based practice: Developing a curriculum model to foster evidence-based practice in undergraduate student nurses. *Nurse Education in Practice*. 2013;13(5):459-65.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of population).

11. Florin J, Ehrenberg A, Wallin L, Gustavsson P. Educational support for research utilization and capability beliefs regarding evidence-based practice skills: a national survey of senior nursing students. *Journal of Advanced Nursing*. 2012;68(4):888-97.

**Reason for exclusion:** This study does not meet the inclusion criteria (construct of interest).

12. Hagedorn Wonder A, Spurlock Jr DR, Ironside PM. Using the Evidence-Based Practice Knowledge Assessment in Nursing Instrument to Evaluate Exposure Effects in Baccalaureate Nursing Students. *Nursing Education Perspectives*. 2016;37(6):310-2. doi: 10.1097/01.NEP.0000000000000086

**Reason for exclusion:** This study does not answer to the review question. The data present regarding the review question is from study of Spurlock and Wonder (2015) that is included in this systematic review.

13. Hickman LD, Kelly H, Phillips JL. Eviteach: A study exploring ways to optimise the uptake of evidence-based practice to undergraduate nurses. *Nurse Education in Practice*. 2014;14(6):598-604. doi: 10.1016/j.nepr.2014.05.013

**Reason for exclusion:** This study does not meet the inclusion criteria (construct and outcomes of interest).

14. Hung H-Y, Huang Y-F, Tsai J-J, Chang Y-J. Current state of evidence-based practice education for undergraduate nursing students in Taiwan: A questionnaire study. *Nurse Education Today*. 2015;35(12):1262-7.

**Reason for exclusion:** This study does not meet the inclusion criteria (construct of interest and type of population).

15. Iradukunda F, Mayers PM. Nursing Students' Knowledge, Attitudes, and Application of Evidence-Based Practice at the University of Rwanda. *Student-Related Trends in Nursing Education*.

**Reason for exclusion:** This is only an abstract. The review authors contacted the author to ask the full-text. Dr. Favorite Iradukunda reply and send to review authors the thesis “Knowledge, Attitudes and Application of Evidence-Based Practice by Third- and Fourth-Year Undergraduate Nursing Students”.

16. Iradukunda F. Knowledge, attitudes and application of evidence-based practice by third- and fourth-year undergraduate nursing students at the University of Rwanda (UR): University of Cape Town; 2016.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of population).

17. Karki S, Acharya R, Budhwani H, Shrestha P, Chalise P, Shrestha U, et al. Perceptions and attitudes towards evidence based practice among nurses and nursing students in Nepal. *Kathmandu University Medical Journal*. 2016;13(52):308-15.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of population – it includes nurses and nursing students and does not present separate results).

18. Keib CN, Cailor SM, Kiersma ME, Chen AMH. Changes in nursing students' perceptions of research and evidence-based practice after completing a research course. *Nurse Education Today*. 2017;54:37-43.

**Reason for exclusion:** This study does not meet the inclusion criteria (construct of interest).



19. Leach MJ, Hofmeyer A, Bobridge A. The impact of research education on student nurse attitude, skill and uptake of evidence-based practice: a descriptive longitudinal survey. *Journal of Clinical Nursing*. 2016;25(1/2):194-203.

**Reason for exclusion:** This study does not meet the inclusion criteria (outcomes of interest). Lotz KS. The ABCs of evidence-based practice: integrated evidence-based practice into associate degree nursing curriculum. *Teaching & Learning in Nursing*. 2010;5(3):95-7.

**Reason for exclusion:** This study does not meet the inclusion criteria (constructs of interest).

20. Macintosh JLB, Merrill K, Macintosh CI. Undergraduate Nursing Students' Beliefs and Readiness to Implement Evidence-Based Practice. *Global Research Regarding Undergraduate Nursing Students*. 2014. 25th International Nursing Research Congress

**Reason for exclusion:** This is only an abstract. The review authors contacted the paper authors (Janelle L. B. Macintosh) to ask the full-text. The author Dr. Janelle reply and inform that they do not have more information about this study.

21. Mohammadi MM, Poursaberi R, Salahshoor MR. Evaluating the adoption of evidence-based practice using Rogers's diffusion of innovation theory: a model testing study. *Health Promot Perspect*. 2018;8(1):25-32. doi: 10.15171/hpp.2018.03

**Reason for exclusion:** This study does not meet the inclusion criteria (population and outcomes of interest).

22. Morris J, Maynard V. The feasibility of introducing an evidence based practice cycle into a clinical area: an evaluation of process and outcome. *Nurse Education in Practice*. 2009;9(3):190-8.

**Reason for exclusion:** This study does not meet the inclusion criteria (outcomes of interest).

23. Oh EG, Kim S, Kim SS, Kim S, Cho EY, Yoo JS, et al. Integrating evidence-based practice into RN-to-BSN clinical nursing education. *Journal of Nursing Education*. 2010;49(7):387-92.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of population).

24. Reid J, Briggs J, Carlisle S, Scott D, Lewis C. Enhancing utility and understanding of evidence based practice through undergraduate nurse education. *BMC nursing*. 2017;16(1). doi: 10.1186/s12912-017-0251-1

**Reason for exclusion:** This study does not meet the inclusion criteria (outcomes of interest).

25. Rojjanasrirat W, Rice J. Evidence-based practice knowledge, attitudes, and practice of online graduate nursing students. *Nurse Education Today*. 2017;53:48-53.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of population).

26. Ruzafa-Martínez M, López-Iborra L, Armero Barranco D, Ramos-Morcillo AJ. Effectiveness of an evidence-based practice (EBP) course on the EBP competence of undergraduate nursing students: A quasi-experimental study. *Nurse Education Today*. 2016;38:82-7.

**Reason for exclusion:** This study does not meet the inclusion criteria (outcomes of interest).

27. Ruzafa-Martínez M, Molina-Salas Y, Ramos-Morcillo AJ. Evidence-based practice competence in undergraduate Nursing Degree students. *Enfermería Clínica*. 2016;26(3):158-64.

**Reason for exclusion:** This study does not meet the inclusion criteria (outcomes of interest – it does not present data regarding the outcomes of interest, it only cite the Ruzafa-Martínez et al., 2013).<sup>21</sup>

28. Scurlock-Evans L, Upton P, Rouse J, Upton D. To embed or not to embed? A longitudinal study exploring the impact of curriculum design on the evidence-based practice profiles of UK pre-registration nursing students. *Nurse Education Today*. 2017;58:12-8. doi: 10.1016/j.nedt.2017.07.011

**Reason for exclusion:** This study does not meet the inclusion criteria (outcomes of interest).

29. Waters D, Crisp J, Rychetnik L, Barratt A. The Australian experience of nurses' preparedness for evidence-based practice. *Journal of Nursing Management*. 2009;17(4):510-8.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of population, constructs of interest and outcomes of interest).

30. Watters R, Moore ER, Wallston K. Development and Validation of an Evidence-Based Practice Instrument for Nursing Students Based on the Theory of Planned Behavior. *J Nurs Meas*. 2016;24(1):E1-17.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of population – it includes nurses and nursing students and does not present separate results).

31. Wonder AH, Spurlock DR. A First Look at Undergraduate Nursing Students' Knowledge of Evidence-based Practice Using the Evidence-Based Practice Knowledge Assessment in Nursing. STTI 26th International Nursing Research Congress

**Reason for exclusion:** It is only a PowerPoint presentation. The results are presented at Spurlock Jr, D., & Wonder, A. H. (2015). Validity and Reliability Evidence for a New Measure: The Evidence-Based Practice Knowledge Assessment in Nursing. *Journal of Nursing Education*, 54(11), 605-613. doi: 10.3928/01484834-20151016-01

32. Zeleníková R, Gurková E, Žiaková K, Tomagová M, Jarošová D, Fineout-Overholt E. Psychometric Properties of the Slovak and Czech Versions of the Evidence-Based Practice Beliefs and Implementation Scales. *Worldviews on Evidence-Based Nursing*. 2016;13(2):139-52.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of population – it includes nurses and nursing students and does not present separate results).

33. Jalali-Nia SF, Salsali M, Dehghan-Nayeri N, Ebadi A. Effect of evidence-based education on Iranian nursing students' knowledge and attitude. *Nursing and Health Sciences*. 2011;13(2):221-7.

**Reason for exclusion:** The review authors contacted the paper authors to clarify information regarding the constructs of interest, but the corresponded author (Dr.Mahvash Salsali) did not reply.

34. Brown CE, Kim SC, Stichler JF, Fields W. Predictors of knowledge, attitudes, use and future use of evidence-based practice among baccalaureate nursing students at two universities. *Nurse Education Today*. 2010;30(6):521-7.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of study – this study only assessed the internal consistency and it did not have as objective the assessment of measurement properties).

35. Kim SC, Brown CE, Fields W, Stichler JF. Evidence-based practice-focused interactive teaching strategy: A controlled study. *Journal of Advanced Nursing*. 2009;65(6):1218-27.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of study – this study only assessed the internal consistency and it did not have as objective the assessment of measurement properties).

36. Zhang Q, Zeng T, Chen Y, Li X. Assisting undergraduate nursing students to learn evidence-based practice through self-directed learning and workshop strategies during clinical practicum. *Nurse Education Today*. 2012;32(5):570-5.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of study – this study only assessed the internal consistency and it did not have as objective the assessment of measurement properties).

37. Cosme S, Milner KA, Wonder A. Benchmarking of Prelicensure Nursing Students' Evidence-Based Practice Knowledge. *Nurse Educator*. 2018;43(1):50-3.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of study – this study only assessed the internal consistency and it did not have as objective the assessment of measurement properties).

38. Llasus LSM. Graduating BSN students' EBP knowledge, EBP readiness and EBP implementation: University of Nevada, Las Vegas; 2011.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of study – this study only assessed the internal consistency and it did not have as objective the assessment of measurement properties).

39. Llasus L, Angosta AD, Clark M. Graduating baccalaureate students' evidence-based practice knowledge, readiness, and implementation. *The Journal of nursing education*. 2014;53(9):S82-S9.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of study – this study only assessed the internal consistency and it did not have as objective the assessment of measurement properties).

40. Serfass RL, Wonder AH. You're Teaching Evidence-Based Practice to BSN Students... But Are They Learning? *Nursing Education Perspectives* (Wolters Kluwer Health). 2018;39(3):172-4.

**Reason for exclusion:** This study does not meet the inclusion criteria (type of study – this study only assessed the internal consistency and it did not have as objective the assessment of measurement properties).

## Appendix IV: Characteristics of included studies

Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
Ashktorab et al. 2013 Randomized control trial	Country: Iran Setting: Faculty of nursing and midwifery Mean age: 22.8 years Gender: female (74%) Language: Persian Graduation year: Final semester of the degree program	EBP questionnaire developed by Rubin and Parrish (2010)  Persian version	Subscales: 5 subscales but only 3 were used Constructs: Knowledge, attitude and adoption Number of items: Total of 34 items (knowledge= 10 items, attitude= 14 items and adoption=10 items) Types of Response: Responses were in the 5-point Likert's scale	Face and content validity were evaluated by 14 nursing faculty members and experts in the field of EBP. Scale-Content Validity Index = 0.98. Knowledge subscale: Cronbach's alpha = 0.82 and Interclass Correlation Coefficient = 0.94 Attitude subscale: Cronbach's alpha = 0.80 and Interclass Correlation Coefficient = 0.94 Adoption subscale: Cronbach's alpha = 0.75 and Interclass Correlation Coefficient = 0.74. Overall Cronbach's alpha was more than 0.80.
Ashktorab et al. 2015 Cross-sectional study	Country: Iran Setting: two faculties of nursing and midwifery at Tehran Mean age: 22.75 years Gender: female (77.6%) Language: Persian Graduation year: all nursing students in last year of their education in nursing	EBP questionnaire developed by Rubin and Parrish (2010)  Persian version	Subscales: 5 subscales; however, only three were used. Constructs: knowledge, attitude, and intention to implement EBP Number of items: Total of 34 items (knowledge= 10 items, attitude= 14 items and adoption=10 items) Types of Response: 5-point Likert's scale ranging from 1 (I completely disagree) to 5 (I completely agree).	

Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
Pashaeypoor et al. 2016 cross-sectional study	Country: Iran Setting: two faculties of nursing Mean age: 22.7 years Gender: female (77.6%) Language: Persian Graduation year: final year of nursing programs	EBP questionnaire developed by Rubin and Parrish (2010)  Persian version	Subscales: 5 subscales; however, only three were used. Constructs: Knowledge, attitude, and adoption. Number of items: Total of 34 items (knowledge= 10 items, attitude= 14 items and adoption=10 items) Types of Response: 5-point Likert's scale ranging from 1 (I completely disagree) to 5 (I completely agree).	
Beccaria et al. 2018 cross-sectional study for constructing validity	Country: Australia Setting: Regional university Age: Over half of the students were between the ages of 20–29 years (50.1%), with 46.6% older than 30 years. Gender: female (85.8%) Language: English Graduation year: third year of study, and some second year students	Student Evidence-Based Practice Questionnaire (S-EBPQ) developed by Upton et al., 2016  Australian version	Subscales: four subscales – Frequency of Practice, Attitude, Retrieving and Evidence, and Sharing and Applying Evidence-Based Practice Constructs: Practice, Attitude, Retrieving and Reviewing, and Applying. Number of items: Total of 21 items Types of Response: 7-point Likert scales	Cronbach alpha were 0.92 (Practice), 0.52 (Attitude), 0.94 (Retrieving and Reviewing), and 0.91 (Sharing and Applying). A Principal Components Analysis (PCA) was conducted and all items loaded on a four-factor structure identical to that of the S-EBPQ (Upton et al., 2016) The initial CFA resulted in a poor fitting model, where $\chi^2/(df)=4.875$ , a comparative fit index (CFI) =0.873, and a RMSEA = 0.106 (CI90 =0.099–0.113). Modification indices are provided in AMOS 23 to indicate which items can be correlated to improve model fit. These indices indicated that the error terms for questions 6 & 19, 1 & 2, 14 & 15, and 19 & 20 could be correlated. It was also noted that item 6 cross

Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
	who take the EBP course			<p>loaded on the PCA; and therefore, was deleted from the final solution, leaving a 20-item questionnaire. In the final solution the four factors suggested by Upton et al. (2016) were retained, and the suggested modifications were applied to the final model.</p> <p>This solution represented a reasonable fitting model, where <math>\chi^2/(df) = 2.57</math>, a comparative fit index (CFI) = 0.951, and a RMSEA = 0.068 (CI90 = 0.060–0.076).</p> <p>All standardised path coefficients were significant with the smallest being the path to question 1 = 0.4 and the largest was the path to question 14 = 0.89.</p> <p>The updated Cronbach's alpha for scale 4 after item 6 was deleted remained at 0.92.</p>
Upton et al. 2016 Instrument development study	Country: United Kingdom Setting: University - Faculty of Health Age: Between 18 and 29 years (74.6%) Gender: female (91%) Language: English Graduation year: 1st (44.3%), 2nd (34.8%) or 3rd (20.9%) year	Student Evidence-based Practice Questionnaire (S-EBPQ)  Version for undergraduate nursing students	Subscales: Practice; Attitude; Retrieving and reviewing evidence; and Sharing and applying EBP Constructs: Practice – 6 items; Attitude – 3 items; Retrieving and reviewing evidence – 7 items; Sharing and applying EBP – 5 items  Number of items: 21 Items Types of Response:	Principal Component Analysis demonstrated evidence for the S-EBPQ's construct validity, and analyses comparing the subscale scores of students in their first and second years of studies identified evidence for the tool's convergent validity. Descriptive statistics, correlation coefficients and reliability estimates demonstrated evidence for the S-EBPQ's internal reliability, and item facility and discrimination.  The pattern matrix revealed that all items loaded highly onto a factor, except for item 13 (Monitoring and reviewing of practice skills — from the

Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
			7-point Likert scale	<p>original knowledge/skills scale) which failed to load highly onto any factor. Two items (item 20 — Ability to apply information and item 6 — shared this information with colleagues, from the knowledge/skills and use subscales respectively) loaded highly onto more than one factor. The structure matrix and component correlation matrix revealed a number of high correlations between items and factors, and between the factors themselves (indicating the suitability of Direct Oblimin rotation). Parallel analysis was conducted (based on 24 items, with 244 participants and 100 replications) and revealed that four factors were the most appropriate to be extracted. The PCA was therefore performed again with three items excluded (items 7, 12 and 13), which produced a clearer solution. Four factors were now extracted based on Kaiser's criterion, explaining 65% of the variance. Factor 1 comprised 7 items, all taken from the original knowledge/skills subscale; factor 2 comprised 6 items, all taken from the original practice subscale; factor 3 comprised 6 items all from the original knowledge/subscale, and; factor 4 comprised 3 items all originally from the attitude subscale. Based on the items comprising each factor they were labelled as: Factor 1 — Retrieving and reviewing evidence subscale; Factor 2 —</p>



Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
				<p>Frequency of practice subscale; Factor 3 — Sharing and applying EBP subscale; Factor 4 — Attitude subscale.</p> <p>The component correlation matrix revealed moderate correlations between factors 1 and 2, 3 and 4 and between 2 and 3.</p> <p>All in the expected direction (i.e., positive relationships). Providing further evidence of the questionnaire's construct validity (and the appropriateness of the Direct Oblimin rotation).</p> <p>Two items (item 6 — “shared this information with colleagues” and item 21 — “ability to apply information”) loaded highly onto more than one factor. Item 6 loaded highly onto the practice subscale and the sharing and applying EBP subscale. This may represent the relationship between ability to share information and frequency of sharing information. Item 21 loaded highly onto the two factors which originally comprised the knowledge/skills subscale, demonstrating the relationship between these two factors.</p> <p><b>Convergent Validity</b></p> <p>The MANOVA revealed a statistically significant main effect of study year (Wilks' lambda = .90, F(8476)= 3.28, p = .001, <math>\eta^2 = .05</math>).</p> <p>The Bonferroni correction was applied (resulting in a new alpha of .013) and statistically significant differences were</p>

Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
				<p>identified separately on the practice subscale (<math>F(2,241) = 7.14, p = .001, \eta^2 = .06</math>) and the retrieval/reviewing of evidence subscale (<math>F(2,241) = 8.20, p = .001, \eta^2 = .06</math>). However, no significant differences were identified on the attitude subscale (<math>F(2,241) = 1.09, p = .337, \eta^2 = .01</math>) or the sharing and applying subscale (<math>F(2,241) = 3.34, p = .037, \eta^2 = .03</math>). Post-hoc comparisons were performed on the practice subscale and retrieval/reviewing evidence subscale scores for students in their 1st, 2nd and 3rd years of study. Significant differences were identified (based on a Bonferroni corrected alpha of 0.17) between students in years 1 and 3 (<math>p = .001</math>) and years 2 and 3 (<math>p = .007</math>) on the practice subscale and between students in years 1 and 3 (<math>p = .012</math>) and years 2 and 3 (<math>p = .001</math>) on the retrieval/reviewing evidence subscale. No other statistically significant differences were identified. Examining the means for each year revealed patterns broadly in the direction anticipated; for example, the third-year scores were higher than first year scores on all subscales. Internal reliability estimates were calculated for each subscale of the S-EBPQ. The Cronbach's alpha and split-half reliability estimates were all over 0.7, indicating strong internal consistency.</p> <p>Item facility and discrimination</p>

Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
				<p>were investigated using the means and standard deviations for each question. No evidence for floor or ceiling effects were identified and all but one item (13) demonstrated a standard deviation of greater than 1 point on the scale, providing evidence of item discrimination. The corrected-item total coefficients were all greater than .2 and the squared multiple correlations indicated a substantial overlap between item and subscale score of between 29% and 75%. Combined these provide evidence of good item discrimination. Cronbach's alpha if item deleted was calculated to help identify if the removal of any item would improve the internal consistency of the S-EBPQ subscales. Examining the estimates indicated that all items were contributing in a meaningful way and so were retained.</p>
<p>Zhang et al. 2018 A cross-sectional validation study</p>	<p>Country: China Setting: Universities in Xi'an, a northwest city in China Mean age: 23.16 (SD = 1.10) Gender: female (91.5%) Language: Mandarin Chinese language</p>	<p>Student Evidence-Based Practice Questionnaire (S-EBPQ) Chinese version</p>	<p>Subscales: Practice; Attitude; Retrieving and reviewing evidence; and Sharing and applying EBP Constructs: EBP use, attitudes, knowledge and skills Number of items: 21-items Types of Response: scale of 1 to 7, with</p>	<p>The split-half coefficient for the overall Chinese S-EBPQ was 0.858. A content validity index of 0.986 was achieved. Principal component analysis resulted in a 4-factor structure explaining 68.285% of the total variance. The comparative fit index was 0.927, and the root mean squared error of approximation was 0.072 from the confirmatory factor analysis. Known-group validity was</p>

Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
Spurlock et al. 2015 Development and validation of a measurement instrument study	<p>Graduation year: No information</p> <p>Country: United States of America Setting: nursing education programs offered in two large midwestern cities Mean age: No data available, but the participants have at least 18 years old Gender: female (90.5%) Language: English Graduation year: No specific available information, but the majority (38.5%) of participants indicated they had completed approximately 50% of their current programs and 23.5% indicated</p>	<p>Evidence-Based Practice Knowledge Assessment in Nursing (EKAN)</p> <p>Original version</p>	<p>a higher score indicating a more positive attitude toward clinical effective, use, knowledge, and skills.</p> <p>Subscales: Without subscales Constructs: EBP knowledge Number of items: 20 items Types of Response: multiple choice test</p>	<p>supported by the significant differences according to various characteristics of participants. Internal consistency was high for the Chinese S-EBPQ reaching a Cronbach <math>\alpha</math> value of 0.934. Test-retest reliability was 0.821.</p> <p>For the final, 20-item EKAN measure, mean item difficulty was <math>M = 0.19</math> (range = <math>-2.0</math> to <math>2.8</math>), weighted mean square infit was <math>M = 1.01</math> (range = <math>0.95</math> to <math>1.06</math>), standardized weighted mean square infit was <math>M = 0.33</math> (range = <math>-0.7</math> to <math>1.6</math>), unweighted mean square outfit was <math>M = 1.02</math> (range = <math>0.93</math> to <math>1.14</math>), and standardized unweighted mean square outfit was <math>M = 0.34</math> (range = <math>-1.08</math> to <math>2.00</math>). Strong evidence of unidimensionality was confirmed by narrow item infit statistics centering on 1.0. The item separation index was 7.05, and the person separation index was 1.66. Item reliability was 0.98, and person reliability was 0.66.</p>

Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
	they had completed approximately 25% or 75%.			
Nick et al. 2017 A cross-sectional, descriptive, correlational design	Country: Dominican Republic Setting: baccalaureate nursing program in Dominican Republic Mean age: 29.6 (SD= 7.8) Gender: female (93.5%) Language: Spanish Graduation year: 66% of subjects were seniors, and reported being in their eighth or ninth term of enrollment in the nursing program (with a range of five to ten terms).	Evidence-Based Practice Knowledge Assessment in Nursing (EKAN)  Spanish version	Subscales: Without subscales Constructs: knowledge Number of items: 20 items Types of Response: multiple choice test	Good validity and reliability parameters under the Rasch model Using Rasch model analytics, validity indices of the EKAN produced a difficulty index ranging from $\Theta = -1.78$ to 2.22. Mean infit and outfit statistics narrowly centered on 1.0 (WMS M = .978; UMS M= .988) indicating strong evidence of trait unidimensionality. For reliability indices, separation index values of $> 2.0$ is a desirable goal. The EKAN-Spanish item separation was robust at 4.27 but person separation was somewhat limited at .38. Item reliability was .94 and person reliability was .13, indicating trait (EBP knowledge) restriction among the study sample. Additionally, differential item functioning (DIF) analysis produced no evidence of language-related concern on any of the EKAN's 20 items, supporting translational accuracy.
Ruzafa-Martinez et al. 2013 Development and validation of a measurement instrument	Country: Spain Setting: Faculty of Nursing, University of Murcia Mean age: 22.14 (SD 5.305) Gender: female	Evidence Based Practice Evaluation Competence Questionnaire (EBP-COQ)  Original	Subscales: Attitude toward EBP; Skills in EBP; and Knowledge in EBP. Constructs: attitude, knowledge and skills in EBP Number of items: 25 items	The 25 items correlated at least 0.3 with at least one other item, suggesting reasonable factorability. The Kaiser–Meyer–Olkin measure of sampling adequacy was 0.933 ( $p < 0.001$ ), suggesting that factor analysis was appropriate for this data set.

Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
study	(82.5%) Language: Spanish Graduation year: First year (1.6%); Second year (68.8%); Third year (29.6%)	version	Types of Response: 5-point Likert-type scale, ranging from 1 “Strongly disagree” to 5 “Strongly agree”.	Barlett’s test of sphericity was significant ( $\chi^2(300) = 3037.995$ , $p < 0.001$ ). The diagonals of the anti-image correlation matrix were all over 0.5, supporting the inclusion of each item in the factor analysis. Finally, the communalities were all above 0.3 further confirming that each item shared some common variance with other items. Given these overall indicators, factor analysis was conducted with all 25 items. The exploratory factor analysis (principal components) of the remaining 25 items, using varimax rotation to account for the relationship among the factors, yielded a three-factor structure that explained 55.55% of the variance of the data. Cronbach’s alpha was 0.888 for the entire questionnaire. Internal reliability was also confirmed for each of the subscales with Cronbach’s alpha being 0.940 for factor 1: Attitude toward EBP; 0.756 for factor 2: Skills in EBP and 0.800 for factor 3: Knowledge in EBP. External construct validity was also established by exploring the correlation between questionnaire scores and other variables that have been supposed are related to the competence in EBP concept. A positive and high relationship was found between “attitude toward research” and EBP competence (global score) and factor 1: “attitude toward EBP”. However, there is not relationship with factor 3: “knowledge in

Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
				<p>EBP” and the correlation with the factor 2: “skills in EBP” is moderate. A sizable and significant positive correlation is present between factor 2 and 3 and the perception of knowledge level and skills level measured through a visual analogue scale. Other correlations are smaller, even though some are significant. However, we should notice that factor 1 only correlates with self-reported attitude toward EBP scale.</p> <p>Discriminant validity was assessed by comparing those nursing students with previous training in EBP and research methodology and those without. The results of the Student’s t-test used to compare independent means indicated that those who have receive formal education in EBP and research methodology had a better self perception of Knowledge and Skills in EBP. The attitude toward EBP is also higher at those nursing students with training in EBP and Research although the different are only near significant. Overall, the EBP-COQ demonstrates good sensitivity to the effects of training, distinguishes among respondents with different educational training in EBP and research methodology,</p>
Yildiz et al. 2016 Translation and validation	Country: Turkey Setting: University located in	Evidence-based Practice Evaluation Competence	Subscales: Attitude toward EBP; Skills in EBP; and Knowledge in EBP. Constructs:	Eight team members evaluated the scale items, and the content validity indices (CVI) of the items were found to be between 0.87 and 1.00. The CVI for all

Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
study	eastern Turkey Mean age: $22.07 \pm 2.14$ years Gender: female (77.9%) Language: Turkish. Graduation year: third and fourth years	Questionnaire (EBP-COQ) Turkish version	attitude, knowledge and skills in EBP Number of items: 25 items Types of Response: The 5-point Likert- type scale (1 = Strongly Disagree, 2 = Somewhat Disagree, 3 = Neither Disagree nor Agree, 4 = Somewhat Agree, 5 = Strongly Agree)	<p>items in the scale was found to be 0.93.</p> <p>In testing the sample adequacy, KMO value was found to 0.856, and the Bartlett's test result was <math>X^2 = 2174.93</math>, <math>df = 300</math> <math>p = 0.000</math>. The scale has three subscales.</p> <p>The exploratory factor analysis implied a three-factor structure, explaining 50.93% of the variance in the data. Factor 1 (13 items), attitudes towards EBP, consisted of items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13. Factor 2 (6 items), skills in EBP, consisted of items 14, 15, 16, 17, 18 and 19. Factor 3 (6 items), knowledge of EBP consisted of items 20, 21, 22, 23, 24 and 25. Factor analysis showed that factor 1 explains 26.29% of the total variance (eigenvalue 6.321), factor 2 explains 15.31% of the total variance (eigenvalue 3.82), and factor 3 explains 9.33% of the total variance (eigenvalue 2.33).</p> <p>The reliability coefficient for the total scale was 0.826, and alpha coefficients for the subscales ranged from 0.52 to 0.85. Factor-1: "Attitude towards EBP" consisted of 13 items Cronbach's alpha coefficients for this subscale 0.850. Factor-2: "Skills in EBP" consisted of 6 items Cronbach's alpha coefficients for this subscale 0.516, the factor-3: "Knowledge in EBP" consisted of 6 items Cronbach's alpha coefficients for this subscale</p>



Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
Titlestad et al. 2017 Translation and cross-culturally adaption study	Country: Norway Setting: Large University College Mean age: 24.4 (6.4) Gender: female (87%) Language: Norwegian Graduation year: Second year nursing students	Evidence-based practice profile (EBP <sup>2</sup> ) questionnaire Norwegian version	Subscales: Relevance, Sympathy, Terminology, Practice and Confidence. Relevance (14 items) refers to the value, emphasis and importance placed on EBP, Sympathy (7 items) refers to the individual's perception of the compatibility of EBP with professional work, Terminology (17 items) refers to the understanding of common research terms, Practice (9 items) refers to the use of EBP in clinical situations and Confidence (11 items) refers to the perception of an individual's ability	0.587. the ratio of chi-square statistic to degrees of-freedom( $\chi^2/df$ ) was found to be 2.416 ( $\chi^2=657.364$ $df=272$ ). The root mean square error of approximation (RMSEA) was 0.076. The Tucker-Lewis Index (TLI) was 0.902, and the comparative fit index (CFI) value was 0.926. Having higher CFI and TLI values over 0.90 means that that model has a good fit  The pilot tested the comprehension of the translated version of EBP2 on 18 participants from five different health and social professions. Nine of these participants were considered experts in EBP. All participants completed the questionnaire while they read aloud the item response options and their own choice of answer. After completion, the participants were interviewed by KBT to elaborate on items or response options that were unclear. The data from the interviews were organised and summarised using "The Problem Respond Matrix". "The Problem Respond Matrix" showed that eleven items were unclear or challenging to understand (the matrix is available on request). These items were re-worded after consulting the copyright holder. The pilot participants with expertise in EBP (n = 9) confirmed face validity. The expert panel assessed content validity and found the

Study and Study design	Characteristics of the study sample	Instrument and version	Characteristics of the instrument	Results of the measurement properties
			<p>with EBP skills</p> <p>Constructs: knowledge, behaviour and attitudes related to evidence-based practice</p> <p>Number of items: 74 items (58 domain items and 16 non-domain)</p> <p>Types of Response: 5-point Likert scale</p>	<p>questionnaire, questions and rating scale clinically reasonable and relevant to the area of applicability.</p> <p>They formulated a priori hypotheses on Effect Size and Paired t test results (P value) to measure the questionnaire's responsiveness. Responsiveness was as expected or better for all domains except Sympathy.</p> <p>Statistically significant mean differences comparing pre- and post-EBP course measurements were observed for all domains except Sympathy. ES values were as expected or better for the domains Relevance, Terminology, Practice and Confidence, but lower for Sympathy.</p>

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# Chapter 4

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Translation, cross-cultural adaptation and preliminary validation of instruments for Portuguese nursing educators regarding evidence based practice

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## Chapter 4. Translation, cross-cultural adaptation and preliminary validation of instruments for Portuguese nursing educators regarding evidence based practice

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### Resumen

El objetivo de este estudio es traducir y adaptar culturalmente al portugués europeo “EBP Beliefs Scale for Educators” (EBPB-E), “EBP Implementation Scale for Educators” (EBPI-E) y “Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey” para docentes (OCRSIEP-E); y presentar datos preliminares de validación. El estudio se realizó en dos fases: traducción y adaptación transcultural; y validación preliminar en docentes de enfermería de nueve escuelas de enfermería de Portugal. Las versiones pre-finales de los instrumentos se consideraron de fácil comprensión. Pero, los participantes sugirieron incluir la posibilidad de respuesta "no sé" y aumentar el período de recuerdo en el EBPI-E. 68 educadores participaron en la fase II. El  $\alpha$  para EBPB-E, EBPI-E y OCRSIEP-E fue 0,88, 0,95 y 0,94 y las correlaciones elemento-total corregidas entre los ítems y la puntuación total variaron de 0,20 a 0,75, 0,59 a 0,84 y -0,06 a 0,78, respectivamente. Los hallazgos preliminares mostraron una fuerte consistencia interna. Se necesitan otros estudios de validación con muestras más robustas para probar la confiabilidad y la validez de los instrumentos.

Palabras Clave: estudios-de-validación; práctica-clínica-basada-en-la-evidencia; educación-en-enfermería; docentes

### Abstract

The objectives of this study are to translate and cross-cultural adapt to European Portuguese the EBP Beliefs Scale for Educators (EBPB-E), EBP Implementation Scale for Educators (EBPI-E) and Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey for educators (OCRSIEP-E); and to provide preliminary validation data. The study was performed in two phases: translation and cross-cultural adaptation; and the preliminary validation in nursing educators from nine nursing schools of Portugal. In general, the pre-final instruments were considered easy to understand. However, the participants suggested to include the answer possibility “I do not know” and to increase the recall period in EBPI-E. 68 educators participate in phase II. The  $\alpha$  for the EBPB-E, EBPI-E and OCRSIEP-E were 0.88, 0.95 and 0.94 and the corrected item-total correlations ranged from 0.20 to 0.75, from 0.59 to 0.84 and from -0.06 to 0.78, respectively. The preliminary findings showed

strong internal consistency. Further validation studies with more robust samples are needed for test the reliability and validity of the instruments.

Keywords: validation-studies; evidence-based-practice; education, nursing; faculty

### Resumo

Os objetivos deste estudo são traduzir e adaptar para Português Europeu o EBP Beliefs Scale for Educators (EBPB-E), EBP Implementation Scale for Educators (EBPI-E) e Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey for educators (OCRSIEP-E); e fornecer dados preliminares de validação. O estudo foi realizado em duas fases: tradução e adaptação transcultural; e a validação preliminar em docentes de enfermagem de nove escolas de enfermagem de Portugal. Globalmente, as versões pré-finais dos instrumentos foram considerados de fácil compreensão. Contudo, os participantes sugeriram incluir a possibilidade de resposta “não sei” e aumentar o período recordatório no instrumento EBPI-E. 68 educadores participaram na fase II. O  $\alpha$  para o EBPB-E, EBPI-E e OCRSIEP-E foi 0,88, 0,95 e 0,94 e as correlações item-total corrigidas variaram de 0,20 a 0,75, de 0,59 a 0,84 e de -0,06 a 0,78, respetivamente. Os resultados preliminares mostraram forte consistência interna. São necessários outros estudos de validação com amostras mais robustas para testar a confiabilidade e a validade dos instrumentos.

Palavras-chave: estudos-de-validação; prática-clínica-baseada-em-evidências; educação-em-enfermagem; docentes

### INTRODUCTION

The Evidence Based Practice (EBP) can be defined as a “clinical decision making that considers the best available evidence; the context in which the care is delivered; client preference; and the professional judgment of the health professional.”<sup>1, p. 2</sup> The EBP is not a new concept, however in the last decades it reached a great emphasis due to its recognition in promotion of high-value health care, improvement of patient experience and health outcomes, and reduction of health care costs.<sup>2</sup> As a result, the EBP implementation in clinical contexts has been recommended by several organizations, such as the World Health Organization,<sup>3,4</sup> the International Council of Nurses,<sup>5</sup> the Institute of Medicine,<sup>6</sup> the Directorate-General of Health with Portuguese National Health Plan 2012-2016,<sup>7</sup> and the National Council of Nursing.<sup>8</sup> Nevertheless, the use of research into practice by nurses remains under the desirable.<sup>9-11</sup> In 2008, Melnyk and colleagues<sup>12</sup> argued that to promote the translation of evidence into clinical practice it is mandatory that on the one hand the clinical nurses must acquire EBP Knowledge and skills and develop strong beliefs regarding the EBP value; and, on the other hand, the educators must teach the EBP process to their students in order to infuse EBP skills in the future nurses. Indeed, the educators and the academic institutions play a fundamental role in narrowing the gap between the research and

practice.<sup>13-15</sup> In a recent paper, Melnyk<sup>16</sup> reinforce this preponderant role of academic institutions and nursing educators in providing EBP competencies to their students. Already in 2015, Kalb and colleagues<sup>17</sup> stated that it was necessary to strengthen the educators' capacity to prepare their students to use EBP in clinical practice.

Nevertheless, there are several barriers to the EBP implementation in education, such as: faculty aging<sup>18,19</sup>; lack of EBP knowledge, EBP understanding and confidence in teaching EBP<sup>20,21</sup>; lack of time, resources and support to promote and teaching EBP<sup>20,21</sup>; and inconsistency between academic and clinical teaching contexts.<sup>21</sup>

Whereas, despite these barriers, it is urgent to incorporate EBP competencies in nursing educational programs. Strong EBP beliefs and confidence in ability to implement EBP of educators as well as an organizational culture that supports the EBP use are key factors to successfully integrate EBP in educational programs. Thus, it is important to understand the nursing educators' beliefs regarding EBP, their degree of EBP implementation and the readiness for school-wide integration of EBP.

Within the Portuguese context, there are no instruments available to characterize and understand today's Portuguese reality of nursing education institutions about: readiness of EBP integration; nurse educators' EBP beliefs and the extent of their EBP implementation. To have these instruments is of major importance to characterize and understand the Portuguese current reality and, therefore, to plan an appropriate integration of EBP in nursing schools.

As such, the objective of this study was to translate and cross-cultural adapt to European Portuguese the instruments "EBP Beliefs Scale for Educators" (EBPB-E), "EBP Implementation Scale for Educators" (EBPI-E) and "Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey" for educators (O CRSIEP-E). Moreover, this study intended to provide some preliminary validation data of these European Portuguese versions.

## **MATERIALS AND METHODS**

This study was conducted in two phases during 2017–2018. The phase I consisted of translation and cross-cultural adaptation of the EBPB-E, EBPI-E and O CRSIEP-E. The phase II consisted of the preliminary validation of these versions in Portuguese nursing educators.

### *Instruments*

The instruments EBPB-E, EBPI-E and O CRSIEP-E were developed by Fineout-Overholt and Melnyk.

The EBPB-E instrument assesses health profession educators' beliefs regarding EBP and the confidence in their capacity to teach and implement EBP. It is a 22-item instrument with a 5-point Likert scale (1=

Strongly Disagree to 5= Strongly Agree). Two of the 22 items are reverse-scored items (Item 12 = “I believe that EBP takes too much time.” and Item 14 = “I believe EBP is difficult.”). The total score ranges from 22 to 110 meaning that higher scores signify stronger EBP beliefs regarding EBP and the confidence in the capacity of health profession educators to teach and implement EBP. A score higher than 88 indicates a strong belief in and confidence about teaching EBP. This scale has reliability with internal consistency  $>.85$ .<sup>22</sup>

The EBPI-E is a self-report instrument with 18 items that assesses the EBP implementation of the health profession educators considering the engagement in expected behaviors of evidence-based educators in the last eight weeks. The total score of EBPI-E ranged from 0 to 72. Each item is scored with a 5-point scale (0 = 0 times; 1 = 1-3 times; 2 = 4-5 times, 3 = 6-8 times, 4 = more than 8 times). A total score below 72 indicate that educators are not implement EBP within the educational learning environment.<sup>22</sup>

The OCRSIEP-E is a self-report instrument with 25 items. It measures the readiness for school-wide integration of EBP and factors that influence the EBP implementation within an academic setting. Each item is scored with a 5-point scale (1= none at all to 5= very much) and the OCRSIEP-E total score ranges from 25-125. “Scores greater than 75 demonstrate moderate movement toward a culture of EBP, but not yet sustainable; scores  $<75$  indicate an opportunity for growth within the educational setting to move toward a culture of EBP; scores  $100<$  indicate essential movement toward a sustainable culture of school-wide EBP”.<sup>22, p. 1</sup>

All the instruments described in this section has consistently performs reliability with internal consistency  $>.85$ .<sup>22</sup>

#### *Phase I – Translation and Cross-Cultural Adaptation*

To preserve the content validity of the instrument, the translation and cross-cultural adaptation of the EBPB-E, EBPI-E and OCRSIEP-E into European Portuguese were performed following the guidelines provided by Beaton et al.<sup>23</sup> for the cross-cultural adaptation of self-report measures. These guidelines recommended 5 stages, as outlined below.

Stage I – Initial translation: two bilingual translators, whose first language is the European Portuguese, produced two versions (including item content, response options and instructions) of the instruments in an independent way. One of the translators was familiar with the concepts used in the questionnaires. Another one was a naive translator, which means that she was not aware of the concepts being measured.

Stage II – Synthesis of the translations: the two translators prepared one common translation (T-12) based on the original questionnaires and on the first (T1) and second (T2) translators’ versions.



Stage III – Back translation: to ensure that the translated versions reflected adequately the original versions of the three instruments, two translators (native English speakers and without knowledge of the original version of the instruments) performed, independently, the back translations (BT1 and BT2). Both translators were not aware of the concepts being measured.

Stage IV – Expert committee: 7 experts (health professionals, persons with experience in validation studies, language professional, and translators) analyze all the instruments versions and developed the prefinal versions of each one. Whenever required, one of the original authors of the instruments were contact to clarify some issues in order to make a final decision. In this stage, the expert committee achieved equivalence between the original and target versions in four areas (semantic equivalence, idiomatic equivalence, experiential equivalence and conceptual equivalence).

Stage V – Test of the prefinal versions: The prefinal version of the Portuguese translation of each instrument was tested in a sample of nursing educators/faculties. Each participant completes the instruments and a brief questionnaire (presented in Figure 1) regarding the comprehensibility of each item.

Figure 1. Brief questionnaire applied to each participant in the test of the prefinal version of each instrument.

<p>In your opinion:</p> <p>Do you consider the items statements are written clearly?</p> <p>Yes                      No</p> <p>If not, which are not clear and why?</p>
<p>If you did not rate one or more items, please list them and identify the reason(s) using the following statements:</p> <ul style="list-style-type: none"> <li>- I did not classify the item(s) number _____ because I have no knowledge that allows me to classify.</li> <li>- I did not rate the item(s) number _____ because the statement is not clear.</li> <li>- I did not rate the item(s) number _____ because _____</li> </ul>
<p>If you wish, please leave any additional comments:</p>

*Phase II – Preliminary Validation*

Educators of nine nursing schools of Portugal were included. The three main Portuguese nursing education institutions were selected. These three institutions are not integrated into polytechnic institute or university. The remaining six institutions were randomly selected (one institution from Polytechnic and one from university in each Continental Portugal region – north, centre and south). Ten socio-demographic questions and the three Advancing Research & Clinical practice through close Collaboration & Education (ARCC-E) EBP in Education questionnaires (total 65 items) were included in the online survey.

*Statistical analysis*

The Statistical Package for the Social Science Software (version 24.0; SPSS Inc., Chicago, IL, USA) was used to perform all the statistical analysis. A descriptive analysis was performed regarding the socio-demographic data to characterize the sample. The internal consistency of the European Portuguese version of the EBPB-E, EBPI-E and OCRSIEP-E instruments were assessed with Cronbach's alpha coefficient, corrected item-total correlation and with the means by item.

*Ethical Consideration*

The original authors of the instruments were contacted and have consented the translation, cross-cultural adaptation and validation of the instruments to European Portuguese. The study was approved by the Ethical Committee of the Faculty of Medicine of University of Coimbra (Reference: CE-037/2017). Moreover, all the institutions in which the study was carried out provided written approval. Informed consent was obtained from participants and all the collected data were processed in a confidential way.

**RESULTS***Phase I – Translation and Cross-Cultural Adaptation*

The stage I, II and III of the translation and cross-cultural adaptation phase proceeded smoothly. However, at stage IV, the expert panel through consensus meetings suggested some changes to clarify and adapt the instruments to Portuguese context.

The term “patients” was translated for “*utentes*”, which is more appropriate within the Portuguese context when we want to mention a person who is a user of health services regardless of whether the person is ill or not.

The expert panel decided to translated the expression “evidence-based guidelines” to “*diretrizes/orientações (guidelines) baseadas em evidência*”. In this case, the term “guidelines” was

maintained between brackets, because some Portuguese educators more readily recognize this foreignism.

It was very difficult to find an adequate translation of the English expression “a time efficient way”. After some discussion of the expert panel, it decided to use the expression “*adequadamente e em tempo útil*”, because this expression gives the indication of the efficiency in terms of time and adequacy.

To improve the understanding of the phrase “critically appraising evidence”, it was used the translation “*avaliação da qualidade metodológica*” plus the phrase “critically appraising” between brackets once it was an English expression readily recognize in Portugal.

Regarding the EBPI-E instrument, the item 1 (“Used evidence to change my teaching...”) was clarified using additional information between brackets [*Utilizei evidência para mudar o meu ensino (processo, conteúdos, etc)*]. The items 12 and 13 were adapted to accept other systematic reviews (item 12) and guidelines (item 13) databases beyond the Cochrane database of systematic reviews and the National Guidelines Clearinghouse. The item 12 were adapted from “Accessed the Cochrane database of systematic reviews...” to “*Acedi a base(s) de dados de revisões sistemáticas (por exemplo, Cochrane database of systematic reviews)*” and the item 13 from “Accessed the National Guidelines Clearinghouse...” to “*Acedi a base(s) de dados de Diretrizes/orientações (guidelines) (por exemplo, National Guidelines Clearinghouse)*”.

Concerning the OCRSIEP-E, the expert panel decided to add the following note at the first time the term “mentor” appears to clarify its meaning: *Mentores de PBE: pessoa confiável com conhecimentos e treino avançado em PBE que orienta, promove a autoconfiança e infunde valores no aprendiz.*

Furthermore, some terms/expressions were adapted to the Portuguese nursing education context, such as “community partners” (*instituições parceiras onde decorrem os ensinamentos clínicos/prática clínica*), “clinical faculty” (*assistentes convidados/auxiliares pedagógicos*), “junior faculty” (*professores adjuntos*), and “senior faculty” (*professores coordenadores/professores coordenadores principais*). Item 17 was divided into 3 subitems, besides the adaptation of some expressions (from “College administration” to “*Direção da escola*” and from “University administration” to “*Direção da universidade/instituto politécnico*”), the expert panel agreed on the inclusion of a note in sub item 17.3., because there are nursing schools in Portugal that are not integrated in universities or polytechnics and, considering this, the participants included in this type of schools should select the same answer to item 17.2 and 17.3. The note added was “*Nas escolas não integradas em universidades ou institutos politécnicos a resposta a esta pergunta deverá ser a mesma que a da pergunta anterior*”.

After these modifications, the expert committee produced and agreed on the prefinal versions of the Portuguese translation.

Twenty-one Portuguese nursing educators, five males and 16 females aged between 30 and 62 years, participated in the stage V. They completed a questionnaire (already presented in Figure 1), by each instrument, regarding the comprehensibility of each item. In general, these educators considered that the items were understood, but they suggested two important modifications. They suggested the inclusion of another answer option – I do not have enough knowledge to allow me to answer [Não tenho conhecimento suficiente que me permita responder] – and they recommended to change the recall period of the EBPI-E from 8 weeks to one year. These suggestions were analyzed and included in the final versions of the instruments. The answer option “I do not have enough knowledge to allow me to answer” was made available for the participants, but this answer option was not scored and participants that use this option to at least one item were removed from the analysis.

#### *Phase II – Preliminary Validation*

A total of 68 educators with an average age of 52.87 years (SD = 7.45; range: 29 – 64) answered the online questionnaire. The table 1 shows the socio-demographic characterization of the total sample. A large majority of the sample was female (n = 52, 76.5%). More than half of the participants have Ph.D. (n = 46, 67.6%) and 44 of the 68 educators participate in some form of EBP training (n = 44, 64.7%). The majority of the participants were from the main Portuguese nursing education institutions - not integrated into polytechnic institute or university (n = 38, 55.88%).

*Table 1. Socio-demographic characterization of the sample (n = 68, data collection in 2018)*

Age in years, mean $\pm$ SD (Min – Max)	52.87 $\pm$ 7.45 (29 – 64)
Female, n (%)	52 (76.5)
Male, n (%)	16 (23.5)
Education	
Graduation, n (%)	2 (2.9%)
Master, n (%)	19 (27.9%)
Ph.D., n (%)	46 (67.6%)
Aggregation, n (%)	1 (1.5%)
EBP training	
Yes, n (%)	44 (64.7%)
No, n (%)	24 (35.3%)
Nursing School	
Not integrated, n (%)	38 (55.88%)
Integrated into University, n (%)	18 (26.47%)
Integrated into Polytechnic Institute, n (%)	12 (17.65%)

SD = Standard deviation; *Min* = *Minimum*; *Max* = *Maximum*

#### *Preliminary Validation of the EBPB-E*

For the internal consistency analysis of the EBPB-E, responses from 50 of the 68 educators who did not choose the answer option *I do not have enough knowledge to allow me to answer* in one or more items were included in the preliminary analysis. These 50 educators had an average age of 53.16 years (SD = 6.62; range: 29 – 64). A large majority of this sample was female (n = 36, 72.0%), with more than half of the participants having Ph.D. preparation (n = 36, 72.0%) and participate in some form of EBP training (n = 37, 74.0%). The majority of this sample were from the main Portuguese nursing education institutions - not integrated into polytechnic institute or university (n = 28, 56.0%).

The 18 educators, of the 68, who chose the answer option *I do not have enough knowledge to allow me to answer* in one or more items were excluded from this analysis. The average age of this group was 52.06 years (SD = 9.58; range: 32 – 63). A large majority of these educators was female (n = 16, 88.9%), more than half have Ph.D. (n = 10, 55.6%) and are from the main Portuguese nursing education institutions - not integrated into polytechnic institute or university (n = 10, 55.6%). However, the majority of these educators did not report participating in some form of EBP training (n = 11, 61.1%).

The item means of the EBPB-E range between 3.22 (item 14) and 4.82 (item 5). The EBPB-E had high strong internal consistency ( $\alpha = 0.88$ ) and the corrected item-total correlations ranged between 0.20 and 0.75, representing a moderate to strong correlation between the items and total score (Table 2).

*Table 2. Item Mean, Standard deviation of the item, Corrected Item-Total Correlation and Cronbach's Alpha if Item Deleted of the EBPB-E (n = 50, data collection in 2018)*

<b>Items</b>	<b>Item Mean</b>	<b>Standard deviation of the item</b>	<b>Corrected Item-Total Correlation</b>	<b>Cronbach's Alpha if Item Deleted</b>
Item 1	4.74	.443	.294	.882
Item 2	4.38	.697	.569	.875
Item 3	4.02	.622	.532	.876
Item 4	4.60	.571	.538	.877
Item 5	4.82	.388	.340	.881
Item 6	4.12	.773	.433	.879
Item 7	4.14	.606	.748	.871
Item 8	3.78	.545	.525	.877
Item 9	3.64	.693	.490	.877
Item 10	4.50	.580	.203	.885
Item 11	3.80	.728	.535	.876
Item 12	3.40	.969	.433	.881
Item 13	3.78	.764	.688	.871
Item 14	3.22	1.016	.209	.891
Item 15	3.78	.648	.526	.877
Item 16	3.60	.756	.664	.872
Item 17	4.06	.740	.230	.885
Item 18	3.80	.728	.704	.871
Item 19	4.48	.544	.355	.881

Items	Item Mean	Standard deviation of the item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item 20	3.92	.634	.749	.870
Item 21	4.34	.688	.654	.873
Item 22	4.00	.756	.300	.883

#### *Preliminary Validation of the EBPI-E*

For the internal consistency analysis of the EBPI-E, responses from 55 of the 68 educators who did not choose the answer option *I do not have enough knowledge to allow me to answer* in one or more items were included in the preliminary analysis. These 55 educators had an average age of 52.15 years (SD = 7.83; range: 29 – 63). A large majority of these educators was female (n = 41, 74.5%). More than half of this sample have Ph.D. (n = 37, 67.3%) and reported participating in some form of EBP training (n = 40, 72.7%). The majority of the participants are from the main Portuguese nursing education institutions - not integrated into polytechnic institute or university (n = 36, 65.5%).

The 13 educators who chose the answer option *I do not have enough knowledge to allow me to answer* in one or more items were excluded from this analysis. The average age of this group was 55.92 years (SD = 4.68; range: 48 – 64), with a large majority of the sample female (n = 11, 84.6%) and PhD-prepared (n = 9, 69.2%). Nevertheless, the majority of this sample did not participate in some form of EBP training (n = 9, 69.2%). Two participants (15.4%) are from the main Portuguese nursing education institutions - not integrated into polytechnic institute or university; five participants (38.5%) are from nursing schools integrated into Polytechnic institutes; and six participants (46.2%) are from nursing schools integrated in universities.

The item means of the EBPI-E range between 1.38 (item 15) and 3.11 (item 12). The EBPI-E presents an alpha Cronbach of 0.95 and the corrected item-total correlations ranged between 0.59 and 0.84, representing a moderate to strong correlation between the items and total score (Table 3).

*Table 3. Item Mean, Standard deviation of the item, Corrected Item-Total Correlation and Cronbach's Alpha if Item Deleted of the EBPI-E (n = 55, data collection in 2018)*

Item	Item Mean	Standard deviation of the item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item 1	2.93	1.260	.594	.954
Item 2	2.40	1.422	.835	.950
Item 3	2.49	1.399	.795	.951
Item 4	2.75	1.294	.737	.952
Item 5	2.58	1.329	.748	.951
Item 6	2.29	1.524	.737	.952
Item 7	1.51	1.345	.649	.953

Item	Item Mean	Standard deviation of the item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item 8	2.35	1.456	.792	.951
Item 9	3.00	1.291	.802	.951
Item 10	1.73	1.533	.694	.952
Item 11	2.31	1.464	.768	.951
Item 12	3.11	1.272	.699	.952
Item 13	2.36	1.568	.685	.953
Item 14	1.49	1.386	.642	.953
Item 15	1.38	1.284	.617	.953
Item 16	1.60	1.486	.683	.952
Item 17	1.85	1.367	.733	.952
Item 18	2.07	1.476	.697	.952

#### *Preliminary Validation of the OCRSIEP-E*

For the internal consistency analysis of the OCRSIEP-E, responses from 34 of the 68 educators who did not choose the answer option *I do not have enough knowledge to allow me to answer* in one or more items were included in the preliminary analysis. These 34 educators had an average age of 53.74 years (SD = 4.45; range: 43 – 61). The majority of this sample was female (n = 22, 64.7%), have Ph.D. (n = 27, 79.4%), participate in some form of EBP training (n = 26, 76.5%) and are from the main Portuguese nursing education institutions - not integrated into polytechnic institute or university (n = 20, 58.9%).

The 34 educators who chose the answer option *I do not have enough knowledge to allow me to answer* in one or more items were excluded from this analysis. The average age of this group was 52.00 years (SD = 9.56; range: 29 – 64). The majority of this sample was female (n = 30, 88.2%), have Ph.D. (n = 19, 55.9%), participate in some form of EBP training (n = 18, 52.9%) and are from the main Portuguese nursing education institutions - not integrated into polytechnic institute or university (n = 18, 52.9%).

The item means of the OCRSIEP-E range between 2.50 (item 13) and 4.50 (item 10). The OCRSIEP-E had high strong internal consistency ( $\alpha = 0.94$ ) and the corrected item-total correlations ranged between -0.06 and 0.78, representing a low to moderate correlation between the items and total score, including one negative correlation (Table 4).

*Table 4. Item Mean, Standard deviation of the item, Corrected Item-Total Correlation and Cronbach's Alpha if Item Deleted of the OCRSIEP-E (n = 34, data collection in 2018)*

Item	Item Mean	Standard deviation of the item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item 1	3.26	1.214	.705	.933
Item 2	3.21	1.095	.751	.933

Item	Item Mean	Standard deviation of the item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Item 3	3.38	1.074	.719	.933
Item 4	2.65	1.098	.759	.933
Item 5	3.09	1.288	.513	.936
Item 6	3.29	1.115	.668	.934
Item 7	3.32	1.173	.656	.934
Item 8	3.21	1.038	.411	.937
Item 9	3.21	1.008	.730	.933
Item 10	4.50	.707	.404	.937
Item 11	3.97	.717	.454	.937
Item 12	3.24	1.327	.421	.938
Item 13	2.50	1.308	.635	.934
Item 14	2.68	1.065	.448	.937
Item 15	3.29	1.244	.650	.934
Item 16	2.97	1.141	.786	.932
Item 17	2.65	1.125	.732	.933
Item 18	3.26	1.136	.778	.932
Item 19	3.18	1.141	.761	.932
Item 20	2.97	1.193	.670	.934
Item 21	2.85	.892	.637	.935
Item 22	3.74	1.024	.266	.939
Item 23	3.85	1.048	-.058	.943
Item 24	3.41	1.131	.663	.934
Item 25	2.91	1.164	.660	.934

## DISCUSSION

The EBPB-E, EBPI-E and OCRSIEP-E are the first instruments translated for European Portuguese to assess nursing educators' beliefs regarding EBP, their degree of EBP implementation and the readiness for school-wide integration of EBP. Overall, the translation and cross-cultural adaptation of the three instruments was uneventful. The European Portuguese versions of the three instruments showed high strong internal consistency and low to strong correlation between the items and total score, exception made for the item 23 of the European Portuguese version of the OCRSIEP-E that shown a negative correlation with the total score. This negative correlation might occur because of a cultural issue. In Portugal, there are three different kinds of public nursing educational institutions: a) schools integrated in universities (SIU); b) schools integrated in polytechnic (SIP); and c) schools that are independent and not integrated in universities nor polytechnic (IND; each with self-administrations). In the SIU and SIP schools, the decisions can be generated by all three options – educators, college administration (board of the school), or university/polytechnic administration. However, in the IND schools, decisions can be generated only two of the options: educators/faculties or college administration (board of the school) as there is no university/polytechnic administration. Consequently, we added the following note to the item



23: “In schools not integrated in universities or polytechnic institutes the answer to this question should be the same as in the previous question”. Despite this negative correlation, the value of the overall information from the EBPB-E, EBPI-E and OCRSIEP-E, precludes a focus on this one item.

Moreover, the acceptance of the adaptations of the original scales by the expert panel, specifically the inclusion of another answer option, *I do not have enough knowledge to allow me to answer*, and the change of the EBPI-E recall period from 8 weeks to one year, in the Stage V (Test of the prefinal versions) of the Translation and Cross-Cultural Adaptation phase need to be discussed.

Considering that the participants of pre-test suggested inclusion of *I do not have enough knowledge to allow me to answer* as an answer option and, additionally, we are aware that some potential participants do not have enough knowledge that allows them to answer to certain items, we decided to provide this as a possible of answer in all instruments. Indeed, we reflect that if this answer option were not provided to the participants, many of them could be force to guess the answer and, so, lead to data contamination. It should be noted that the *I do not have enough knowledge to allow me to answer* options in each scale were not scored, and participants that used this option to at least one item were removed from the analysis. That said, this answer option was useful for providing a method for ensuring that only those participants perceived they had the knowledge required to answer the questions were included in the analysis. The enriched data in this descriptive study in the specific context of Portugal was beneficial

Additionally, we analyzed the proposed change to the EBPI-E recall period from 8 weeks to one year by Stage V participants. The expert panel argued that 8 weeks was a limited timeframe, because in the specific nursing educational context of Portugal, there are some periods of the academic year with more intensification of educational activities than others periods (such as holidays, exams seasons). According this, if we consider only a period of 8 weeks, for example immediately after the holidays, the data will not accurate represent the degree of EBP implementation by educators. For that reason, we change the EBPI-E recall period for one year. However, some literature showed that the data accuracy decreases as the recall period increases,<sup>24,25</sup> because long recall periods encourage participants to guess and estimate the answer.<sup>26,27</sup> Thus, a year of recall period could be too long for recall to be reliable and, consequently, the participants may only provide social acceptability responses. Moreover, the reason to extend the recall period may be put into question, because nowadays nursing educators should engage EBP activities throughout the year regardless the academic cycles. If educators are not engaged in EBPI activities within 8 weeks, then their engagement in these activities likely is not driven by their foundational integration of EBP into how they approach problem solving and can be representative of artificially using EBP only when they are actively teaching students. Therefore, this recommendation puts in question the validity of the EBPI-E as it was not designed for such long recall.

### *Limitations*

The small sample size was a limitation of this study. In fact, according to Streiner and Norman<sup>28</sup> for a cronbach's alpha of 0.70 (confidence interval= $\pm 0.10$ ) the sample size must be 300 participants. Moreover, to perform exploratory and confirmatory factor analysis, the sample size must be based on a ratio of 10 participants by each item.<sup>29</sup> Therefore, to perform these analyses it is needed at least 250 participants, since of the three instruments the one with more items has 25 items. Furthermore, extending the recall time frame of the EBPI-E may have affected validity of the instrument.

## **CONCLUSION**

The European Portuguese versions of the EBPB-E, EBPI-E and OCRSIEP-E instruments presented in this paper are the first instruments translated for European Portuguese to assess nursing educators' beliefs about and confidence in their ability to practice EBP in education, their degree of EBP implementation in education and their perception of organizational culture and readiness for school-wide integration of EBP. The European Portuguese versions of the EBPB-E, EBPI-E and OCRSIEP-E showed strong internal consistency.

More research studies with larger samples are needed to further establish the psychometric properties of the European Portuguese versions of the instruments.

## **CONFLICT OF INTEREST**

The authors declare no conflict of interest.

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# Chapter 5

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Translation and cross-cultural adaptation of evidence-based practice instruments for Portuguese nursing students

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## Chapter 5. Translation and cross-cultural adaptation of evidence-based practice instruments for Portuguese nursing students

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### Abstract

**Background:** The implementation of evidence-based practice (EBP) in clinical contexts is recommended due to its positive impact on health, but it remains under the desirable. The training of undergraduate nursing students in the use of EBP is crucial, and, for that, there must be valid and reliable measures of EBP learning.

**Objective:** To translate and to cross-cultural adapt into European Portuguese of the EBP Beliefs Scale (EBPB), EBP Implementation Scale for Students (EBPI-S), and Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey for Students (OCRSIEP-ES).

**Methodology:** Translation and cross-cultural adaptation according to international recommendations. Preliminary validation in Portuguese undergraduate nursing students from nine institutions.

**Results:** In the pre-final versions of the instruments, the participants suggested including the optional answer “I do not have sufficient knowledge to be able to answer” and increasing the recall period in the EBPI-S instrument. Phase 2 included 167 participants. The  $\alpha$  for EBPB, EBPI-S, and OCRSIEP-ES was 0.854, 0.943, and 0.970, respectively.

**Conclusion:** Preliminary results showed good internal consistency. Further validation studies with robust samples are required to test the reliability and validity of the instruments.

**Keywords:** validation studies; evidence-based practice; education, nursing; students, nursing

### Resumo

**Enquadramento:** A implementação da prática baseada na evidência (EBP) em contextos clínicos é recomendada pelo seu impacto positivo na saúde, contudo, permanece abaixo do desejável. A formação de estudantes de licenciatura em enfermagem em EBP é fundamental, pelo que é crucial haver medidas válidas e confiáveis desta aprendizagem.

**Objetivo:** Traduzir e adaptar transculturalmente para português europeu as escalas EBP *Beliefs Scale* (EBPB), EBP *Implementation Scale for Students* (EBPI-S) e *Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey for students* (OCRSIEP-ES).

**Metodologia:** Tradução e adaptação transcultural segundo recomendações internacionais. Validação preliminar em estudantes portugueses de licenciatura em enfermagem, provenientes de nove instituições.

**Resultados:** Às versões pre finais dos instrumentos os participantes sugeriram incluir a possibilidade de resposta “não tenho conhecimento suficiente que me permita responder” e aumentar o período de recordação no instrumento EBPI-S. Na fase II participaram 167 estudantes. O  $\alpha$  para o EBPB, EBPI-S e OCRSIEP-ES foi 0,854, 0,943 e 0,970, respetivamente.

**Conclusão:** Os resultados preliminares revelaram uma forte consistência interna. É necessário realizar mais estudos de validação com amostras robustas para testar a confiabilidade e validade dos instrumentos.

**Palavras-chave:** estudos de validação; prática clínica baseada em evidências; educação em enfermagem; estudantes de enfermagem

## Resumen

**Marco contextual:** Se recomienda implementar la práctica basada en la evidencia (EBP en portugués) en contextos clínicos, debido a su impacto positivo en la salud, aunque sigue estando por debajo de lo deseable. La formación de los estudiantes de enfermería de grado en el uso de la EBP es crítica. Por ello, tener medidas válidas y fiables de este aprendizaje supone un aspecto clave.

**Objetivo:** Traducir y adaptar al portugués europeo: la EBP *Beliefs Scale* (EBPB), la EBP *Implementation Scale for Students* (EBPI-S) y la *Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey for students* (OCRSIEP-ES).

**Metodología:** Traducción y adaptación intercultural de acuerdo con las recomendaciones internacionales. Validación preliminar en estudiantes de enfermería portugueses de grado de nueve instituciones.

**Resultados:** En las versiones pre finales de los instrumentos, los participantes sugirieron incluir la respuesta "no sé" y aumentar el periodo de recuerdo en el instrumento EBPI-S. En la fase II participaron 167 estudiantes. El  $\alpha$  para EBPB, EBPI-S y OCRSIEP-ES fue de 0,854, 0,943 y 0,970, respectivamente.

**Conclusión:** Los resultados preliminares mostraron una fuerte consistencia interna. Se requieren más estudios de validación con muestras sólidas para probar la fiabilidad y la validez de los instrumentos.

**Palabras clave:** estudios de validación; práctica clínica basada en la evidencia; educación en enfermería; estudiantes de enfermería

### **Introduction**

The concept of Evidence-Based Medicine arose in the area of medicine but was quickly embraced by other healthcare professions. As a consequence, terms such as evidence-based practice (EBP), evidence-based healthcare (EBHC), and evidence-based nursing (EBN) emerged (Dawes et al., 2005). There are many definitions of EBP, but the following three elements are always present in most of them: use of best available evidence, use of clinical/professional expertise, and patient involvement (International Council of Nurses [ICN], 2012; Pearson, Jordan, & Munn, 2012).

In the last decades, the use of EBP in clinical practice has been a focus of particular attention due to various concomitant factors, like the acknowledgement of the positive impact of EBP on healthcare, the ever-growing production of new primary research, the well-known delay in incorporating new evidence into clinical practice, the healthcare quality and safety movement, and the pressure of health service users with quick access to health information (Dawes et al., 2005; Melnyk, Gallagher-Ford, Long, & Fineout-Overholt, 2014). Consequently, several organizations have encouraged the implementation of EBP in clinical contexts (World Health Organization [WHO], 2015; ICN, 2012). Despite these recommendations, there is still a less than desired translation of evidence into clinical practice by nurses (Duncombe, 2018; Melnyk, Fineout-Overholt, Gallagher-Ford, & Kaplan, 2012).

In an earlier phase, many studies with nurses working in clinical settings were conducted to support the integration of EBP in clinical practice. However, following the recommendations of the Sicily Statement on Evidence-Based Practice for EBP teaching and education (Dawes et al., 2005), the integration of EBP teaching in nursing curricula has gained a spotlight in recent years. Undergraduate nursing students will be the future health professionals and, as a result, play a crucial role in influencing the use of EBP in healthcare contexts in the future. Therefore, it is essential to understand the undergraduate nursing students' beliefs regarding EBP, the level of their EBP implementation skills, and their perception of the state of readiness for school-wide EBP integration to develop teaching strategies for EBP use promotion. However, there are no available instruments in Portugal for this purpose. Therefore, to tackle this shortcoming, the objective of this study is the translation and cross-cultural adaptation into European Portuguese of the instruments EBP Beliefs Scale (EBPB), EBP Implementation Scale for Students (EBPI-S), and Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey for Students (OCRSIEP-ES). Also, this study aims to provide preliminary validation data of the European Portuguese versions.

## Background

Nowadays, the use of EBP in clinical practice remains less than desirable, despite the strong recommendations for it. Many studies have reported both barriers and facilitators to the integration of EBP in clinical practice. The identified barriers include lack of time; organizational culture and the philosophy of “that is how we have always done it here”; lack of EBP knowledge, as in lack of search skills and lack of confidence in assessing research quality; difficulties in statistical interpretation; lack of resources (e.g., no access to evidence); manager/leader and co-worker resistance to change practices; and heavy workload (Melnyk et al., 2012; Pereira, Cardoso, & Martins, 2012; Solomons & Spross, 2011). As to the facilitators, the following were identified: education (e.g., training in research methods and EBP); organizational support/awareness; collaboration between EBP mentors and clinical staff to implement best practices; time availability; resource availability, like access to evidence (Duncombe, 2018; Melnyk et al., 2012).

Education appears as a facilitator of EBP integration into clinical practice. Melnyk et al. (2004) reported that “knowledge and beliefs about EBP are related to the extent that nurses engage in EBP” (p. 190). Moreover, in 2005, the recommendations of the Sicily Statement on Evidence-Based Practice for EBP teaching and education highlighted that “all health care professionals need to understand the principles of EBP, recognise EBP in action, implement evidence-based policies, and have a critical attitude to their own practice and to evidence.” (Dawes et al., 2005, p. 4). Because undergraduate nursing students will be healthcare professionals in the future, their time spent in nursing school is an absolutely unique opportunity to instill in them the EBP culture. This is why training undergraduate nursing students in the use of EBP is imperative, and, for that, there must be valid and reliable measures of EBP learning.

The “Sicily Statement on Classification and Development of Evidence-Based Practice Learning Assessment Tools” (Tilson et al., 2011) was designed to guide the development of EBP assessment tools. The following assessment categories were suggested: Benefit to patients; Behavior; Skills; Knowledge; Self-efficacy; Attitudes; and Reaction to the educational experience. The Benefit to patients category refers to the assessment of health outcomes of patients and communities. The Behavior category could contribute significantly to the identification of students’ learning needs regarding the use of EBP. The Skills category concerns knowledge applicability when performing an EBP-related task. The Knowledge category related to the preservation of EBP-related facts and concepts by learners. The Self-efficacy category includes the perceptions of individuals regarding their ability to perform a specific activity. The Attitudes category concerns the values acknowledged by the student of the relevance and usefulness of EBP to inform clinical decision-making. Lastly, the Reaction to the educational experience category related to the learners’ perceptions of the learning experience, including aspects like the relevance of organization for an effective education intervention (Tilson et al., 2011).

The last of the four general recommendations for developers of new EBP learning assessment tools presented in the aforementioned statement is “Develop, validate, and use a standardized method for translation of tools into new languages.” (Tilson et al., 2011, p. 8). In this sense, and considering that there are no tools available in Portugal to assess the undergraduate nursing students’ beliefs regarding EBP, the level of their EBP implementation skills, and their perception of the state of readiness for school-wide EBP integration, this study aims at the translation and cross-cultural adaptation of the EBPB, EBPI-S, and OCRSIEP-ES tools into European Portuguese.

### **Research questions**

Do the European Portuguese versions of the EBPB, EBPI-S, and OCRSIEP-ES reflect the original versions of the tools adequately?

Is the internal consistency of the European Portuguese versions of the EBPB, EBPI-S, and OCRSIEP-ES acceptable?

### **Methodology**

This study was conducted during 2017–2018 and comprised two phases: Phase 1 – translation and cross-cultural adaptation of the three instruments into European Portuguese; Phase 2 - preliminary validation of these versions in Portuguese undergraduate nursing students.

### **Instruments**

The EBPB, EBPI-S, and OCRSIEP-ES tools were developed by Fineout-Overholt and Melnyk (Fineout-Overholt, 2018).

The EBPB tool assesses undergraduate nursing students' EBP-related beliefs and their confidence in their EBP implementation ability. It is a 16-item instrument with a 5-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*), whose score ranges from 16 to 80 (the higher the score, the stronger the beliefs). Two of the 16 items are reverse-scored items (Item 11 - “I believe that EBP takes too much time.” and Item 13 - “I believe EBP is difficult.”).

The EBPI-S is an 18-item self-report tool that assesses the EBP implementation skills of undergraduate nursing students considering their engagement in the desired EBP behaviors during the last eight weeks. The EBPI-S total score ranges from 0 to 72. Each item is scored with a 5-point scale (0 = *0 times*; 1 = *1-3 times*; 2 = *4-5 times*; 3 = *6-8 times*; 4 = *more than 8 times*).

The OCRSIEP-ES is a 25-item self-report tool that measures the students' perception of the state of readiness for school-wide integration of EBP and its influencing factors. Each item is scored with a 5-point scale (1 = *none at all* to 5 = *very much*), and the total score ranges from 25 to 125.

### Phase 1 – Translation and Cross-Cultural Adaptation

The translation and cross-cultural adaptation of the EBPB, EBPI-S, and OCRSIEP-ES into European Portuguese were performed according to the guidelines provided by Beaton, Bombardier, Guillemin, and Ferraz (2000) for the cross-cultural adaptation of self-report measures. These guidelines recommended the following five stages.

Stage 1 – Initial translation: independent translation by two bilingual translators (one familiar with the concepts, and the other a naive translator).

Stage 2 – Synthesis of the translations: preparation of a standard translation.

Stage 3 – Back-translation: two translators performed, independently, the back-translations. Both translators were not aware of the concepts being measured.

Stage 4 – Expert committee: 7 experts (health professionals, individuals experienced in validation studies, a language professional, and translators) analyzed the tools' versions and developed the pre-final versions. One of the original authors of the instruments (Dr. Ellen Fineout-Overholt) was contacted to clarify ambiguous items and the meaning of some terms or expressions.

Stage 5 – Testing of the pre-final versions: The pre-final versions were tested in a sample of undergraduate nursing students. Each participant completed the instruments and a brief questionnaire (Figure 1) regarding the tools' comprehensibility.

In your opinion:		
Do you consider that the items' statements are written clearly?	Yes	No
If not, which are not clear and why?		

<p>If you did not rate one or more items, please list them and identify the reason(s) using the following statements:</p> <p>- I did not rate item(s) _____ because I have no sufficient knowledge to be able to answer.</p> <p>- I did not rate item(s) _____ because the statement is not clear.</p> <p>- I did not rate item(s) _____ because _____</p>
<p>If you wish, please leave any additional comments:</p>

*Figure 1.* Brief questionnaire applied to participants in stage 5 of each instrument.

## Phase II – Preliminary validation

Undergraduate nursing students from nine Portuguese nursing schools participated in this phase. The three leading Portuguese nursing education institutions (not integrated into a polytechnic institute or university) were selected by convenience. The remaining six institutions were randomly selected (one institution from a polytechnic institute and one from a university in each region of Continental Portugal – north, center, and south). Nine socio-demographic questions and the three Advancing Research & Clinical practice through close Collaboration in Education (ARCC-E) questionnaires (total of 59 items) were included in the online survey.

## Statistical analysis

All statistical analysis was carried out in the IBM SPSS Statistics program (version 24.0; SPSS Inc., Chicago, IL, USA). Descriptive analysis was used for sample characterization purposes, such as mean, standard deviation, minimum, maximum, and percentages. The internal consistency was assessed using the Cronbach's alpha coefficient.

## Ethical consideration

This study was approved by the Ethical Committee of the Faculty of Medicine of the University of Coimbra (no. CE-037/2017). The original authors of the instruments have consented their use. The institutions provided written approval. All participants provided informed consent, and the data were subject to confidential treatment.

## Results

### Phase 1 – Translation and Cross-Cultural Adaptation

The first three stages of the phase of translation and cross-cultural adaptation carried on smoothly. At stage 4, the expert panel discussed and suggested some modifications to clarify and adapt the instruments into the Portuguese context.

Generally, the expert panel agreed upon the use of the term “utentes” for the translation of “patients” because, in Portugal, that term is more suitable when referring to a user of health services regardless of whether one is ill or not. The expression “evidence-based guidelines” was translated as “diretrizes/orientações (guidelines) baseadas em evidência.” However the expert panel decided to keep the term “guidelines” between brackets, since the meaning of this loanword is widely known in Portugal. Similarly, the expert panel decided to keep the English phrase “critically appraising” between brackets following its translation (“avaliação da qualidade metodológica”) for a better understanding of the phrase “critically appraising evidence.” The phrase “a time-efficient way” was challenging to translate. The expert panel decided to translate it as “adequadamente e em tempo útil” to remain faithful to the original meaning.

Specifically, the EBPI-S items 12 and 13 were adapted to accept other systematic review and guideline databases besides the Cochrane database of systematic reviews and the National Guidelines Clearinghouse. Item 12 was adapted from “Accessed the Cochrane database of systematic reviews...” to “Acedi a base(s) de dados de revisões sistemáticas (por exemplo, Cochrane database of systematic reviews)” and the item 13 from “Accessed the National Guidelines Clearinghouse...” to “Acedi a base(s) de dados de diretrizes/orientações (guidelines; por exemplo, National Guidelines Clearinghouse)”.

As regards the OCRSIEP-ES, the following note was added to explain the meaning of “mentor”:  
*“Mentores de PBE: pessoa confiável com conhecimentos e treino avançado em PBE que orienta, promove a autoconfiança e infunde valores no aprendiz.”* In addition, some terms or expressions were paraphrased for the Portuguese nursing education context, such as “community partners” (*instituições parceiras onde decorrem os ensinamentos clínicos/prática clínica*), “didactic course faculty” (*corpo docente das unidades curriculares teóricas, teórico-práticas, práticas*), and “clinical course faculty” (*corpo docente dos ensinamentos clínicos/prática clínica*). Following all these changes, the expert committee agreed upon the pre-final versions of the Portuguese translation.

Thirty-seven Portuguese undergraduate nursing students, five males and 32 females aged between 18 and 27 years, participated in stage 5. Overall, the students understood the meaning of the items, but many of them (mainly from first and second years) reported insufficient knowledge to choose an optional answer. They also reported that the time of application of the EBPI-S could influence the



answer, whether they are at school or in clinical practice. The comments provided by the students were analyzed, and in response to their concerns the optional answer “I do not have sufficient knowledge to be able to answer” (*Não tenho conhecimento suficiente que me permita responder*) was added and the EBPI-E recall period was changed from 8 weeks to one year.

## Phase 2 – Preliminary validation

A total of 167 undergraduate nursing students with a mean age of 22.13 years ( $SD = 4.20$ ; range: 18 – 45) completed the online questionnaire. A large majority of this sample was female ( $n = 140$ , 83.8%) and has completed the 12<sup>th</sup> grade ( $n = 159$ , 95.2%). More than half of the sample participated in EBP training programs ( $n = 88$ , 52.7%). Of these 88 participants, 76 stated that the training was integrated into the curricula, five stated that it was an extracurricular activity, and seven that it was both. The majority of the participants came from the main Portuguese nursing education institutions ( $n = 118$ , 70.66%; Table 1).

Table 1

*Socio-demographic characterization of the sample (n = 167)*

Age in years, mean $\pm$ <b>SD</b> (Min – Max)	22.13 $\pm$ 4.20 (18 – 45)
Female, <b>n</b> (%)	140 (83.8)
Male, <b>n</b> (%)	27(16.2)
Education	
12 <sup>th</sup> grade, <b>n</b> (%)	159 (95.2%)
Bachelor, <b>n</b> (%)	6 (3.6%)
Master, <b>n</b> (%)	2 (1.2%)
Bachelor’s Degree Year	
1 <sup>st</sup> year	39 (23.4%)
2 <sup>nd</sup> year	20 (12.0%)
3 <sup>rd</sup> year	54 (32.3%)
4 <sup>th</sup> year	54 (32.3%)
EBP training	
Yes, <b>n</b> (%)	88 (52.7%)
No, <b>n</b> (%)	79 (47.3%)
Nursing school	
Not integrated, <b>n</b> (%)	118 (70.66%)
Integrated into a university, <b>n</b> (%)	27 (16.17%)
Integrated into a polytechnic institute, <b>n</b> (%)	22 (13.17%)

*Note.*  $SD$  = Standard deviation; Min = Minimum; Max = Maximum.

## Preliminary validation of the EBPB

Regarding the EBPB internal consistency analysis, 63 participants were excluded for responding, “I do not have sufficient knowledge to be able to answer” in one or more items. Consequently, 104 participants

with a mean age of 22.59 years ( $SD = 4.14$ ; range: 18 – 43) remained. A vast majority of this sample was female ( $n = 85$ , 81.7%), and more than half of it had completed the 12<sup>th</sup> grade ( $n = 97$ , 93.3%), 5 held a bachelor's degree (4.8%), and 2 held a master's degree (1.9%). The majority of this sample participated in EBP training programs ( $n = 68$ , 65.4%) and came from the main Portuguese nursing schools ( $n = 77$ , 74.0%). Of the 104 individuals, 10 were first-year undergraduate students, 12 were second-year students, 36 were third-year students, and 46 were fourth-year students.

The 63 excluded individuals had a mean age of 21.37 years ( $SD = 4.22$ ; range: 18 – 45). A vast majority of these students were female ( $n = 55$ , 87.3%), had completed the 12<sup>th</sup> grade ( $n = 62$ , 98.4%), and came from the main Portuguese nursing schools ( $n = 41$ , 65.1%). However, the majority of them did not participate in EBP training programs ( $n = 45$ , 71.4%). Of the 63 students, 29 were first-year undergraduate students, 8 were second-year students, 18 were third-year students, and 8 were fourth-year students.

The EBPB item means ranged between 2.70 (item 13) and 4.60 (item 1). The EBPB presented a good internal consistency ( $\alpha = 0.854$ ), and the corrected item-total correlations ranged between 0.181 and 0.733, meaning a poor to good correlation between the items and total score (Table 2).

Table 2

*Item mean, standard deviation of the item, corrected item-total correlation, and Cronbach's alpha if item deleted of the EBPB (n = 104)*

Items	Item mean	Standard deviation of the item	Corrected item-total correlation	Cronbach's alpha if item deleted
EBPB 1	4.60	.600	.292	.854
EBPB 2	3.53	.945	.680	.834
EBPB 3	3.57	.822	.733	.832
EBPB 4	4.11	.709	.328	.853
EBPB 5	4.51	.638	.371	.851
EBPB 6	3.66	.888	.536	.843
EBPB 7	3.49	.750	.621	.839
EBPB 8	3.36	.812	.721	.833
EBPB 9	4.38	.610	.320	.853
EBPB 10	3.63	.813	.516	.844
EBPB 11	3.00	.965	.181	.865
EBPB 12	3.30	.799	.404	.850
EBPB 13	2.70	.846	.298	.856
EBPB 14	3.45	.667	.658	.838
EBPB 15	3.34	.771	.603	.840
EBPB 16	4.08	.569	.452	.848

### Preliminary validation of the EBPI-S

Seventy-three participants were excluded from the EBPI-S internal consistency analysis because they answered, “I do not have sufficient knowledge to be able to answer” in one or more items. Therefore, 94 participants with a mean age of 22.41 years ( $SD = 3.83$ ; range: 18 – 43) remained. A large majority of this sample was female ( $n = 77$ , 81.9%), and more than half of it had completed the 12<sup>th</sup> grade ( $n = 91$ , 96.8%) and participated in EBP training programs ( $n = 62$ , 66.0%). The majority came from the main Portuguese nursing schools ( $n = 71$ , 75.6%). Eight students frequented the 1<sup>st</sup> year of the bachelor’s degree, nine the 2<sup>nd</sup> year, 34 the 3<sup>rd</sup> year, and 43 the 4<sup>th</sup> year.

The 73 excluded individuals had a mean age of 21.75 years ( $SD = 4.63$ ; range: 18 – 45). A vast majority of this sample was female ( $n = 63$ , 86.3%) and had completed the 12<sup>th</sup> grade ( $n = 68$ , 93.2%). However, they did not participate in EBP training programs ( $n = 49$ , 67.1%). Forty-seven individuals (64.3%) came from the main Portuguese nursing schools; 8 (11.0%) came from nursing schools integrated into polytechnic institutes, and 18 (24.6%) came from nursing schools integrated into universities. Many of these participants were first-year undergraduate students ( $n = 31$ ). The remaining participants frequented the second year ( $n = 11$ ), the third year ( $n = 20$ ), and the fourth year ( $n = 11$ ).

The item means of the EBPI-S ranged between 1.03 (item 10) and 2.69 (item 1). The EBPI-S presented an excellent internal consistency ( $\alpha = 0.943$ ), and the corrected item-total correlations ranged between 0.308 and 0.808, meaning an acceptable to good correlation between the items and total score (Table 3).

Table 3

*Item mean, standard deviation of the item, corrected item-total correlation, and Cronbach's alpha if item deleted of the EBPI-S ( $n = 94$ )*

Items	Item mean	Standard deviation of the item	Corrected item-total correlation	Cronbach's alpha if item deleted
EBPI-S 1	2.69	1.414	.610	.941
EBPI-S 2	1.65	1.233	.559	.942
EBPI-S 3	1.19	1.129	.308	.946
EBPI-S 4	1.83	1.300	.770	.938
EBPI-S 5	2.64	1.443	.602	.941
EBPI-S 6	1.64	1.310	.740	.938
EBPI-S 7	2.03	1.410	.689	.939
EBPI-S 8	1.86	1.267	.808	.937
EBPI-S 9	1.21	1.066	.645	.940
EBPI-S 10	1.03	1.186	.642	.940
EBPI-S 11	1.50	1.180	.679	.940
EBPI-S 12	2.46	1.412	.563	.942

Items	Item mean	Standard deviation of the item	Corrected item-total correlation	Cronbach's alpha if item deleted
EBPI-S 13	1.97	1.448	.735	.938
EBPI-S 14	2.03	1.395	.780	.937
EBPI-S 15	1.81	1.461	.779	.937
EBPI-S 16	1.60	1.386	.721	.939
EBPI-S 17	1.84	1.409	.708	.939
EBPI-S 18	1.39	1.280	.735	.938

### Preliminary validation of the OCRSIEP-ES

Regarding the internal consistency analysis of the OCRSIEP-ES, 121 participants were excluded for responding, “I do not have sufficient knowledge to be able to answer” in one or more items. As a result, 46 individuals with a mean age of 22.54 years ( $SD = 2.95$ ; range: 19 – 33) remained. The majority of this sample was female ( $n = 39$ , 84.8%), had completed the 12<sup>th</sup> grade ( $n = 43$ , 93.5%), participated in EBP training programs ( $n = 30$ , 65.2%), and came from the main Portuguese nursing schools ( $n = 33$ , 71.7%). Of these 46 students, 4 were first-year undergraduate students, 2 were second-year students, 14 were third-year students, and 26 were fourth-year students.

The 121 excluded participants had an average age of 21.97 years ( $SD = 4.59$ ; range: 18 – 45). The majority of this sample was female ( $n = 101$ , 83.5%), had completed the 12<sup>th</sup> grade ( $n = 116$ , 95.9%), and came from the main Portuguese nursing schools ( $n = 85$ , 70.2%). Fifty-six students (46.3%) reported that they participated in EBP training programs. Of the 121 students, 35 attended the first year of the bachelor’s degree, 18 the second year, 40 the third year, and 28 the fourth year.

The item means of the OCRSIEP-ES ranged between 1.96 (item 23) and 3.87 (item 2). The OCRSIEP-ES presented an excellent internal consistency ( $\alpha = 0.970$ ), and the corrected item-total correlations ranged between 0.169 and 0.910, meaning a low to excellent correlation between the items and total score (Table 4).

Table 4

*Item mean, standard deviation of the item, corrected item-total correlation, and Cronbach's alpha if item deleted of the OCRSIEP-ES (n = 46)*

Items	Item mean	Standard deviation of the item	Corrected item-total correlation	Cronbach's alpha if item deleted
OCRSIEP-ES 1	3.70	1.364	.780	.969
OCRSIEP-ES 2	3.87	1.258	.769	.969

Items	Item mean	Standard deviation of the item	Corrected item-total correlation	Cronbach's alpha if item deleted
OCRSIEP-ES 3	3.85	1.192	.836	.969
OCRSIEP-ES 4	3.35	1.251	.758	.969
OCRSIEP-ES 5	3.37	1.254	.796	.969
OCRSIEP-ES 6	3.80	1.258	.832	.969
OCRSIEP-ES 7	3.74	1.341	.845	.968
OCRSIEP-ES 8	3.54	1.168	.910	.968
OCRSIEP-ES 9	3.52	1.378	.902	.968
OCRSIEP-ES 10	3.85	1.053	.567	.971
OCRSIEP-ES 11	3.46	1.206	.815	.969
OCRSIEP-ES 12	2.76	1.286	.728	.969
OCRSIEP-ES 13	2.61	1.273	.484	.971
OCRSIEP-ES 14	2.83	1.355	.699	.970
OCRSIEP-ES 15	3.35	1.303	.901	.968
OCRSIEP-ES 16	3.26	1.273	.863	.968
OCRSIEP-ES 17	3.54	1.277	.889	.968
OCRSIEP-ES 18	3.50	1.225	.893	.968
OCRSIEP-ES 19	3.04	1.173	.707	.970
OCRSIEP-ES 20	3.30	1.314	.834	.969
OCRSIEP-ES 21	3.80	.934	.169	.973
OCRSIEP-ES 22	3.76	.848	.387	.971
OCRSIEP-ES 23	1.96	.729	.550	.971
OCRSIEP-ES 24	3.37	1.372	.800	.969
OCRSIEP-ES 25	3.07	1.340	.675	.970

## Discussion

The authors believe that the EBPB, EBPI-S, and OCRSIEP-ES are the first instruments translated into European Portuguese to assess undergraduate nursing students' beliefs regarding EBP, their level of EBP implementation skills, and the state of readiness for school-wide EBP integration. Generally, the translation and cross-cultural adaptation of the three instruments was a smooth process and encountered no problems for the majority of the items. Similar to some data reported by Fineout-Overholt (2018), the European Portuguese versions of the three instruments showed good internal consistency with Cronbach's alphas  $\geq 0.85$ . However, there is no available additional information regarding studies that used the original instruments that allows performing more detailed comparisons.

During stage 5 of the phase of translation and cross-cultural adaptation, two recommendations of the participants were accepted by the authors and should be discussed. One related to the inclusion of the optional answer, "I do not have sufficient knowledge to be able to answer," and the other suggested changing the recall period of the EBPI-S from 8 weeks to one year.

The authors decided to include the optional answer “I do not have sufficient knowledge to be able to answer” in all scales because the first recommendation was made during the pre-test, and they were aware of the lack of knowledge of potential participants to answer some items. Furthermore, it was evident that, if this optional answer were not provided to the participants, many of them might be forced to guess the answer, thus leading to data contamination. However, it should be noted that the optional answer “I do not have sufficient knowledge to be able to answer” in each scale was not scored, and if participants chose this answer in at least one item, they were removed from the analysis. It means that this optional answer contributed to ensuring that only the participants who perceived they had the necessary knowledge to answer the items were included in the analysis. This benefits the descriptive analysis in the specific context of Portugal.

As regards the suggestion of stage 5 participants to extend the recall period of the EBPI-S, the authors decided to change this recall period to one year. The participants claimed that the answer could be influenced by the moment when the EBPI-S is applied, depending on whether they are at school or in clinical practice. However, some authors showed that data accuracy decreases as the recall period increases (Clarke, Fiebig, & Gerdtham, 2008; Stull, Leidy, Parasuraman, & Chassany, 2009) since long recall periods lead to participants guessing the answer (Brown, 2002; Blair & Burton, 1987). Therefore, a one-year recall period could be too long for recall reliability, and, as a result, participants may answer the instrument taking into account only the social acceptability. Indeed, this change of the recall period challenges the validity of the EBPI-S because it was not designed for such a long recall.

This study presents some limitations. First, it used a small sample size. According to Streiner and Norman (2008), the sample size should be 300 participants for a Cronbach’s alpha of 0.70 and a confidence interval of  $\pm 0.10$ . Also, at least 250 participants are necessary (the scale with the most items has 25) to carry out the exploratory and confirmatory factor analysis because the sample size should have a ratio of 10 participants per item (Tinsley & Tinsley cited by DeVellis, 2016). Moreover, extending the recall period of the EBPI-S may have affected the validity of the tool.

## **Conclusion**

To the best of our Knowledge, the European Portuguese versions of the EBPB, EBPI-S, and OCRSIEP-ES are the first instruments translated into European Portuguese to assess undergraduate nursing students’ EBP beliefs, their level of EBP implementation skills, and their perception of the readiness for school-wide integration of EBP. The translation and cross-cultural adaptation used a rigorous methodology that ensured the structural, linguistic, and cultural equivalences between the original versions and the European Portuguese versions of the three scales. These European Portuguese versions showed a good internal consistency and low to excellent correlations between the items and total score.

The translation and cross-cultural adaptation of the EBPB, EBPI-S, and OCRSIEP-ES are the first contributions to having valid and reliable measures of EBP learning for Portuguese undergraduate nursing students.

However, more research studies for validation of the European Portuguese versions of those tools should be conducted with larger sample sizes to test their measurement properties.

### **Conflict of interest**

The authors declare no conflict of interest.

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# Chapter 6

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Translation and adaptation of the Fresno Test to measure evidence-based practice knowledge and skills for Portuguese undergraduate nursing students

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## Chapter 6. Translation and adaptation of the Fresno Test to measure evidence-based practice knowledge and skills for Portuguese undergraduate nursing students

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### **Abstract**

**Background:** The Fresno Test was originally identified as an instrument to assess evidence-based practice (EBP) knowledge and skills through cognitive testing and performance assessment in medical students. Further studies have been recommended to establish the measurement properties of the Fresno Test in different learner populations.

**Objectives:** To perform a cross-cultural adaptation of the Fresno Test for Portuguese undergraduate nursing students and to analyze the interrater reliability.

**Design:** Cross-cultural adaptation and psychometric validation study carried out in two phases during 2017–2018.

**Settings:** One of the main nursing schools, Portugal.

**Participants:** Fourth year undergraduate nursing students.

**Methods:** The study was performed in two phases, firstly the cross-cultural adaptation (performed in five stages) and secondly the analysis of interrater reliability.

**Results:** Stages I, II, III and IV of the cross-cultural adaptation proceeded smoothly and the expert panel produced and agreed upon the pre-final version of Adapted Fresno Test. In stage V (the pre-test stage), students reported a general understanding of the items, but they reported a lack of knowledge to answer the test. An expert panel subsequently agreed that modifications were needed to ensure the test was within the student's competency level and to decrease risk of assessment bias. For phase II, 50 complete questionnaires were randomly selected to be rated by three independent nurses using the modified rubric to score the test. The overall interrater reliability was 0.826 with a range from 0.271 to 1.000 for each item.

**Conclusions:** The Adapted Fresno Test presented in this paper is the first instrument translated for European Portuguese and adapted specially for undergraduate nursing students. Despite good interrater

reliability, further validation studies with more robust samples are suggested to definitively establish psychometric properties beyond the interrater reliability.

Keywords: Evidence-based practice; Evidence-based nursing; Education, Nursing; Students, Nursing; Knowledge; Validation studies; Surveys and Questionnaires; Psychometrics

## 1. Background

Evidence-based practice (EBP) is an approach for clinical decision-making that considers the best evidence available; the clinical expertise; the patient values and experiences; and the context in which the care is delivered (Pearson, Jordan, and Munn, 2012). The importance of using EBP in clinical practice has increased due to the following factors: (1) the huge proliferation of novel primary research, (2) the delay in integrating new evidence into clinical care, (3) the need for improved health care quality and safety, and (4) the pressure of patients having rapid access to health information (Dawes et al., 2005; White and Dudley-Brown, 2012). Moreover, it is recognized that the use of EBP increases high-value health care, the patient experience and health outcomes, as well as reduces health care costs (Melnyk, Gallagher-Ford, Long, & Fineout-Overholt, 2014).

Given all these factors, many organizations internationally recognize the importance of implementing EBP in clinical settings (Institute of Medicine – IoM, 2009; World Health Organization – WHO, 2015; ICN, 2012). Nevertheless, evidence implementation in clinical contexts is still limited (Duncombe, 2018; Melnyk, Fineout-Overholt, Gallagher-Ford, & Kaplan, 2012; Melnyk, Gallagher-Ford, Long, Fineout-Overholt, 2014). Education is promoted as one strategy to improve EBP use into clinical practice (Asokan, 2012; Black, Balneaves, Garossino, Puyat, Qian, 2015; Mohsen, Safaan, Okby, 2016; Committee on the Health Professions Education Summit, 2003; Dawes et al, 2005), as staff within nursing schools and/or universities play a pivotal role in teaching EBP and preparing students for the critical use of the best available evidence in their future clinical contexts. Training undergraduate nursing students to use EBP is essential and is currently undertaken in many courses however, there is a need for appropriate instruments to measure the effectiveness of any educational program on students' EBP knowledge and skills.

Tilson et al. (2011) created the Classification Rubric for EBP Assessment Tools in Education (CREATE). According to this classification, each assessment instrument “can be characterized with regard to the 5-step EBP model, type(s) and level of educational assessment specific to EBP, audience characteristics, and learning and assessment aims” (Tilson et al., 2011, p. 3). Moreover, the authors considered the following seven dimensions of EBP learning: Reaction to the Educational Experience; Attitudes; Self-Efficacy; Knowledge; Skills; Behaviors; and Benefit to Patient. According to the CREATE, knowledge refers to “learners’ retention of facts and concepts about EBP” (Tilson et al., 2011, p. 5) which should be measured using cognitive testing. ‘Skills’ refers to “the application of knowledge,

ideally in a practical setting” (Freeth et al. cited by Tilson et al., 2011, p. 5) and is recommended to be measured using performance assessment.

The Fresno Test (Ramos, Schafer, & Tracz, 2003) is the only known instrument available to measure a combination of EBP knowledge and skills using cognitive testing and objective performance assessment (Tilson et al., 2011). The test was originally developed for medical students and it has been recommended that more studies should be performed in different learner populations in order to more confidently establish measurement properties of the test (Tilson et al., 2011). As such, the aims of this study were: a) to translate the Fresno Test from English language to European Portuguese; b) to adapt the Fresno test to undergraduate nursing students; and c) to assess the interrater reliability of the adapted European Portuguese version of the Fresno test.

## **2. Methods**

We adapted the Fresno test to measure undergraduate nursing students’ EBP knowledge and skills.

### **2.1. Design**

This study was a cultural adaptation and psychometric validation study carried out in two phases during 2017–2018. Phase I consisted of translation and cross-cultural adaptation of the Fresno test to Portuguese undergraduate nursing students. Phase II consisted of the preliminary validation of the final Portuguese version of Fresno.

### **2.2. Instruments**

The Fresno Test was developed by Ramos, Schafer, and Tracz (2003) to measure knowledge and skills on EBP in family practice residents and educators. It is useful to assess the effectiveness of EBP education and to point out the weaknesses and strengths of curriculums and individuals. The Fresno Test has seven short answer questions, two questions that involve mathematical calculations, and three fill-in-the-blank questions and takes at least 30 minutes to complete. At the beginning, the instrument presents two possible scenarios suggesting clinical uncertainty. These two scenarios guide the answers to question 1 to 4. These questions ask the participant to: (1) write a focused clinical question; (2) identify and discuss the strengths and weaknesses of information sources as well as advantages and disadvantages for information sources; (3) identify the type of study most suitable for answering the question of one of the clinical scenarios and justify the choice; (4) describe a possible search strategy in Medline for one of the clinical scenarios and explain the rationale for the proposed search strategy approach. The next three short answer questions require that persons identify topics for determining the relevance and validity of a research study, and address the magnitude and value of research findings. The following two questions require a series of calculations and the last three questions are fill-in-the-

blank questions (Ramos et al., 2003). All the answers are scored using a standardized grading system which was created based on predicted answers and expert opinions regarding the components of a model response. The Fresno Test is a reliable and valid instrument with inter-rater correlations ranged between 0.72 and 0.96 for individual items, for total score was 0.97 (Ramos et al., 2003).

## 2.3. Procedure

### 2.3.1. Phase I - Translation, Cross-Cultural Adaptation and Adaptation to Undergraduate Nursing Students

The translation and cross-cultural adaptation of Fresno Test and its Grading Rubric into European Portuguese were made in accordance with Beaton et al. (2000) guidelines, which recommended five stages, as follows.

Stage I – Initial translation: two bilingual translators, whose first language is European Portuguese, made two versions of the Fresno test (including instructions, item content and grading system), independently. One of the translators was aware of the concepts being measured and the other translator was a naive translator (i.e. not aware of the test concepts). At this stage, the clinical scenarios were not translated.

Stage II – Synthesis of the translations: the two translators organized one joint translation (T-12) based on the test and on the first (T1) and second (T2) translators' versions.

Stage III – Back translation: two translators performed, independently, the back translations (BT1 and BT2). They did not have knowledge of the original version of the Fresno, and were not aware of the used test concepts.

Stage IV – Expert committee: 7 experts (health professionals, persons with validation studies experience, language professional, and translators) built a pre-final version based on the versions produced in the previous stages as well as on their expertise. During this stage, the expert panel developed the nursing-specific scenarios.

Stage V – Pre-final version test: A sample of undergraduate nursing students tested the pre-final version of the Portuguese translation of Fresno test. Each participant completed the test and a brief questionnaire (in Figure 1) about the comprehensibility of each item. Additionally, three expert researchers tested the standardized grading system for assessment of the answers providing by the students.



**Figure 1. Brief questionnaire applied to each participant in the test of the pre-final version.**

<p>In your opinion:</p> <p>Do you consider the items statements are written clearly?</p> <p>Yes                      No</p> <p>If not, which are not clear and why?</p>
<p>If you did not rate one or more items, please list them and identify the reason(s) using the following statements:</p> <p>I did not classify the item(s) number _____ because I have no knowledge that allows me to classify.</p> <p>I did not rate the item(s) number _____ because the statement is not clear.</p> <p>I        did        not        rate        the        item(s)        number _____</p> <p>because _____</p>
<p>If you wish, please leave any additional comments:</p>

### 2.3.2.Phase II – Interrater reliability

This study included 148 undergraduate nursing students in their fourth (and final) year from one of the main nursing schools of Portugal. The students answered eight socio-demographic questions and the Adapted Fresno Test during a pilot study conducted from February to June 2018. Alike to the Fresno Test, the answers to the Adapted Fresno Test for undergraduate nursing students were scored using a standardized rubric. To establish interrater reliability, 50 completed questionnaires were randomly selected from the full sample (n=148), and three nurses rated the answers. Table 1 characterizes the three raters' backgrounds. The raters were informed that they should score each answer independently and confidentially, without discussing or comparing ratings.

**Table 1. Characteristics of raters' backgrounds**

	<b>Raters (n=3)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>
<b>Profession</b>	Nursing	Nursing	Nursing
<b>Academic background</b>	Bachelor of Nursing	PhD candidate in Health Sciences - Nursing	PhD in Health Sciences - Nursing
<b>EBP training</b>	Informal EBP training as a researcher fellow	Formal training in EBP	Formal training in EBP
<b>EBP-related research experience</b>	2-years	7-years	2-years

## 2.4. Data Analysis

Data were entered and analyzed in the SPSS (version 24.0; SPSS Inc., Chicago, IL, USA). Interrater reliability was calculated using intraclass correlation coefficients (ICC) for the individual Adapted Fresno Test items and the total score. ICC estimates and their 95% confident intervals were calculated based on an absolute-agreement using the 2-way mixed-effects model (Koo, & Li, 2016).

## 2.5. Ethical Issues

The Ethical Committee of the Faculty of Medicine of the University of Coimbra approved this study (Reference: CE-037/2017). The nursing school where the study was carried out provided written approval. The original authors of the instrument were contacted and consented to the translation, cross-cultural adaptation and validation of the instrument from English language to European Portuguese undergraduate nursing students. All participants provided informed consent and all collected data were processed in a confidential way.

## 3. Results

### 3.1. Translation, Cross-Cultural Adaptation and Adaptation to Undergraduate Nursing Students

The stage I, II, III and IV of the translation, cross-cultural adaptation and adaptation to undergraduate nursing students of the Fresno Test proceeded smoothly and the expert panel produced and agreed upon the pre-final version of Adapted Fresno Test.

Thirteen-seven Portuguese undergraduate nursing students (five males and 32 females) aged between 18 and 27 years participated in the stage V. Despite the students having general understanding of the items, many of them reported lack of knowledge to answer the questionnaire. At this stage, the expert panel decided to remove the items 8, 9 and 10 of the Fresno Test because these items required mathematical calculations outside the scope of the preparation of the undergraduate nursing students. Comparison between the original and the adapted Fresno Test is presented in Table 2.

**Table 2. Comparison of Fresno Test and Adapted Fresno Test for Undergraduate Nursing Students**

<b>Variable</b>	<b>Fresno Test (Ramos et al., 2003)</b>	<b>Adapted Fresno Test</b>
<b>Number of items</b>	12	9
<b>Question format</b>		
<b>Short answer/open-ended</b>	7	7
<b>Mathematical calculations</b>	2	0
<b>Fill-in-the-blank</b>	3	2
<b>Scenarios</b>	2	2
<b>Maximum score</b>	100	101
<b>Instructions</b>	The practice of Evidence-Based Medicine (EBM) involves some basic knowledge and skills related to searching and evaluating medical literature. This UCSF-Fresno Medical Education tool is designed to assess the level at which you are already utilizing EBM skills. Please complete the entire test in one sitting. There are 7 short answer questions, 2 questions that require a series of mathematical calculations, and three fill-in-the-blank questions. Allow yourself at least 30 minutes to complete the test.	A utilização da prática baseada em evidência (PBE) implica alguns conhecimentos e capacidades básicas sobre pesquisa e avaliação de literatura científica. Este instrumento de avaliação adaptado do FRESNO (Universidade Califórnia, São Francisco) foi criado para avaliar em que medida já utiliza competências de PBE. Por favor complete todo o teste de uma só vez. São 7 questões de resposta aberta e 2 de preenchimento dos espaços em branco. Este teste exige um tempo mínimo de 30 minutos para ser completado.
<b>Formulate PICO questions</b>	Item 1. Write a focused clinical question for each of these patient encounters that will help you organize a search of the clinical literature for an answer and choose the best article from among those you find.	Item 1. Para cada um dos casos, elabore uma questão clínica focalizada que o ajudará a organizar uma pesquisa da literatura para lhe dar uma resposta.
<b>Sources of information</b>	Item 2. Where might clinicians go to find an answer to questions like these? Name as many possible types or categories of information sources as you can. You may feel that some are better than others, but discuss as many as you can to demonstrate your awareness of the strengths and weaknesses of common information sources in clinical practice. Describe the	Item 2. Onde podem os clínicos encontrar uma resposta para perguntas como as anteriormente elaboradas? Enumere todos os tipos ou as categorias de fontes de informação que puder. Pode pensar que algumas fontes são mais adequadas do que outras, contudo aponte todas as que conheça. Descreva as vantagens e desvantagens mais importantes para

<b>Variable</b>	<b>Fresno Test (Ramos et al., 2003)</b>	<b>Adapted Fresno Test</b>
	most important advantages and disadvantages for each type of information source you list.	cada tipo de fonte de informação enumerada.
<b>Search strategy</b>	Item 3. If you were to search Medline for original research on one of these questions, describe what your search strategy would be. Be as specific as you can about which topics and search categories (fields) you would search. Explain your rationale for taking this approach. Describe how you might limit your search if necessary and explain your reasoning.	Item 3. Se tivesse que pesquisar na base de dados Medline por artigos científicos primários sobre uma destas questões, descreva qual seria a sua estratégia de pesquisa. Seja o mais específico(a) possível sobre os termos de pesquisa e os campos de pesquisa que utilizaria. Fundamente a sua estratégia de pesquisa. Descreva como poderia limitar a sua pesquisa se fosse necessário e explique o seu raciocínio.
<b>Study design</b>	Item 4. Choose to focus on one of the clinical scenarios (breastfeeding and oral contraceptives, or bedwetting alarm). What type of study (study design) would best be able to address this question? Why?	Item 4. Centre-se num dos casos clínicos anteriores (programa de reminiscência e programa de estimulação multissensorial ou tratamento de feridas). Que tipo de estudo (desenho de estudo) seria o adequado para responder à questão elaborada? Porquê?
<b>Relevance</b>	Item 5. When you find a report of original research on these questions, what characteristics of the study will you consider to determine if it is relevant? Include examples.	Item 5. Ao encontrar um artigo com investigação primária sobre uma das referidas questões, quais as características do estudo que consideraria para determinar a sua relevância para responder a uma questão clínica? Inclua exemplos.
<b>Validity</b>	Item 6. When you find a report of original research on these questions, what characteristics of the study will you consider to determine if its findings are valid? Include examples.	Item 6. Ao encontrar um artigo com investigação primária sobre uma das referidas questões, quais as características do estudo que consideraria para determinar a validade dos resultados deste? Inclua exemplos.
<b>Differentiating statistical significance and clinical significance</b>	Item 7. When you find a report of original research on these questions, what characteristics of the findings will you consider to determine their magnitude and significance? Include examples.	Item 7. Ao encontrar um artigo com investigação primária sobre uma das referidas questões, quais as características dos resultados que consideraria para determinar a magnitude e significância destes? Inclua exemplos.
<b>Best study design, diagnosis</b>	Item 11. Which study design is best for a study about diagnosis?	Item 8. Qual o melhor desenho de estudo para realizar uma investigação sobre diagnóstico?

Variable	Fresno Test (Ramos et al., 2003)	Adapted Fresno Test
Best study design, prognosis	Item 12. Which study design is best for a study about prognosis?	Item 9. Qual o melhor desenho de estudo para realizar uma investigação sobre prognóstico?

### 3.1.1. Modifying the Grading Rubric

At stage V, the three expert researchers that tested the standardized grading system decided to modify it in order to decrease the risk of assessment bias and to establish evidence of interrater reliability. The scoring rubric offers details about the criteria that must be met by respondents for each question and the corresponding points that should be allocated for each answer by the rater according to the met criteria.

Within the modified grading rubric and in order to facilitate the grading, the following changes were made. For question 1, we included example clinical questions, using the PICO mnemonic. For question 2, we added or deleted examples of databases and information sources to adapt the grading rubric to the general nursing databases. Additionally, we divided the scoring for this item into two parts (number of sources and discussion) with a maximum of 3 points each part. For question 3, we provided an example of a search strategy and a justification for each clinical scenario. Moreover, we divided the scoring for this item into eight parts (natural language search terms, descriptors, synonymous, fields of search, Boolean Operators, limits/filters and justification) with a minimum of 1 point and a maximum of 4 points each part. For question 4, we divided the scoring into two parts: study design (maximum of 8 points) and justification (maximum of 4 points). For question 5, we divided the scoring into four parts: inclusion criteria; examples of inclusion criteria; feasibility, appropriateness, meaningfulness and effectiveness (FAME); and examples of FAME (Jordan, Lockwood, Munn, & Aromataris, 2019). Each part can be graded until a maximum of 3 points. Minimal changes were made to question 6 and for question 7, we divided the scoring into two parts: magnitude (maximum of 6 points) and statistical significance (maximum of 6 points).

As mentioned, questions 8 to 10 of the Fresno Test (Ramos et al., 2003) were removed of this adapted version as they required mathematical calculations outside the scope of the preparation of the undergraduate nursing students. Questions 11 and 12 from the Fresno Test were moved to questions 8 and 9 in this adapted version and there were no changes to the grading rubric for these two items. Table 3 shows a comparison of Fresno Test and adapted Fresno Test for undergraduate nursing students regarding the maximum numerical score of each item. The full adapted standardized grading system can be found in Supplement 1 of this paper.

**Table 3. Comparison of Fresno Test (Ramos et al., 2003) and Adapted Fresno Test for Undergraduate Nursing Students regarding the maximum numerical score of each item**

Item Fresno Test (Ramos et al., 2003)	Item Adapted Fresno Test	EBP activity	Maximum numerical score Fresno Test (Ramos et al., 2003)	Maximum numerical score Adapted Fresno
1	1	Formulate PICO questions	6	6
2	2	Sources of information	6	6
3	3	Search strategy	8	21
4	4	Study design	12	12
5	5	Relevance	12	12
6	6	Validity	24	24
7	7	Differentiating statistical significance and clinical significance	12	12
11	8	Best study design, diagnosis	4	4
12	9	Best study design, prognosis	4	4

### 3.2. Interrater Reliability

Using the modified rubric to score the test, the interrater reliability of the items ranged from 0.271 to 1.000. The interrater reliability for the total test was 0.826, which indicates good reliability (Table 4).

**Table 4. Intraclass Correlation Coefficient and 95% Confidence Interval of the Adapted Fresno test**

Items	Intraclass Correlation Coefficient	95% Confidence Interval	
		Lower Bound	Upper Bound
Item 1	.788	.619	.881
Item 2	.798	.678	.879
Item 3	.764	.510	.878
Item 4	.851	.689	.923
Item 5	.271	-.176	.564
Item 6	.645	.436	.785
Item 7	.839	.740	.903
Item 8	1.000	1.000	1.000
Item 9	.980	.969	.988
Total	.826	.504	.923

#### 4. Discussion

This study aimed to: translate the Fresno Test to European Portuguese language; adapt the Fresno test to undergraduate nursing students; and assess the interrater reliability of the Adapted Fresno test.

The Fresno Test has previously been translated and adapted to different languages and health disciplines. Argimon-Pallàs, Flores-Mateo, Jiménez-Villa, & Pujol-Ribera, 2010 translated the Fresno test into Spanish to assess the EBP knowledge and skills of the Family Medicine residents. McCluskey and Bishop (2009) adapted the Fresno Test for occupational therapists and physiotherapists. This adapted version was translated into Italian and adapted to undergraduate physiotherapy students by Bozzolan, Pavanello, Barbieri, Spada, Del Giovane, & Gaiani (2011). Lizarondo, Grimmer, and Kumar (2014), based on the Fresno Test and adapted Fresno Test developed by McCluskey, and Bishop (2009) built a new version for speech pathologists, social workers, and dietitians/nutritionists. Tilson (2010) developed a Modified Fresno Test to physical therapists, which was translated into Brazilian-Portuguese by Silva, Costa, Comper, and Padula (2016) and was adapted for acute care nursing by Halm (2018). Coppenrath, Filosa, Akselrod, & Carey (2017) adapted the Fresno Test to Pharmacy students and Laibhen-Parkes, Kimble, Melnyk, Sudia, and Codone (2018) to Pediatric Bedside Nurses. However, the Adapted Fresno Test presented in this paper is the first instrument translated for European Portuguese and adapted specifically for undergraduate nursing students to assess EBP knowledge and skills.

Similarly to other adaptations of the Fresno test (Coppenrath, Filosa, Akselrod, & Carey, 2017; Halm, 2018; Laibhen-Parkes, Kimble, Melnyk, Sudia, & Codone, 2018; Lizarondo, Grimmer, & Kumar, 2014; McCluskey & Bishop, 2009), we built new clinical scenarios adapted to nursing students. Moreover, we removed some items that required mathematical calculations outside the scope of the preparation of the undergraduate nursing students, which is identical to the adaptation performed by McCluskey and Bishop (2009), Tilson (2010) and Laibhen-Parkes, Kimble, Melnyk, Sudia, and Codone (2018). Additionally, as in the studies of Halm (2018), Laibhen-Parkes, Kimble, Melnyk, Sudia, and Codone (2018), Lizarondo, Grimmer, and Kumar (2014) and McCluskey and Bishop (2009), we revised and modified the standardized grading system to make the test more applicable to scenarios that may be experienced by students in our cohort and to decrease the risk of assessment bias. These changes were accepted positively by the expert panel and were also deemed relevant to the students in the study.

Using the modified rubric to score the Adapted Fresno Test, the interrater reliability of the items in this study ranged from 0.271 to 1.000. The interrater reliability for the total test was 0.826. These results are similar to the results of the original authors (Ramos et al., 2003) and to the results of other studies (Argimon-Pallàs, Flores-Mateo, Jiménez-Villa, & Pujol-Ribera, 2010; Coppenrath, Filosa, Akselrod, & Carey, 2017; Halm, 2018; Lizarondo, Grimmer, & Kumar, 2014; McCluskey & Bishop, 2009; Silva, Costa, Comper, & Padula, 2016; Tilson, 2010). The results suggest the translated and adapted test is

acceptable for measuring subjective and objective knowledge and skills in undergraduate nursing students in our context.

Items 8 and 9 had the highest interrater reliability, respectively 1.000 (95% CI: 1.000; 1.000) and 0.980 (95% CI: 0.969; 0.988). The excellent reliability between raters in these two items indicates that the variability between multiple raters in scoring these items does not exist or is very low. One reason for these results could be the fact that these items ask only for identification of the best study design for a study about diagnosis (item 8) or prognosis (item 9) without asking any justification. This could lead to a more objective answer and, consequently, easier grading of answers by raters using clear criteria.

Conversely, the item with the lower interrater reliability (0.271; 95% CI: -0.176; 0.564) was item 5 (When you find a report of original research on these questions, what characteristics of the study will you consider to determine if it is relevant? Include examples.). A similar result was found in the study of Lizarondo, Grimmer, & Kumar, 2013, in which the interrater reliability was 0.22 (95% CI: -0.07 to 0.61). This result suggests a significant inconsistency among raters. A possible reason for this happening is the complexity of the modified grading rubric to rate answers to item 5. First, the raters need to consider the answers to items 5, 6 and 7 to grade the item 5. Second, in the modified grading rubric, we divided the scoring of item 5 into four parts: inclusion criteria; examples of inclusion criteria; feasibility, appropriateness, meaningfulness and effectiveness (FAME) (Jordan, Lockwood, Munn, & Aromataris, 2019); and examples of FAME. Providing some training to raters, specifically about the grading rubric before the assessment of the answers, would be helpful in decreasing the variability between them and consequently to achieve good interrater reliability in all items.

The Adapted Fresno Test presented in this study is the only known instrument available to measure a combination of EBP knowledge and skills using cognitive testing and performance assessment in Portuguese undergraduate nursing students. As such, it is a useful and appropriate tool to measure the effectiveness of the educational programs on undergraduate nursing students' EBP knowledge and skills. However, due to the specific features of this type of test, namely the scoring rubric and rating procedures as well as personal experience of the raters and use of different raters, there is potential for subjectivity influencing the result. Despite these possibilities, the interrater reliability found in this pilot study was promising, and confirmed this process as an essential step toward establishing the measurement properties of the European Portuguese version of the Adapted Fresno Test for use with undergraduate nursing students.

## 5. Limitations

The small sample size was a limitation of this study, once the analysis of the interrater reliability was performed in the context of a pilot study with only a small part of the total sample size of the



undergraduate nursing students. Thus, it is likely that we could find different estimates of interrater reliability in larger sample sizes.

The complexity of the modified scoring rubric was also a limitation. For future studies, it would be recommended to deliver some specific training regarding the scoring rubric and also perform a pilot test to allow the discussion between raters (Ramos et al, 2003; Tilson, 2010). These strategies could assist in clarifying any doubts or disagreements between the raters, leading them to adopt a uniform approach when evaluating responses.

## **6. Conclusions**

The Adapted Fresno Test presented in this paper is the first instrument translated for European Portuguese and adapted specifically for undergraduate nursing students to assess EBP knowledge and skills. This instrument is a useful and valid tool for measuring the effectiveness of educational programs on undergraduate nursing students' knowledge and skills regarding EBP. Additional research studies using the adapted test should be performed in a wider sample of undergraduate nursing students to further establish psychometric properties.

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## SUPPLEMENT 1

## Fresno Test - Grading Rubrics

## Questão 1

Questão para o caso clínico 1:

Exemplo de resposta para pontuação excelente: Qual é a efetividade da **reminiscência em grupo** versus **estimulação multissensorial em grupo** na **função cognitiva** de **idosos com compromisso cognitivo ligeiro**?

<b>Excelente (3 pontos)</b>	Apresentar todos os componentes do PICO ( <b>População</b> , <b>intervenção</b> , <b>comparador</b> e <b>resultados/outcomes</b> )
<b>Forte/ Sólida (2 pontos)</b>	Falta uma das componentes da mnemónica ou 1 das componentes está incompleta.
<b>Limitada (1 ponto)</b>	Faltam 2 ou mais componentes da mnemónica, ou 2 ou mais componentes estão incompletas.
<b>Não é claro (0 pontos)</b>	Não apresenta nenhuma componente do PICO ou apresenta 1 componente do PICO incompleta (por exemplo, “idosos”).

Questão para o caso clínico 2:

Exemplo de resposta para pontuação excelente: Qual é a efetividade da **oxigenoterapia tópica com recurso a câmara portátil** versus o **tratamento convencional** (lavagem com soro fisiológico, desbridamento autolítico com hidrogel, proteção com creme de barreira do tecido perilesional, aplicação de espuma e encerramento) nas **taxas de cicatrização** de **úlceras de perna de etiologia venosa por recidivas em idosos**?

<b>Excelente (3 pontos)</b>	Apresentar todos os componentes do PICO ( <b>População</b> , <b>intervenção</b> , <b>comparador</b> e <b>resultados/outcomes</b> )
<b>Forte/ Sólida (2 pontos)</b>	Falta uma das componentes da mnemónica ou 1 das componentes está incompleta.
<b>Limitada (1 ponto)</b>	Faltam 2 ou mais componentes da mnemónica, ou 2 ou mais componentes estão incompletas.
<b>Não é claro (0 pontos)</b>	Não apresenta nenhuma componente do PICO ou apresenta 1 componente do PICO incompleta (por exemplo, “idosos”).

## Questão 2

### 2.1.

Pontos	Número de Fontes
3	Pelo menos <b>4 tipos de fontes</b> apresentadas
2	<b>3 tipos de fontes</b> apresentadas
1	<b>2 tipos de fontes</b> apresentadas
0	Só apresentam <b>1 fonte ou todas as fontes são do mesmo tipo</b>

### 2.2.

Pontos	Discussão
3	<b>discutem 3 ou mais vantagens e/ou desvantagens</b> que podem estar relacionadas com qualquer um dos seguintes aspetos: Conveniência; Relevância clínica; Validade.
2	<b>discutem 2 vantagens e/ou desvantagens</b> que podem estar relacionadas com qualquer um dos seguintes aspetos: Conveniência; Relevância clínica; Validade.
1	<b>discutem 1 vantagem e/ou desvantagem</b> que podem estar relacionadas com qualquer um dos seguintes aspetos: Conveniência; Relevância clínica; Validade.
0	não justificam, mas podem, por exemplo, referir apenas "conveniente" ou "fácil" ou "difícil" etc.

Considerar o somatório destes dois aspetos para pontuar esta resposta.

Tipos de fontes	Conveniência	Relevância clínica	Validade
<ul style="list-style-type: none"> <li>• Bases de dados eletrónicas de literatura original (Medline, Embase, CINAHL)</li> <li>• Revistas (Worldviews on evidence-based nursing, International Journal of Nursing Studies, etc.)</li> <li>• Livros (Fundamentals of Nursing, monografias)</li> <li>• Revisões Sistemáticas (Cochrane, Joanna Briggs Institute)</li> </ul>	<p>Os temas podem incluir:</p> <ul style="list-style-type: none"> <li>• Custo (e. g. "gratuito" "só subscrição")</li> <li>• Velocidade (e. g. "rápido," "demora")</li> <li>• Facilidade de pesquisa (e. g. "deve saber como reduzir a pesquisa," "fácil de navegar")</li> <li>• Facilidade de uso (e. g. "preciso" e "NNTs já calculados")</li> </ul>	<p>Os temas podem incluir:</p> <ul style="list-style-type: none"> <li>• Resultados clinicamente relevantes</li> <li>• Escrito para aplicação clínica (e. g. "pertinente" "informação sobre efeitos adversos" ou "disponibilizam folhas de informações ao utente")</li> <li>• Ênfase em especialidade apropriada (e. g. dirigido aos enfermeiros especialistas de reabilitação)</li> <li>• Informação aplicável ao utente em causa (e. g.</li> </ul>	<p>Os temas podem incluir:</p> <ul style="list-style-type: none"> <li>• Certeza da validade (e. g. "A qualidade é incerta" ou "não foi analisada" ou "precisa de ser avaliada criticamente")</li> <li>• Abordagem baseada na evidência (e. g. "evidence based" ou "Grau 1 de Evidência" ou "sem referências")</li> <li>• Opinião de perito (e. g. "normalmente a opinião de alguém")</li> <li>• Abordagem sistemática</li> <li>• Revisão por pares</li> <li>• Capacidade de verificação</li> </ul>

<ul style="list-style-type: none"> <li>• Publicações de prática baseada em evidência ou bases de dados de informação pré-avaliada (BMJ Best Practice, Cochrane Clinical Answers)</li> <li>• Páginas/Websites (World Health Organization) e literatura cinzenta (dissertações e teses)</li> <li>• Pesquisas gerais na internet (google, yahoo)</li> <li>• Boas práticas clínicas (National Guideline Clearinghouse)</li> <li>• Organizações profissionais (International Council of Nurses website)</li> <li>• Peritos</li> </ul>	<ul style="list-style-type: none"> <li>• Disponibilidade (e. g. "prontamente disponível online/em linha")</li> </ul>	<p>"pode rever os detalhes do utente em causa" ou "a maioria dos estudos são europeus")</p> <ul style="list-style-type: none"> <li>• Inclui intervenções específicas em análise</li> <li>• Especificidade (visão geral vs. específica (e. g. "consegue informação básica" ou "mais especializada")</li> <li>• Abrangência da fonte (possibilidade de encontrar uma resposta nessa fonte) (e. g. "pode encontrar tudo" ou "contem referências úteis" ou "pouco provável que encontre respostas para esta questão")</li> </ul>	<ul style="list-style-type: none"> <li>• Padrão de cuidados (e. g. "aceite na comunidade científica")</li> <li>• Informação suficiente sobre validade crítica (e. g. "apenas abstract" ou "texto completo não disponível")</li> <li>• Atualizado/Desatualizado (e. g. "pesquisa mais recente")</li> </ul>
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### Questão 3

#### *Exemplo de resposta para o caso clínico 1:*

Search (((reminescence[Title/Abstract] OR life review[Title/Abstract])) AND (sensor\*[Title/Abstract] OR snoezelen[Title/Abstract] OR "sensory stimulation"[Title/Abstract] OR "multisensory stimulation"[Title/Abstract] OR "multi-sensory stimulation"[Title/Abstract])) AND (cognit\*[Title/Abstract] OR brain function[Title/Abstract] OR memory[Title/Abstract])) AND (elder\*[Title/Abstract] OR old\*[Title/Abstract] OR geriatric[Title/Abstract] OR senior\*[Title/Abstract]))

Filtros:

- Língua - Inglês, português e espanhol
- Ano de publicação – a partir de 1990

**Justificação:** Pesquisei a partir de 1990 porque foi quando se iniciaram os estudos com estimulação multissensorial. Utilizei o operador booleano OR entre as palavras sinónimas e o operador booleano AND para restringir os resultados de pesquisa e torná-la mais específica (mais direcionada para encontrar estudos que respondam à questão de partida).

Exemplo de resposta para o caso clínico 2:

Search (((("oxygen therapy"[Title/Abstract] OR "oxygen treatment"[Title/Abstract])) AND (healing[Title/Abstract] OR cicatrization[Title/Abstract])) AND ("leg ulcer"[Title/Abstract] OR "leg ulcers"[Title/Abstract] OR "venous ulcer"[Title/Abstract] OR "venous ulcers"[Title/Abstract])) AND (elder\*[Title/Abstract] OR old\*[Title/Abstract] OR geriatric[Title/Abstract] OR senior\*[Title/Abstract])

Filtros:

- Língua - Inglês, português e espanhol
- Ano de publicação – a partir de 1969

**Justificação:** Pesquisei a partir de 1969 porque foi o ano em que a oxigenoterapia tópica foi desenvolvida. Utilizei o operador booleano OR entre as palavras sinónimas e o operador booleano AND para restringir os resultados de pesquisa e torná-la mais específica (mais direcionada para encontrar estudos que respondam à questão de partida).

### 3.1.

Pontos	Termos (linguagem natural/palavras-chave)
4	4 termos
3	3 termos
2	2 termos
1	1 termo
0	0 termos

### 3.2.

Pontos	Descritores (por exemplo, MeSH, CINAHL Headings)
1	Menciona possível utilização de descritores
0	Não menciona

### 3.3.

Pontos	Sinónimos
4	Pelo menos 2 sinónimos para cada termo
2	1 sinónimo para cada termo ou refere que procuraria sinónimos ou 1 sinónimo num único termo
0	0 sinónimos

## 3.4.

Pontos	Campos
2	Pesquisa cada termo em Título e Resumo
1	Só define um campo (Título ou Resumo) em todos os termos ou utiliza os campos de forma inadequada até ao máximo de 2 vezes ou refere que utilizaria 1 ou os 2 campos, mas sem associar aos termos
0	Não define campos de pesquisa ou utiliza os campos de pesquisa de forma incorreta em mais de 2 vezes.

## 3.5.

Pontos	Operadores Booleanos (AND/OR/NOT)
2	Usa pelo menos dois operadores booleanos diferentes (AND/NOT/OR) adequadamente
1	Usa apenas um dos operadores booleanos entre todas as palavras de forma adequada / Usa pelo menos dois operadores booleanos diferentes, mas utiliza operadores de forma inadequada até ao máximo de 2 vezes ou refere apenas que utilizaria operadores booleanos.
0	Sem operadores booleanos Ou Utiliza os operadores booleanos de forma incorreta em mais de 2 vezes

## 3.6.

Pontos	Uso de truncaturas
2	Uso adequado de pelo menos uma truncatura <b>de forma correta</b>
1	Uso de pelo menos uma truncatura, <b>de forma incorreta ou</b> refere apenas que utilizariam as truncaturas
0	Não usam truncaturas

## 3.7.

Pontos	Limites/Filtros
2	Utilizam ou mencionam a utilização de 2 ou mais filtros
1	Utilizam ou mencionam a utilização de um filtro (se referirem que não usam data limite de publicação para encontrar tudo o que já foi publicado, deve ser contabilizado como utilização de um filtro)
0	Sem utilização de filtros



## 3.8.

Pontos	Justificação
4	Apresenta pelo menos justificação para <b>4 tomadas de decisão</b> (por exemplo, justifica porque utilizou o AND/E ou o OR/OU; porque utilizou aqueles termos de pesquisa e não outros; porque utilizou determinado filtro; etc)
3	Apresenta pelo menos justificação para <b>3 tomadas de decisão</b> (por exemplo, justifica porque utilizou o AND/E ou o OR/OU; porque utilizou aqueles termos de pesquisa e não outros; porque utilizou determinado filtro; etc)
2	Apresenta pelo menos justificação para <b>2 tomadas de decisão</b> (por exemplo, justifica porque utilizou o AND/E ou o OR/OU; porque utilizou aqueles termos de pesquisa e não outros; porque utilizou determinado filtro; etc)
1	Apresenta pelo menos justificação para <b>1 tomada de decisão</b> (por exemplo, justifica porque utilizou o AND/E ou o OR/OU; porque utilizou aqueles termos de pesquisa e não outros; porque utilizou determinado filtro; etc)
0	Sem justificação

Considerar o somatório de todos os aspetos apresentados para pontuar esta resposta.

## Questão 4

## 4.1.

Pontos	Desenho de estudo
8	Menciona uma das melhores fontes: Estudo controlado randomizado ou Estudo randomizado, Revisão sistemática ou Meta-análise de estudos controlados randomizados, Randomizado, Estudo clínico duplo-cego
6	Descreve mas não identifica pelo nome uma das melhores fontes referidas acima e. g. “comparação de dois grupos, um recebe tratamento, o outro recebe placebo...” ou refere estudo quasi-experimentais
4	Descreve ou menciona um desenho de estudo menos conveniente e. g. “Estudo de coorte” ou “Estudo clínico prospetivo”, “caso controlo” ou meta-análise destes estudos, “longitudinal” ou “prospetivo”, “retrospetivo”
2	Descreve um estudo com pormenores insuficientes para identificar o desenho e. g. estudo quantitativo, experimental, observacional, comparativo
0	Nenhuma situação referida acima é apresentada

## 4.2.

Pontos	Justificação
4	Inclui uma <b>justificação bem fundamentada</b> que mostra a compreensão da importância da aleatorização e/ou da ocultação. Liga especificamente a aleatorização à diminuição da confusão e/ou ocultação em relação ao observador ou ao viés de avaliação. e. g. “Um estudo randomizado controlado visa evitar qualquer viés que influenciaria o resultado do estudo através da

Pontos	Justificação
3	aleatorização.” ou “que melhor se adequa às questões de terapia/tratamento porque reduz o viés e controla os fatores confundentes.” <b>Justificação é apresentada e aborda temas sobre aleatorização e/ou ocultação</b> , mas com articulação pouco clara e. g. “grupos devem ser semelhantes” ou “tentativa de eliminar os fatores confundentes” ou “evitar o viés de seleção” ou “ser objetivo” ou “eliminar viés”
2	<b>Justificação é identificada e levanta temas legítimos sem ligação à aleatorização e à ocultação</b> , tais como custo-efetividade, preocupações éticas, viés de memória. Pode indicar aleatorização ou ocultação, mas sem explicação (e. g. “melhor em contexto randomizado e cego”) e. g. “seleção impossível de idosos submetidos a oxigenoterapia tópica com recurso a câmara portátil ou submetidos a tratamento convencional com lavagem com soro fisiológico, desbridamento autolítico com hidrogel, proteção com creme de barreira do tecido perilesional, aplicação de espuma e encerramento” ou “a revisão de processos clínicos fornece muita informação com poucos custos.”
1	<b>Tentativa de justificação</b> , mas os argumentos não são específicos e não demonstram compreensão da ligação entre o desenho e as várias ameaças à validade. Pode indicar aleatorização ou ocultação, mas sem explicação (e. g. “melhor em contexto randomizado e cego”) e. g. “para assegurar qualidade” ou “para diminuir potenciais conflitos” ou “para comparar”
0	Nenhuma situação referida acima é apresentada ou a <b>justificação não coincide</b> com o desenho de estudo identificado

Considerar o somatório destes dois aspetos para pontuar esta resposta.

### Questão 5

As questões 5-7 abordam a revisão crítica da literatura que se divide em relevância, validade e magnitude do tamanho do efeito. Estas podem ser subdivisões arbitrárias do processo de revisão crítica. Assim os participantes podem descrever assuntos de relevância nas respostas a qualquer destas 3 questões. Considere as respostas às 3 questões como apenas 1 resposta ao aplicar o critério da seção seguinte.

#### 5.1.

Pontos	Crítérios de Inclusão
3	<b>Refere 3 ou + características relacionadas com os critérios de inclusão</b> Importância da ligação entre os sujeitos da investigação e a população-alvo (e. g. "os utentes são semelhantes aos meus no que diz respeito à idade e à raça/etnia?" ou "era uma amostra de um hospital ou de uma clínica como os meus utentes/doentes?" ou "os doentes apresentam o mesmo nível de gravidade/intensidade da doença que os meus doentes?", etc") Importância da ligação entre a intervenção da investigação e a intervenção de interesse (a intervenção em estudo é a intervenção do meu interesse?) Importância da ligação entre os resultados de interesse ( <i>outcomes</i> ) da investigação e os meus resultados de interesse ( <i>outcomes</i> ) do estudo (os resultados de interesse ( <i>outcomes</i> ) do estudo são os meus resultados de interesse ( <i>outcomes</i> )?)
2	<b>Refere 2 características relacionadas com os critérios de inclusão</b>

Pontos	Crítérios de Inclusão
1	<b>Refere 1 característica relacionada com os critérios de inclusão</b>
0	Não refere nenhuma das situações apresentadas anteriormente ou apenas menciona critérios de inclusão

## 5.2.

Pontos	Exemplos Crítérios de Inclusão
3	<b>Refere 3 ou + exemplos de características relacionadas com os critérios de inclusão</b> Importância da ligação entre os sujeitos da investigação e a população-alvo (e. g. "os utentes são semelhantes aos meus no que diz respeito à idade e à raça/etnia?" ou "era uma amostra de um hospital ou de uma clínica como os meus utentes/doentes?" ou "os doentes apresentam o mesmo nível de gravidade/intensidade da doença que os meus doentes?", etc") Importância da ligação entre a intervenção da investigação e a intervenção de interesse (a intervenção em estudo é a intervenção do meu interesse?) Importância da ligação entre os resultados de interesse ( <i>outcomes</i> ) da investigação e os meus resultados de interesse ( <i>outcomes</i> ) do estudo (os resultados de interesse ( <i>outcomes</i> ) do estudo são os meus resultados de interesse ( <i>outcomes</i> )?)
2	<b>Refere 2 exemplos de características relacionadas com os critérios de inclusão</b>
1	<b>Refere 1 exemplo de características relacionadas com os critérios de inclusão</b>
0	Não refere nenhuma das situações apresentadas anteriormente

## 5.3.

Pontos	FAME
3	<b>Refere 3 ou + características relacionadas com Aplicabilidade (Feasibility), Adequação (Appropriateness), Significado (Meaningfulness) e Efetividade (Effectiveness) – FAME</b> Atividade ou intervenção física, cultural ou financeiramente possível dentro de um determinado contexto. E. g. “o teste pode funcionar, mas se a minha instituição/o meu serviço não pode comprar o equipamento então não interessa” A adequação clínica de uma atividade ou intervenção ao contexto cultural ou ético em que o cuidado é dado. Significado para as pessoas Medida em que uma intervenção, quando utilizada adequadamente, alcança o efeito pretendido.
2	<b>Refere 2 características relacionadas com Aplicabilidade (Feasibility), Adequação (Appropriateness), Significado (Meaningfulness) e Efetividade (Effectiveness) – FAME</b>
1	<b>Refere 1 característica relacionada com Aplicabilidade (Feasibility), Adequação (Appropriateness), Significado (Meaningfulness) e Efetividade (Effectiveness) – FAME</b>
0	Não refere nenhuma das situações apresentadas anteriormente

## 5.4.

Pontos	Exemplos FAME
3	Refere 3 ou + exemplos de características relacionadas com o FAME
2	Refere 2 exemplos de características relacionadas com o FAME
1	Refere 1 exemplo de características relacionadas com o FAME
0	Não refere nenhuma das situações apresentadas anteriormente

Considerar o somatório de todos os aspetos apresentados para pontuar esta resposta.

## Questão 6

(As questões 5-7 abordam a revisão crítica da literatura que se divide em relevância, validade e magnitude do tamanho do efeito. Estas podem ser subdivisões arbitrárias do processo de revisão crítica. Assim os participantes podem descrever assuntos de validade nas respostas a qualquer uma destas 3 questões. Considere as respostas às 3 questões como apenas 1 resposta ao aplicar o critério da seção seguinte)

<b>Excelente (24 pontos)</b>	Enumera ou descreve pelo menos <u>5</u> assuntos importantes para a validade interna, tais como: Adequação do desenho do estudo Adequação da ocultação Ocultação da alocação Aleatorização da alocação de grupo/Aleatoriedade na atribuição aos grupos Medição inválida ou enviesada (“seguiu protocolo próprio?”) Importância dos grupos de comparação ou de controlo Análise da Intenção de tratar (intention-to-treat) Consideração de covariáveis apropriadas (“outros factores relevantes foram considerados?”) / redução de factores externos Conclusões consistentes com a evidência (“os resultados fazem sentido?”) Importância do acompanhamento (follow-up) de todos os participantes do estudo Análise estatística apropriada Rigor da análise dos resultados Tamanho da amostra/Poder do teste /Número de participantes Financiamento Quando o estudo foi realizado / Ano de publicação / Ano / Data de realização Confirmação com outros estudos
<b>Forte/ Fundamentado (18 pontos)</b>	Apresenta <u>3 – 4</u> temas específicos dos enumerados acima
<b>Limitada (6 pontos)</b>	Apresenta <u>2</u> temas específicos dos enumerados acima
<b>Mínima (5 pontos)</b>	Menciona validade interna ou apresenta <u>1</u> tema específico dos enumerados acima
<b>Não é claro/não evidente (0 pontos)</b>	Nenhum tema específico enumerado acima é apresentado

### Questão 7

(As questões 5-7 abordam a revisão crítica da literatura que se divide em relevância, validade e magnitude do tamanho do efeito. Estas podem ser subdivisões arbitrárias do processo de revisão crítica. Assim os participantes podem descrever assuntos de magnitude do tamanho do efeito nas respostas a qualquer uma destas 3 questões. Considere as respostas às 3 questões como apenas 1 resposta ao aplicar o critério da seção seguinte)

#### 7.1.

Pontos	Magnitude
6	<b>Discussão bem fundamentada e clara</b> da significância clínica onde incluem pelo menos <b>1 exemplo específico</b> de conceitos relacionados, tais como: Especificidade Sensibilidade razão de verossimilhança de um teste número necessário para tratar risco relativo diminuição do risco absoluto diferença de médias para resultados contínuos valor preditivo positivo ou negativo
4	Apresenta <b>1 exemplo específico dos conceitos</b> (dos enumerados acima) <b>sem discussão e/ou</b> apresenta apenas o conceito significância clínica ( e.g. “qual é a significância clínica?” ou “qual foi o tamanho da diferença encontrado?”)
2	A resposta apenas sugere consideração da significância clínica ou do tamanho do efeito (p. ex. “interessa?” ou “terá impacto na minha prática”) mesmo que não apliquem o termo significância clínica ou do tamanho do efeito.
0	Nenhuma situação referida acima é apresentada

#### 7.2.

Pontos	Significância estatística
6	<b>Discussão bem fundamentada e clara</b> dos índices de significância estatística que incluem pelo menos <b>2 exemplos específicos</b> de conceitos relacionados, tais como: Valores de p Intervalos de confiança Poder Precisão de estimativas Erros tipo I ou Tipo II
4	Apresenta <b>1 exemplo específico dos conceitos</b> (dos enumerados acima) e discute adequadamente <b>ou</b> apresenta e discute apenas <b>1 exemplo específico dos conceitos</b> (e. g. “valor de p inferior a $< 0,5$ ”) mas com discussão insuficiente
2	Indica a necessidade de avaliar a significância estatística ou apresenta apenas <b>1 exemplo específico dos conceitos</b> sem discussão (e. g. “valores de p”).
0	Nenhuma situação referida acima é apresentada

Considerar o somatório de todos os aspetos apresentados para pontuar esta resposta.

**8. Qual o melhor desenho de estudo para realizar um estudo sobre diagnóstico?**

Estudo transversal OU comparação de teste com teste de referência (“gold standard”)

(4 pontos)

**9. Qual o melhor desenho de estudo para realizar um estudo sobre prognóstico?**

Estudos coorte OU prospetivos OU longitudinais

(4 pontos)

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# Chapter 7

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Nursing educators' and undergraduate nursing students' beliefs and perceptions on evidence-based practice, evidence implementation, organizational readiness and culture: An exploratory cross-sectional study

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## Chapter 7. Nursing educators' and undergraduate nursing students' beliefs and perceptions on evidence-based practice, evidence implementation, organizational readiness and culture: An exploratory cross-sectional study

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### Abstract

The integration of evidence-based practice in nursing curricula is crucial. This study aimed to describe undergraduate nursing students' and nursing educators' evidence-based practice beliefs and extent of evidence-based practice implementation. Additionally, perspectives from nursing educators and the undergraduate nursing students regarding evidence-based practice culture and readiness to implement evidence-based practice within their work environment were analyzed. A cross-sectional study was undertaken using an electronic survey of nursing educators and undergraduate nursing students from nine Portuguese nursing schools. Sixty-eight nursing educators and 167 undergraduate nursing students responded. Results identified positive and statistically significant relationships between evidence-based practice beliefs, implementation and organizational culture and readiness among the nurse educators and the nursing students. However, the study also revealed that despite nursing educators and undergraduate nursing students having strong evidence-based practice beliefs, low levels of evidence implementation were present.

Keywords: Evidence-based practice; Education, Nursing; Faculty, Nursing; Students, Nursing.

### Highlights

- Educators and students had strong evidence-based practice beliefs.
- Educators and students had low levels of evidence-based practice implementation.
- The nine nursing schools surveyed showed a moderate movement toward a culture of evidence-based practice.
- There was a positive moderate relationship among the variables in students.
- A positive small/moderate relationship among the variables was identified in educator responses.

## 1. Background

Evidence Based Practice (EBP) is a process of clinical decision-making that considers the following three elements: the best available research evidence, clinical/professional expertise and patient preferences (International Council of Nurses – ICN, 2012; Pearson et al., 2012; Sackett et al., 2000). Due to positive impact on healthcare, as evidenced by improved patient outcomes and decreased health care costs (Melnyk et al., 2014; Melnyk, 2007; André et al., 2016), several organizations now promote EBP implementation in clinical contexts (World Health Organization – WHO, 2015; ICN, 2012). However, actual EBP use in clinical environments remains below desired levels (Duncombe, 2018; Melnyk et al., 2012; Melnyk et al., 2014).

Education is an effective strategy to promote EBP implementation into clinical practice (Black et al., 2015; Mohsen et al., 2016; Committee on the Health Professions Education Summit, 2003; Dawes et al., 2005). Academic institutions therefore, have a key role in educating nursing students to incorporate EBP in their future clinical practice (Melnyk, 2018). Nevertheless, some studies report that a critical barrier for EBP use, in both clinical and academic contexts, is organizational culture (Duncombe, 2018; Melnyk et al., 2012; Youssef et al., 2018; Pereira et al., 2012). Evidence reports a positive relationship between organizational culture concerning EBP integration, EBP beliefs and EBP use not only in the clinical context, but also in the academic environment (Aarons et al., 2009; Milner et al., 2018; Melnyk et al., 2010). Consequently, to promote EBP use within nursing education, it is important to deeply understand how prepared academic institutions are for teaching about and supporting EBP integration (Melnyk & Fineout-Overholt, 2015).

In educational contexts, besides the importance of the organization's readiness for EBP integration, educators play a vital role in integrating EBP in nursing curricula. As mentors and role models, educators influence the clinical practice of future nurses (Melnyk & Fineout-Overholt, 2015). The World Health Organization (WHO, 2016) created the "Nurse Educator Core Competencies" to allow educators to train effective, efficient and skilled nurses who are capable of meeting the population's health needs. It established that a nurse educator must "integrate evidence-based teaching and learning processes, and help learners interpret and apply evidence in their clinical learning experiences." (WHO, 2016, p. 12). However, there are reported barriers to EBP integration in educational contexts, such as: faculty aging (Kaufman, 2010; PORDATA, 2018), lack of EBP knowledge, lack of confidence in teaching EBP as well as lack of time, resources and support to promote and teaching EBP (Stichler et al., 2011; Upton et al., 2015). Notwithstanding these barriers, research suggests that positive EBP beliefs impact graduates' future use of EBP (Ramis et al., 2018) therefore there is a responsibility for nursing educators to not only promote positive EBP beliefs but to also integrate EBP in their teaching and curricula to prepare students for providing evidence-based nursing care.

Indeed, as future workers within health institutions, undergraduate students have a fundamental driving role for the integration of EBP in health care contexts. It is important that undergraduate nursing students start to acquire knowledge and apply EBP during their course and continue to develop this, integrating skills within their learning throughout life as well as in their delivery of nursing care (Dawes et al, 2005).

Indeed, some studies performed with nurses showed that they had moderately strong EBP beliefs, but low levels of EBP implementation which suggests that the organizational culture was moderately positive for EBP (Melnyk et al., 2010; Pereira et al., 2018). Additionally, the studies reported positive relationships between EBP beliefs, EBP implementation and organizational culture for EBP (Melnyk et al., 2010; Pereira et al., 2018; Stokke et al., 2014).

In light of these factors and in order to develop appropriate interventions that address the individual and organizational needs to promote EBP use, it is important to identify both undergraduate nursing students' and nursing educators' beliefs regarding EBP, their degree of EBP implementation and the readiness for school-wide integration of EBP. Therefore, this study aims to describe and explore: a) undergraduate nursing students' beliefs toward EBP; b) nursing educator's EBP beliefs and their level of confidence for teaching EBP; c) the level of EBP implementation of nursing educators and undergraduate nursing students; and d) the organizational culture and readiness for EBP from the perspective of both nursing educators and undergraduate nursing students.

## **2. Methods**

### **2.1. Design**

This study was an exploratory cross-sectional study using online surveys.

### **2.2. Sample**

The target population was nursing educators and undergraduate nursing students from nine Portuguese nursing schools. The students were enrolled across first to fourth (final) year of their degree course. The survey was conducted during 2018.

### **2.3. Setting**

Three Portuguese nursing education institutions were selected by convenience being the largest and more representative organizations delivering nursing education in Portugal. The other six institutions were randomly selected, using the random.org program, from the remaining public nursing schools (two per region - northern, central and southern Portugal).

## 2.4. Instruments

Several validated tools were used to capture responses from both nursing students and nursing educators. After receiving permission from the original developers, each were translated and adapted for Portugal by Cardoso et al. (2019, 2020). The tools used to survey the undergraduate nursing students and the nursing educators are described in table 1 and table 2, respectively.

Table 1. The instruments used to survey the undergraduate nursing students

<b>Tool</b>	<b>Brief description</b>	<b>Variable</b>
<b>Demographic tool developed by authors</b>	Nine questions	Age, Gender, Education, Graduation Year, EBP training
<b>EBP Beliefs Scale (EBPB) for students (Fineout-Overholt, 2018; Melnyk &amp; Fineout-Overholt, 2015)</b>	16 items. 5-point Likert Scale (1=strongly disagree to 5=strongly agree). The items 11 and 13 are reverse scored items.	Beliefs about EBP and confidence regarding EBP implementation
<b>EBP Implementation Scale for Students (EBPI-S) (Fineout-Overholt, 2018; Melnyk &amp; Fineout-Overholt, 2015)</b>	18 items. 5-point Likert scale (0=0 times to 4= >/=8 times).	Level of EBP implementation
<b>Organizational Culture &amp; Readiness for School-wide Integration of EBP Survey for Students (OCRSIEP-S) (Fineout-Overholt, 2018; Melnyk &amp; Fineout-Overholt, 2015)</b>	25-items. 5-point Likert scale (1= none at all to 5 = very much). Scores greater than 75 suggest a reasonably good culture for EBP however does not indicate constantly high EBP practices. Scores less than 75 suggest there are several areas that could be improved within the institution to support sustainable EBP activity (Fineout-Overholt, 2018; Milner et al., 2018).	Perceived readiness for school-wide EBP integration and cultural factors influencing implementation of EBP in the educational environment

Table 2. The instruments used to survey the nursing educators

<b>Tool</b>	<b>Brief description</b>	<b>Variable</b>
<b>Demographic tool developed by authors</b>	Ten questions	Age, Gender, Education, EBP training (received and provided),
<b>EBP Beliefs Scale for Educators (EBPB-E) (Fineout-Overholt, 2018; Melnyk &amp; Fineout-Overholt, 2015)</b>	22 items. 5-point Likert Scale (1=strongly disagree to 5=strongly agree) The items 12 and 14 are reverse scored items.	Beliefs about EBP and confidence in individual capability for teaching and implementing EBP in their context
<b>EBP Implementation Scale for Educators (EBPI-E) (Fineout-Overholt, 2018; Melnyk &amp; Fineout-Overholt, 2015)</b>	18 items. 5-point Likert scale (0=0 times to 4= >/=8 times).	Level of EBP implementation
<b>Organizational Culture &amp; Readiness for School-wide Integration of EBP Survey for Educators (OCRSIPE-E) (Fineout-Overholt, 2018; Melnyk &amp; Fineout-Overholt, 2015)</b>	25-items. 5-point Likert scale (1= none at all to 5 = very much). Scores greater than 75 suggest a reasonably good culture for EBP however does not indicate constantly high EBP practices. Scores less than 75 suggest there are several areas that could be improved within the institution to support sustainable EBP activity (Fineout-Overholt, 2018).	Perceived readiness for school-wide EBP integration and cultural factors influencing implementation of EBP in the educational environment

## 2.5. Procedure

All questionnaires were uploaded on a free online survey tool (Google Forms). The link to the surveys was established and sent to the contact points of the selected nursing schools. Subsequently, the schools forwarded the e-mail to their nursing educators and undergraduate nursing students. For both surveys, the schools were asked to send reminders to potential participants.

## 2.6. Data Analysis

All completed questionnaires were download on an excel file and data were imported to the Statistical Package for the Social Science Software (SPSS) (version 24.0; SPSS Inc., Chicago, IL, USA). Sample characteristics and instrument responses were described using means, standard deviations and percentages. For each overall score and corresponding mean, cases were excluded where the participant selected the answer option, “*I do not have enough knowledge to allow me to answer*” in at least one item of each instrument. Therefore, different sample sizes are reported for each analysis. Variables were

analyzed for normal distribution, measured by Shapiro-Wilk's test or an absolute z-score for either skewness or kurtosis smaller than 1.96 (Kim, 2013). The level of significance was set at  $p < 0.05$ . Associations between variables were explored within the nursing educators' responses and within the nursing students' responses, with correlations tested using the Pearson's correlation coefficient ( $r$ ).

## 2.7. Ethical Issues

The Ethical Committee of the Faculty of Medicine of University of Coimbra approved this study (Reference: CE-037/2017). The nine institutions where the study was conducted provided written approval. The original authors of the instruments provided permissions for use. An email was sent to each participant with a link to the survey however, prior to entering the survey an introductory page clarified the study aims and assured participants that participation was voluntary and responses would be confidential and non-identifiable. All participants provided informed consent through an online survey consent form.

## 3. Results

At the end of the data collection, responses were obtained from 68 nursing educators and 167 undergraduate nursing students. Table 1 shows the socio-demographic characteristics of each sample.

*Table 1. Socio-demographic characteristics of the sample*

<b>Nursing Educators (n=68)</b>	
Age in years, mean±SD (Min–Max)	52.87±7.45 (29–64)
Female, n (%)	52 (76.5)
Male, n (%)	16 (23.5)
Education	
Graduation, n (%)	2 (2.9%)
Master, n (%)	19 (27.9%)
Ph.D., n (%)	46 (67.6%)
Aggregation, n (%)	1 (1.5%)
EBP training	
Yes, n (%)	44 (64.7%)
No, n (%)	24 (35.3%)
<b>Undergraduate Nursing Students (n=167)</b>	
Age in years, mean±SD (Min–Max)	22.13±4.20 (18–45)
Female, n (%)	140 (83.8)
Male, n (%)	27(16.2)
Education	
12 <sup>th</sup> grade, n (%)	159 (95.2%)
Graduation, n (%)	6 (3.6%)
Master, n (%)	2 (1.2%)

Graduation Year	
1 <sup>st</sup> year	39 (23.4%)
2 <sup>nd</sup> year	20 (12.0%)
3 <sup>rd</sup> year	54 (32.3%)
4 <sup>th</sup> year	54 (32.3%)
EBP training	
Yes, n (%)	88 (52.7%)
No, n (%)	79 (47.3%)

SD = Standard deviation; Min = Minimum; Max = Maximum

### 3.1. Nurse educator scale responses

The overall mean score for the EBP beliefs scale (EBPB-E; Fineout-Overholt, 2018; Melnyk & Fineout-Overholt, 2015) was  $88.92 \pm 8.18$  (minimum=65; maximum=106), which indicated high levels of belief in the value of EBP among the nurse educators, as well as high confidence in teaching ability and EBP implementation. All mean scores were  $> 3.5$ , indicating that most educators answered that they agree or strongly agree with the items. Two items (Item 12 - "I believe that EBP takes too much time" and Item 14 "I believe EBP is difficult"), had mean scores of 3.40 and 3.22, respectively. In the total of 68 educators that responded to the EBPB-E, more than 10% answered. "*I do not have enough knowledge to answer*" only to item 15 "*I know how to implement EBP sufficiently enough to make curricular changes.*" Approximately 50% of educators believed that EBP was not difficult and did not take too much time.

From a sample of 55 educators, the overall mean score for evidence implementation (EBPI-E; Fineout-Overholt, 2018; Melnyk & Fineout-Overholt, 2015) was  $40.20 \pm 18.93$  (minimum=6; maximum=72), suggesting that nursing educators are not implementing EBP within the educational learning environment. All items presented mean scores below 3, except for item 12 ("Accessed to databases of systematic reviews (for example, the Cochrane database of systematic reviews)"), which had a mean score of 3.11. This is an indication that the educators are not sufficiently engaged in the EBP implementation activities, answering that they performed the expected behaviors of evidence-based educators *0 times* to *4-5 times* within the last year, with searching for systematic reviews was performed more frequently. A very low rate of educators using the answer option "*I do not have enough knowledge to answer*" in this scale as showed in Table 2.

The overall OCRSIEP-E mean score for educators (n=34) was  $80.59 \pm 17.52$  (minimum=42; maximum=107). All items presented a mean score below 3.5, except for items 10 ("To what extent do faculty have access to quality computers and access to electronic databases for searching for best evidence?"), 11 ("To what extent do faculty have proficient computer skills?"), 22 ("To what extent are decisions generated from College administration?") and 23 ("To what extent are decisions generated

from University administration?”). Twenty-one out of 25 items received answers of, “None at All, A Little or Somewhat”. In total, of out 68 educators that responded to the OCRSIEP-E, more than 20% answered *I do not have enough knowledge to answer* to items 13 (“To what extent are librarians used to search for evidence?”), 21 (“To what extent are decisions generated from Faculty?”), 22 (“To what extent are decisions generated from College administration?”) and 23 (“To what extent are decisions generated from University administration?”). Table 2 presents descriptive statistics for each item of the educators’ responses.

Table 2. Descriptive statistics for each item of the Educator’s responses to EBP beliefs, implementation and Organizational readiness and culture

<b>EBPB-E (EBP beliefs – Educators)</b>				
	N=68			N=50 <sup>a</sup>
<b>Items</b>	<b>I do not have enough knowledge to answer (%)</b>	<b>Neither Agree nor Disagree (%)</b>	<b>Agree/Strongly Agree (%)</b>	<b>Mean (SD)</b>
1	1.5	-	97.0	4.74 (0.443)
2	7.4	-	89.7	4.38 (0.697)
3	8.8	13.2	76.5	4.02 (0.622)
4	8.8	2.9	85.3	4.60 (0.571)
5	2.9	-	95.5	4.82 (0.388)
6	2.9	4.4	85.3	4.12(0.773)
7	4.4	5.9	86.8	4.14 (0.606)
8	7.4	27.9	63.2	3.78 (0.545)
9	8.8	26.5	55.8	3.64(0.693)
10	4.4	5.9	89.7	4.50(0.580)
11	8.8	13.2	67.6	3.80(0.728)
12*	8.8	23.5	48.6	3.40(0.969)
13	7.4	22.1	63.2	3.78(0.764)
14*	5.9	20.6	50.0	3.22(1.016)
15	10.3	20.6	61.8	3.78(0.648)
16	7.4	33.8	51.5	3.60(0.756)
17	1.5	7.4	80.9	4.06(0.740)
18	4.4	27.9	63.2	3.80(0.728)
19	1.5	5.9	91.2	4.48(0.544)
20	2.9	16.2	73.5	3.92(0.634)
21	2.9	8.8	83.9	4.34(0.688)
22	5.9	10.3	80.9	4.00(0.756)
<b>EBPI-E (EBP Implementation – Educators)</b>				
	N=68			N=55 <sup>a</sup>
<b>Items</b>	<b>I do not have enough knowledge to answer (%)</b>	<b>4-5 times (%)</b>	<b>6-8 times/ &gt; 8 times (%)</b>	<b>Mean (SD)</b>
1	2.9	20.6	61.7	2.93(1.260)
2	4.4	22.1	44.1	2.40(1.422)
3	-	14.7	51.4	2.49(1.399)



4	-	22.1	51.5	2.75(1.294)
5	-	16.2	54.4	2.58(1.329)
6	1.5	20.6	41.2	2.29(1.524)
7	4.4	17.6	19.1	1.51(1.345)
8	1.5	20.6	38.2	2.35(1.456)
9	1.5	16.2	58.8	3.00(1.291)
10	1.5	14.7	26.5	1.73(1.533)
11	2.9	16.2	44.1	2.31(1.464)
12	-	10.3	72.1	3.11(1.272)
13	-	7.5	47.8	2.36(1.568)
14	1.5	16.2	23.5	1.49(1.386)
15	2.9	8.8	17.7	1.38(1.284)
16	-	10.3	25.0	1.60(1.486)
17	2.9	22.1	28.0	1.85(1.367)
18	1.5	20.6	32.3	2.07(1.476)

**OCRSIEP–E (Organizational Culture and readiness for school wide Integration of EBP – educators)**

		N=68		N=34 <sup>a</sup>
Items	I do not have enough knowledge to answer (%)	Somewhat (%)	Moderately/Very Much (%)	Mean (SD)
1	2.9	25.0	48.6	3.26(1.214)
2	-	27.9	45.6	3.21(1.095)
3	2.9	19.1	52.9	3.38(1.074)
4	5.9	29.4	20.5	2.65(1.098)
5	2.9	13.2	39.7	3.09(1.288)
6	1.5	26.5	53.0	3.29(1.115)
7	8.8	10.3	48.5	3.32(1.173)
8	7.4	19.1	36.8	3.21(1.038)
9	1.5	19.1	47.1	3.21(1.008)
10	1.5	10.3	85.3	4.50(0.707)
11	2.9	16.2	75.0	3.97(0.717)
12	17.6	14.7	38.3	3.24(1.327)
13	20.6	14.7	17.6	2.50(1.308)
14	8.8	27.9	19.1	2.68(1.065)
15	8.8	16.2	47.1	3.29(1.244)
16	11.8	25.0	35.3	2.97(1.141)
17	16.2	17.6	23.5	2.65(1.125)
18	7.4	20.6	44.1	3.26(1.136)
19	10.3	20.6	41.2	3.18(1.141)
20	4.4	19.1	30.9	2.97(1.193)
Items	I do not have enough knowledge to answer (%)	50% (%)	75%/100% (%)	Mean (SD)
21	25.0	29.4	20.6	2.85(0.892)
22	22.1	13.2	57.3	3.74(1.024)
23	23.5	13.2	55.9	3.85(1.048)
Items	I do not have enough knowledge to answer (%)	Been Ready but Not Acting (%)	Ready to Go/Past Ready	Mean (SD)

		<b>&amp; onto Action (%)</b>			
24	5.9	19.1	48.5	3.41(1.131)	
<b>Items</b>	<b>I do not have enough knowledge to answer (%)</b>	<b>Somewhat (%)</b>	<b>Moderately/Very Much (%)</b>	<b>Mean (SD)</b>	
25	16.2	10.3	36.7	2.91(1.164)	

SD = Standard deviation

<sup>a</sup>Participants, that used the *I do not have enough knowledge to allow me to answer* option to at least one item, were removed from the analysis of the mean and standard deviation.

\* These are reverse scored items. We transformed them.

### 3.2. Nurse Educators - Associations between variables

To calculate the associations between the variables, cases, where the participant selected the answer option “I do not have enough knowledge to allow me to answer” in at least one item of each instrument, were excluded.

Associations between the variables of EBP Beliefs and EBP Implementation were analyzed in a sample of 43 nursing educators (25 cases excluded). Pearson's correlation showed a statistically significant positive moderate linear relationship between the EBP beliefs and implementation (EBPI-E) ( $r=0.414$ ,  $p = 0.006$ ). The association between beliefs in EBP and organizational culture and readiness for integrating EBP (OCRSIEP-E scale) was explored in a sample of 30 nursing educators (38 cases excluded). Results again identified a moderate but statistically significant positive linear relationship between the two variables ( $r=0.381$ ,  $p=0.038$ ). Finally, associations between EBP implementation and organizational culture and readiness for EBP integration (OCRSIEP-E scale) were calculated in a sample of 30 nursing educators (38 cases excluded) with a small but positive relationship identified ( $r=0.319$ ,  $p=0.086$ ).

### 3.3. Undergraduate nursing student's scale results

For 104 undergraduate students, the overall mean score for EBP beliefs was  $58.69 \pm 6.92$ , (minimum=38; maximum=72), indicating that students had strong beliefs about the benefit and value of EBP. Individual item mean scores were  $> 3.0$ , except for item 13 (“I believe EBP is difficult”), which had a mean score of 2.70. Despite the overall positive EBP belief scores, only 28.7% ( $n = 48$ ) of students reported that EBP does not take too much time and 15.6% ( $n = 26$ ) responded that EBP is not difficult. From the total of 167 students that responded to the EBP Beliefs questionnaire, more than 25% answered *I do not have enough knowledge to answer* to the items 4 (“I believe that critically appraising evidence is an important step in the EBP process”), 14 (“I know how to implement EBP sufficiently enough to make practice changes”) and 15 (“I am confident about my ability to implement EBP where I work”).

Results from 94 students identified an overall mean score for the EBP implementation scale of  $32.37 \pm 16.97$  (minimum=0; maximum=71), which suggests that few students were engaged in EBP implementation activities. All items presented mean scores below 3, meaning that the students performed the behaviors less than 6-8 times in the last year. In the total of 167 students that respond to the EBPI-S, more than 20% answered *I do not have enough knowledge to answer* to items 1 (“Used evidence as the basis for my clinical decision-making”), 2 (“Critically appraised evidence from a research study”) and 3 (“Generated a PICOT question”).

For a sample of 46 undergraduate students, the mean score for organizational culture and readiness to integrate EBP was  $84.20 \pm 23.48$  (minimum=41; maximum=121). All items presented a mean score > 3.0, exception made for items 12 (“To what extent do librarians within your educational organization have EBP knowledge and skills”), 13 (“To what extent are librarians used to search for evidence?”), 14 (“To what extent are fiscal resources used to support EBP (e.g. education-attending EBP conferences/workshops, computers, paid time for the EBP process, mentors”) and 23 (“To what extent are decisions generated from students?”). More than 45% of students answered *I do not have enough knowledge to answer* to the three items in this scale: item 15 (“To what extent are there EBP champions (i.e. those who will go the extra mile to advance EBP) in the environment among dean?”), item 16 (“To what extent are there EBP champions (i.e. those who will go the extra mile to advance EBP) in the environment among associate deans?”) and item 22 (“To what extent are decisions generated from Dean?”). Table 3 presents the descriptive statistics for each item of the EBPB-S, EBPI-S and OCSRSEP-ES.

*Table 3. Descriptive statistics for each item of the student responses to EBP beliefs, EBP implementation and Organizational culture and readiness for integration scales*

<b>EBPB (EBP Beliefs – undergraduate students)</b>				
N =167			N =104 <sup>a</sup>	
<b>Items</b>	<b>I do not have enough knowledge to answer (%)</b>	<b>Neither Agree nor Disagree (%)</b>	<b>Agree/Strongly Agree (%)</b>	<b>Mean(SD)</b>
1	12.0	3.0	84.4	4.60(0.600)
2	18.6	18.6	46.7	3.53(0.945)
3	18.6	22.2	47.3	3.57(0.822)
4	25.1	12.0	61.7	4.11(0.709)
5	9.6	4.2	85.6	4.51(0.638)
6	13.8	18.6	55.7	3.66(0.888)
7	19.8	28.1	43.1	3.49(0.750)
8	17.4	26.9	40.7	3.36(0.812)
9	12.6	6.6	80.8	4.38(0.610)
10	18.0	21.6	52.1	3.63(0.813)
11*	20.4	25.1	28.7	3.00(0.965)

12	21.6	27.5	36.5	3.30(0.799)
13*	19.8	28.7	15.6	2.70(0.846)
14	25.7	29.9	34.7	3.45(0.667)
15	25.1	27.5	34.7	3.34(0.771)
16	13.8	10.2	75.5	4.08(0.569)
<b>EBPI-S (EBP implementation – undergraduate students)</b>				
N=167			N=94 <sup>a</sup>	
	<b>I do not have enough knowledge to answer (%)</b>	<b>4-5 times (%)</b>	<b>6-8 times/ &gt; 8 times (%)</b>	<b>Mean(SD)</b>
1	24.0	12.6	44.9	2.69(1.414)
2	23.4	15.6	15.0	1.65(1.233)
3	29.3	10.8	7.8	1.19(1.129)
4	13.2	22.2	21.6	1.83(1.300)
5	12.0	13.2	49.1	2.64(1.443)
6	15.0	16.8	21.6	1.64(1.310)
7	17.4	12.6	31.2	2.03(1.410)
8	15.0	18.6	25.8	1.86(1.267)
9	15.0	18.6	11.4	1.21(1.066)
10	14.4	10.2	10.2	1.03(1.186)
11	16.2	16.8	12.6	1.50(1.180)
12	13.8	15.0	38.9	2.46(1.412)
13	15.0	12.6	27.0	1.97(1.448)
14	17.4	16.2	29.4	2.03(1.395)
15	19.2	13.8	24.0	1.81(1.461)
16	18.0	15.0	18.0	1.60(1.386)
17	19.2	15.0	25.8	1.84(1.409)
18	19.8	15.6	13.2	1.39(1.280)
<b>OCRSIEP–ES (Organizational culture and readiness for school wide integration of EBP – undergraduate students)</b>				
N=167			N=46 <sup>a</sup>	
	<b>I do not have enough knowledge to answer (%)</b>	<b>Somewhat (%)</b>	<b>Moderately/Very Much (%)</b>	<b>Mean(SD)</b>
1	14.4	12.0	61.7	3.70(1.364)
2	9.0	15.6	63.5	3.87(1.258)
3	14.4	13.8	61.0	3.85(1.192)
4	26.3	21.0	38.3	3.35(1.251)
5	19.8	15.6	43.2	3.37(1.254)
6	16.2	17.4	55.0	3.80(1.258)
7	32.3	15.6	41.9	3.74(1.341)
8	28.1	18.0	40.2	3.54(1.168)
9	22.8	17.4	43.2	3.52(1.378)
10	9.0	21.6	60.4	3.85(1.053)
11	8.4	18.0	56.3	3.46(1.206)
12	34.1	15.6	19.2	2.76(1.286)
13	28.7	17.4	14.4	2.61(1.273)
14	31.7	13.2	22.2	2.83(1.355)
15	45.5	14.4	28.2	3.35(1.303)

16	47.9	16.8	23.4	3.26(1.273)
17	25.1	18.0	45.0	3.54(1.277)
18	31.7	17.4	37.8	3.50(1.225)
19	28.1	18.6	28.8	3.04(1.173)
20	20.4	17.4	42.6	3.30(1.314)
	<b>I do not have enough knowledge to answer (%)</b>	<b>50% (%)</b>	<b>75%/100% (%)</b>	<b>Mean(SD)</b>
21	38.9	16.2	38.3	3.80(0.934)
22	49.7	12.6	34.2	3.76(0.848)
23	29.3	6.0	1.8	1.96(0.729)
	<b>I do not have enough knowledge to answer (%)</b>	<b>Been Ready but Not Acting (%)</b>	<b>Ready to Go/ Past Ready &amp; onto Action (%)</b>	<b>Mean(SD)</b>
24	18.0	13.2	46.2	3.37(1.372)
	<b>I do not have enough knowledge to answer (%)</b>	<b>Somewhat (%)</b>	<b>Moderately/Very Much (%)</b>	<b>Mean(SD)</b>
25	32.9	13.2	31.2	3.07(1.340)

SD = Standard deviation

<sup>a</sup> Participants, that used the *I do not have enough knowledge to allow me to answer* answer option to at least one item, were removed from the analysis of the mean and standard deviation

\* These are reverse scored items. We transformed them.

### 3.4. Undergraduate nursing students - Associations between variables

To calculate the associations between the variables, cases, where the participant selected the answer option “I do not have enough knowledge to allow me to answer” in at least one item of each instrument, were excluded.

The association between variables of EBP Beliefs and EBP Implementation was calculated in a sample of 77 students. Pearson's correlation showed a moderate, positive and statistically significant relationship between the two variables ( $r=0.458$ ,  $p<0.01$ ) among undergraduate nursing students. The association between EBP beliefs and organizational EBP culture/readiness was calculated in a sample of 39 students. Again, a significant and positive, moderate relationship was identified ( $r=0.497$ ,  $p<0.01$ ) among students. The association between EBP implementation and organizational culture and readiness for EBP integration was calculated in a sample of 38 students. A moderate, significant positive relationship was identified between the variables ( $r=0.481$ ,  $p=0.002$ ).

## 4. Discussion

This study explored responses from undergraduate nursing students and nursing educators across several academic institutions to identify individual EBP beliefs and the extent of EBP implementation activity

as well as culture of the educational organization and perceptions of how ready the school was for integrating EBP.

Both educators and students showed strong beliefs in EBP and responses suggested that the educational institutions have a moderate focus on developing a culture of EBP, but opportunities still exist for growth within the educational settings for improving and sustaining this culture (Milner et al., 2018). The impact of a positive EBP culture on implementation practices has been discussed by Fineout-Overholt, Stillwell, Williamson, Cox, and Robbins (2015). They suggested that the support provided and the resources allocated by the institutions to promote EBP as well as the commitment and engagement in EBP by both educators and students are key to a positive EBP culture (Fineout-Overholt, Stillwell, Williamson, Cox, & Robbins, 2015).

However, the educators and the students presented low levels of EBP implementation which indicate an opportunity for interventions to promote the EBP integration on education. Despite this, there are some signs of EBP implementation. For instance, more than 50% of the educators reported that the options 6-8 times/ or > 8 times to the items “Used evidence to change my teaching”, “Generated a PICO question about my teaching/practice specialty”, “Informally discussed evidence from a research study with a colleague”, “Collected data on a clinical/educational issue”, “Shared evidence from a research study with a student” and “Accessed to databases of systematic reviews (for example, the Cochrane database of systematic reviews)”. Educators also recognized that they have access to quality computers, electronic databases and have proficient computer skills, as well as they considered that decisions are made in the school by College/University administration. Nonetheless, the students presented levels of EBP implementation lower than the educators. Only one item (“Collected data of a patient problem, clinical issue or clinical scenario (simulation)”) achieved almost 50% of the students that answered 6-8 times/ > 8 times. Such low levels of EBP implementation require further investigation to clearly identify barriers.

The results of this cross-sectional study are in line with the results of the study of Milner et al. (2018). Also using the ARCC-E questionnaires for educators, the authors reported health professions educators had strong EBP beliefs, but low EBP implementation, as well as, an organizational context that indicated urgent attention was needed to develop an organizational wide culture of EBP. As discussed further in their study, staff who teach EBP must be supported in their beliefs on the value and importance of EBP (Milner et al., 2018).

Regarding associations between the variables in the sample of nurse educators, in our study there were moderate relationships between the EBPB-E and EBPI-E and between EBPB-E and OCRSIEP-E. Between EBPI-E and OCRSIEP-E the relationship was small. The study of Milner et al. (2018) also reported positive relationships between the EBPB-E and EBPI-E, and between the EBPB-E and

OCRSIEP-E among health professions educators, but they found a weak relationship between EBPI-E and OCRSIEP-E.

Undergraduate nursing students revealed similar results to those presented by educators, except for the relationship between EBP implementation and the overall culture of the school regarding EBP, which showed a significant and moderate, positive relationship. To the best of our knowledge, there are no other studies with undergraduate nursing students using the ARCC-E instruments, but some studies with nurses showed similar results (Cruz et al., 2016; Melnyk et al., 2010).

Other issues to discuss are the higher percentage of students that use the answer option *I do not have enough knowledge to answer* and that believe EBP takes too much time and it is difficult. These results indicate that undergraduate nursing students in this study had low levels of EBP knowledge and limited understanding of EBP principles. Integrating EBP into undergraduate curricula provides avenues to improve EBP knowledge of undergraduate nursing students as well as their understanding about the EBP principles instead of focusing on research principles and methods for rigorously conducting research (Melnyk, 2018).

### **Limitations**

Despite all the reminders sent to potential participants, the response rate was very low which leads to a small sample size. Indeed, online surveys present lower response rates than paper surveys (Yetter & Capaccioli, 2010) as do long questionnaires (Rolstad et al., 2011). Additionally, since the data were self-reported there is risk of social desirability response bias. The responses pertain to one context therefore generalizability of results may be limited; however, they do support similar studies (Milner et al., 2018) on this topic.

### **5. Conclusions**

This study revealed that both the nursing educators and the undergraduate nursing students had strong EBP beliefs, but they presented low levels of EBP implementation. In nursing educators' and undergraduate nursing students' perspectives, there were opportunities in their schools for the development of an EBP culture.

Considering the low levels of EBP implementation reported by both educators and students, support for development and testing of interventions, specifically tailored for promoting EBP implementation in nursing educational contexts, is recommended. Additionally, undertaking studies about barriers and facilitators for EBP implementation in educational contexts would be beneficial to guide development and implementation of these interventions.

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# Chapter 8

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Evidence-based practice educational program:  
A Portuguese experience with undergraduate  
nursing students

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[https://journals.lww.com/ijebh/Fulltext/2019/06001/Evidence\\_based\\_practice\\_educational\\_program\\_\\_a.23.aspx](https://journals.lww.com/ijebh/Fulltext/2019/06001/Evidence_based_practice_educational_program__a.23.aspx)

## Chapter 8. Evidence-based practice educational program: A Portuguese experience with undergraduate nursing students

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### Abstract

**Background:** Several studies pointed out that evidence-based practice (EBP) promotes healthcare quality, reduces healthcare costs and improves the patients' experience. However, the EBP implementation and sustainment in clinical practice remain a challenge mainly due to several gaps between research and practice. Some authors and organizations have highlighted the important role that education could have to reduce those gaps. Therefore, it is mandatory to include EBP content in undergraduate nursing curricula to promote an EBP culture among future nurses.

**Aims:** To develop an EBP educational intervention designed for undergraduate nursing students. To explore the opinion of students who received the intervention.

**Methods:** An EBP educational intervention was developed for undergraduate nursing students according to the guideline for reporting EBP educational interventions and teaching checklist by two researchers with experience in science synthesis. The draft of the intervention was sent to experts for an opinion. Their opinions were analyzed and the suggestions were incorporated. Then, the intervention was applied to fourth-year nursing undergraduate students and, afterwards, the feedback of participants was requested through an online questionnaire.

**Results/Discussion:** The program was designed for 17 weeks with a total of 18 h (12 h of classroom lessons and 6 h of mentorship). Eight experts analyzed the draft and provided their opinion. Overall, the experts considered that the program was well designed, but recommended some adjustments regarding the objectives and the target population. After the intervention implementation, 16 participants provided feedback on the program. Their feedback was positive, with an exception made for the duration of the program.

**Conclusion:** According to the experts' opinion and students' feedback, the EBP educational program seems to be an appropriate educational program to embed EBP in the undergraduate nursing curricula.

**Keywords:** education; evidence-based practice; nursing students

### Background

It is recognized that evidence-based practice (EBP) use promotes high-value health care, improves the patient experience and health outcomes, and reduces health care costs.<sup>1</sup> Consequently, several organizations have strongly recommended EBP use in clinical settings.<sup>2-4</sup> However, due to gaps between research and practice, the EBP implementation and sustainment remains a challenge. Some authors/organizations have highlighted the important role that education could have to reduce these gaps.<sup>5,6</sup> Therefore, it is mandatory that EBP contents be introduced in undergraduate nursing curricula to promote an EBP culture among future nurses.

### **Aims**

To develop an EBP educational intervention designed for undergraduate nursing students. To explore the opinion of students who received the intervention.

### **Methods**

An EBP educational intervention was developed, by two science synthesis researchers, for undergraduate nursing students according to the guideline for reporting evidence-based practice educational interventions and teaching (GREET) checklist.<sup>7</sup> The draft was sent for opinion to experts of different backgrounds (nursing, psychology, education, and physiology). Their opinion was evaluated and the suggestions were incorporated into the intervention. Between February and June 2018, the intervention was applied to Portuguese fourth-year undergraduate nursing students and the feedback of participants was requested through an online questionnaire.

### **Results/Discussion**

Eight experts analyzed the EBP educational program proposal. Overall, they considered that the program was well designed, but recommended some adjustments regarding the objectives as well as the addition of information regarding the target population. Moreover, due to specific learners' needs and time constraints, it was not possible to include the objective concerning critical analysis. Therefore, the program was limited in terms of promotion of critical appraisal skills. Table 1 shows the final program. Sixteen undergraduate nursing students, who underwent the intervention, answered an online opinion questionnaire. Their feedback was very positive but recommended that the program should include more hours of mentorship.

*Table 1. EBP Educational Intervention designed according to the GREET checklist<sup>7</sup>*

<b>1. INTERVENTION</b>	EBP Educational Program
<b>2. THEORY</b>	JBI Model of Evidence-based Healthcare <sup>8</sup>
<b>3. LEARNING OBJECTIVES</b>	Main objective: To enhance EBP use. Specific objectives: a) To know models of thinking about EBP, especially the JBI Model of Evidence-based Healthcare; b) To develop a focused review question;



	<p>c) To identify the most appropriate study design to answer the question;</p> <p>d) To show knowledge regarding database search;</p> <p>e) To analyze the search results to answer a review question;</p> <p>f) To know software to develop systematic reviews;</p> <p>g) To identify important aspects that determine the relevance and validity of a particular study.</p>
<b>4. EBP CONTENT</b>	<p><b>Session 1</b> – Introduction to Evidence-based Health Care: models of thinking and action; International collaborations for EBP: Cochrane collaboration and JBI; Introduction to systematic reviews; Types of systematic reviews and types of primary studies; Review question development.</p> <p><b>Session 2</b> – Searching for Studies: Databases (concept and organization); Important concepts (silence, noise, sensibility, specificity); Types of Resources (databases/platforms/trials registers); Concept map; Search with index terms versus search with keywords; Fields where search, truncation and wildcard symbols, and operators Booleans.</p> <p><b>Session 3</b> – Study selection process; Data extraction and synthesis; Software to synthesis (RevMan; JBI-SUMARI; Covidence; Rayyan).</p> <p><b>Session 4</b> – Definition of a review question of interest to students and important in the context of their Clinical Practice/Fieldwork.</p> <p><b>Session 5</b> – Definition of a search strategy to answer the review question previously defined.</p> <p><b>Session 6</b> – Clarification and guidance of the study selection process, the data extraction and the synthesis of studies.</p>
<b>5. MATERIALS</b>	Powerpoints, Papers of reference, Worksheets
<b>6. EDUCATIONAL STRATEGIES</b>	Lectures with a practical component and mentoring
<b>7. INCENTIVES</b>	None
<b>8. INSTRUCTORS</b>	<u>Daniela Cardoso</u> (CV: <a href="https://orcid.org/0000-0002-1425-885X">https://orcid.org/0000-0002-1425-885X</a> ) <u>João Apóstolo</u> (CV: <a href="https://orcid.org/0000-0002-3050-4264">https://orcid.org/0000-0002-3050-4264</a> )
<b>9. DELIVERY</b>	Sessions 1-3: Face-to-face (groups of 20-30 students); expositive method with practice tasks. Sessions 4-6: Face-to-face (groups of 2-3 students); active method–mentoring.
<b>10. ENVIRONMENT</b>	Classrooms and small meeting rooms
<b>11. TARGET POPULATION</b>	Fourth-year nursing undergraduate students
<b>12. SCHEDULE</b>	6 sessions during 17 weeks Sessions 1-3: total of 12 hours (4 hours by session) during the first 7 weeks. Sessions 4-6: total of 6 hours (2 hours by session) during the last 10 weeks.
<b>13. Amount of time learners spent in face to face contact with instructors and time spent in self-directed learning activities</b>	The student is face-to-face with instructors for the entire session period. It is expected that most students spend about 10 hours to prepare each mentoring session (sessions 4-6).

### **Conclusion**

According to the experts' and students' feedback, the EBP educational program seems to be an appropriate educational intervention to embed EBP in the undergraduate nursing curricula.

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### **Conflict of interest**

The authors report no conflicts of interest.

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# Chapter 9

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The Effectiveness of an Evidence Based Practice Educational Program in Undergraduate Nursing Students' EBP Knowledge and skills: A Cluster Randomized Controlled Trial

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## Chapter 9. The Effectiveness of an Evidence Based Practice Educational Program in Undergraduate Nursing Students' EBP Knowledge and skills: A Cluster Randomized Controlled Trial

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### Abstract

**Background:** Evidence-based practice (EBP) prevents unsafety/inefficiency and improves healthcare quality. However, EBP implementation and sustainment are challenging for healthcare organizations and providers considering gaps between research and practice. An educational preparation of the future healthcare professionals can minimize these gaps.

**Aims:** To assess the effectiveness of an EBP educational program in the undergraduate nursing students' EBP knowledge and skills.

**Methods:** Prospective cluster randomized control trial. Six optional courses of the 8<sup>th</sup> semester (fourth year) of the nursing Bachelor were randomly assigned to experimental (EBP educational program) or control group (education as usual) by an independent researcher. Undergraduate nursing students' EBP knowledge and skills were measured at baseline and after the intervention. Moreover, after the intervention, a qualitative analysis of 18 monographs (final written work of the Nursing Bachelor) was performed: 9 from the control group and 9 from intervention group.

**Results:** The results showed a statistically significant interaction between the intervention and time on EBP knowledge and skills,  $F(1, 146) = 9.550, p = .002$ , partial  $\eta^2 = .061$ . From pre to posttest, students' knowledge and skills on EBP improved in both groups (intervention group:  $F(1, 73) = 53.028, p < .001$ , partial  $\eta^2 = .421$ ; control group:  $F(1, 73) = 13.832, p < .001$ , partial  $\eta^2 = .159$ ). At the posttest, there was a statistically significant difference in EBP knowledge and skills between intervention and control groups,  $F(1, 146) = 6.720, p = .011$ , partial  $\eta^2 = .044$ . Students within the intervention group presented monographs with more clear review questions, inclusion/exclusion criteria and methodology than students from control group.

**Linking evidence to action:** EBP educational program showed significant improvements in undergraduate nursing students' EBP knowledge and skills. Nursing educators could use that program to promote the EBP knowledge and skills of future nurses.

**Keywords**

curriculum; competency-based education; education, nursing; evidence-based practice; knowledge; nursing education research; students, nursing.

**BACKGROUND**

According to Pearson, Jordan, and Munn (2012), Evidence-Based Practice (EBP) is defined as a “clinical decision-making that considers the best available evidence; the context in which the care is delivered; client preference; and the professional judgment of the health professional” (p. 2). As it promotes high-value health care, improves the patient experience and health outcomes, and reduces health care costs (Melnyk, Gallagher-Ford, Long, & Fineout-Overholt, 2014), several organizations recommended the EBP implementation in clinical settings (World Health Organization, 2004, 2015; International Council of Nurses, 2012; Institute of Medicine, 2009). Nevertheless, currently, EBP is not the standard of care in the world (Duncombe, 2018; Fink, Thompson, & Bonnes, 2005; Melnyk, Fineout-Overholt, Gallagher-Ford, & Kaplan, 2012) and some studies acknowledged education as an approach to promote the adoption, implementation and sustainment of EBP (Asokan, 2012; Black, Balneaves, Garossino, Puyat, & Qian, 2015; Kalb, O’Conner-Von, Brockway, Rierson, & Sendelbach, 2015; Melnyk, 2018; Melnyk, Fineout-Overholt, Feinstein, Sadler, & Green-Hernandez, 2008; Mohsen, Safaan, & Okby, 2016).

Taking this into account, in the Sicily Statement on EBP it is recommended the development of competencies regarding the EBP use in all health professional educational programs, claiming that all health students must understand the EBP principles, must have positive attitudes towards EBP and must implement it (Dawes et al., 2005). Furthermore, they recommended that Curricula to deliver knowledge, skills and attitudes of EBP should be based on the five steps of EBP. These steps are: Translation of uncertainty into an answerable question; Search for and retrieval of evidence; Critical appraisal of evidence for validity and clinical importance; Application of appraised evidence to practice; and Evaluation of performance (Dawes et al., 2005).

To respond to this recommendation, the undergraduate nursing curricula should include courses, teaching strategies and training that focuses on the development of research and EBP skills in order to nurses be able to incorporate valid and relevant research findings in practice. Nevertheless, teaching research and EBP to undergraduate nursing students is a challenging task. Some studies reported that undergraduate students have negative attitudes/beliefs towards research and EBP, specially the statistical components of the research courses and the complex terminology used, as well as they do not understand the importance of the research practice link (Al Furaikh, Al Omairi, & Ganapathy, 2017; Burkhart, & Hall, 2015; Halcomb & Peters, 2009). In fact, the lack of EBP and research knowledge, namely the difficulties in interpreting statistics and the inadequate understanding of the terminology



used in research, are common identified barriers by nurses and nursing students. Therefore, it is imperative to empower future nurses with research and EBP skills in order to overcome the barriers to the EBP use in clinical settings.

At an international level, several studies have been performed with undergraduate nursing students to assess the effectiveness of EBP interventions on multiple outcomes, such as, EBP knowledge and skills (Ashktorab, Pashaeypoor, Rassouli, & Alavi-Majd, 2013; Kim, Brown, Fields, & Stichler, 2009; Ruzafa-Martínez, López-Iborra, Armero Barranco, & Ramos-Morcillo, 2016; Zhang, Zeng, Chen, & Li, 2012). Nevertheless, any of these studies assessed the EBP knowledge and skills using a cognitive and performance instrument. Indeed, in line with the Classification Rubric for EBP Assessment Tools in Education (CREATE), the EBP knowledge should be assessed using paper and pencil tests, i.e., using cognitive tests as EBP knowledge is defined as “learners’ retention of facts and concepts about EBP” (Tilson et al, 2011, p. 5). In CREATE framework, EBP skills should be assessed using performance tests, as skills are defined as “the application of knowledge” (Tilson et al, 2011, p. 5). In addition, the intervention used within this study was recently developed (Cardoso, Rodrigues, & Apóstolo, 2019) and this is the first study design to assess its effectiveness.

Therefore, this cluster randomized control trial aims to evaluate the effectiveness of an educational EBP program in undergraduate nursing students’ EBP knowledge and skills using a cognitive and performance instrument.

## **METHODS**

### **Study Aims**

To evaluate the effectiveness of an educational EBP program in the undergraduate nursing students’ EBP knowledge and skills.

### **Design**

Prospective cluster randomized control trial with two-armed parallel group design (ClinicalTrials.gov Identifier: NCT03411668).

### **Sample Size calculation**

For sample size calculation it was used the software G\*Power 3.1.9.2. Recognizing that there are no previous studies using a cognitive and performance instrument to assess the effectiveness of an educational EBP program in undergraduate nursing students’ EBP knowledge and skills, we used an effect size of 0.25 which is a small effect size as proposed by Cohen (1988).

Therefore, a power analysis based on a type I error of 0.05; power of 0.80; effect size  $f=0.25$ ; and ANOVA: repeated measures between factors determined a total sample size of 98.

Taking into account that our study used clusters (optional courses) and that each one has an average of 25 students, we needed at least four clusters to cover the total sample size of 98. However, to cover potential losses to follow-up, we included a total of six optional courses.

### **Participants' recruitment and randomization**

We recruited the participants in one Portuguese nursing school in 2018. From the 12 optional courses of the 8<sup>th</sup> semester of the nursing graduation (last year of graduation), three were randomly assigned to experimental (EBP educational program) and three were randomly assigned to control group (no intervention – standard education). An independent researcher performed this assignment using random.org.

### **Intervention**

The participants within the intervention group received the EBP educational program, which was developed by Cardoso, Rodrigues, & Apóstolo, 2019. This program was implemented over 17 weeks (12 hours of lessons - expositive method and practice method and three sessions of mentorship to small groups of students - 2/3 students - with the duration of 2 hours each). The participants in control group received standard education. Due to the nature of the intervention, it was no possible to blind participants regarding the intervention assignment as well as to blind the individuals delivering intervention.

### **Assessment**

All participants were assessed before (week 0) and after the intervention (week 18), using a self-report instrument.

EBP knowledge and skills were assessed by the Adapted Fresno Test for undergraduate nursing students (Cardoso et al., submitted). The Fresno test was originally developed by Ramos, Schafer, & Tracz (2003) to measure knowledge and skills on EBP in family practice residents. The Adapted Fresno Test for undergraduate nursing students has seven short answer questions and two fill-in-the-blank questions. At the beginning of the instrument, it presents two scenarios, suggesting clinical uncertainty. These two scenarios guide the answers to questions 1 to 4. These questions ask the participants to: (1) write a focused clinical question; (2) identify and discuss the strenghts and weaknesses as well as the advantages and disadvantages of the information sources; (3) identify the type of study most suitable for answering the question of one of the clinical scenarios and justify the choice; (4) describe a possible search strategy in Medline for one of the clinical scenarios, and explain the rationale for the proposed search strategy approach. The next three short answer questions require the persons to identify topics for determining

the relevance and validity of a research study, and address the magnitude and value of research findings. The last two questions are fill-in-the-blank questions. The answers were scored using a modified standardized grading system, which was adapted from the original one proposed by Ramos et al., 2003. That modified standardized grading system is presented in Cardoso et al. (submitted). The inter-rater correlation for total score of the Adapted Fresno test was 0.826 (Cardoso et al., submitted). The rater that graded the answers to the Adapted Fresno test were blinded to treatment assignment.

Additionally, in order to assess the EBP knowledge and skills in a practical example, we performed a qualitative analysis of monographs after the intervention. The monographs are the final written work of the Nursing Bachelor Degree, performed by students in work groups of two/three elements, in the selected nursing school. In this work, the students need to define a review question of interest regarding the context of clinical practice where they are performing the clinical training and to answer that review question based on a systematic process of search for studies, select the studies, and extract and synthesize the data. From the 58 monographs (30 of the control group and 28 of the intervention group), 18 were randomized for evaluation (9 from the control group and 9 from intervention group). Three independent experts performed the qualitative analysis of the selected monographs: one psychologist with Ph.D. and two nurses (one with graduation and one with master degree). All the experts had experience with EBP approach and were blinded to treatment assignment. The experts used an evaluation form to analyze each monograph. This form presented 11 criteria regarding the elaboration of review questions, inclusion/exclusion criteria, methodology (namely search for studies, study selection process, data extraction and data synthesis), results presentation and congruency between review questions and the answers to them provided in the conclusion section. Three experts analyzed the monographs independently. Thereafter, they met to discuss the discrepancies and to reach a consensus.

### **Statistical analyses**

The data were analyzed using Statistical Package for the Social Sciences (SPSS; version 24.0; SPSS Inc., Chicago, IL, USA). Differences in sociodemographic and outcome data at baseline were analyzed using Pearson's Chi-square test for nominal data and independent *t*-test for continuous data.

Taking into account that Central Limit Theorem supports that as sample size increases, the sample distribution tends toward a normal distribution and that ANOVA are robust to violations of assumptions (Tabachnick, & Fidell, 2013), we decided to perform two-way mixed ANOVA, to compare the outcome between and within groups. However, to analyze in each group how many participants had improved their EBP knowledge and skills item by item, how many remained the same, and how many decreased their performance, we used the Wilcoxon's signed-rank test. We chose this nonparametric test because it can be used with ordinal variables. We decided that *p*-values less than 0.05 was statistically significant

To minimize the noncompliance impact, the intention to treat (ITT) analysis was used to analyze the participants in the groups that they were initially randomized (Gupta, 2011), through the last observation carried forward.

### **Ethics**

This study was approved by the Ethical Committee of the Faculty of Medicine of the University of Coimbra (Reference: CE-037/2017). The institution where the study was carried out provided written approval. All participants gave informed consent and the data were managed in a confidential way.

### **RESULTS**

Twelve potential clusters (optional courses of the 8th semester of the nursing) were identified as eligible to this study. Of these twelve clusters, three were randomized for intervention group and three for control group. During the study, eight participants (two in intervention group and six in control group) were lost to follow-up because they did not fill the instrument in the post-intervention. Figure 1 shows the flow of participants through each stage of the trial.

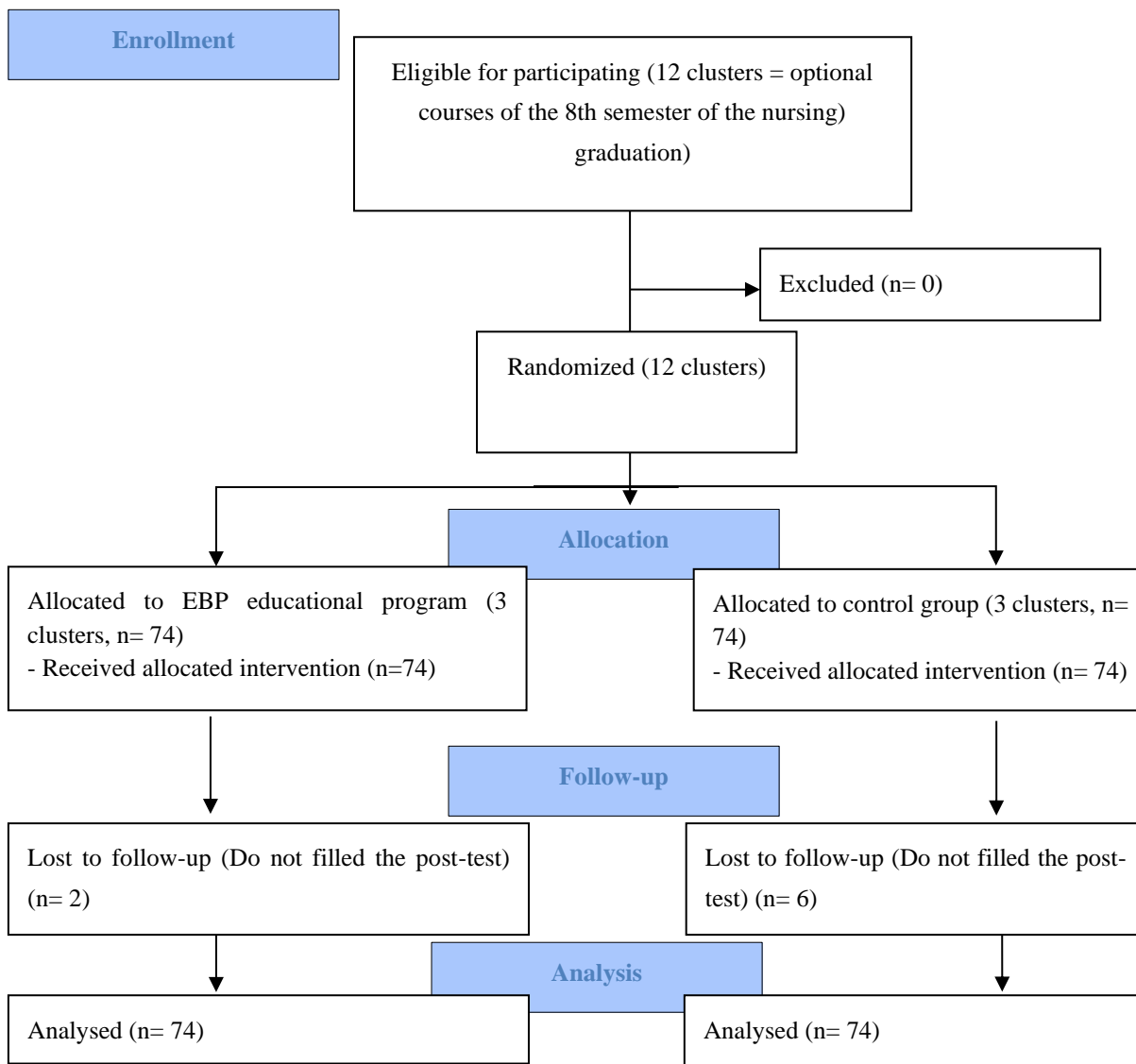
**CONSORT 2010 Flow Diagram**

Figure 1. CONSORT diagram showing the flow of participants through each stage of the trial.

**Demographic characterization**

As Table 1 displays, 148 undergraduate nursing students with an average age of 21.95 years ( $SD = 2.25$ ; range: 21 – 41) participated in the study. A large majority of the sample was female ( $n = 118, 79.7\%$ ), with the 12th grade ( $n = 144, 97.3\%$ ), and participated in some form of EBP training ( $n = 121, 81.8\%$ ).

At baseline, the experimental and control group were comparable regarding sex, age, education, EBP training and EBP knowledge and skills as assessed by the Adapted Fresno test (Table 1 and 3). The baseline data is similar if we exclude the dropouts, therefore, only ITT analysis results are presented.

Table 1. Socio-demographic characterization of the sample – ITT analysis

	<b>Total (n = 148)</b>	<b>Intervention Group (n = 74)</b>	<b>Control Group (n = 74)</b>		
	<b>mean ± SD (Min – Max)</b>	<b>mean ± SD (Min – Max)</b>	<b>mean ± SD (Min – Max)</b>	<b>Independent t-test</b>	<b>p-value</b>
Age in years	21.95 ± 2.25 (21 – 41)	22.20 ± 2.84 (21 – 41)	21.70 ± 1.42 (21 – 31)	1.353	0.178
	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	<b>X<sup>2</sup></b>	<b>p-value</b>
Female	118 (79.7)	63 (85.1)	55 (74.3)	2.676	0.102
Male	30 (20.3)	11 (14.9)	19 (25.7)		
Education				0.993	0.609
12 <sup>th</sup> grade	144 (97.3)	72 (97.3)	72 (97.3)		
Graduation	2 (1.4)	1 (1.4)	1 (1.4)		
Master	1 (0.7)	1 (1.4)	-		
Missing	1 (0.7)	-	1 (1.4)		
EBP training				0.221	0.638
Yes	121 (81.8)	59 (79.7)	62 (83.8)		
No	26 (17.6)	14 (18.9)	12 (16.2)		
Missing	1 (0.7)	1 (1.4)	-		

### EBP Knowledge and skills

#### *Adapted Fresno Test*

The two-way mixed ANOVA showed that there was a statistically significant interaction between the intervention and time on EBP knowledge and skills,  $F(1, 146) = 9.550$ ,  $p = .002$ , partial  $\eta^2 = .061$  (Table 2).

Excluding the dropouts, the two-way mixed ANOVA analysis is similar. Thus, only ITT analysis results are presented.

Table 2. Main effects of Time and Group and interaction effects on EBP Knowledge and skills – ITT analysis

<b>Outcome measure</b>	<b>Effects</b>	<b>F</b>	<b>p-value</b>	<b>Partial eta<sup>2</sup></b>
EBP knowledge and skills assessed by Adapted Fresno Test	Time × Group	9.550	0.002	0.061

To determine the difference between groups at baseline and post-intervention, two separate between-subjects ANOVAs (i.e., Two separate one-way ANOVAs) were performed. At the pre-intervention time,

there was not a statistically significant difference in EBP knowledge and skills between groups,  $F(1, 146) = 0.221, p = .639$ , partial  $\eta^2 = .002$ . At the post-intervention time, there was a statistically significant difference in EBP knowledge and skills between groups,  $F(1, 146) = 6.720, p = .011$ , partial  $\eta^2 = .044$  (Table 3).

To determine the difference within groups from the baseline to post-intervention, two separate within-subjects ANOVAs (repeated measures ANOVAs) were performed. There was a statistically significant effect of time on EBP knowledge and skills for the intervention group,  $F(1, 73) = 53.028, p < .001$ , partial  $\eta^2 = .421$  and for the control group,  $F(1, 73) = 13.832, p < .001$ , partial  $\eta^2 = .159$  (Table 3).

The results of repeated measures ANOVA and between-subjects ANOVA analysis are similar if we exclude the dropouts, therefore, only ITT analysis results are presented.

Table 3. Repeated measures ANOVA and between-subjects ANOVA with ITT

		Baseline	Post-test	Repeated measures ANOVA	<i>p</i>
		mean $\pm$ SD	mean $\pm$ SD		
EBP knowledge and skills assessed by Adapted Fresno Test	Intervention Group (n=74)	6.85 $\pm$ 5.16	12.47 $\pm$ 7.21	53.028	<0.001
	Control Group (n=74)	7.26 $\pm$ 5.34	9.73 $\pm$ 5.56	13.832	<0.001
Between-subjects ANOVA		0.221	6.720		
<i>p</i>		0.639	0.011		

The results of the Wilcoxon signed-rank test for each item of the Adapted Fresno Test are presented in Table 4. The results of this analysis revealed that students of both intervention and control groups significantly improved their knowledge and skills to write a focused clinical question (Item 1) (intervention group:  $Z = -4.572, p < .000$ ; control group:  $Z = -2.338, p = .019$ ), to build a search strategy (item 3) (intervention group:  $Z = -4.740, p < .000$ ; control group:  $Z = -4.757, p < .000$ ), to identify and justify the study design most suitable for answering the question of one of the clinical scenarios (item 4) (intervention group:  $Z = -4.508, p < .000$ ; control group:  $Z = -3.738, p < .000$ ) and to describe the characteristics of a study to determine its relevance (item 5) (intervention group:  $Z = -2.699, p = .007$ ; control group:  $Z = -1.980, p = .048$ ).

The students of the control group significantly improved their knowledge and skills in describing the characteristics of a study to determine its validity (item 6) ( $Z = -2.714, p = .007$ ). The students of the

intervention group significantly improved their knowledge and skills in describing the characteristics of a study to determine its magnitude and significance (item 7) ( $Z = -2.543$ ,  $p = .011$ ). No other significant differences were detected.

The results of the within groups comparison with Wilcoxon signed-rank test are similar if we exclude the dropouts, therefore, only ITT analysis results are presented.

Table 4. Within groups comparison with Wilcoxon signed-rank test for each item of the Adapted Fresno Test – ITT analysis.

	Intervention Group (n = 74)				Control Group (n = 74)			
	Status	n	Z	p	Status	n	Z	p
Item 1	Improved	43	-4.572	<.000	Improved	29	-2.338	.019
	Decreased	13			Decreased	16		
	Maintained	18			Maintained	29		
Item 2	Improved	20	-1.498	.134	Improved	24	-.371	.711
	Decreased	32			Decreased	19		
	Maintained	22			Maintained	31		
Item 3	Improved	49	-4.740	<.000	Improved	41	-4.757	<.000
	Decreased	14			Decreased	10		
	Maintained	11			Maintained	23		
Item 4	Improved	43	-4.508	<.000	Improved	33	-3.738	<.000
	Decreased	8			Decreased	10		
	Maintained	23			Maintained	31		
Item 5	Improved	9	-2.699	.007	Improved	6	-1.980	.048
	Decreased	0			Decreased	1		
	Maintained	65			Maintained	67		
Item 6	Improved	12	-1.236	.216	Improved	4	-2.714	.007
	Decreased	9			Decreased	15		
	Maintained	53			Maintained	55		
Item 7	Improved	11	-2.543	.011	Improved	8	-1.941	.052
	Decreased	2			Decreased	2		
	Maintained	61			Maintained	64		
Item 8	Improved	1	-.577	.564	Improved	2	-1.134	.257
	Decreased	2			Decreased	5		
	Maintained	71			Maintained	67		
Item 9	Improved	4	-.378	.705	Improved	5	.000	1.000
	Decreased	3			Decreased	5		
	Maintained	67			Maintained	64		
Total Fresno	Improved	54	-5.780	.000	Improved	45	-3.354	.001
	Decreased	13			Decreased	17		
	Maintained	7			Maintained	12		



### *Qualitative analysis of monographs*

The analysis of the intervention group monographs showed that the groups of students clearly defined the review question and the inclusion/exclusion criteria used. The group of students effectively searched for studies, using appropriate databases, keywords, Booleans operators and truncation. Also, we found a good description performed by students concerning the selection process, the data extraction and the data synthesis. Although, only some groups of students provided in the monographs a good description of the review findings, with an appropriate data synthesis, as well as a clear answer to the review question in the conclusion section. As a matter of fact, the criteria regarding the results and conclusion section were more difficult to successfully achieve even in the intervention group.

The monographs of the control group demonstrated more weaknesses. From the nine monographs of the control group, only two presented the review question clearly defined. However, in all the monographs the inclusion/exclusion criteria were not very informative, were unclear or did not match with the defined review questions. Also, the search strategies were not clear and had many fragilities, such as without definition of appropriate synonyms, without truncations, and without the definition of the search field for each word or expression to be searched. In the methodology section, any monograph reported information about the methods used to study selection process, to data extraction and to data synthesis. As well as in the intervention group, students from the control group showed difficulties to synthesize the data and to provide a clear answer to the review question in the conclusion section.

Moreover, students within the intervention group presented monographs with more clear review questions, inclusion/exclusion criteria and methodology than students from control group.

## **DISCUSSION**

This study sought to evaluate the effectiveness of an educational EBP program in undergraduate nursing students' EBP knowledge and skills. The results showed that the intervention was effective in improvement EBP knowledge and skills of students.

To the best of our knowledge, this is the first study with undergraduate nursing students that used a cognitive and performance assessment instrument (Adapted Fresno Test) as suggested by CREATE (Tilson et al., 2011). Also, it is the first study conducted using the EBP education program developed by Cardoso, Rodrigues and Apóstolo (2019). Therefore, comparison of our findings with similar studies in terms of type of instrument assessment and intervention is limited.

However, when we compared our study with other previous research studies that used other types of instruments and interventions, the results were similar (Ashktorab, Pashaeypoor, Rassouli, & Alavi-

Majd, 2013; Kim, Brown, Fields, & Stichler, 2009; Ruzafa-Martínez, López-Iborra, Armero Barranco, & Ramos-Morcillo, 2016; Zhang, Zeng, Chen, & Li, 2012). In a quasi-experimental study, Ashktorab, Pashaeypoor, Rassouli, and Alavi-Majd (2013) found that an EBP Education teaching strategy showed positive results in improving knowledge of EBP in undergraduate nursing students. The study of Kim, Brown, Fields, and Stichler (2009) showed that undergraduate nursing students who received an EBP-focused interactive teaching intervention improved their EBP knowledge. A study of Ruzafa-Martínez, López-Iborra, Armero Barranco, and Ramos-Morcillo (2016) indicated that a 15-week educational intervention in undergraduate nursing students (second- and third-year) significantly improved their EBP knowledge and skills. Also, the study of Zhang, Zeng, Chen, & Li (2012) revealed a significant improvement in undergraduate nursing students' EBP knowledge after participating in a two-phase intervention: a Self-Directed Learning Process and a Workshop for Critical Appraisal of Literature.

Despite the effectiveness of the program in improving the EBP knowledge and skills, the students included in the study have low levels of EBP knowledge and skills as assessed by the Adapted Fresno Test at the pretest and posttest. This low levels of EBP knowledge and skills, especially at the pre-test, might influence our study results. Other studies also showed that students have low levels of EBP knowledge and skills, even using instruments with Likert's scales (Kim, Brown, Fields, & Stichler, 2009; Ruzafa-Martínez, López-Iborra, Armero Barranco, & Ramos-Morcillo, 2016; Zhang, Zeng, Chen, & Li, 2012).

These low levels of EBP knowledge and skills of the undergraduate nursing students may be a reflection of a still very traditional education with regard to research. By this we mean that the focus of training remains on primary research, preparing students to be “research generators” instead of preparing them to be “evidence users” (Fineout-Overholt, Stillwell, Williamson, Cox, & Robbins, 2015). Besides, the designed and tested intervention used in this study was limited in time (only 17 weeks), was provided by only two instructors and was delivered to fourth-year undergraduate nursing students, which are limitations for the curricula-wide integration of EBP.

Indeed, a curricula that promote the EBP should facilitate to the students the acquisition of EBP knowledge and skills through their participations in EBP courses and during their clinical practice experiences (Bloom, Olinzock, Radjenovic, & Trice, 2013; Fineout-Overholt et al., 2015; Melnyk, 2013; Moch, Cronje, & Branson, 2010). As Moch, Cronje, and Branson (2010) suggested “It is only in such practical settings that students can experience the challenges intrinsic to applying scientific evidence to the care of real patients. In these clinical settings, students can experience both the frustrations and the triumphs inevitable to integrating scientific knowledge into patient care.” (p. 11). Therefore, in future studies other broad approaches for curricula-wide integration of EBP as well as the long-terms effects should be evaluated.

## **CONCLUSION**

Our findings showed that the educational EBP program was effective in improving the EBP knowledge and skills of the undergraduate nursing students. Therefore, the use of an EBP approach as a complement to the research education of undergraduate nursing students should be promoted by nursing schools and educators. This will help to prepare the future nurses with EBP knowledge and skills that are essential to overcome the barriers to the EBP use in clinical settings and, consequently, it is expected that contribute for better health outcomes.

### **Implications for future research**

Future studies should assess the long-term effects of the EBP educational intervention and the impact in the EBP knowledge and skills of potential variations in contents and teaching methods. In addition, studies using more broad interventions for curricula-wide integration of EBP should also be performed.

## **LINKING EVIDENCE TO ACTION**

- Undergraduate nursing students have low levels of EBP knowledge and skills.
- The EBP educational program used in this study showed a significant improvement in the undergraduate nursing students' EBP knowledge and skills.

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# Chapter 10

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Integrated Discussion  
and  
Overview of the Findings





## Chapter 10. Integrated Discussion and Overview of the Findings

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This chapter comprises an integrated discussion of all studies, in view of the strengths and limitations of the research results, and an overview of the findings of this Ph.D. Project, their potential implications for nursing education and the identification of potential areas for additional research.

As we highlighted in Chapter 1, the Evidence-Based Practice (EBP) movement was strongly developed in the beginning of 1990s in the medicine discipline and, rapidly, it was embraced by other health disciplines, namely nursing. This occurred due to EBP great impact on clinical practice. The EBP is recognized because it promotes high-value health care, improves the patient experience and health outcomes, and reduces health care costs (Melnyk, Gallagher-Ford, Long, & Fineout-Overholt, 2014).

Based on this assumption, many national and international organizations have been underling the EBP value and, therefore, have recommended its implementation in clinical settings (Institute of Medicine, 2009; International Council of Nurses, 2012; Ordem dos Enfermeiros, 2006; World Health Organization, 2004, 2015). To achieve this, the EBP integration into the graduation curricula of health professional students has been pointed out as the best strategy to enhance the EBP implementation in clinical settings (Dawes et al., 2005; Directorate-General of Health, Ministry of Health, 2012; International Council of Nurses, 2012; World Health Organization, 2015).

To assist the EBP integration in healthcare, many conceptual models were developed. Nevertheless, all of them suggested that the translational science consists of several steps: from clinical problem identification to the implementation of a change in practice and evaluation of its impact (Apóstolo, 2017; Melnyk, 2017).

Despite the fact that this linear process seems quite simple, some gaps make it less smoothly. As stated by Pearson, Jordan and Munn (2012), there are three gaps on Evidence-Based Healthcare and translation of research into action: (1) From Knowledge Need to Discovery (Gap between the “knowledge needs” identified by patients, community, clinicians, governments, and organizations, and the discovery of that new knowledge); (2) From Discovery to Clinical Application (Gap between “discovery research” [theoretical, epidemiological, or “bench” style research] and “clinical research” [experimental trials including but not limited to drug trials]); and (3) From Clinical Application to Action (Gap between the clinical application and the inclusion of knowledge in routine clinical actions or policy).

Besides these three gaps, the literature described several barriers to and facilitators of EBP implementation in both clinical and educational contexts as we already cited in Chapter 1 (Table 2). The most common barriers are: the lack of time; the lack of leadership support; the organizational culture and a philosophy of “that is the way we have always done it here”; the lack of EBP knowledge (for example the lack of searching skills, the difficulties in interpreting statistics); the lack of confidence; the lack of resources (namely lack of access to evidence); the managers/leaders’ and co-workers’ resistance to practices change; and the heavy workload. The most frequently facilitators are: education (for examples training in research methods and EBP); the organizational support/awareness; the availability of EBP mentors; the availability of time; and the availability of resources (i.e. resources to access evidence).

If we acknowledge that the education is one of the facilitators that can promote the EBP integration in clinical contexts, then we must provide the future nurses with research and EBP skills.

To support this, two Sicily statements (Dawes et al., 2005; Tilson et al., 2011), already described in Chapter 1, offered recommendations for EBP competencies, curricula and design of EBP learning assessment tools. In line with these recommendations, several research studies have been performed and many health educational organizations have been making determined efforts to integrate EBP in health professional curricula.

Notwithstanding these recommendations, we accomplished a brief analysis of the current curriculum programs of the Nursing Degree Courses in Portugal and we found that most curricula include research courses that already introduce the EBP approach. However, there are only three curriculum plans that consider a specific EBP course.

Accordingly, this thesis was intentionally designed to contribute to the integration of EBP into undergraduate nursing curricula.

Initially, as good quality instruments are required to assess the impact of the EBP educational programs on undergraduate nursing students, we proposed to identify and assess the measurement properties of the instruments used to evaluate the undergraduate nursing students’ attitudes, knowledge and skills in EBP. To accomplish these objectives, we undertook a protocol, which is the first and crucial step to decrease the risk of bias of a systematic review. We designed what we call a measurement properties systematic review protocol (presented in Chapter 2). The protocol included the definition of the review questions, the inclusion/exclusion criteria and the remaining methods enabling transparency to the review process (Aromataris & Munn, 2017). Based on this protocol (Cardoso et al., 2017), we conducted the systematic review (Chapter 3) and we found the following five instruments: Evidence Based Practice Questionnaire; Student Evidence-based Practice Questionnaire; Evidence-based Practice Knowledge Assessment in Nursing; Evidence Based Practice Evaluation Competence Questionnaire; and Evidence-

based practice profile questionnaire. Of these, only two measured the three constructs of interest (knowledge, attitudes, and skills regarding EBP). The measurement properties assessed were content validity, structural validity, internal consistency, cross-cultural validity, reliability, construct validity and responsiveness.

Due to the low number of studies per instrument version (e.g., language and context), it was not possible to perform a best-evidence synthesis and to know what was the most valid and reliable instrument for measuring undergraduate nursing students' knowledge, attitudes and skills in EBP. For this purpose, more research studies with the same instrument version and in the same context are needed. Nonetheless, this systematic review synthesized potential instruments for both research purposes and use in educational context in order to describe the undergraduate nursing students' attitudes, knowledge, and skills regarding EBP and to assess the impact of educational programs.

As we explained in the introduction section, while conducting the project we decided to use similar instruments for both educators and students to identify strengths and opportunities for the promotion of an EBP culture in educational organizations based on the Advancing Research & Clinical Practice through Close Collaboration and Education (ARCC-E) model (Fineout-Overholt, Stillwell, Williamson, Cox, & Robbins, 2015). For this reason, the instruments included in the systematic review were not used in the subsequent research studies described in this thesis.

However, conducting this review contributed to the development of knowledge and skills regarding both EBP implementation in educational context and research methods. First, it allowed having an understanding of the several studies performed in the area of the EBP integration in educational context, particularly studies on the development or use of instruments to assess the EBP attitudes, knowledge and skills of undergraduate nursing students. Second, it allowed to become aware of the existence of the Fresno Test. During the protocol development of the systematic review (Chapter 2), we analyzed the consensus statement "Sicily statement on classification and development of evidence-based practice learning assessment tools", which provides important recommendations and principles to contemplate when developing assessment tools for EBP related constructs. Moreover, the statement identified the necessary type of tools to promote a more consistent assessment of the results of EBP training. Through this statement, we determined that the Fresno test would be a suitable instrument for assessing EBP knowledge and skills of health students. Therefore, as recommended by the Sicily statement (Tilson et al., 2011), we decided to translate and cross-cultural adapt the Fresno Test to a different population (Portuguese nursing students) and educational context (school of nursing) and to evaluate its measurement properties (study described in Chapter 6). Third, the systematic review process facilitated the acquisition of knowledge at the methodological level related to the construction of instruments and evaluation of their measurement properties. The methodological quality assessment of studies, that fulfilled the inclusion criteria, required the use of a complex assessment checklist proposed by the

COSMIN (COnsensus-based Standards for the selection of health Measurement INstruments) initiative (Mokkink et al., 2018). This checklist includes items to guide the critically appraisal of studies that assess the measurement properties of the instruments. This task allowed improving not only our skills on critical analysis, but also on planning and conducting primary studies for the construction of instruments and evaluation of measurement properties.

Having said that, our research proceeded with the adaption to the Portuguese population of the “EBP Beliefs Scale for Educators” (EBPB-E), the “EBP Implementation Scale for Educators” (EBPI-E), the “Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey” (OCRSIEP-E) for educators, the “EBP Beliefs Scale” (EBPB), the “EBP Implementation Scale for Students” (EBPI-S) and the “Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey” (OCRSIEP-ES) for students (Fineout-Overholt, 2018; Fineout-Overholt, Stillwell, Williamson, Cox, & Robbins, 2015). The whole processes are described in Chapters 4 and 5.

The translation and cross-cultural adaptation of the EBPB-E, EBPI-E, OCRSIEP-E, EBPB, EBPI-S and OCRSIEP-ES instruments were uneventful and its internal consistency was good. Still, we need to interpret the internal consistency results carefully due to the small sample sizes included in the studies. Additionally, this fact prevented performing exploratory and confirmatory factor analysis (Cardoso et al., 2019, 2020).

Another limitation of these studies is the duration of the recall time frame of the EBPI-E and EBPI-S from 8 weeks to one year. Initially, considering that this proposal came from both students and educators that participated in pre-test of instruments, this seemed the right decision to take. However, we realized later on that data accuracy of the results decreases as the recall time frame increases (Clarke, Fiebig, & Gerdtham, 2008; Stull, Leidy, Parasuraman, & Chassany, 2009). This is due to the fact that long recall periods encourage participants to guess and estimate the answer (Blair & Burton, 1987; Brown, 2002). That decision may have affected the validity of the EBPI-E and EBPI-S bearing in mind that originally the instruments were not designed for such a long recall. Indeed, nowadays, it is expected that both educators and nursing students are engaged in EBP activities throughout the academic year and not only at specific times of the year, such as when teaching a specific EBP course.

With these two studies, and at the best of our knowledge, we obtained the first instruments translated for European Portuguese to assess undergraduate nursing students’ and nursing educators’ beliefs about, and confidence in, their ability to practice EBP in education, their degree of EBP implementation in education and their perception of organizational culture and readiness for school-wide integration of EBP. Having these instruments was crucial for performing the exploratory cross-sectional study described in Chapter 7.

While we performed these two studies, we conducted another one to adapt the Fresno test to the Portuguese population and to the undergraduate nursing students, which is presented in Chapter 6. This study was designed in order to have an appropriate instrument to measure the effectiveness of the EBP educational program on students' EBP knowledge and skills (Chapter 9).

The Fresno Test, originally developed for medical students by Ramos, Schafer, and Tracz (2003), is the only known instrument available to evaluate a combination of EBP knowledge and skills using a cognitive and performance assessment (Tilson et al., 2011). For this reason, and as we already stated, Tilson et al. (2011) recommended its adaptation for different learner populations.

The translation, the cross-cultural adaptation and the adaptation to undergraduate nursing students of the Fresno Test proceeded well. The members of the expert panel decided to remove items 8, 9, and 10 of the Fresno Test because they required mathematical calculations outside the scope of the training of the undergraduate nursing students. They, also, built nursing-specific scenarios to replace the medical ones. Moreover, three members of the expert panel revised and modified the standardized grading system to decrease the risk of assessment bias.

Definitely, due to the specific features of Fresno test, the results could be influenced namely by the scoring rubric, the rating procedures, the personal experience of the raters, and the use of different raters. Despite this, we had promising results as the interrater reliability of the items in this study ranged from 0.271 to 1.000 and of the total test was 0.826. Nonetheless, in future studies using the adapted Fresno Test, we recommend that training on the scoring rubric should be provided to the raters and a pilot test should be performed (Ramos et al, 2003; Tilson, 2010) in order to clarify any doubts and to promote the adoption of a standardized approach when raters assess the responses.

Moreover, and taking into account that interrater reliability was calculated only in a small part of the total sample size of the undergraduate nursing students of a pilot study, we anticipate that in larger sample sizes it is possible to reach different estimates of interrater reliability.

Following the conclusion of the translations and cross-cultural adaptations of the assessment tools required to achieve the main objectives of the thesis, we performed the exploratory cross-sectional study conducted in nine Portuguese nursing schools through an online questionnaire as outlined in Chapter 7. The aims of this cross-sectional study were to describe and explore: a) the undergraduate nursing students' and nursing educator's beliefs toward EBP; b) the level of EBP implementation of nursing educators and undergraduate nursing students; and c) the organizational culture and readiness for EBP from the perspective of both nursing educators and undergraduate nursing students.

Before presenting a brief description of results, limitations and implications for nursing education of this cross-sectional study, we would like to highlight that the sample used for this study was the same

used for reliability analysis of the instruments indicated in Chapters 4 and 5. Due to time constraints and lack of funds for project development, it was not possible to perform two moments of data collection that would allow us to have a sample to test the reliability of the instruments (collected before cross-sectional study planning) and another sample (collected after the reliability assessment of instruments) for cross-sectional study.

Hereupon, the results of the cross-sectional study demonstrated that both the nursing educators and the undergraduate nursing students had strong EBP beliefs, but they presented low levels of EBP implementation. In nursing educators' and undergraduate nursing students' perspectives, there were opportunities in their schools for the development of an EBP culture.

In addition, we found that, amongst the undergraduate nursing students, there was a positive moderate linear relationship between all the variables. Regarding the nursing educators, there was a positive moderate linear relationship between the EBP beliefs and implementation, and between EBP beliefs and organizational culture and readiness for school-wide integration of EBP. Although, we found a positive small linear relationship between the EBP implementation and the organizational culture and readiness for school-wide integration of EBP.

These results should be carefully interpreted in view of study limitations. First, the response rate was very low which leads to a small sample size. The reason for this event can be the use of online surveys and long questionnaires. Second, by using self-report instruments, there is a risk of social desirability response bias. Last, but not the least, the generalization of the results was limited as the study was performed in only one context (Portuguese context). In spite of this limitation, our study supports others studies (Milner et al., 2018) performed on this topic.

Considering the low levels of EBP implementation reported by both educators and students, we recommend the development and testing of interventions, specifically tailored for promoting EBP implementation in nursing educational contexts. We, also, recommend undertaking studies about the barriers and facilitators for EBP implementation in educational context to guide the development and implementation of interventions.

Despite the limited generalization of our study, its results warn of the need for a paradigm shift in the field of nursing education as far as the integration of EBP in curricula is concerned, particularly in Portugal. Looking at the cross-sectional study results, particularly the low levels of EBP implementation of students and educators, and to our brief analysis of the current curriculum programs of the Nursing Degree Courses in Portugal, we recognize that nursing education is still *traditional* regarding research training. This means that nowadays the focus of training is mainly on primary research and, thus, the students are being prepared to be *research generators*. Although, the EBP education should train the students to be *evidence users* as suggested by Fineout-Overholt, Stillwell, Williamson, Cox, and

Robbins (2015). This means that the students should be trained on: (1) formulate clear clinical questions based on identification of problems (uncertainty) in clinical context; (2) search for evidence; (3) critical appraisal of evidence; (4) application of results in clinical context; and (5) assessment of this application (Dawes et al., 2005; Fineout-Overholt et al., 2015).

To promote EBP education in nursing, we designed an educational EBP program (Chapter 8) and we evaluated its effectiveness in undergraduate nursing students' EBP knowledge and skills (Chapter 9).

Two science synthesis researchers developed the EBP Educational Intervention in compliance with the guideline for reporting evidence-based practice educational interventions and teaching checklist (Phillips et al., 2016). It aimed to prepare the undergraduate nursing students to define a clinical question, search for evidence in databases, selection of studies, and synthesize the evidence. According to the experts' and students' feedback, the EBP educational program could be a suitable educational intervention to embed EBP in the undergraduate nursing curricula.

Then, this intervention was used in the cluster randomized control trial design in order to assess its effectiveness in undergraduate nursing students' EBP knowledge and skills. The trial results showed significant improvements in undergraduate nursing students' EBP knowledge and skills as assessed by the Adapted Fresno Test. They showed that students within the intervention group presented monographs with clearer review questions, inclusion/exclusion criteria and methodology than students from the control group.

Notwithstanding these positive results, the designed and tested intervention was limited in time (only 17 weeks); only two instructors provided it; and it was delivered to fourth-year undergraduate nursing students. These three features constituted limitations for the curricula-wide integration of EBP. Indeed, as stated by Fineout-Overholt et al. (2015), "Teaching EBP should not be restricted to one instructor or to a stand-alone course (e.g., academic or clinical course). Rather, it should be woven into the fabric of academic programs' overall curricula in such a fashion that it becomes part of the culture." (p. 339). In addition, Dawes et al. (2005) recommended "The teaching of EBP should, as far as possible, be integrated into the clinical setting and routine care so that students not only learn the principles and skills, but learn how to incorporate these skills with their own life-long learning and patient care." (p. 4-5). Actually, the EBP training should begin early in undergraduate education to facilitate the acquisition of EBP knowledge and skills by students not only by their participation in EBP courses but also by training those knowledge and skills in their clinical practice experiences (Bloom, Olinzock, Radjenovic, & Trice, 2013; Fineout-Overholt et al., 2015; Melnyk, 2013; Moch, Cronje, & Branson, 2010). These limitations should be taken into account in future studies on this field, which should assess the long-term effects of the EBP educational intervention and the impact of potential variations in contents and teaching methods in the EBP knowledge and skills of the students.

Recently, we found a funded European Project, the *EBP e-Toolkit Project: Providing a Teaching and Learning Open and Innovative toolkit for Evidence-Based Practice to Nursing European Curriculum*, which aimed to analyze the current state of EBP in European nursing curricula to build an European EBP competency framework and to establish guidelines on EBP teaching and learning in the European nursing curriculum (Ruzafa-Martínez, 2019). Along with the results presented in this thesis, the results of this project will bring important contributions to design new strategies to promote the EBP integration in the overall curricula of nursing graduations in Portugal.

In the light of the foregoing and taking into account its contribution to the EBP integration in educational contexts, it becomes clear that this research is important and that it is relevant not only for nursing education, but also for healthcare context since education is one strategy to improve EBP use into clinical practice. Preparing students for the critical use of the best available evidence in their future clinical contexts will help them to overcome the barriers to the EBP use in clinical settings and, consequently, will contribute to promote high-value health care, to improve the patient experience and health outcomes, and to reduce health care costs.

In conclusion, this thesis provided the following resources for nursing education in the EBP field:

- Three instruments to assess EBP beliefs, the degree of EBP implementation and the readiness for school-wide integration of EBP by Portuguese nursing educators;
- Three instruments to assess the EBP beliefs, the degree of EBP implementation and the readiness for school-wide integration of EBP by Portuguese undergraduate nursing students;
- One instrument of cognitive testing and performance to assess a combination of EBP knowledge and skills of Portuguese undergraduate nursing students;
- A structured EBP educational program, which can be implemented in nursing schools to promote the EBP integration in undergraduate nursing curricula.



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# Appendices

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## Appendix I. Ethical Committee Approval



FMUC FACULDADE DE MEDICINA  
UNIVERSIDADE DE COIMBRA

**COMISSÃO DE ÉTICA DA FMUC**

Of. Ref<sup>o</sup> **043-CE-2017**  
Data 22/05/2017

C/conhecimento ao aluno

Exmo. Senhor  
Presidente do Conselho Científico da FMUC


**Assunto: Projecto de Investigação no âmbito do Programa de Doutoramento em Ciências da Saúde (ref<sup>o</sup> CE-037/2017)**

**Candidato(a):** Daniela Filipa Batista Cardoso

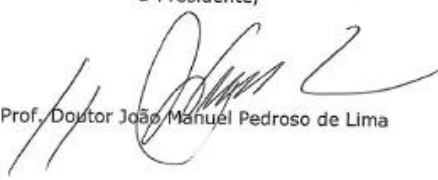
**Título do Projeto:** *"Prática baseada na evidência no processo de educação em enfermagem em Portugal"*.

A Comissão de Ética da Faculdade de Medicina, após análise do projecto de investigação supra identificado, decidiu emitir o parecer que a seguir se transcreve:

**"Parecer favorável não se excluindo, no entanto, a necessidade de submissão à Comissão de Ética, caso exista, da(s) Instituição(ões) onde será realizado o Projeto"**.

Queira aceitar os meus melhores cumprimentos. 

O Presidente,

  
Prof. Doutor João Manuel Pedroso de Lima

HC

SERVIÇOS TÉCNICOS DE APOIO À GESTÃO - STAG - COMISSÃO DE ÉTICA  
Pólo das Ciências da Saúde - Unidade Central  
Avenida de Santa Comba, Celas, 3000-354 COIMBRA - PORTUGAL  
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## Appendix II. Consent of Authors of the Advancing Research & Clinical Practice through Close Collaboration and Education (ARCC-E) Model

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January 30, 2017

Daniela Cardoso, RN, PhD student

Faculty of Medicine, University of Coimbra

Research Grant Holder

Portugal Centre for Evidence-based Practice (PCEBP): a JBI Centre of Excellence

Health Sciences Research Unit Nursing (UICISA:E), Nursing School of Coimbra (ESENfC)

E-mail: [dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)

ARCC Ilc has agreed to provide permission for Ms. Daniela Cardoso, PhD student at Faculty of Medicine, University of Coimbra and research grant holder at Portugal Centre for Evidence-based Practice (PCEBP): a JBI Centre of Excellence, Health Sciences Research Unit Nursing (UICISA:E), Nursing School of Coimbra (ESENfC) to translate the OCRSIEP-E, OCRSIEP-ES, EBPB, EBPB-E, EBPI-S and EBPI-E scales and to assess the validity and reliability of the Portuguese versions of these scales in a study of over 1000 educators and students to explore the current Portuguese reality of nursing education institutions about: the readiness of EBP integration (OSCRIEP-E: educators; OCRSIEP-ES: students), the undergraduate nursing students' attitudes, knowledge and skills in EBP (EBPB) and nurse educators' EBP beliefs (EBPB-E), and the extent of student (EBPI-S) and educators' EBP implementation (EBPI-E). Ms. Cardoso and team agree that there will be **no changes** made in the EBP scales in any form that varies from the original intent of the scales. Changes for cultural context will be discussed with Dr. Ellen Fineout-Overholt (Dr. EFO) prior to finalization of translated scales. Ms. Cardoso will work with Dr. EFO in verifying the back translation of the Portuguese versions of the EBP scales prior to using them in a study to establish validity and reliability of the translated instruments. ARCC Ilc agrees to allow Ms. Cardoso and team to create an online version of these scales in accordance with the format in the attachment accompanying this agreement. Full title, copyright and instructions should be included in the online survey just prior to the items (see example). When published, either for academic or general readership [journals], the scales are not to be published in their entirety, i.e., as a scale. Items within tables with items means is acceptable. A sample scale may be provided for inclusion in academic documents upon request by emailing Dr. Fineout-Overholt. Ms. Cardoso and team also agree that this permission and agreement are solely for this academic study. This signed affidavit is an acknowledgement all of these agreements between ARCC Ilc and Ms. Cardoso and her team, including the advising committee. Ms. Cardoso will also include **at the bottom of each of the translated EBP scales** the following copyright statement:

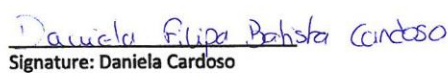
Appropriate copyright on each of the original scales should be placed appropriately as in the sample. Then add at the bottom of the page

*Do not use this scale without permission from authors. For further information about use, please contact Dr. Ellen Fineout-Overholt at [ellen.fineout.overholt@gmail.com](mailto:ellen.fineout.overholt@gmail.com). Portuguese translation by Daniela Cardoso, PhD student at Faculty of Medicine, University of Coimbra and research grant holder at Portugal Centre for Evidence-based Practice (PCEBP): a JBI Centre of Excellence, Health Sciences Research Unit Nursing (UICISA:E), Nursing School of Coimbra (ESENfC). Publishing of this scale, for any reason, is strictly prohibited.*

This signed affidavit is an acknowledgement all of these agreements between ARCC Ilc and Ms. Daniela Cardoso. Written signature required.

  
Signature: Dr. EFO

Date: 4-24-17

  
Signature: Daniela Cardoso

Written signature required

Date: 4-24-17



## Appendix III. Consent of Fresno Author

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### Daniela Cardoso

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**De:** Kathleen Dyer <kdyer@csufresno.edu>  
**Enviado:** quarta-feira, 5 de abril de 2017 16:28  
**Para:** Daniela Cardoso  
**Assunto:** Re: Fresno Test\_adaptation and validation

**Sinal. de seguimento:** Dar seguimento  
**Estado do sinalizador:** Concluído

Daniela,

Thank you for your very nice message. It sounds like you are doing important work!

Yes, please feel free to use the instrument. We made it available in hopes that others would find it useful. It has been adapted for various populations already, perhaps nursing, but I haven't kept track. You are welcome to do so.

Best of luck!

Katie Dyer (formerly Ramos)

Kathleen D. Dyer, PhD, CFLE  
 Associate Professor and Department Chair  
 Child, Family, and Consumer Sciences  
 California State University, Fresno

On Wed, Apr 5, 2017 at 6:48 AM, Daniela Cardoso <[dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)> wrote:

Dear Professor Kathleen Ramos,

I am Daniela Cardoso, a research grant holder at the Portugal Centre for Evidence-Based Practice: a Joanna Briggs Institute Centre of Excellence (at Health Sciences Research Unit: Nursing - UICISA: E, Nursing School of Coimbra -ESENfC) and a PhD Student at Faculty of Medicine, University of Coimbra.

I read your paper "Validation of the Fresno test of competence in evidence based medicine".

In the context of the development of my PhD project (related to the Evidence based Practice in the nursing education process in Portugal), I have a lot of interest in the instrument that are presented in the paper cited above (Fresno Test).

Therefore, I would like to ask your permission to adapt the Fresno test for nursing students and to validate to the Portuguese population.

Thank you in advance for your support. I am looking forward to hearing from you soon.

[Página n.º]

Yours Sincerely,

Daniela Cardoso

RN, PhD Student at Faculty of Medicine, University of Coimbra

Research Grant Holder

Portugal Centre for Evidence-Based Practice (PCEBP): A JBI Centre of Excellence, Health Sciences  
Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESENFC)

E-mail: [dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)

## Appendix IV. Institutions Authorizations

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### Daniela Cardoso

---

**De:** Rui Costa <rcosta@ua.pt>  
**Enviado:** quarta-feira, 1 de novembro de 2017 18:49  
**Para:** Daniela Cardoso  
**Assunto:** Re: Pedido de autorização para a realização de projeto de investigação

Boa tarde, Daniela Cardoso.

Acuso a receção do vosso pedido que mereceu a nossa melhor atenção e que desde já aceitamos em participar.

Coloca apenas uma questão relativa à participação dos Estudantes de Enfermagem. Pretende-se que participem tos Estudantes dos 4 anos?

Melhores cumprimentos

Rui Jorge Dias Costa

Diretor

---

Escola Superior de Saúde de Aveiro, Universidade de Aveiro  
 Campus Universitário Santiago  
 3810-193 Aveiro

[rcosta@ua.pt](mailto:rcosta@ua.pt)  
 Tel.: 234372459 Ext.: 27118 Telm.: 927992288

No dia 27/10/2017, às 09:48, Daniela Cardoso <[dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)> escreveu:

Exmo. Sr. Diretor da Escola Superior de Saúde de Aveiro da Universidade de Aveiro  
 Professor Doutor Rui Jorge Dias Costa,

Eu, Daniela Filipa Batista Cardoso, venho por este meio solicitar a Vossa Excelência autorização para a realização do projeto Prática baseada na evidência no processo de educação em enfermagem em Portugal na instituição que vossa excelência dirige.

Em anexo, envio o pedido de autorização, o projeto no qual se enquadra este pedido e o parecer da comissão de ética da Faculdade de Medicina da Universidade de Coimbra.

Com a mais elevada consideração e respeitosos cumprimentos,

Daniela Cardoso, RN  
 PhD Student at Faculty of Medicine, University of Coimbra  
 Research Grant Holder at Portugal Centre for Evidence-Based Practice (PCEBP): A JBI Centre of Excellence, Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESENFC)

**Daniela Cardoso**

---

**De:** Ana Maria Grego Dias Sobral Canhestro <ana.canhestro@ipbeja.pt>  
**Enviado:** quinta-feira, 15 de março de 2018 20:48  
**Para:** dcardoso@esenfc.pt  
**Cc:** Secretariado da Escola Superior de Saúde  
**Assunto:** Re: LEMBRETE: Pedido de autorização para a realização de projeto de investigação

**Estado do sinalizador:** Sinalizado

Cara colega

Em primeiro lugar as minhas desculpas pela demora na resposta ao seu pedido, aspeto que teve sobretudo a ver com a mudança na Direção da Escola Superior de Saúde do IPBeja.

Assim cumpre-me informar que autorizamos a realização da colheita de dados, através de questionário online, a estudantes de licenciatura em enfermagem bem como a colheita dados aos professores do Curso de Licenciatura em Enfermagem.

Conte com a nossa colaboração para o que necessitar.

Cordiais cumprimentos

Ana Sobral Canhestro  
Diretora  
Escola Superior de Saúde do IPBeja  
Telefone: (+351) 284 323 180 – Extensão 03037



---

**De:** Secretariado da Escola Superior de Saúde  
**Enviado:** 15 de março de 2018 16:17  
**Para:** Ana Maria Grego Dias Sobral Canhestro  
**Assunto:** FW: LEMBRETE: Pedido de autorização para a realização de projeto de investigação

*Engenheira*  
*Clara Figueira*  
*Secretariado de Saúde do IPBeja*  
*escola.superior@ipbeja.pt*  
Tel: 284 323 180 / 284 323 182 Fax: 284 323 111




---

**De:** Daniela Cardoso [<mailto:dcardoso@esenfc.pt>]  
**Enviada:** quinta-feira, 15 de março de 2018 10:17  
**Para:** Secretariado da Escola Superior de Saúde  
**Assunto:** FW: LEMBRETE: Pedido de autorização para a realização de projeto de investigação

---

**De:** Daniela Cardoso [<mailto:dcardoso@esenfc.pt>]  
**Enviada:** segunda-feira, 26 de fevereiro de 2018 10:35  
**Para:** 'ess@ipbeja.pt'  
**Assunto:** LEMBRETE: Pedido de autorização para a realização de projeto de investigação

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**De:** Daniela Cardoso [<mailto:dcardoso@esenfc.pt>]  
**Enviada:** sexta-feira, 27 de outubro de 2017 09:40  
**Para:** 'ess@ipbeja.pt'  
**Assunto:** Pedido de autorização para a realização de projeto de investigação

Exmo. Sr. Diretor da Escola Superior de Saúde do Instituto Politécnico de Beja  
 Professor Doutor Rogério Manuel Ferrinho Ferreira,

Eu, Daniela Filipa Batista Cardoso, venho por este meio solicitar a Vossa Excelência autorização para a realização do projeto Prática baseada na evidência no processo de educação em enfermagem em Portugal na instituição que vossa excelência dirige.

Em anexo, envio o pedido de autorização, o projeto no qual se enquadra este pedido e o parecer da comissão de ética da Faculdade de Medicina da Universidade de Coimbra.

Com a mais elevada consideração e respeitosos cumprimentos,

Daniela Cardoso, RN  
 PhD Student at Faculty of Medicine, University of Coimbra  
 Research Grant Holder at Portugal Centre for Evidence-Based Practice (PCEBP): A JBI Centre of Excellence,  
 Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESENFC)  
 E-mail: [dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)

**Daniela Cardoso**

---

**De:** adiliasilvaf@gmail.com em nome de Adília Fernandes <adilia@ipb.pt>  
**Enviado:** quinta-feira, 9 de novembro de 2017 22:03  
**Para:** Daniela Cardoso  
**Assunto:** Re: Pedido de autorização para a realização de projeto de investigação

Exma. Sra. Dra. Daniela Cardoso,

Em resposta ao pedido efetuado, venho por este meio informar que V.Ex.<sup>a</sup> tem autorização para a realização do projeto "Prática baseada na evidência no processo de educação em enfermagem em Portugal" nesta instituição.

Com os melhores cumprimentos

---

Adília da Silva Fernandes  
Diretora  
Escola Superior de Saúde  
Instituto Politécnico de Bragança  
Av. D. Afonso V  
5300-121 Bragança  
Telef. 273330968/Ext. 3968/Fax 273327915

No dia 27 de outubro de 2017 às 09:51, Daniela Cardoso <[dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)> escreveu:

Exma. Sr.<sup>a</sup> Diretora da Escola Superior de Saúde de Bragança do Instituto Politécnico de Bragança

Professora Doutora Adília Maria Pires da Silva Fernandes,

Eu, Daniela Filipa Batista Cardoso, venho por este meio solicitar a Vossa Excelência autorização para a realização do projeto Prática baseada na evidência no processo de educação em enfermagem em Portugal na instituição que vossa excelência dirige.

Em anexo, envio o pedido de autorização, o projeto no qual se enquadra este pedido e o parecer da comissão de ética da Faculdade de Medicina da Universidade de Coimbra.

Com a mais elevada consideração e respeitosos cumprimentos,

Daniela Cardoso, RN

PhD Student at Faculty of Medicine, University of Coimbra

Research Grant Holder at Portugal Centre for Evidence-Based Practice (PCEBP): A JBI Centre of Excellence, Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESENfC)

E-mail: [dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)

**Daniela Cardoso**

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**De:** Secretariado da Presidência <secretariadocd@esel.pt>  
**Enviado:** sexta-feira, 23 de fevereiro de 2018 11:27  
**Para:** Daniela Cardoso  
**Cc:** Celia Maria Gonçalves Simao De Oliveira; Coordenacao 1 Ciclo  
**Assunto:** Pedido de autorização para a realização de projeto de investigação  
**Anexos:** Parecer Comissão de Ética da ESEL - Daniela Filipa Batista Cardoso.pdf; Pedido institucional\_ESEL.PDF; Anexo 1\_Nota biográfica.pdf; Anexo 2\_ autorização instituições.pdf; Anexo 4\_Autorização autores.pdf; Anexo 6\_Projeto\_11-11-2017.pdf; Anexo 5\_Consentimento informado.pdf; anexo 3\_instrumentos a validar.pdf; FORMULÁRIO PARA SUBMISSÃO DE PROJETO DE INVESTIGAÇÃO À CE DA ESEL.PDF; Carta dirigida à Srª Presidente da ESEL.docx.pdf; Parecer Comissão de Ética da ESEL - Daniela Filipa Batista Cardoso.pdf

Exma. Senhora  
 Doutoranda Daniela Cardoso

Em resposta ao seu pedido, solicita-me o Sr. Vice-Presidente da ESELL, Prof. João Santos, de informar que o mesmo foi autorizado.

Com os melhores cumprimentos,

**Patricia Marques**

*Assistente Técnico*

*Secretariado da Presidência*

*Serviços Centrais - Pólo Maria Fernanda Resende  
 Avª do Brasil, 53-B 1700-063 LISBOA – PORTUGAL  
 Tel.: (351) 21 792 41 00 Fax: (351) 21 792 41 97  
 E-mail: [secretariadocd@esel.pt](mailto:secretariadocd@esel.pt)*



Antes de imprimir este email pense bem se tem mesmo de o fazer.

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**De:** Daniela Cardoso [mailto:dcardoso@esenfc.pt]  
**Enviada:** quinta-feira, 22 de fevereiro de 2018 18:33  
**Para:** Secretariado da Presidência <secretariadocd@esel.pt>  
**Assunto:** RE: Pedido de autorização para a realização de projeto de investigação

Exma. Sr.ª Presidente da Escola Superior de Enfermagem de Lisboa  
 Professora Doutora Maria Filomena Mendes Gaspar,

De acordo com o pedido efetuado a 27 de outubro de 2017, venho por este meio solicitar a Vossa Excelência autorização para a realização do projeto Prática baseada na evidência no processo de educação em enfermagem em Portugal na instituição que vossa excelência dirige, considerando que o mesmo já foi aprovado pela comissão de ética da ESEL (pdf anexo).

Em anexo, envio ainda o pedido de autorização.

[Página n.º]

Com a mais elevada consideração e respeitosos cumprimentos,

Daniela Cardoso, RN  
PhD Student at Faculty of Medicine, University of Coimbra  
Research Grant Holder at Portugal Centre for Evidence-Based Practice (PCEBP): A JBI Centre of Excellence, Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESENFC)  
E-mail: [dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)

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**De:** Secretariado da Presidência [<mailto:secretariado@esel.pt>]  
**Enviada:** terça-feira, 31 de outubro de 2017 15:23  
**Para:** Daniela Cardoso  
**Cc:** Comissão Ética Secretariado  
**Assunto:** Pedido de autorização para a realização de projeto de investigação

Exma. Senhora Doutoranda  
Daniela Cardoso

Relativamente ao seu pedido de autorização para a realização do projeto Prática baseada na evidência no processo de educação em enfermagem em Portugal e de acordo com o despacho da Senhora Presidente da ESEL, somos a informar que apesar do mesmo já ter sido submetido à Comissão de Ética, deve também ser submetido à Comissão de Ética da ESEL. Para o efeito deverá preencher os documentos necessários que se encontram no Portal da ESEL.

A fim de facilitar o envio segue o [Link](#) do Portal da ESEL

Com os melhores cumprimentos.

**Fátima Silva**  
*Assistente Técnico*  
*Secretariado da Presidência*  
*Escola Superior de Enfermagem de Lisboa*

Serviços Centrais - Pólo Maria Fernanda Resende  
Av<sup>ª</sup> do Brasil, 53-B 1700-063 LISBOA – PORTUGAL  
Tel.: (351) 21 792 41 00 Fax: (351) 21 792 41 97  
E-mail: [secretariado@esel.pt](mailto:secretariado@esel.pt)

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**De:** Daniela Cardoso [<mailto:dcardoso@esenfc.pt>]  
**Enviada:** sexta-feira, 27 de outubro de 2017 09:24  
**Para:** Secretariado da Presidência <[secretariado@esel.pt](mailto:secretariado@esel.pt)>  
**Assunto:** Pedido de autorização para a realização de projeto de investigação

Exma. Sr.<sup>ª</sup> Presidente da Escola Superior de Enfermagem de Lisboa  
Professora Doutora Maria Filomena Mendes Gaspar,

Eu, Daniela Filipa Batista Cardoso, venho por este meio solicitar a Vossa Excelência autorização para a realização do projeto Prática baseada na evidência no processo de educação em enfermagem em Portugal na instituição que vossa excelência dirige.

[Página n.º]



Em anexo, envio o pedido de autorização, o projeto no qual se enquadra este pedido e o parecer da comissão de ética da Faculdade de Medicina da Universidade de Coimbra.

Com a mais elevada consideração e respeitosos cumprimentos,

Daniela Cardoso, RN  
PhD Student at Faculty of Medicine, University of Coimbra  
Research Grant Holder at Portugal Centre for Evidence-Based Practice (PCEBP): A JBI Centre of Excellence, Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESENfC)  
E-mail: [dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)

  
 S. R.  
 MINISTÉRIO DA CIÊNCIA TECNOLOGIA E ENSINO SUPERIOR  
**ESCOLA SUPERIOR DE ENFERMAGEM DE COIMBRA**  
 Rua 5 de Outubro e ou Avenida Bissaya Barreto - Apartado 7001  
 3046-851 COIMBRA  
 E-mail: esenfc@esenfc.pt

Exma. Senhora  
 Enfermeira Daniela Filipa Batista Cardoso  
 (dcardoso@esenfc.pt)

VOSSA REFERÊNCIA	
Processo	Data
Ofício n.º	


NOSSA REFERÊNCIA	
Processo	Data 10.11.17
Ofício n.º	431/Pres.

ASSUNTO: **Autorização para colheita de dados**

Em resposta ao pedido formulado por V. Exa. para a colheita de dados - através da aplicação de questionário online, a estudantes do Curso de Licenciatura em Enfermagem e a professores da Escola Superior de Enfermagem de Coimbra, bem como condução de um estudo randomizado a estudantes do 8º semestre do Curso de Licenciatura em Enfermagem, integrados no estudo de investigação no âmbito do doutoramento em Ciências da Saúde – Ramo Enfermagem, da Faculdade de Medicina da Universidade de Coimbra (Prática baseada na evidência no processo de educação em Enfermagem em Portugal) que se encontra a desenvolver, informo que o mesmo foi autorizado.

Com os melhores cumprimentos, *também pessoais.*

A Presidente

  
 Maria da Conceição Saraiva da Silva Costa Bento

**Daniela Cardoso**

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**De:** Felismina Mendes <fm@uevora.pt>  
**Enviado:** quinta-feira, 15 de março de 2018 23:29  
**Para:** dcardoso@esenfc.pt  
**Assunto:** Re: [geral@esesjd] Pedido de autorização para a realização de projeto de investigação

**Estado do sinalizador:** Sinalizado

Cara Daniela Cardoso  
 Venho por este meio informar que lhe é concedida a autorização para a realização do estudo.  
 Agradeço que me informe quando pretende vir à Escola convocar os docentes para a participação no estudo.

*Os melhores cumprimentos,*  
 Felismina Mendes  
 Diretora da ESESJD




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**De:** geral@esesjd.uevora.pt [mailto:geral@esesjd.uevora.pt] **Em nome de** Daniela Cardoso  
**Enviada:** 15 de março de 2018 10:24  
**Para:** geral@esesjd.uevora.pt  
**Assunto:** [geral@esesjd] Pedido de autorização para a realização de projeto de investigação

---

**De:** Daniela Cardoso [mailto:dcardoso@esenfc.pt]  
**Enviada:** sexta-feira, 27 de outubro de 2017 09:37  
**Para:** 'director@esesjd.uevora.pt'  
**Assunto:** Pedido de autorização para a realização de projeto de investigação

Exma. Sr.<sup>a</sup> Diretora da Escola Superior de Enfermagem de São João de Deus da Universidade de Évora  
 Professora Doutora Felismina Rosa Parreira Mendes,

Eu, Daniela Filipa Batista Cardoso, venho por este meio solicitar a Vossa Excelência autorização para a realização do projeto Prática baseada na evidência no processo de educação em enfermagem em Portugal na instituição que vossa excelência dirige.

Em anexo, envio o pedido de autorização, o projeto no qual se enquadra este pedido e o parecer da comissão de ética da Faculdade de Medicina da Universidade de Coimbra.

Com a mais elevada consideração e respeitosos cumprimentos,

Daniela Cardoso, RN  
 PhD Student at Faculty of Medicine, University of Coimbra  
 Research Grant Holder at Portugal Centre for Evidence-Based Practice (PCEBP): A JBI Centre of Excellence, Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESENFC)  
 E-mail: [dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)

[Página n.º]

## Daniela Cardoso

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**De:** Ana Paula Morais Carvalho Macedo <amacedo@ese.uminho.pt>  
**Enviado:** terça-feira, 27 de fevereiro de 2018 17:14  
**Para:** Daniela Cardoso  
**Cc:** Paula Alexandra Sousa Seixas  
**Assunto:** RE: Pedido de autorização para a realização de projeto de investigação

**Importância:** Alta

Exma. Daniela Cardoso

Como presidente da Unidade Orgânica - Escola Superior de Enfermagem da Universidade do Minho -, autorizo que proceda aos passos seguintes, planeados na sua investigação:

- Realizar colheita de dados, através de questionário online, a estudantes de licenciatura em enfermagem com recurso a questionário com dados sociodemográficos e as versões em português dos instrumentos “EBP Beliefs Scale - Students” (EBPB - S); “EBP Implementation Scale – Students” (EBPI-S); e “Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey” (OCRSIEP-E) para estudantes;

- Realizar colheita de dados, através de questionário online, a professores de enfermagem com recurso a questionário com dados sociodemográficos e as versões em português dos instrumentos “EBP Beliefs Scale for Educators” (EBPB-E); “EBP Implementation Scale for Educators” (EBPI-E); e “Organizational Culture & Readiness for School-wide Integration of Evidence-based Practice Survey” (OCRSIEP-E) para professores.

Por favor proceda conforme o seu planeamento.

Os meus cumprimentos,

Ana Paula Macedo



Ana Paula Macedo  
Presidente / Dean  
Escola Superior de Enfermagem - Edifício  
04  
Universidade do Minho  
Campus de Gualtar  
4710-057 Braga

Tel. +351 253 601304  
e-mail: [amacedo@ese.uminho.pt](mailto:amacedo@ese.uminho.pt)  
[www.ese.uminho.pt](http://www.ese.uminho.pt)

---

**De:** Daniela Cardoso [mailto:dcardoso@esenfc.pt]  
**Enviada:** 15 de janeiro de 2018 20:22  
**Para:** Ana Paula Morais Carvalho Macedo <amacedo@ese.uminho.pt>  
**Assunto:** FW: Pedido de autorização para a realização de projeto de investigação

Exma. Sr.ª Diretora da Escola Superior de Enfermagem da Universidade do Minho

Professora Doutora Ana Paula Morais de Carvalho Macedo,

No seguimento do telefonema com o Prof Manuel Rodrigues, reencaminho pedido de autorização para a realização de projeto de investigação.

Atenciosamente,  
Daniela Cardoso, RN

PhD Student at Faculty of Medicine, University of Coimbra  
Research Grant Holder at Portugal Centre for Evidence-Based Practice (PCEBP): A JBI Centre of Excellence, Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESENFC)  
E-mail: [dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)

---

**De:** Daniela Cardoso [<mailto:dcardoso@esenfc.pt>]  
**Enviada:** sexta-feira, 27 de outubro de 2017 10:02  
**Para:** 'amacedo@ese.uminho.pt'; 'sec.graduacao@ese.uminho.pt'  
**Assunto:** Pedido de autorização para a realização de projeto de investigação

Exma. Sr.ª Diretora da Escola Superior de Enfermagem da Universidade do Minho  
Professora Doutora Ana Paula Morais de Carvalho Macedo,

Eu, Daniela Filipa Batista Cardoso, venho por este meio solicitar a Vossa Excelência autorização para a realização do projeto Prática baseada na evidência no processo de educação em enfermagem em Portugal na instituição que vossa excelência dirige.

Em anexo, envio o pedido de autorização, o projeto no qual se enquadra este pedido e o parecer da comissão de ética da Faculdade de Medicina da Universidade de Coimbra.

Com a mais elevada consideração e respeitosos cumprimentos,

Daniela Cardoso, RN  
PhD Student at Faculty of Medicine, University of Coimbra  
Research Grant Holder at Portugal Centre for Evidence-Based Practice (PCEBP): A JBI Centre of Excellence, Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESENFC)  
E-mail: [dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)

## Daniela Cardoso

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**De:** ESEP - Serviço de Secretariado <secretariado@esenf.pt>  
**Enviado:** terça-feira, 7 de novembro de 2017 11:08  
**Para:** dcardoso@esenf.pt  
**Assunto:** Pedido de colaboração no preenchimento de questionário no âmbito do projeto Prática baseada na evidência no processo de educação em enfermagem em Portugal

**Importância:** Alta

Exma. Senhora  
Daniela Cardoso

Em referência ao assunto em epígrafe, remete-se para conhecimento e devidos efeitos, o despacho do Presidente da ESEP, Professor Paulo Parente:

*«Considerando que o estudo já tem o parecer favorável de uma comissão de ética; considerando que se trata de um questionário online, autorizo. A coordenadora do serviço de secretariado funcionará como elemento de contacto com a investigadora.»*

Com os melhores cumprimentos,

**Teresa Teixeira**  
(Coordenadora Técnica)  
Secretariado  
Email [secretariado@esenf.pt](mailto:secretariado@esenf.pt)  
Telef +351 22 507 35 00



Escola Superior de Enfermagem do Porto  
Rua Dr. António Bernardino de Almeida  
4200-072 Porto  
Email [esep@esenf.pt](mailto:esep@esenf.pt)  
Telef +351 22 507 35 00  
Fax +351 22 509 63 37  
<http://www.esenf.pt>  
*Por uma enfermagem mais significativa para as pessoas*

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## Daniela Cardoso

---

**De:** Escola Superior de Saúde de Santarém - ESSaude <geral@essaude.ipsantarem.pt>  
**Enviado:** segunda-feira, 26 de março de 2018 16:13  
**Para:** Daniela Cardoso  
**Assunto:** RE: LEMBRETE: Pedido de autorização para a realização de projeto de investigação

Exma./ Senhora

Por despacho da Senhora Diretora, somos a informar que está autorizado o pedido, deve ser articulado com a Subdiretora da ESSS Professora Hélia Dias.

Com os melhores cumprimentos

Piedade Barbosa

Secretariado da Diretora



**Address:** Qt.ª do Mergulhão - Sr.ª da Guia, 2005-075 Santarém  
**Phone:** 351 243 307 200

---

**De:** Daniela Cardoso <dcardoso@esenfc.pt>  
**Enviada:** 15 de março de 2018 12:05  
**Para:** Escola Superior de Saúde de Santarém - ESSaude <geral@essaude.ipsantarem.pt>  
**Assunto:** FW: LEMBRETE: Pedido de autorização para a realização de projeto de investigação

---

**De:** Daniela Cardoso [<mailto:dcardoso@esenfc.pt>]  
**Enviada:** segunda-feira, 26 de fevereiro de 2018 10:32  
**Para:** 'Escola Superior de Saúde de Santarém - ESSaude'  
**Assunto:** LEMBRETE: Pedido de autorização para a realização de projeto de investigação

---

**De:** Daniela Cardoso [<mailto:dcardoso@esenfc.pt>]  
**Enviada:** sexta-feira, 27 de outubro de 2017 09:44  
**Para:** 'geral@essaude.ipsantarem.pt'  
**Assunto:** Pedido de autorização para a realização de projeto de investigação

Exma. Sr.ª Diretora da Escola Superior de Saúde de Santarém do Instituto Politécnico de Santarém  
 Professora Doutora Isabel Maria Rodrigues Ribeiro Barroso da Silva,

Eu, Daniela Filipa Batista Cardoso, venho por este meio solicitar a Vossa Excelência autorização para a realização do projeto Prática baseada na evidência no processo de educação em enfermagem em Portugal na instituição que vossa excelência dirige.

[Página n.º]

Em anexo, envio o pedido de autorização, o projeto no qual se enquadra este pedido e o parecer da comissão de ética da Faculdade de Medicina da Universidade de Coimbra.

Com a mais elevada consideração e respeitosos cumprimentos,

Daniela Cardoso, RN

PhD Student at Faculty of Medicine, University of Coimbra

Research Grant Holder at Portugal Centre for Evidence-Based Practice (PCEBP): A JBI Centre of Excellence, Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESENFC)

E-mail: [dcardoso@esenfc.pt](mailto:dcardoso@esenfc.pt)



## Appendix V. Instruments

### Escala de Crenças sobre Prática Baseada na Evidência para docentes (EBPB-E)

Abaixo vai encontrar 22 afirmações sobre prática baseada em evidência (PBE). Por favor, assinale o número que melhor descreve a sua concordância ou discordância com cada uma das afirmações. Não existem opções certas ou erradas.

	Discordo totalmente	Discordo	Nem concordo nem discordo	Concordo	Concordo totalmente
1. Creio que a PBE resulta em melhores cuidados clínicos para o(s) utente(s).	1	2	3	4	5
2. Entendo claramente as etapas da PBE.	1	2	3	4	5
3. Estou seguro(a) que consigo implementar a PBE.	1	2	3	4	5
4. Creio que a avaliação da qualidade metodológica ( <i>critically appraising</i> ) da evidência é uma etapa importante no processo da PBE.	1	2	3	4	5
5. Estou certo(a) que as diretrizes/orientações ( <i>guidelines</i> ) baseadas em evidência podem melhorar a prática clínica.	1	2	3	4	5
6. Acredito que consigo procurar a melhor evidência para responder adequadamente e em tempo útil a questões clínicas.	1	2	3	4	5
7. Estou seguro(a) que consigo ensinar como procurar pela melhor evidência.	1	2	3	4	5

8. Acredito que consigo ultrapassar barreiras na implementação da PBE.	1	2	3	4	5
9. Estou seguro(a) que consigo implementar a PBE adequadamente e em tempo útil.	1	2	3	4	5
10. Estou certo(a) que implementar a PBE irá melhorar os cuidados que os meus estudantes prestam aos utentes.	1	2	3	4	5
11. Estou certo(a) sobre como medir os resultados (outcomes) dos cuidados clínicos.	1	2	3	4	5
12. Creio que a PBE consome demasiado tempo.	1	2	3	4	5
13. Estou seguro(a) que consigo aceder aos melhores recursos para integrar a PBE no currículo.	1	2	3	4	5
14. Creio que a PBE é difícil.	1	2	3	4	5
15. Sei como implementar a PBE de modo satisfatório para gerar mudanças curriculares.	1	2	3	4	5
16. Estou confiante sobre a minha capacidade de implementar a PBE no meu local de trabalho	1	2	3	4	5
17. Acredito que os cuidados que ensino/supervisiono são baseados em evidência.	1	2	3	4	5
18. Estou seguro(a) que consigo ensinar a PBE adequadamente e em tempo útil.	1	2	3	4	5
19. Estou certo(a) que integrar a PBE no curriculum irá melhorar os cuidados que os estudantes prestam aos seus utentes.	1	2	3	4	5
20. Estou seguro(a) que consigo ensinar a PBE.	1	2	3	4	5

21. Estou seguro(a) que consigo ensinar como formular uma questão PICOD.	1	2	3	4	5
22. Sei como ensinar a PBE de modo satisfatório para ter impacto na prática dos estudantes.	1	2	3	4	5

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**Escala de crenças sobre Prática Baseada na Evidência (EBPB-S)**

Abaixo vai encontrar 16 afirmações sobre prática baseada na evidência (PBE). Por favor, assinale o número que melhor descreve a sua concordância ou discordância com cada uma das afirmações. Não existem opções certas ou erradas.

	Discordo totalmente	Discordo	Nem concordo nem discordo	Concordo	Concordo totalmente
1. Creio que a PBE resulta em melhores cuidados clínicos para o(s) utente(s).	1	2	3	4	5
2. Entendo claramente as etapas da PBE.	1	2	3	4	5
3. Estou seguro(a) que consigo implementar a PBE.	1	2	3	4	5
4. Creio que a avaliação da qualidade metodológica ( <i>critically appraising</i> ) da evidência é uma etapa importante no processo da PBE.	1	2	3	4	5
5. Estou certo(a) que as diretrizes/orientações ( <i>guidelines</i> ) baseadas em evidência podem melhorar a prática clínica.	1	2	3	4	5
6. Acredito que consigo procurar a melhor evidência para responder adequadamente e em tempo útil a questões clínicas.	1	2	3	4	5
7. Acredito que consigo ultrapassar barreiras na implementação da PBE.	1	2	3	4	5
8. Estou seguro(a) que consigo implementar a PBE adequadamente e em tempo útil.	1	2	3	4	5
9. Estou certo(a) que ao implementar a PBE vou melhorar os cuidados que presto aos meus utentes.	1	2	3	4	5

10. Estou certo(a) sobre como medir os resultados ( <i>outcomes</i> ) dos cuidados de enfermagem.	1	2	3	4	5
11. Creio que a PBE consome demasiado tempo.					
12. Estou certo(a) que consigo aceder aos melhores recursos para implementar a PBE.	1	2	3	4	5
13. Creio que a PBE é difícil.	1	2	3	4	5
14. Sei como implementar a PBE de modo satisfatório para gerar mudanças na prática.	1	2	3	4	5
15. Estou confiante acerca da minha capacidade de implementar PBE no meu local de trabalho.	1	2	3	4	5
16. Acredito que os cuidados que presto são baseados em evidência.	1	2	3	4	5

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**Escala de implementação da PBE para docentes  
EBPI-E**

Abaixo vai encontrar 18 afirmações sobre prática baseada em evidência (PBE). Alguns docentes da área da saúde costumam efetuar mais vezes estas ações do que outros. Por favor assinale quantas vezes cada item se aplicou a si no último ano (Não existe uma frequência certa para as realizar).

No **último ano**, eu:

	Nenhuma vez	1 a 3 vezes	4 a 5 vezes	6 a 8 vezes	> 8 vezes
1. Utilizei evidência para mudar o meu ensino (processo, conteúdos, etc)	0	1	2	3	4
2. Analisei a qualidade metodológica da evidência (critically appraised) de um estudo de investigação ...	0	1	2	3	4
3. Formulei uma questão PICO(D) relacionada com a especialidade da minha prática/ensino ...	0	1	2	3	4
4. Discuti evidência de um estudo de investigação, informalmente, com um colega ...	0	1	2	3	4
5. Recolhi dados sobre uma problemática clínica/educacional ...	0	1	2	3	4
6. Partilhei evidência, de um ou mais estudos, sob a forma de um relatório/artigo ou de uma apresentação com mais de 2 colegas ...	0	1	2	3	4
7. Avaliei os resultados ( <i>outcomes</i> ) de uma mudança educacional ...	0	1	2	3	4
8. Partilhei uma diretriz/orientação ( <i>guideline</i> ) baseada em evidência com um colega ...	0	1	2	3	4
9. Partilhei evidência de um estudo de investigação com um estudante ...	0	1	2	3	4
10. Partilhei evidência de um estudo de investigação com um colega de uma outra disciplina do conhecimento (por exemplo, da área da medicina, fisioterapia, psicologia, etc)	0	1	2	3	4
11. Li e analisei a qualidade metodológica (critically appraised) de um estudo de investigação clínica ...	0	1	2	3	4
12. Acedi a base(s) de dados de revisões sistemáticas (por exemplo, Cochrane database of systematic reviews)	0	1	2	3	4

13. Acedi a base(s) de dados de Diretrizes/orientações (guidelines) (por exemplo, National Guidelines Clearinghouse)	0	1	2	3	4
14. Utilizei uma diretriz/orientação (guideline) ou uma revisão sistemática para mudar estratégias educacionais na instituição onde trabalho ...	0	1	2	3	4
15. Avaliei a implementação de uma prática educacional através de resultados (outcomes) verificados ...	0	1	2	3	4
16. Partilhei com colegas os resultados (outcomes) verificados ...	0	1	2	3	4
17. Mudei políticas/materiais curriculares com base em resultados ...	0	1	2	3	4
18. Promovi a utilização da PBE junto dos meus colegas ...	0	1	2	3	4

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**Escala de implementação da Prática Baseada em Evidência para estudantes (EBPI-S)**

Abaixo vai encontrar 18 perguntas sobre prática baseada em evidência (PBE). Na área da saúde, alguns estudantes costumam efetuar mais vezes estas ações do que outros. Não existe uma frequência certa para realizar estas tarefas.

Nota: para o efeito a palavra colega pode referir-se a colegas de turma, professores/tutores, orientador de ensino clínico ou outro profissional de saúde. Por favor assinale quantas vezes cada item se aplicou a si no último ano.

No **último ano**, eu:

	Nenhuma vez	1 a 3 vezes	4 a 5 vezes	6 a 8 vezes	> 8 vezes
1. Utilizei evidência como base para a minha tomada de decisão clínica...	0	1	2	3	4
2. Analisei a qualidade metodológica da evidência (critically appraised) de um estudo de investigação ...	0	1	2	3	4
3. Formulei uma questão PICO(D)	0	1	2	3	4
4. Discuti evidência de um estudo de investigação, informalmente, com um colega ...	0	1	2	3	4
5. Recolhi dados sobre um problema de um utente, uma situação clínica ou um cenário clínico simulado	0	1	2	3	4
6. Partilhei evidência, de um ou mais estudos, sob a forma de um relatório/artigo ou de uma apresentação, com mais de 2 colegas.	0	1	2	3	4
7. Avaliei os resultados (outcomes) de uma decisão na prática clínica.	0	1	2	3	4
8. Partilhei uma diretriz/orientação ( <i>guideline</i> ) baseada em evidência com um colega ...	0	1	2	3	4
9. Partilhei evidência de um estudo de investigação com um utente/familiar ou outra pessoa significativa...	0	1	2	3	4
10. Partilhei evidência de um estudo de investigação com um colega de uma outra disciplina do conhecimento (por exemplo, da área da medicina, fisioterapia, psicologia, etc) ...	0	1	2	3	4



11. Li e analisei a qualidade metodológica (critically appraised) de um estudo de investigação clínica ...	0	1	2	3	4
12. Acedi a base(s) de dados de revisões sistemáticas (por exemplo, Cochrane database of systematic reviews)	0	1	2	3	4
13. Acedi a base(s) de dados de Diretrizes/orientações (guidelines) (por exemplo, National Guidelines Clearinghouse)	0	1	2	3	4
14. Utilizei uma diretriz/orientação (guideline) ou uma revisão sistemática para informar uma decisão clínica ...	0	1	2	3	4
15. Avaliei a implementação de uma prática de cuidados através de resultados (outcomes) verificados em utentes...	0	1	2	3	4
16. Partilhei com colegas os resultados (outcomes) verificados ...	0	1	2	3	4
17. Tomei uma decisão clínica sobre como cuidar baseada em resultados dos dados dos doentes...	0	1	2	3	4
18. Promovi a utilização da PBE junto dos meus colegas...	0	1	2	3	4

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**Questionário para docentes sobre Cultura e preparação das Instituições para a integração da prática baseada em evidência no ensino (OCRSIEP-E)**

Abaixo vai encontrar 19 perguntas (25 itens) sobre prática baseada em evidência (PBE). Por favor considere a situação da sua instituição de ensino relativamente à preparação para a PBE e assinale qual a opção que melhor descreve a sua resposta para cada pergunta. Não há respostas certas ou erradas.

	Não de todo	Um pouco	Em certa medida	Moderadamente	Muitíssimo
1. Em que medida está a PBE claramente descrita como central na missão e filosofia da sua instituição de ensino?	1	2	3	4	5
2. Em que medida acredita que a educação baseada em evidência é uma prática na sua instituição?	1	2	3	4	5
3. Em que medida os docentes com que trabalha estão comprometidos com a PBE?	1	2	3	4	5
4. Em que medida as instituições parceiras onde decorrem os ensinamentos clínicos/prática clínica estão comprometidas com a PBE?	1	2	3	4	5
5. Em que medida os gestores da sua instituição estão comprometidos com a PBE (p. ex. têm planeado recursos e apoio [p. ex. tempo] para iniciar PBE)?	1	2	3	4	5
6. Na sua instituição, em que medida existe uma massa crítica de docentes com sólidos conhecimentos e competências em PBE?	1	2	3	4	5
7. Na sua instituição, em que medida estão em curso investigações realizadas por enfermeiros com grau de doutor para apoiar a produção de evidência quando esta é inexistente?	1	2	3	4	5

8. Na sua instituição, em que medida existem docentes que são mentores de PBE? Nota (o que é um mentor): Mentores de PBE: pessoa confiável com conhecimentos e treino avançado em PBE que orienta, promove a autoconfiança e infunde valores no aprendiz .	1	2	3	4	5
9. Em que medida os docentes são um modelo de PBE nos contextos didáticos e clínicos?	1	2	3	4	5
10. Em que medida os docentes têm acesso a bases de dados para pesquisar a melhor evidência?	1	2	3	4	5
11. Em que medida os docentes têm competências informáticas adequadas?	1	2	3	4	5
12. Em que medida os bibliotecários da sua instituição têm conhecimento e competências de PBE?	1	2	3	4	5
13. Em que medida as pessoas recorrem aos bibliotecários para que estes pesquisem por evidência?	1	2	3	4	5
14. Em que medida os recursos orçamentais são utilizados para apoiar a PBE (p. ex. participação em conferências/workshops sobre PBE, computadores, tempo remunerado para o processo da PBE, mentores)?	1	2	3	4	5
15.1. Em que medida existem defensores da PBE (p. ex. aqueles que vão mais além para desenvolver a PBE) na	1	2	3	4	5

sua instituição entre os gestores?					
15.2. Em que medida existem defensores da PBE (p. ex. aqueles que vão mais além para desenvolver a PBE) na sua instituição entre as instituições parceiras (instituições onde decorrem os ensinos clínicos/prática clínica)?	1	2	3	4	5
15.3. Em que medida existem defensores da PBE (p. ex. aqueles que vão mais além para desenvolver a PBE) na sua instituição entre os assistentes convidados/auxiliares pedagógicos?	1	2	3	4	5
15.4. Em que medida existem defensores da PBE (p. ex. aqueles que vão mais além para desenvolver a PBE) na sua instituição entre os professores adjuntos?	1	2	3	4	5
15.5. Em que medida existem defensores da PBE (p. ex. aqueles que vão mais além para desenvolver a PBE) na sua instituição entre os professores coordenadores/professores coordenadores principais?	1	2	3	4	5
16. Em que medida a medição e partilha dos resultados ( <i>outcomes</i> ) fazem parte da cultura da sua instituição de ensino?	1	2	3	4	5
	Nenhum	25%	50%	75%	100%

17.1. Em que medida as decisões são tomadas por docentes na sua instituição?	1	2	3	4	5
17.2. Em que medida as decisões são tomadas pela Direção da escola na sua instituição?	1	2	3	4	5
17.3. Em que medida as decisões são tomadas pela Direção da universidade/instituto politécnico na sua instituição? Nota: Nas escolas não integradas em universidades ou institutos politécnicos a resposta a esta pergunta deverá ser a mesma que a da pergunta anterior	1	2	3	4	5
	Não preparada	Em preparação	Preparada, mas sem agir	Preparada para agir	Já preparada & em ação
18. Globalmente, como avalia a sua instituição no que diz respeito à preparação para a PBE?	1	2	3	4	5
	Não de todo	Um pouco	Em certa medida	Moderadamente	Muitíssimo
19. Comparando com a situação de há 6 meses atrás, quanto movimento existiu na sua instituição rumo a uma cultura de PBE?	1	2	3	4	5

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**Questionário para estudantes sobre Cultura e preparação das Instituições para a integração da prática baseada em evidência no ensino (OCRSIEP-ES)**

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Abaixo vai encontrar 19 perguntas sobre prática baseada em evidência (PBE). Por favor considere a situação da sua instituição de ensino relativamente à preparação para a PBE e assinale qual a opção que melhor descreve a sua resposta para cada pergunta. Não há respostas certas ou erradas.

	Não de todo	Um pouco	Em certa medida	Moderadamente	Muitíssimo
1. Em que medida está a PBE claramente descrita como central na missão e filosofia da sua instituição de ensino?	1	2	3	4	5
2. Em que medida acredita que a educação baseada em evidência é uma prática na sua instituição?	1	2	3	4	5
3. Em que medida os professores estão comprometidos com a PBE?	1	2	3	4	5
4. Em que medida as instituições parceiras onde realiza ensinamentos clínicos/prática clínica estão comprometidas com a PBE?	1	2	3	4	5
5. Em que medida os gestores da sua instituição estão comprometidos com a PBE (p. ex. têm planeado recursos e apoio [p. ex. tempo] para o ensino da PBE ao longo das unidades curriculares)?	1	2	3	4	5
6. Na sua instituição, em que medida existe uma massa crítica de docentes com sólidos conhecimentos e competências em PBE?	1	2	3	4	5
7. Na sua instituição, em que medida estão em curso investigações realizadas por enfermeiros com grau de doutor para apoiar a produção	1	2	3	4	5

de evidência quando esta é inexistente?					
8. Na sua instituição, em que medida existem docentes que são mentores de PBE? Mentores de PBE: pessoa confiável com conhecimentos e treino avançado em PBE que orienta, promove a autoconfiança e infunde valores no aprendiz.	1	2	3	4	5
9. Em que medida os docentes são um modelo de PBE nos contextos didáticos e clínicos?	1	2	3	4	5
10. Em que medida os estudantes têm acesso a bases de dados para pesquisar a melhor evidência?	1	2	3	4	5
11. Em que medida os estudantes têm competências informáticas adequadas?	1	2	3	4	5
12. Em que medida os bibliotecários da sua instituição têm conhecimento e competências de PBE?	1	2	3	4	5
13. Em que medida as pessoas recorrem aos bibliotecários para que estes pesquisem por evidência?	1	2	3	4	5
14. Em que medida os recursos orçamentais são utilizados para apoiar a PBE (p. ex. participação em conferências/workshops sobre PBE, computadores, tempo remunerado para o processo da PBE, mentores)?	1	2	3	4	5
15.1. Em que medida existem defensores da PBE (p. ex. aqueles que vão mais além	1	2	3	4	5

para desenvolver a PBE) na sua instituição entre o Presidente/Diretor?					
15.2. Em que medida existem defensores da PBE (p. ex. aqueles que vão mais além para desenvolver a PBE) na sua instituição entre os Vice-presidentes/Vice-Diretores?	1	2	3	4	5
15.3. Em que medida existem defensores da PBE (p. ex. aqueles que vão mais além para desenvolver a PBE) na sua instituição entre o corpo docente das unidades curriculares teóricas, teórico-práticas, práticas?	1	2	3	4	5
15.4. Em que medida existem defensores da PBE (p. ex. aqueles que vão mais além para desenvolver a PBE) na sua instituição entre o corpo docente dos ensinos clínicos/prática clínica?	1	2	3	4	5
15.5. Em que medida existem defensores da PBE (p. ex. aqueles que vão mais além para desenvolver a PBE) na sua instituição entre os estudantes?	1	2	3	4	5
16. Em que medida a medição e partilha de resultados (outcomes) fazem parte da cultura da sua instituição de ensino?	1	2	3	4	5
	Nenhum	25%	50%	75%	100%
17.1. Em que medida as decisões na sua instituição são tomadas pelos docentes?	1	2	3	4	5



17.2. Em que medida as decisões na sua instituição são tomadas pelo Presidente/Diretor?	1	2	3	4	5
17.3. Em que medida as decisões na sua instituição são tomadas pelos estudantes?	1	2	3	4	5
	Não preparada	Em preparação	Preparada, mas sem agir	Preparada para agir	Já preparada & em ação
18. Globalmente, como avalia a sua instituição no que diz respeito à preparação para a PBE (o quanto está preparada)?	1	2	3	4	5
	Não de todo	Um pouco	Em certa medida	Moderadamente	Muitíssimo
19. Comparando com a situação de há 6 meses atrás, quanto movimento existiu na sua instituição rumo a uma cultura de PBE?	1	2	3	4	5

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