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SCOPING REVIEW

Instruments for assessing healthcare professionals' knowledge and skills of evidence-based practice: A scoping review

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Abstract

Objective: The aim of this scoping review was to describe the instruments used to assess the knowledge and skills of evidence-based practice (EBP) in healthcare settings.

Methods: A scoping review was undertaken. Three electronic databases (CINAHL, PubMed and Cochrane) were searched in January 2022. The search phrases consisted of the following terms: healthcare professionals, EBP, competence and instrument and their synonyms, keywords and MeSH terms. The database search was run without any limitations. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were followed to support reporting.

Results: Ultimately, 39 studies were included; most of them (35) were cross-sectional studies. The studies were conducted in 17 countries. A total of 17 evidence-based knowledge and skills instruments were identified. The Upton and Upton instrument was used in 19 studies. Twelve self-reported instruments were used only once. The psychometric properties of the instruments varied. The reliability was typically reported with Cronbach's alpha coefficient. The content of the EBP knowledge/skills instruments consists of five main categories: EBP, evaluation of current practice, preparation for the implementation of EBP, implementation of evidence and active participation in the development of EBP.

Conclusion: Almost all instruments are self-assessment instruments. Validated knowledge tests should be further developed. The instruments emphasise the preparation for the implementation of EBP. Further research is needed to develop instruments for healthcare professionals to assess the knowledge and skills of the implementation of evidence.

KEYWORDS
evidence-based healthcare, healthcare professionals, Knowledge, knowledge test, skills

1 | INTRODUCTION

Evidence-based healthcare (EBHC) has been recognised worldwide as important for the quality of social and healthcare services and patient care. It improves patient/client safety and decreases the variability of care, adverse events, and healthcare costs (Rudman et al., 2020). Also, the World Health Organization (WHO) has assumed that healthcare services and practices should be based on the best available evidence (WHO, 2017). Therefore, the WHO produces, for example, evidence-based guidelines and recommendations for informing global healthcare policy and practices (WHO, 2014). Systematic reviews and evidence-based clinical guidelines represent the best evidence, which is a prerequisite for the implementation of EBHC (WHO, 2017).

The aim of EBHC is to improve effective, meaningful, appropriate and feasible healthcare services for patients. EBHC includes different phases, which are evidence generation, synthesis, transfer and implementation. Evidence generation means that research seeks answers to health and well-being questions. Then reliable studies are synthesised, for example, into different kinds of systematic reviews and evidence-based clinical guidelines (Jordan et al., 2019). In these two phases, researchers and those who have the expertise to develop clinical guidelines have the primary responsibility to produce evidence. Frontline healthcare professionals, such as nurses, do not have the time and expertise to search for evidence and critically appraise it. This is not a realistic expectation for frontline healthcare professionals. Instead, they should have the available evidence that they can implement in practice (Warren et al., 2016). The next phase, evidence transfer, is to spread this evidence into practice for healthcare professionals, for example, through education or systems integration. In the last phase, evidence implementation integrates the best available evidence with clinical expertise, patient's preferences and context facilities. This phase applies to every healthcare professional as only the implementation of evidence assures consistent evidence-based practices (EBPs). When the synthesised evidence is implemented into practice, we can say that we have EBP (Jordan et al., 2019). Therefore, it is important that all frontline healthcare professionals, for example, nurses, physiotherapists, occupational therapists and practical nurses, understand what EBHC and EBP mean and why it is important to improve clinical practices based on evidence (Belita et al., 2020; Scott & McSherry, 2009). However, the results of previous studies indicate that nurses' knowledge and skills regarding EBP are quite poor (Dolezel et al., 2021; Li et al., 2019). Also, physiotherapists (Rotor et al., 2020) have knowledge gaps. Among other things, education has been shown to improve nurses' EBP knowledge and skills (Sapri et al., 2022). Thus, the healthcare professionals' lack of competence should be assessed and understood before education and adoption of the EBP process. It helps to focus education on areas where healthcare professionals have the greatest gaps.

There is a need for high-quality validated instruments to assess healthcare professionals' knowledge, skills, and attitudes towards EBP to achieve best practices. Also, instruments are needed to measure changes in skills and knowledge (McCluskey & Bishop, 2009). There are several studies concerning core competencies in evidence-based decision-making or practice among nurses (Belita et al., 2020; Dolezel et al., 2021; Melnyk et al., 2014) and allied health professionals (Albarqouni et al., 2018). In these studies, core competencies (knowledge, skills, attitudes, beliefs and behaviours) have been measured using mostly self-report instruments instead of performance-based instruments (Belita et al., 2020; Leung et al., 2014). Instead, there are fewer purely knowledge tests. However, knowledge tests are also needed because the actual knowledge has an impact on the decision-making in the practice (Capras et al., 2020). Knowledge tests are needed, for example, when healthcare professionals' knowledge and EBP understanding are assessed before and after the education of EBP (cf. Mudderman et al., 2020).

To the best of our knowledge, no reviews have examined the instruments that have been used to assess the knowledge and skills of EBP in healthcare settings. Therefore, this scoping review compiles and evaluates the EBP instruments used in the studies.

What does this paper contribute to the wider global clinical community?

- The review provides an overview of the instruments that can be used in clinical practice to assess healthcare professionals' EBP knowledge and skills.
- Information regarding healthcare professionals' EBP knowledge and skills help in the planning and implementation of the evidence-based strategy.

2 | AIM

The aim of this scoping review was to describe the instruments that are used to assess frontline healthcare professionals' knowledge and skills of EBP.

Two research questions were posed, as follows:

1. What instruments have been used to assess knowledge and skills of EBP in healthcare and what are the reported reliability and validity of instruments?
2. What is the content of the knowledge and skills assessed in EBP?

3 | METHOD

3.1 | Design

A scoping review was chosen because it can be used to determine the scope and extent of the existing literature and evidence base. It is more flexible than the traditional review and serves well as a basis for further research, for example, to help identify and analyse knowledge gaps and the realisation of previous research on a particular topic. Critical appraisal was not conducted in this review because it is not generally recommended in scoping reviews (Peters et al., 2020). The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were followed to support reporting (Moher et al., 2015; Appendix S1).

3.2 | Search strategy

The search was conducted by two authors for the CINAHL, PubMed and Cochrane databases in January 2022, with no other time limit. An information specialist at the medical library was consulted in drafting the search terms and Boolean operators. The search phrases consisted of the following terms: healthcare professionals, EBP, knowledge, skills and instruments and their synonyms, keywords and MeSH terms. RefWorks was used to manage data throughout the review.

The inclusion criteria were as follows: (1) studies included an instrument for assessing knowledge or skills of healthcare professionals' EBP, (2) the contents of the instrument are described in the articles, (3) studied focused healthcare professionals who have legalised profession and provide patient care: registered nurses, physiotherapists, midwives, occupational therapists, podiatrists and radiotherapists, (4) studies were original scientific and peer-reviewed and (5) the language of the articles was English, Finnish or Swedish. This review considered studies conducted in various healthcare settings (e.g. inpatient and outpatient care, different types of hospitals, healthcare centres and community care).

Studies were excluded if (1) studies did not use an instrument to assess knowledge or skills, (2) a sample consisted of physicians, healthcare students, healthcare educators or nursing directors or professions that are not legalised like chiropractors or other types of healthcare professionals who did not provided patient care, (3) research focused on evidence-based attitudes, beliefs, barriers or cultures, (4) studies focused on instrument development or testing and (5) articles were dissertations or editorial, professional or theoretical papers.

3.3 | Retrieval of the studies

The retrieval of the studies consisted of four steps. In the first step, a total of 4541 (CINAHL n = 2427, PubMed n = 1999, Cochrane n = 115) studies were identified, of which there were 221 duplicates (Figure 1). In the second step, titles and abstracts were screened using the inclusion and exclusion criteria. According to the titles and abstracts, 4210 were excluded, of which seven were in a language other than English, Finnish or Swedish. In the third step of retrieval, 110 studies meeting the inclusion criteria were selected for full-text evaluation. After screening, 39 studies were included in the data extraction process.

3.4 | Data analysis

The data analysis was based on the research questions. First, each instrument's basic data, such as the parts of the instruments, reliability and validity, was collected from the articles and converted into tables. Table 1 consisted of the instruments used more than once and in Table 2 the instruments were used only once. Second, the first research question was answered based on the data in Tables 1 and 2. Third, using inductive content analysis (Elo & Kyngäs, 2008), the second research question was answered. The meaning units were the assessed concepts and statements from the instruments. The original expressions were condensed and grouped according to similarity, first to the subcategories, and second to the categories. One researcher first analysed the data, and the final analysis was discussed in the study group.

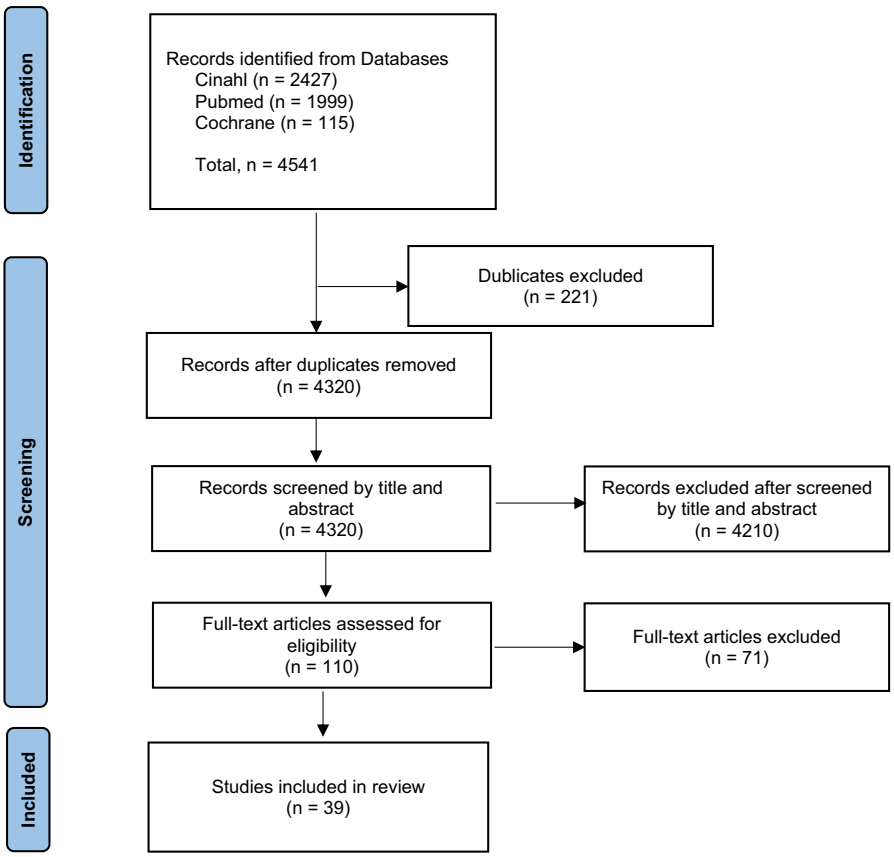

FIGURE 1 Search strategy and study selection and inclusion process (Moher et al., 2009).

TABLE 1 Description of the instruments used more than once to assess healthcare professionals' knowledge and skills of evidence-based practice

Instrument/ Developer(s)	Source(s)	Themes/scales/number of the items of the instrument	Knowledge test/ self-evaluation instrument	Reliability of the subscales knowledge and skills/ the entire instrument	Validity of the subscales knowledge and skills/the entire instrument
EBPQ (Upton & Upton, 2006)	Al-Busaidi et al. (2019), Alqahtani et al. (2020), Ammouri et al. (2014), Azmoude et al. (2017)[a], Brown et al. (2009), Heydari et al. (2014), Koehn and Lehman (2008), Koota et al. (2021)[b], Lunden et al. (2021), Maydick-Youngberg et al. (2021), Pérez-Campos et al. (2014), Salah and Abu-Moghli (2020), Schneider et al. (2020), Seyyedrasooli et al. (2012), Shafiei et al. (2014), White-Williams et al., 2013), Williamson et al. (2015), Wonder et al. (2017)[c] and Zhou et al. (2016)	Part I: EBP practice (6 items) Part II: Knowledge/skills (14 items) Part III: Attitudes about EBP (4 items) All items were rated on a 7-point Likert scale (poor–best knowledge) with a higher score representing a more positive response.	Self-reported	Internal consistency using Cronbach's alpha varied related to the study. The alpha coefficient of 1. Subscales knowledge/skills: 0.81 (Azmoude et al., 2017), 0.87 (Shafiei et al., 2014), 0.90 (Salah & Abu-Moghli, 2020), 0.92 (Wonder et al., 2017), 0.93 (Al-Busaidi et al., 2019; Wonder et al., 2017), 0.94 (Ammouri et al., 2014; Brown et al., 2009), 0.95 (Koehn & Lehman, 2008), 0.96 (Alqahtani et al., 2020; Heydari et al., 2014) 2. Subscale values: 0.80–0.90 (Zhou et al., 2016) 3. Overall alpha (not reported subscales): 0.96 (Williamson et al., 2015) The test–retest reliability was 98% by administration of the questionnaire twice to a group of the participants 15 days apart (Heydari et al., 2014). The reliability was not tested (Maydick-Youngberg et al., 2021; Pérez-Campos et al., 2014; Schneider et al., 2020; White-Williams et al., 2013; Williamson et al., 2015). The study reported reliability was confirmed earlier (Brown et al., 2009; Koota et al., 2021; Lunden et al., 2021; White-Williams et al., 2013; Williamson et al., 2015).	The content and face validity of the items were confirmed by a group of experts (Azmoude et al., 2017). Content validity of the translation of the questionnaire was confirmed by a bilingual person and subsequent review by an EBP expert (Heydari et al., 2014). Internal consistency of the Spanish version of the EBPQ was adequately validated (Pérez-Campos et al., 2014). The accuracy of the translation of the questionnaire was determined by two English language and literature specialists. Face and content validity was assessed by 14 faculty members (Seyyedrasooli et al., 2012). Construct validity was established using a peer-reviewed method (Shafiei et al., 2014). The validity was not tested (Alqahtani et al., 2020; Brown et al., 2009; Koehn & Lehman, 2008; Maydick-Youngberg et al., 2021; Schneider et al., 2020; Wonder et al., 2017; Zhou et al., 2016). The study reported validity was confirmed earlier (Al-Busaidi et al., 2019; Ammouri et al., 2014; Koota et al., 2021; Lunden et al., 2021; Salah & Abu-Moghli, 2020; White-Williams et al., 2013; Williamson et al., 2015).

TABLE 1 (Continued)

Instrument/ Developer(s)	Source(s)	Themes/scales/number of the items of the instrument	Knowledge test/ self-evaluation instrument	Reliability of the subscales knowledge and skills/ the entire instrument	Validity of the subscales knowledge and skills/the entire instrument
EBP questionnaire (Jette et al., 2003)	Jette et al. (2003) and Ramírez-Vélez et al. (2015)	Part I: Attitudes and beliefs about EBP (9 items) Part II: Interest and motivation in using EBP (2 items) Part III: Knowledge and skills (6 items and 8 terms) Part IV: Attention to literature (3 items) Part V: Ability to access information (5 items) Part VI: Availability and use of clinical practice guidelines (6 items) Part VII: Perceived barriers to EBP (1 item) Responses to most items were addressed using a 5-point Likert scale (strongly disagree–strongly agree). Terminology was assessed using a 3-point scale (understand completed-do not understand). Several items related to access to information required "yes/ no" responses.	Self-reported	Internal consistency was tested. The intraclass correlation coefficients (ICC) ranged from 0.37–0.90 with 50% of the items having ICCs of >70. Percentages of agreement ranged from 68%–93% for dichotomous items and from 59%–80% for ranked items (Jette et al., 2003). The study reported reliability being tested in a previous study (Ramírez-Vélez et al., 2015).	The content validity was assessed using evaluation of 10 experienced in various care contexts (Jette et al., 2003). The study reported validity being tested in a previous study (Ramírez-Vélez et al., 2015). The validity was not tested (Ramírez-Vélez et al., 2015).
EBP knowledge assessment questionnaire (Melnyk et al., 2018)	Ginex et al. (2021)[f], Melnyk et al. (2018)[f] and Melnyk et al. (2020)[d]	25 multiple choice and 13 true/false questions	Self-reported except for 13 knowledge test items	The internal consistency reliability was 0.87. Rasch analysis was used for the development of the scales (Melnyk et al., 2018, 2020). The study reported reliability has been confirmed earlier (Ginex et al., 2021).	The scale of the knowledge test has established face, content and construct validity (Melnyk et al., 2018, 2020). The study reported validity has been confirmed earlier (Ginex et al., 2021).
EBP competency scale (Melnyk et al., 2020)	Ginex et al. (2021)[f], Melnyk et al. (2018)[f] and Melnyk et al. (2020)[d]	24 items; 4-point Likert scale; not at all competent–highly competent. The scores range from 0–96.	Self-reported	The internal consistency reliability was 0.98.	The scale of the Competency Scale has established face, content and construct validity (Melnyk et al., 2018, 2020).

(Continues)

TABLE 1 (Continued)

Instrument/ Developer(s)	Source(s)	Themes/scales/number of the items of the instrument	Knowledge test/ self-evaluation instrument	Reliability of the subscales knowledge and skills/ the entire instrument	Validity of the subscales knowledge and skills/the entire instrument
No name[g] (Silva et al., 2015).	Claudino et al. (2019) and Silva et al. (2015)[e]	Part I: Demographic details (7 items) Part II: Dermatology (1 item) Part III: Skills in reading English texts (1 item) Part IV: Characteristics related to EBP behaviour (5 items), knowledge (9 items), skills and resources (9 items), opinion (5 items), and barriers (15 items)	Self-reported	The study (Claudino et al., 2019) reported that the questionnaire was tested in a previous study (Silva et al., 2015)	Two pilot study were performed prior to data collection (assessing questions comprehension; verifying the quality of submission and the link-based response process) (Silva et al., 2015)

Abbreviation: EBPQ, Evidence-based practice questionnaire.

[a]Azmoude et al. (2017) also used one modified part (self-efficacy) of the instrument of Majid et al. (2011).

[b]Koota et al. (2021) also used a knowledge test developed based on a previous study, but the content of the instrument was not described in the article.

[c]Wonder et al. (2017) also used the EKAN knowledge test (the Evidence-Based Practice Knowledge Assessment in Nursing) (the content of the instrument was not described in the article).

[d]Secondary data analysis (Melnyk et al., 2020) based on data in a study by Melnyk et al. (2018). The content of the knowledge test was not described in the article.

[e]Pilot study (Silva et al., 2015) for the study of Claudino et al. (2019). The items concerning the knoledge are identical in content, but the expression has been clarified.

[f]The content of the knowledge test was not described in the article.

[g]The researcher has not named the instrument.

4 | RESULTS

4.1 | Description of the studies

A total of 39 studies met the inclusion criteria. By design of the selected studies, 35 were cross-sectional studies (Al-Busaidi et al., 2019; Alqahtani et al., 2020; Alshehri et al., 2017; Ammouri et al., 2014; Azmoude et al., 2017; Bajracharya et al., 2019; Belowska et al., 2020; Brown et al., 2009; Claudino et al., 2019; Dao et al., 2018; Filippini et al., 2011; Fu et al., 2020; Ginex et al., 2021; Heydari et al., 2014; Jette et al., 2003; Koehn & Lehman, 2008; Lunden et al., 2021; Majid et al., 2011; Maydick-Youngberg et al., 2021; McCluskey, 2003; Melnyk et al., 2018, 2020; Nickles et al., 2019; Patelarou et al., 2017; Pérez-Campos et al., 2014; Ramírez-Vélez et al., 2015; Ramos-Morcillo et al., 2021; Salah & Abu-Moghli, 2020; Seyyedrasooli et al., 2012; Shafiei et al., 2014; Silva et al., 2015; White-Williams et al., 2013; Wonder et al., 2017; Yue et al., 2018; Zhou et al., 2016), two were descriptive studies (Schneider et al., 2020; Williamson et al., 2015), one RCT (Koota et al., 2021) and one mixed methods study (Schuler et al., 2021).

The studies were conducted in 17 countries: 12 in the USA (Brown et al., 2009; Ginex et al., 2021; Jette et al., 2003; Koehn & Lehman, 2008; Maydick-Youngberg et al., 2021; Melnyk et al., 2018, 2020; Nickles et al., 2019; Schuler et al., 2021; White-Williams et al., 2013; Williamson et al., 2015; Wonder et al., 2017), four in Iran (Azmoude et al., 2017; Heydari et al., 2014; Seyyedrasooli et al., 2012; Shafiei et al., 2014), three in Brazil (Claudino et al., 2019; Schneider et al., 2020; Silva et al., 2015) and China (Fu et al., 2020; Yue et al., 2018; Zhou et al., 2016), two each in Oman (Al-Busaidi et al., 2019; Ammouri et al., 2014), Saudi Arabia (Alqahtani et al., 2020; Alshehri et al., 2017), Finland (Koota et al., 2021; Lunden et al., 2021) and Spain (Pérez-Campos et al., 2014; Ramos-Morcillo et al., 2021), one each in Nepal (Bajracharya et al., 2019), Poland (Belowska et al., 2020), Vietnam (Dao et al., 2018), Italy (Filippini et al., 2011), Singapore (Majid et al., 2011), Greece (Patelarou et al., 2017), Colombia (Ramírez-Vélez et al., 2015), Jordania (Salah & Abu-Moghli, 2020) and Australia (McCluskey, 2003).

This scoping review focused on healthcare professionals' who provide patient care. In most studies (n = 28/39, N = 22,008), participants were registered nurses (83% [n = 18,265], mean n = 652, range 13, 2924). The studies also included physiotherapists in seven studies (n = 3098, mean n = 443; range 101, 1064), midwives (n = 98), occupational therapists (n = 67) and both nurses and midwives (n = 150).

4.2 | Instruments used to assess healthcare professionals' knowledge and skills of EBP

A total of 18 instruments were identified to assess EBP knowledge and skills (Tables 1 and 2). The Upton and Upton (2006) instrument was the most used in a total of 19 studies (Table 1). Four

TABLE 2 Description of the instruments used only once to assess healthcare professionals' knowledge and skills of evidence-based practice

Instrument/developer(s)¤	Source/s	Themes/scales/items	Knowledge test/ self-evaluation instrument	Reliability of the subscales knowledge and skills/the entire instrument	Validity of the subscales knowledge and skills/the entire instrument
No name[a] Alshehri et al. (2017) The tool based on the questionnaires of Jette et al. (2003) and Upton and Upton (2006) and the Evidence-based practice profile questionnaire of the University of South Australia	Alshehri et al. (2017)	Part I: Demographics Part II: Behaviour (6 items) Part III: Attitudes about EBP (4 items) Part IV: Awareness (14 items) Part V: Knowledge (6 items) Part VI: Formal training (2 items) and Barriers (6 items) Awareness was assessed using 5-points scale (never heard–understand completed) Knowledge was assessed with answer options: (1) agree, (2) disagree and (3) unsure. They were also structured to allow only one valid answer, which was the second answer (disagree) for all six items; this received two points (for each item) giving a maximum total score of 12, and other answers (agree, unsure) received a score of zero.	Knowledge test and self-reported	The reliability was confirmed by assessing the logistic of the method and language. The internal consistency reliability with the subscale knowledge was 0.805.	The clarity and the accuracy of the survey was confirmed by a pilot test (20 physiotherapists). The final version of the survey was confirmed using several consensus meeting of the authors.
No name[a] Bajracharya et al. (2019) The Questionnaire was modified from previous studies.	Bajracharya et al. (2019)	Part I: Demographics Part II: Knowledge and skills (7 items), attitude (10 items), barriers to EBP (6 items), knowledge of research terms (8 items). Knowledge and skills were rated on 5-point Likert scale (strongly disagree -strongly agree).	Self-reported	The reliability was not tested.	The validity was not tested.
EBP^{2}Q developed at the University of Australia by the team. The questionnaire was modified from Upton and Upton (2006) and Jette et al. (2003)	Belowska et al. (2020)	Part I: Demographic Five subscales: Relevance (14 items), Terminology (17 items), Confidence (11 items), Practice (9 items), Sympathy (6 items). Rated on a 5-point Likert scale.	Self-reported	The study reported reliability was confirmed earlier.	The study reported validity was confirmed earlier. The translation and back translation have been conducted according to scientific manner.
No name[a] Questionnaire based on Jette et al. (2003) and Upton and Upton (2006) questionnaires.	Dao et al. (2018)	Part I: Attitudes toward the use, limitation, and perceived benefit toward EBP (11 items) Part II: Knowledge/skills relating to learning the 5 steps of EBP (9 items) and English reading ability (8 items) Part III: Frequency of EBP use (6 items) Part IV: Use of EBP (3 items) Demographic characteristics (11 questions)	Self-reported	The reliability was not tested.	Content validity was confirmed by four experts in EBP, teaching and applying research at universities. Translation of the questionnaire was conducted by two native speakers. To ensure validity, the questions were trialled with 10 people from different healthcare fields.

(Continues)

TABLE 2 (Continued)

Instrument/developer(s)¤	Source/s	Themes/scales/items	Knowledge test/ self-evaluation instrument	Reliability of the subscales knowledge and skills/the entire instrument	Validity of the subscales knowledge and skills/the entire instrument
No name[a] Filippini et al. (2011)	Filippini et al. (2011)	Part I: The six sociodemographic and practice characteristics Part II: Knowledge (6 items) Part III: Attitude (6 items) Part IV: Behaviours (5 items) 3-point Likert scale (agree – disagree).	Self-reported	Cronbachs a reliability coefficient ranged from 0.82–0.93, indicating a high internal consistency. The test–retest reliability showed Kappa scores comprised between 0.87–0.92, revealing high reliability.	Content validity was confirmed by an expert panel. Calculation of the content validity indicated the unanimous agreement with the questionnaires content and clarity.
EBNCRS Originally developed in Chinese based on JBI Model of EB healthcare.	Fu et al. (2020)	Part I: Evidence searching and critical appraisal (7 items) Part II: Evidence synthesis (5 items) Part III: Evidence transfer (3 items) Part IV: Situation assessment and evidence implementation (8 items) Rated on a 5-point Likert scale (unclear - complete conformity). The total possible original scores using the Likert-type scale ranged from 0–92 points.	Self-reported	Cronbachs alpha coefficient of EBNCRS was 0.951, test–retest reliability coefficient of EBNCRS was 0.900, and the interrater reliability among evaluators was 0.702.	The scale content validity index was 0.987. Three components were revealed by exploratory factor analysis, accounting for 62.891%. The factor structure of 2 models was tested using confirmatory factor analysis and showed acceptable fit.
Perceptions of nurses of evidence-based practice (EBP) questionnaire developed by the team at the Nanayang Techonogical Universitys and nursing representatives from the National University Hospital.	Majid et al. (2011)	Part I: Demographic information Part II: Attitude (5 items), skills (9 items) and self-efficacy of EBP (9 items), including motivators and barriers to adopting EBP. Skills were rated on a 5-point Likert scale (strongly agreed–strongly disagreed). Self-efficacy was assessed using 5-point Likert-scale poor-excellent.	Self-reported	The questionnaire was pilot tested by 20 nurses from different wards. The Cronbachs alpha of different sections ranged from 0.681–0.954. The Cronbach alpha of Self-efficacy of EBP skills was 0.88.	The content validity was confirmed by the team of experts.
No name[a] Questionnaire was modified by McCluskey based on previous study.	McCluskey (2003)	Part I: Demographic information Part II: Level of knowledge and skills (7 items); rated on a 3-point scale (low - high). Part III: The number of books and journal articles they had read and courses they had attended in the previous 12 months, related to evidence-based practice. Part IV: Accessing to the Internet, using the internet for work in the past 4 weeks Part V: Identifying barriers to implementing or adopting evidence-based practice.	Self-reported	The reliability was not tested.	The questionnaire was pilot tested with four occupational therapists. They evaluated wording of questions, layout and range of response options.

TABLE 2 (Continued)

Instrument/developer(s)¤	Source/s	Themes/scales/items	Knowledge test/ self-evaluation instrument	Reliability of the subscales knowledge and skills/the entire instrument	Validity of the subscales knowledge and skills/the entire instrument
The self-assessment of evidence-based practice and research knowledge (unpublished)	Nickles et al. (2019)	Part I: Demographics (6 items) Part II: EBP and research (21 items) Rated on a 4-point Likert scale (no knowledge–high knowledge)	Self-reported	The Cronbachs alpha for the entire instrument was 0.956.	The validity was not tested.
EBPRS Patelarou et al. (2017)	Patelarou et al. (2017)	Part I: Informational needs (35 items) Part II: EBP-knowledge (8 items) Part III: EBP-attitude (17 items) Part IV: Workplace Culture (6 items).	Self-reported	The EBPRS showed an overall high internal consistency and Cronbachs alpha was 0.85. Cronbachs alpha was 0.78 for the "EBP-knowledge" domain.	Face validity was considered to be very good, and the mean content validity ratio was satisfactory. Construct validity was performed using both the explanatory and confirmatory factor analysis. FA demonstrated that the Greek version includes 23 items instead of initial version 66 items.
EBP-COQ-Prof Ruzafa-Martínez et al. (2020)	Ramos-Morcillo et al. (2021)	Part I: Attitudes (8 items) Part II: Knowledge (11 items) Part III: Skills (6 items) Part IV: Utilisation (10 items)	Self-reported	The Cronbachs alpha coefficient of subscale knowledge was 0.984 and subscale skills was 0.817.	Validity was reported to be adequate confirmed using factor analysis.
Quick-EBP-VIK No named developer	Schuler et al. (2021)	EBP-VIK instrument Part I: Value (5 items) Part II: Knowledge (7 items) Part III: Implementation (7 items) Rated on a 5 -point Likert scale (strongly agreed–strongly disagreed).	Self-reported	The study reported reliability has been confirmed earlier which was demonstrating internal consistency.	Quick-EBP-VIK has subsequently been translated into a Chinese version.
No name[a] Yue et al. (2018) Based on the JBI evidence-based healthcare model and previous literature.	Yue et al. (2018)	Part I: General profiles Part II: EBN practice: 1. EBN comprehension & training (6 items); 2. Ability of EBN practice (24 items); 3. Barriers to EBN practice (8 items); 4. Willingness of solving problems Through evidence-based practice (11 items). The ability and barriers to EBN practice were rated on a 5- point Likert scale (totally agree- totally disagree)	Self-reported	The Cronbachs alpha coefficients of ability of EBN practice was 0.975; split-half reliabilities 0.899; test–retest reliabilities 0.985. According to the authors the questionnaire had good reliability.	The validity was not tested.

Abbreviations: EBNCRS, Evidence-based nursing competency rating scale; EBP Questionnaire, Evidence-based practice questionnaire (Jette et al., 2003); EBP^{2}Q, The questionnaire was modified from Upton and Upton (2006) and Jette et al. (2003); EBP-COQ-Prof, Evidence-based practice competency questionnaire, professional version; EBPQ, Evidence-based practice questionnaire (Upton & Upton, 2006); EBPRS, Evidence-based practice readiness scale.

[a]The researcher has not named the instrument.

instruments were also used more than once, each in two studies (Ginex et al., 2021; Jette et al., 2003; Melnyk et al., 2018, 2020; Ramírez-Vélez et al., 2015; Silva et al., 2015). There were 13 instruments used only once (Table 2). The instruments consisted of one to seven parts in addition to the background variables, most typically three or four. In addition to the part of knowledge and skills, the instruments typically included the parts of attitude, practice and barriers, but also use of evidence, ability to access information, available to use clinical practice guidelines, behaviour, awareness, English reading ability, evidence searching and critical appraisal. All instruments were self-reported. Also, three instruments included a knowledge test section, of which only one had been described (Alshehri et al., 2017). For the other two instruments, there was only a mention of the knowledge test with 13 true-false items (Melnyk et al., 2018, 2020) or a mention of the EKAN knowledge test (the Evidence-Based Practice Knowledge Assessment in Nursing; Wonder et al., 2017).

Of the instruments used more than once, Upton and Upton (2006) contained 14 knowledge/skills items (Table 1). The reliability of the knowledge/skills subscale has been extensively evaluated. Internal consistency was typically reported with good Cronbach's alpha coefficients related to knowledge/skill which varied in studies between 0.81–0.96. Reliability was also evaluated using a test–retest (Koehn & Lehman, 2008). Reliability has been evaluated in five studies (Maydick-Youngberg et al., 2021; Pérez-Campos et al., 2014; Schneider et al., 2020; White-Williams et al., 2013; Williamson et al., 2015) and five reported that it had been confirmed in a previous study (Brown et al., 2009; Koota et al., 2021; Lunden et al., 2021; White-Williams et al., 2013; Williamson et al., 2015). The validity was confirmed using content (Azmoude et al., 2017; Koehn & Lehman, 2008; Shafiei et al., 2014), face (Azmoude et al., 2017; Seyyedrasooli et al., 2012) and construct validity (Shafiei et al., 2014). Validity was not tested in seven studies (Alqahtani et al., 2020; Brown et al., 2009; Koehn & Lehman, 2008; Maydick-Youngberg et al., 2021; Schneider et al., 2020; Wonder et al., 2017; Zhou et al., 2016) and in seven studies it had been confirmed by previous studies (Al-Busaidi et al., 2019; Ammouri et al., 2014; Koota et al., 2021; Lunden et al., 2021; Salah & Abu-Moghli, 2020; White-Williams et al., 2013; Williamson et al., 2015). The reliability, typically internal consistency, and validity of the instruments used twice were assessed during instrument development (Jette et al., 2003; Melnyk et al., 2018, 2020; Silva et al., 2015). When reused, the researchers reported that they have been confirmed in a previous study (Ginex et al., 2021; Ramírez-Vélez et al., 2015). In the studies of Melnyk et al. (2018, 2020), Rasch analysis was used for scale development.

The reliability of the instruments used only once (Table 2) has also typically been assessed using internal consistency (Alshehri et al., 2017; Filippini et al., 2011; Fu et al., 2020; Majid et al., 2011; Nickles et al., 2019; Patelarou et al., 2017; Yue et al., 2018). Cronbach's alpha coefficients were reported as good. Alpha coefficients related to knowledge varied in studies between 0.81 (Alshehri et al., 2017) and 0.98 (Ramos-Morcillo et al., 2021), and those related to skills varied between 0.82 (Ramos-Morcillo et al., 2021) and 0.98 (Yue et al., 2018). Internal consistency was also estimated with the Kappa coefficient (Filippini et al., 2011; Fu et al., 2020), which was found to be good. Reliability was not assessed in three studies (Bajracharya et al., 2019; Dao et al., 2018; McCluskey, 2003). Belowska et al. (2020) and Schuler et al. (2021) reported that this has been confirmed in a previous study. Validity was confirmed using content (Dao et al., 2018; Filippini et al., 2011; Fu et al., 2020; Majid et al., 2011) and construct validity (Fu et al., 2020). Validity was not tested in three studies (Bajracharya et al., 2019; Nickles et al., 2019; Yue et al., 2018) and in one study it had been confirmed by a previous study (Belowska et al., 2020).

4.3 | Content of knowledge and skills assessed in EBP

The content of the EBP knowledge and skills instruments consists of five main categories (Table 3): EBP, evaluation of current practice, preparation for the implementation of the EBP, implementation of evidence and active participation in the development of the EBP.

Evidence-based practice was divided into two categories (Table 3). Healthcare professionals need to know *the concept of EBP* (Alshehri et al., 2017; Belowska et al., 2020; Claudino et al., 2019; Schuler et al., 2021; Silva et al., 2015). They must also be aware of *the purpose of EBP*, which consists of the aim of the EBP process (Alshehri et al., 2017), the core elements of EBP (Claudino et al., 2019; Patelarou et al., 2017), EBP in the profession (Belowska et al., 2020), as well as the best scientific evidence (Filippini et al., 2011) and clinical expertise (Alshehri et al., 2017; Filippini et al., 2011) as a basis for patient care. Also, the length of the period involved in searching, evaluating and implementing evidence must also be understood (Alshehri et al., 2017).

The evaluation of the current practice is defined according to two categories (Table 3). Healthcare professionals need to have the skills to *monitor and review current practice* (Al-Busaidi et al., 2019; Ammouri et al., 2014; Azmoude et al., 2017; Brown et al., 2009; Lunden et al., 2021; Maydick-Youngberg et al., 2021; Ramos-Morcillo et al., 2021; Salah & Abu-Moghli, 2020; Shafiei et al., 2014), the ability to identify gaps in their own practice (Al-Busaidi et al., 2019; Azmoude et al., 2017; Brown et al., 2009; Lunden et al., 2021; Maydick-Youngberg et al., 2021; McCluskey, 2003; Salah & Abu-Moghli, 2020; Schneider et al., 2020; Shafiei et al., 2014; Zhou et al., 2016), especially regarding professional practice (Ammouri et al., 2014; Schneider et al., 2020; Zhou et al., 2016), and knowledge (Belowska et al., 2020). Reviewing practice is based on clinical experience and professional judgement (Yue et al., 2018). *Identification and naming clinical questions* in practice means identifying clinical issues and problems (Majid et al., 2011; Nickles et al., 2019), analysing clinical problems (Ramos-Morcillo et al., 2021) and converting information needs into well-formulated research questions (Al-Busaidi et al., 2019; Ammouri et al., 2014; Azmoude et al., 2017; Belowska et al., 2020; Brown et al., 2009; Lunden et al., 2021; Majid et al., 2011; Maydick-Youngberg et al., 2021; Salah & Abu-Moghli, 2020;

TABLE 3 Contents of the instruments

Main category	Subcategory	Authors
Evidence-based practice	Concept of EBP	Alshehri et al. (2017), Belowska et al. (2020), Claudino et al. (2019), Schuler et al. (2021) and Silva et al. (2015)
	Purpose of EBP	Alshehri et al. (2017), Belowska et al. (2020), Claudino et al. (2019), Filippini et al. (2011) and Patelarou et al. (2017)
Evaluation of current practice	Monitor and review current practice	Al-Busaidi et al. (2019), Ammouri et al. (2014), Azmoude et al. (2017), Belowska et al. (2020), Brown et al. (2009), Lunden et al. (2021), Maydick-Youngberg et al. (2021), McCluskey (2003), Ramos-Morcillo et al. (2021), Salah and Abu-Moghli (2020), Schneider et al. (2020), Shafiei et al. (2014), Yue et al. (2018)[a] and Zhou et al. (2016)
	Identification and naming clinical questions in practice	Al-Busaidi et al. (2019), Ammouri et al. (2014), Azmoude et al. (2017), Belowska et al. (2020), Brown et al. (2009), Dao et al. (2018), Fu et al. (2020), Ginex et al. (2021), Majid et al. (2011), Melnyk et al. (2018, 2020), Nickles et al. (2019), Ramos-Morcillo et al. (2021), Salah & Abu-Moghli (2020), Schneider et al. (2020), Schuler et al. (2021), Shafiei et al. (2014), Yue et al. (2018) and Zhou et al. (2016)
Preparation for the implementation of EBP	Searching for information	Al-Busaidi et al. (2019), Alshehri et al. (2017), Ammouri et al. (2014), Azmoude et al. (2017), Bajracharya et al. (2019), Belowska et al. (2020), Brown et al. (2009), Dao et al. (2018), Fu et al. (2020), Jette et al. (2003), Lunden et al. (2021), Maydick-Youngberg et al. (2021), McCluskey (2003), Melnyk et al. (2018, 2020), Nickles et al. (2019), Patelarou et al. (2017), Ramírez-Vélez et al. (2015), Ramos-Morcillo et al. (2021), Salah & Abu-Moghli (2020), Schneider et al. (2020), Schuler et al. (2021), Shafiei et al. (2014), Silva et al. (2015), Yue et al. (2018)[a] and Zhou et al. (2016)
	Research process and concepts	Al-Busaidi et al. (2019), Alshehri et al. (2017), Ammouri et al. (2014), Azmoude et al. (2017), Belowska et al. (2020), Brown et al. (2009), Claudino et al. (2019), Fu et al. (2020), Jette et al. (2003), Lunden et al. (2021), Maydick-Youngberg et al. (2021), McCluskey (2003), Nickles et al. (2019), Ramírez-Vélez et al. (2015), Ramos-Morcillo et al. (2021), Salah & Abu-Moghli (2020), Schneider et al. (2020), Shafiei et al. (2014), Silva et al. (2015), Yue et al. (2018)[a] and Zhou et al. (2016)
	Reading research articles	Majid et al. (2011), Patelarou et al. (2017), Silva et al. (2015) and Yue et al. (2018)
	Critical appraisal of the evidence	Al-Busaidi et al. (2019), Ammouri et al. (2014), Azmoude et al. (2017), Bajracharya et al. (2019), Belowska et al. (2020), Brown et al. (2009), Dao et al. (2018), Fu et al. (2020), Ginex et al. (2021), Jette et al. (2003), Lunden et al. (2021), Majid et al. (2011), Maydick-Youngberg et al. (2021), McCluskey (2003), Melnyk et al. (2018, 2020), Nickles et al. (2019), Patelarou et al. (2017), Ramos-Morcillo et al. (2021), Salah & Abu-Moghli (2020), Schneider et al. (2020), Shafiei et al. (2014), Silva et al. (2015), Yue et al. (2018)[a] and Zhou et al. (2016)
	Sharing of evidence	Al-Busaidi et al. (2019), Ammouri et al. (2014), Azmoude et al. (2017), Belowska et al. (2020), Brown et al. (2009), Fu et al. (2020), Lunden et al. (2021), Majid et al. (2011), Maydick-Youngberg et al. (2021), Ramos-Morcillo et al. (2021), Salah & Abu-Moghli (2020), Schneider et al. (2020), Shafiei et al. (2014), Silva et al. (2015) and Zhou et al. (2016)[a]

(Continues)

TABLE 3 (Continued)

Main category	Subcategory	Authors
Implementation of evidence	Selection evidence	Al-Busaidi et al. (2019), Ammouri et al. (2014), Azmoude et al. (2017), Belowska et al. (2020), Brown et al. (2009), Filippini et al. (2011), Lunden et al. (2021), Maydick-Youngberg et al. (2021), Salah & Abu-Moghli (2020), Schneider et al. (2020), Shafiei et al. (2014), Yue et al. (2018)[a] and Zhou et al. (2016)
	Area of applications of the evidence	Al-Busaidi et al. (2019), Ammouri et al. (2014), Azmoude et al. (2017), Belowska et al. (2020), Brown et al. (2009), Dao et al. (2018), Fu et al. (2020) and Silva et al. (2015)
	Contents of evidence	Alshehri et al. (2017), Claudino et al. (2019), Filippini et al. (2011), Fu et al. (2020), Ginex et al. (2021), Jette et al. (2003), Majid et al. (2011), Melnyk et al. (2018, 2020), Nickles et al. (2019), Patelarou et al. (2017), Ramírez-Vélez et al. (2015), Ramos-Morcillo et al. (2021) and Silva et al. (2015)
	Way of implementation	Fu et al. (2020), McCluskey (2003), Nickles et al. (2019), Patelarou et al. (2017) and Yue et al. (2018)
	Evaluation of implementation	Dao et al. (2018), Filippini et al. (2011), Ginex et al. (2021) and Melnyk et al. (2018, 2020)
Active participation in the development of EBP	Strategic activities to develop EBP	Ginex et al. (2021), Melnyk et al. (2018, 2020), Nickles et al. (2019) and Yue et al. (2018)
	Leadership to support EBP	Ginex et al. (2021), Melnyk et al. (2018, 2020), Ramos-Morcillo et al. (2021) and Yue et al. (2018)
	Participation in the development of the application of evidence	Ginex et al. (2021), Melnyk et al. (2018, 2020) and Yue et al. (2018)

[a]The articles that used the instrument of Upton and Upton (2006), but the contents have not been described in the article (Alqahtani et al., 2020; Heydari et al., 2014; Koehn & Lehman, 2008; Koota et al., 2021; Pérez-Campos et al., 2014; Seyyedrasooli et al., 2012; White-Williams et al., 2013; Williamson et al., 2015; Wonder et al., 2017).

Schneider et al., 2020; Shafiei et al., 2014; Zhou et al., 2016), clinical questions (Majid et al., 2011) or PICO questions (Dao et al., 2018; Fu et al., 2020; Melnyk et al., 2018, 2020; Ramos-Morcillo et al., 2021; Schuler et al., 2021; Yue et al., 2018). The purpose of naming questions is to improve the quality of care. Internal evidence (meaning patients' preferences and clinical expertise) must also be used to describe the clinical problem. The ability to distinguish between different types of questions, such as interventions, prognosis, harm and cost-effectiveness (Melnyk et al., 2018, 2020) is needed.

Preparation for the implementation of EBP was divided into five categories (Table 3). *Searching for information* includes different required skills. Healthcare professionals need to be aware of and be able to identify information types and sources (Al-Busaidi et al., 2019; Ammouri et al., 2014; Azmoude et al., 2017; Belowska et al., 2020; Brown et al., 2009; Dao et al., 2018; Lunden et al., 2021; Maydick-Youngberg et al., 2021; McCluskey, 2003; Salah & Abu-Moghli, 2020; Schneider et al., 2020; Shafiei et al., 2014; Zhou et al., 2016), as well as have knowledge of how to obtain evidence (Al-Busaidi et al., 2019; Ammouri et al., 2014; Azmoude et al., 2017; Bajracharya et al., 2019; Brown et al., 2009; Jette et al., 2003; Lunden et al., 2021; Maydick-Youngberg et al., 2021; Salah & Abu-Moghli, 2020; Schneider et al., 2020; Shafiei et al., 2014; Zhou et al., 2016). The requirement to conduct online searches using databases is highlighted in several instruments (Bajracharya et al., 2019; Belowska et al., 2020; Fu et al., 2020; Ginex et al., 2021; Jette et al., 2003; Majid et al., 2011; Melnyk et al., 2018, 2020; Nickles et al., 2019; Patelarou et al., 2017; Ramírez-Vélez et al., 2015; Schuler et al., 2021; Silva et al., 2015; Yue et al., 2018), and the databases CINAHL, MEDLINE, PEDro, Pubmed and Google are mentioned. Also, knowledge about databases was investigated (Alshehri et al., 2017; Ginex et al., 2021; Jette et al., 2003; Melnyk et al., 2018, 2020; Ramírez-Vélez et al., 2015; Yue et al., 2018). Healthcare professionals need to know that the content of the data search can vary, as they are practice guidelines, evidence summaries, RCT (Fu et al., 2020; Yue et al., 2018), systematic reviews, meta-analysis and cohort studies (Fu et al., 2020).

Healthcare professionals must have skills in *research processes and concepts* (Table 3; Al-Busaidi et al., 2019; Ammouri et al., 2014; Azmoude et al., 2017; Belowska et al., 2020; Brown et al., 2009; Lunden et al., 2021; Maydick-Youngberg et al., 2021; Salah & Abu-Moghli, 2020; Shafiei et al., 2014; Zhou et al., 2016), especially theoretical or conceptual framework (Nickles et al., 2019), research questions (Nickles et al., 2019), study design (Claudino et al., 2019; Nickles et al., 2019; Patelarou et al., 2017; Silva et al., 2015), study samples (Nickles et al., 2019; Ramos-Morcillo et al., 2021), research methods (Fu et al., 2020; Yue et al., 2018), data analysis (Nickles et al., 2019), especially understanding statistical analysis (Claudino et al., 2019; Silva et al., 2015), statistical descriptions or inferences (Fu et al., 2020), and qualitative analysis including some software (Fu et al., 2020), as well as drawing conclusions, research ethics and writing summary (Nickles et al., 2019). Knowledge of research concepts, especially those related to statistical analysis, is critical (Alshehri

et al., 2017; Belowska et al., 2020; Jette et al., 2003; Ramírez-Vélez et al., 2015). *Reading research articles* is one of the skills required by healthcare professionals. They need to be able to read research reports (Patelarou et al., 2017; Silva et al., 2015), extract key information from the literature, such as intervention measures and outcome indicators (Yue et al., 2018), and have general notions about its strengths and weaknesses, as well as to apply research findings to their clinical practice (Majid et al., 2011).

Critical appraisal of the evidence related to different study designs is a mentioned knowledge and skill required from healthcare professionals (Al-Busaidi et al., 2019; Ammouri et al., 2014; Azmoude et al., 2017; Bajracharya et al., 2019; Brown et al., 2009; Dao et al., 2018; Ginex et al., 2021; Jette et al., 2003; Lunden et al., 2021; Maydick-Youngberg et al., 2021; McCluskey, 2003; Melnyk et al., 2018, 2020; Patelarou et al., 2017; Ramírez-Vélez et al., 2015; Salah & Abu-Moghli, 2020; Schuler et al., 2021; Table 3). Evidence is to be reviewed against common standards (Ammouri et al., 2014; Belowska et al., 2020; Lunden et al., 2021; Maydick-Youngberg et al., 2021; Salah & Abu-Moghli, 2020; Schneider et al., 2020; Shafiei et al., 2014; Zhou et al., 2016). Healthcare personnel need to have the ability to determine how valid the material is, meaning close to the truth (Al-Busaidi et al., 2019; Ammouri et al., 2014; Azmoude et al., 2017; Belowska et al., 2020; Brown et al., 2009; Lunden et al., 2021; Maydick-Youngberg et al., 2021; Salah & Abu-Moghli, 2020; Schneider et al., 2020; Shafiei et al., 2014; Zhou et al., 2016), to determine tools for quality assessment (Fu et al., 2020; Majid et al., 2011; Yue et al., 2018) and methodological quality of a specific article (Ramos-Morcillo et al., 2021). They need to know the focus of appraisal, such as the application of intervention (Majid et al., 2011), individual studies (Nickles et al., 2019), especially quantitative and qualitative studies (Ramos-Morcillo et al., 2021; Schuler et al., 2021), practice recommendations, guidelines (Majid et al., 2011; Nickles et al., 2019) and strength of evidence (Melnyk et al., 2018, 2020; Nickles et al., 2019). Healthcare professionals must have the skills to *share evidence* with colleagues (Al-Busaidi et al., 2019; Ammouri et al., 2014; Azmoude et al., 2017; Lunden et al., 2021; Maydick-Youngberg et al., 2021; Melnyk et al., 2018, 2020; Salah & Abu-Moghli, 2020; Schneider et al., 2020; Shafiei et al., 2014; Silva et al., 2015; Zhou et al., 2016), team members, managers (Fu et al., 2020) and policymakers (Ginex et al., 2021; Melnyk et al., 2018, 2020) by choosing effective ways of doing so (Fu et al., 2020; Yue et al., 2018). It includes sharing confusion, experiences and suggestions (Fu et al., 2020). Dissemination and discussion of new ideas regarding care are important (Al-Busaidi et al., 2019; Ammouri et al., 2014; Azmoude et al., 2017; Belowska et al., 2020; Brown et al., 2009; Lunden et al., 2021; Salah & Abu-Moghli, 2020; Schneider et al., 2020; Shafiei et al., 2014; Zhou et al., 2016). Dissemination of the best practices to improve quality of care and patient outcomes (Melnyk et al., 2018, 2020) can be realised in various ways, such as through presentation, publication (Nickles et al., 2019), EBPs, assessment tools and operational standards (Fu et al., 2020).

The implementation of evidence includes five categories (Table 3). Healthcare professionals need to have the ability to *select evidence*, which means determining how clinically useful or applicable information or materials, such as instructions, are (Al-Busaidi et al., 2019; Ammouri et al., 2014; Azmoude et al., 2017; Belowska et al., 2020; Brown et al., 2009; Lunden et al., 2021; Maydick-Youngberg et al., 2021; Ramos-Morcillo et al., 2021; Salah & Abu-Moghli, 2020; Schneider et al., 2020; Shafiei et al., 2014; Zhou et al., 2016). The ability to assess whether the evidence application fields have suitable characteristics is important (Yue et al., 2018), as is the economics and efficiency of interventions (Filippini et al., 2011). *The area of applications of the evidence* varies. Evidence needs to apply to individual cases (Al-Busaidi et al., 2019; Azmoude et al., 2017; Belowska et al., 2020; Brown et al., 2009; Lunden et al., 2021; Maydick-Youngberg et al., 2021), to their own cases (Dao et al., 2018; Silva et al., 2015) or to policy and the environment (Fu et al., 2020; Yue et al., 2018).

Healthcare professionals need to be able to implement the different *contents of the evidence*, such as research findings (Claudino et al., 2019; Majid et al., 2011; Patelarou et al., 2017; Silva et al., 2015), guidelines (Filippini et al., 2011; Nickles et al., 2019), interventions (Filippini et al., 2011) and standards and recommendations (Nickles et al., 2019). In addition to research evidence, clinical expertise, patients and families should be considered (Ginex et al., 2021; Melnyk et al., 2018, 2020; Table 3). Patient preferences (Alshehri et al., 2017; Melnyk et al., 2018, 2020; Ramos-Morcillo et al., 2021; Silva et al., 2015), values (Alshehri et al., 2017), as well as their wishes, needs and benefits (Fu et al., 2020) should integrate into guidelines (Jette et al., 2003; Ramírez-Vélez et al., 2015).

Different *ways of implementation* include collaboration with colleagues (Nickles et al., 2019), organising the latest best evidence into simple easy-to-read tools, such as evidence summary (Fu et al., 2020), and guiding the application of evidence into practice (e.g. through special lectures and training and discussion; Fu et al., 2020; Table 3). Understanding the needs of personnel regarding the content, format and implementation of evidence (Yue et al., 2018) is vital. The characteristics of personnel who plan for changes and the ability to assess the effects of evidence application are valuable to know as well (Fu et al., 2020). The team needs to determine the level of evidence required by the standards (Yue et al., 2018). Skills to change one's own clinical practice towards new evidence (McCluskey, 2003) and having sufficient knowledge to implement EBP (Patelarou et al., 2017) are important to handle. *Evaluation of implementation* is one required skill. Healthcare professionals need to be able to assess their own work after applying evidence (Dao et al., 2018) to monitor adequate links and ensure the quality of evidence application (Filippini et al., 2011). To identify best practices, the outcomes of decisions and changes in practice should be assessed (Ginex et al., 2021; Melnyk et al., 2018, 2020).

Active participation in the development of EBP consists of three categories (Table 3). *Strategic activities to develop EBP* require the ability to develop and implement evidence-based policies, strategic goals (Ginex et al., 2021; Melnyk et al., 2018, 2020; Nickles et al., 2019) and procedures (Ginex et al., 2021; Melnyk et al., 2018, 2020; Nickles et al., 2019; Yue et al., 2018). Participation

in strategic activities sustains an EBP culture (Melnyk et al., 2018, 2020). *Leadership to support EBP* relates to the selection of appropriate staff to set up an EB nursing team (Yue et al., 2018). Healthcare professionals must lead interdisciplinary teams to apply evidence to clinical decisions and implement changes to improve the health of individuals, groups and populations (Ginex et al., 2021; Melnyk et al., 2018, 2020), as well as lead changes in clinical practice (Ramos-Morcillo et al., 2021). They also require the ability to find resources to organise different ways to guide implementation into practice and stimulate colleagues to actively use evidence (Yue et al., 2018). Participation in the *development of the application of evidence* relates to generating internal evidence with the help of outcome management and EBP implementation projects. External evidence will be generated from other healthcare professionals (Ginex et al., 2021; Melnyk et al., 2018, 2020). Healthcare professionals should be able to develop evidence-based assessment tools and comprehensive systems to evaluate the effectiveness of the application of evidence.

5 | DISCUSSION

The aim of this scoping review was to describe the instruments that are used to assess frontline healthcare professionals' knowledge and skills of EBP.

The studies in this review described several different instruments. Most of them were self-assessment instruments and only a few of them were knowledge tests. The lack of knowledge tests have also been found in previous studies (Capras et al., 2020; Leung et al., 2014). However, an objective true-false knowledge test is important in cases where we need information that corresponds to the actual competence of healthcare professionals, for example, to determine the need for continuing education and required resources or to improve the level of EBP in patient care. Additionally, the need for knowledge and skills tests is particularly emphasised when assessing healthcare professionals' knowledge before and after EBP education, which provides information on the effectiveness of the training (McCluskey & Bishop, 2009; Mudderman et al., 2020). Healthcare students can also use knowledge tests to assess their progress in learning EBP. Thus, the need for performance-based instruments is obvious (Leung et al., 2014). Instead, self-assessment can be used to describe healthcare professionals' own perceptions of their skills. It tells more about their experience in applying evidence-based knowledge, which is also important in assessing competence and planning continuing education.

Most studies used the self-assessment EBPQ instrument of Upton and Upton (2006) alone (Al-Busaidi et al., 2019; Alqahtani et al., 2020; Ammouri et al., 2014; Brown et al., 2009; Heydari et al., 2014; Koehn & Lehman, 2008; Lunden et al., 2021; Maydick-Youngberg et al., 2021; Pérez-Campos et al., 2014; Salah & Abu-Moghli, 2020; Schneider et al., 2020; Seyyedrasooli et al., 2012; Shafiei et al., 2014; White-Williams et al., 2013; Williamson et al., 2015; Wonder et al., 2017; Zhou et al., 2016) or in combination with other instruments (Azmoude et al., 2017; Koota et al., 2021). It is noteworthy that this instrument has been in use for 15 years worldwide, in different cultures and healthcare settings, mainly by nurses but also by midwives, and has been translated into various languages. However, in more than half of the studies, the reliability or validity of the instrument related to the knowledge/skills subscale was not assessed. The reliability and validity of the instrument should be reassessed when used in a new context (Kielo et al., 2020), even though the developers have reported the instrument to be reliable and valid.

The reliability and validity assessments of the self-developed instruments varied. For the most part, either reliability or validity was assessed. However, the psychometric testing of the instruments was not extensive. Reliability was almost invariably assessed using the coefficient of Cronbach's alpha, which, however, was confirmed as good. Validation was limited, and except for two studies that used factor analysis to confirm construct validity, content validity was assessed using expert panels. The future use of these instruments may require extensive psychometric testing. Also, there was one instrument that had not been validated (Bajracharya et al., 2019).

The required knowledge and skills related to EBP were extensive in the instruments described. They emphasised the preparation for the implementation of EBP. On the other hand, evaluation of current practice, implementation of evidence and active participation in the development of EBP were less assessed knowledge and skills. Although frontline healthcare professionals need knowledge and skills for the preparation phase of implementation, such as searching for information (e.g. evidence-based clinical guidelines and systematic reviews), knowledge and skills of the research process and concepts, and critical appraisal of the literature, they are not responsible for evidence generation or evidence synthesis (Warren et al., 2016; WHO, 2017). Furthermore, working in healthcare settings is demanding and professionals' workloads are heavy. Therefore, it could be preferable that they focus on the implementation phase and have the competence, knowledge and skills to recognise, select and implement evidence, such as clinical guidelines, and evaluate the implementation process (Warren et al., 2016). In the implementation phase, frontline healthcare professionals integrate the best available evidence, their clinical expertise and context facilities with patient's preferences (Jordan et al., 2019; WHO, 2017). Thus, the implementation of evidence assures consistent EBP. In the next development stage of EBP knowledge and skills tests, it is essential to emphasise the implementation phase instead of the process of evidence synthesis before implementation, and that way to ensure healthcare professionals' competence to use the best available evidence (WHO, 2017).

5.1 | Limitations

Some limitations should be considered. The review focused only on those instruments whose content could be analysed and described and which were used to assess the knowledge and skills of EBP of healthcare professionals. Also, only scientific publications were included, since the review looked at the reliability and validity of the

instruments. These things have excluded some instruments that may have been used in clinical practice to assess knowledge and skills. Based on the scoping review, no critical appraisal was conducted. Therefore, there is no information on the quality of the analysed articles, but the studies' quality may vary. However, the validity and reliability of the instruments were examined and described. Some of the content of the instruments was difficult to understand and some incomplete, which may have affected the interpretation of the analysis. The search was limited to three widely used databases (Cinahl, PubMed and Cochrane). Although the search resulted in 4540 references, it is possible that the use of other databases would generate some new references. On the other hand, the current search of three databases already yielded multiple duplicates.

6 | CONCLUSION

Several instruments are used to assess the knowledge and skills of healthcare professionals regarding EBP. Almost all instruments are self-assessment instruments. Validated knowledge tests should be further developed. The instruments emphasise the preparation for the implementation of EBP. EBP knowledge and skills have been assessed mainly by nurses. The assessment should also be extended to other healthcare professionals. Further research is needed to develop instruments for healthcare professionals to assess knowledge and skills for the implementation of evidence.

7 | RELEVANCE TO CLINICAL PRACTICE

1. The review provides an overview of the instruments that can be used in clinical practice to assess healthcare professionals' EBP knowledge and skills.
2. Measuring EBP knowledge and skills help identify knowledge gaps to target training in relevant areas.
3. Identifying the level of EBP knowledge and skills will help in the planning and implementation of continuing education.
4. EBP knowledge and skills are essential to ensure the quality of care and patient safety, which is information that can be used by nursing directors and ward managers.
5. Information regarding healthcare professionals' EBP knowledge and skills help in the planning and implementation of the evidence-based strategy.

AUTHOR CONTRIBUTIONS

Conception/design, acquisition of data, and analysis and interpretation of data EH, HS, AT and AR. Drafting the manuscript and revising it critically for important intellectual content EH, HS, AT and AR. Final approval of the version to be published EH, HS, AT and AR. All authors have agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

DATA AVAILABILITY STATEMENT

There is no data available.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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