



BMJ Open Design and validity of an instrument to assess healthcare professionals' perceptions, behaviour, self-efficacy and attitudes towards evidence-based health practice: I-SABE

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ABSTRACT

Objectives To develop and validate an instrument to measure Brazilian healthcare professionals' perceptions, behaviour, self-efficacy and attitudes towards evidence-based health practice.

Design Validation of an instrument using the Delphi method to ensure content validity and data from a cross-sectional survey to evaluate psychometric characteristics (psychometric sensitivity, factorial validity and reliability).

Setting National Register of Health Establishments database.

Participants We included clinical health professionals who were working in the Brazilian public health system.

Results The Instrument to assess Evidence-Based Health (I-SABE) was constructed with five domains: self-efficacy; behaviour; attitude; results/benefits and knowledge/skills. Content validity was done by 10–12 experts (three rounds). We applied I-SABE to 217 health professionals. Bartlett's sphericity test and the Kaiser-Meyer-Olkin (KMO) index were adequate ($\chi^2=1455.810$, $p<0.001$; $KMO=0.847$). Considering the factorial loads of the items and the convergence between the Scree Plot and the Kaiser criterion the four domains tested in this analysis, explaining 59.2% of the total variance. The internal consistency varied between the domains: self-efficacy ($\alpha=0.76$), behaviour ($\alpha=0.30$), attitudes ($\alpha=0.644$), results/benefits to the patient ($\alpha=0.835$).

Conclusions The results of the psychometric analysis of the I-SABE confirm the good quality of this tool. The I-SABE can be used both in educational activities as well as an assessment tool among healthcare professionals in the Brazilian public health settings.

INTRODUCTION

Evidence-based health practice (EBP) is identified as one of the most important factors for improving the results and sustainability of health systems and it has become an important competency for health professionals involved in patient care.¹ EBP is defined as the integration of best research evidence with clinical expertise and patient

Strengths and limitations of this study

- The Instrument to assess Evidence-Based Health was developed through a rigorous process, which involved the integration of evidence from the literature using a theoretical framework, a Delphi survey for the validity of the content, and psychometric assessments.
- Although the response rate was 15%, this survey presented a good number of respondents from different types of healthcare professionals coming from diverse practice settings with different levels of experience, thus providing a good assessment of the overall knowledge and use of evidence-based health practice in public health settings.
- Composite reliability was not performed in this study, therefore, future studies in a larger sample of health professionals are needed to assess reliability with greater robustness, as well as confirmatory factor analysis.

values.² There are several studies of improved patient outcomes following implementation of EBP such as reductions in length of hospital stay and costs, increased patient satisfaction, and the elimination of unnecessary or ineffective practices.²

Although the incorporation of scientific evidence as a basis for health decision making is considered a critical factor to improve quality of care, the application of EBP is remains a major challenge.^{3–5} Studies showed competency gaps and low implementation rates among healthcare professionals across diverse practices and settings. Understanding of knowledge, skills, attitudes and barriers related to EBP among healthcare professionals can help to elaborate effective and systematic strategies for integrating the EBP in healthcare services.⁵

Despite the availability of tools to assess EBP implementation among healthcare professionals, most of them have been developed to assess knowledge and skills and none is able to cover all domains established by the Classification Rubric for EBP Assessment Tools in Education (CREATE) framework.⁶⁻⁸ According to a recent systematic review which includes 12 validated tools, few demonstrated multiple (≥ 3) types of established evidence on the reliability and validity of the instrument, and none addressed domains such as self-efficacy, behaviours or patient benefit.⁹

These limitations might compromise the ability to evaluate the impact of EBP implementation on health outcomes. The development of a validated instrument is important to determine gaps, to design interventions needed for integrating this competency in healthcare organisations, and to assess the effectiveness of future interventions in different contexts (eg, hospitals, primary care services).⁵

In Latin America, despite increased efforts to disseminate and apply the EBP concepts, the application of EBP among healthcare professionals is still limited.^{10 11} Research is lacking that supports the development of interventions to promote the EBP implementation in the clinical routine.^{10 11} In addition, no study developed a valid and reliable instrument to assess the gaps in EBP implementation among healthcare professionals in the Brazilian context. Thus, this study aims to develop and validate an instrument for determining healthcare professionals' perceptions, behaviour, self-efficacy and attitude related to EBP in Brazil.

METHODS

Identifiable information, such as names, phone numbers and addresses, was not collected from participants in order to fully protect their privacy.

The development was conducted in a systematic manner, using an accepted measure development methodology, which included development of items, content validity, pilot study and evaluation of psychometric characteristics. The flow of instrument development is shown in figure 1.

Development and validation of the instrument

Development of items

We drew on the EBP conceptual framework proposed by the CREATE to guide the item development process.¹²⁻¹⁴ This framework is a common taxonomy for new and existing tools and it is designed to help EBP educators/researchers identify the best assessment tool available and provide guidance for developers of new EBP assessment tools. Using this framework, the nature of an assessment can be characterised with regard to the five-step EBP model (Ask, Search, Appraise, Integrate Evaluate), type(s) and level of educational assessment specific to EBP, audience characteristics and learning and assessment aims.¹²⁻¹⁴

A scoping review was used to systematically select and summarise existing tools with established evidence on the reliability and validity.¹⁴⁻²¹ We used the CREATE framework to guide the data extraction of potential domains. Items were pooled by two researchers in five domains established by CREATE framework: (1) attitudes, (2) self-efficacy, (3) knowledge/skills, (4) behaviours and (5)=results/benefits for patients. The Excel spreadsheet was used to extract and analyse the items. Disagreements about the items included in each domain were resolved by a consensus-based discussion.

Considering that we used the CREATE framework, the method used to identify the items was the modified frameworks synthesis.²² This method is an excellent tool for supporting qualitative analysis because it provides a

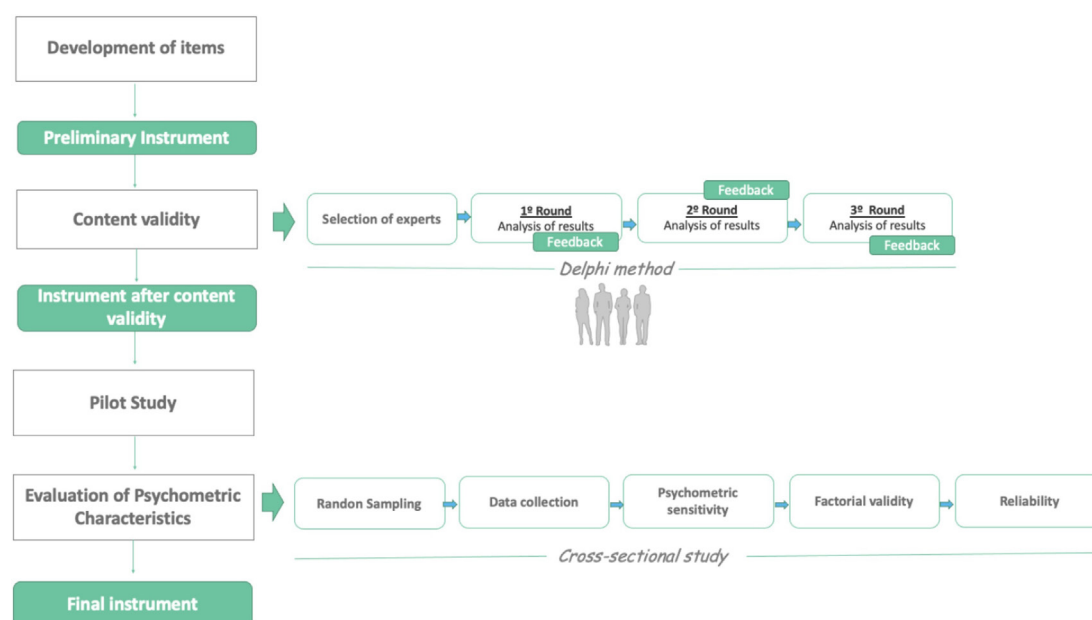


Figure 1 Study steps.

systematic model for managing and mapping the data.²² The definitions of domains derived from this framework are presented in online supplemental appendix 1. We used these definitions as a guide for the development of new items if there is no existing instrument.

After translation, technique revision and semantic evaluation by the research group, the initial item pool was discussed and critically assessed and appropriate changes to the translation were made to ensure consistency. After this stage, we used the consensus approach to ensure the content validity of instrument which is described in the later section entitled ‘content validity’.

Content validity

Content validity refers to the degree to which elements of the instrument are relevant to and representative of the targeted construct for a particular assessment purpose.²³ This could be done using the results of several examiners’ analyses (panel of experts) who verify the items’ representation regarding content areas and the relevance of the objectives to be measured. We used a panel of experts through a consensus technique, according to simplified Delphi’s method.²⁴

The Delphi method is a structured process distributing rounds of the questionnaire in analysis to gather information and set priorities or gain consensus regarding a specific issue. This method is characterised by anonymity, iteration, controlled feedback, and stability in responses among those with expertise on a specific issue.^{25 26} The Delphi technique was conducted in online web surveys where the panel of experts filled out the form given their responses directly and blinded from others.²⁶

Selection and recruitment of experts

The panellists were identified through an advanced search system of the Lattes platform on the National Council for Scientific and Technological Development website (www.cnpq.br/lattes), using the following keywords: evidence-based health, EBP, evidence-based medicine, questionnaire, measurement instruments, questionnaire validation and psychometric analysis. The Lattes Platform is a publicly available information system about individual researchers working in Brazil maintained by the Brazilian Federal Government.

As this project aims to create an instrument to assess knowledge, skills and attitudes, we understand that the panel of experts should be composed of researchers working with EBP and healthcare professionals who use EBP in their practice. Considering these aspects, the following criteria were used for selecting a panel of experts: publication of at least three peer-reviewed academic indexed journal articles on EBP or projects/articles that involved validation of questionnaires in the health area published in the last 4 years, or healthcare professional with at least 5 years of experience in EBP. We identified 25 potential participants who were then invited by email. Each potential panellist was informed about the voluntary nature of the study and was

provided with full study information, outlining the aim of the study, the extent and the timing of their expected involvement.

Rounds

We planned at least three rounds. During the rounds, the panel board members were invited to comment on grammar and phrasing to improve uniform interpretation of items and prevent socially desirable responses. The content assessment was done considering Theoretical Dimension, Theoretical Relevance, Clarity and Relevance or representativeness as it was explained in our protocol.²⁷ For each item in the questionnaire, we used the traditional 4-point Likert scale in which there is no neutral option (1=completely disagree; 2=disagree; 3=agree and 4=completely agree). In this case, neutral option is useless where researchers prefer to extract a specific opinion from the respondents on clarity, and relevance or representativeness of each item in the instrument.²⁸ Additionally, following each item, a space was included for panellists to write their suggestions for improving the item or making comments. If the expert marked the answer I completely disagree with or disagree with, he must justify his answer. The experts were also offered the opportunity to add items. If they suggested additional items or dimensions, these were submitted to be assessed in the next round. Doubts about comments or suggestions were resolved with the experts by telephone or email. To avoid imposing our views on participants, the researchers only contacted panellists if there was some doubt about their suggestions in order to avoid possible mistakes related to elaboration of items. After each round, the results and comments were analysed and summarised by the research team in order to guide the instrument revision. The modified instrument was again sent to the panellist group for the next round of analysis. Each round lasted 30 days corresponding to 15 days for the panellists’ answers and another 15 days for the researchers’ analysis

Descriptive analyses

After each round, data generated from completing the online questionnaire were extracted to Microsoft Excel for descriptive analysis (frequencies and percentages) to determine the percentage rating of agreement or disagreement among experts.

Determining consensus

We used the traditional 9-point scale (1=extremely irrelevant to 9=extremely relevant) to assess each item. The participants’ responses were categorised as irrelevant (1–3), equivocal (4–6) and relevant (7–9). For each item, the consensus was reached if at least 80% of the participants’ votes belong to the same category (1–3, 4–6 or 7–9).^{29 30} Items that did not reach a consensus was reviewed and submitted for the next round. During the Delphi process, only one panellist suggested significant changes in the instrument. The items were revised and returned to the vote in the next round.

Criteria for dropping items at each round

If 80% or more of the participants' votes completely disagree or disagreed, the item was excluded from the instrument. After the end of content validation, this stage was complemented with exploratory factor analysis which is described in the later section entitled 'factorial validity'.

Feedback

Quantitative (percentage rating) and qualitative feedback from each round of the Delphi process were incorporated into the survey for the next round. The expert panel was instructed to consider the feedback.

Anonymity

The anonymity among panellists was ensured during the Delphi process as the entire was traditionally handled via remote participation that was coordinated by the researcher(s).³¹ Responses and feedbacks from panellists are always anonymous to everyone except the researcher(s). Therefore, the panellist didn't know the identities of each other or their comments/suggestions.

Pilot study

In order to identify possible doubts regarding the understanding of the items, panellists were asked to indicate health professionals to answer the instrument. Each panellist appointed three health professionals, totalling 36 potential participants. Of these, 28 agreed to participate in the research. If any of the nominated professionals were a panellist during the content validation, this professional was not included in the pilot study. Therefore, the researchers asked to panellist appoint another possible participant.

Health professionals who agreed to participate in the pilot study had to answer the following three questions about the instrument in order to identify difficulties in the use of the Instrument to assess Evidence-Based Health (I-SABE): (1) How long did it take you to answer the instrument?; (2) Was there any difficulty in understanding any question? If YES, please describe it below. (3) Did you have difficulty with the topic?

In the case of a misunderstanding regarding one or more items of the instrument, and of over 20% of the assessed sample, the parts were reviewed by the expert panel.

Evaluation of psychometric characteristics

Study design: this step is a cross-sectional study.

Setting

We gathered the survey participants from the National Register of Health Establishments database (CNES), which hosts free access to data from all public health institutions of Brazil. Queries on CNES can be performed at <http://cnes.datasus.gov.br/> filtering by geographical location (ie, state and municipality), and type of establishment. It also provides the name, role, workload and employment contract of each healthcare professional. We selected only medical professionals, nurses, dentists,

and pharmacists who are working in Brazil's public health sector (Unified Health Care System).

Participants

We included clinical health professionals who are currently working in the public health system and excluded professionals on leave from work for limited or unlimited time during the period of application of the questionnaire, or retired professionals.

Study size

The estimated minimum sample size was based on the requirement of 5–10 subjects per model parameter.³² In 2016, government database registered 240 750 physicians; 182 861 nurses, 58 421 dentists and 20 593 pharmacists. Thus, we choose to work with a representative sample bigger than that recommended for the statistical analysis. Considering a 30% response rate, we estimate a sample size of 1270 respondents needed to answer one of our questions (percentage of prior contact, familiarity with EBP), with 5% precision. To obtain this precision we dichotomized the first item of the survey (being favourable or not to EBP) assuming maximum variability (50% of responses favourable to EBP). A 95% CI was applied to the percentage of favourable responses.

Random sampling

The random sample was performed with the Microsoft Excel software in a central computer considering some stratifications (eg, type of professional, geography, settings). We recruited potential participants through email with an invitation letter containing a link to the web survey. Professionals without e-mail addresses available in CNES were contacted by phone or fax at their workplace and will be sent a physical survey by postal mail to their work addresses.

Data collection

After health professionals agreed to participate in the study, the instrument I-SABE was sent online through the *survey monkey* platform (<https://pt.surveymonkey.com/>).

Data analysis

Data analysis were performed using SPSS (V.20.0) and Stata (V.12.0).

Psychometric sensitivity

The summary and shape measures of the questionnaire items distribution were used to estimate their psychometric sensitivity. Items with a skewness (Sk) greater than 3 and kurtosis (Ku) greater than 7 in absolute values are considered to have psychometric sensitivity issues.³⁰ The diagnosis of multivariate outliers is to be performed by computing the Mahalanobis distance.³⁰

Factorial validity

The exploratory factor analyses (EFAs) were directed to the following domains: self-efficacy, behaviour, attitudes and results/benefits. Therefore, only 20 items were

included in this analysis. All items from domain knowledge/skills and item 21 from the domain attitude were not included since they are not measuring latent variables.

EFA were conducted by using principal axis factoring in order to partition systematic and error variance in the solution.^{33 34} Promax oblique rotation was used, allowing for factor intercorrelations. To promote simple structure, items were retained on a factor if they load at least 0.30 on the primary factor and less than 0.30 on all other factors.³³

Reliability

The reliability of an instrument used for data collection is its coherence, determined by the constancy of the results.³⁵ A reliable (stable) measure is consistent and precise because it provides a constant measurement of the variable.³⁵ To estimate the reliability, both the internal consistency and stability were evaluated.

We explored internal consistency, that is, the reliability estimated from the internal consistency, by using standardised alpha Cronbach coefficient (α), where Cronbach α of 0.7–0.8 is considered satisfactory, 0.8–0.9 is good and 0.9 is excellent.³⁶

Patient and public involvement

No patient was involved.

RESULTS

Development and validation of the instrument

The results of the development and validation of the instrument are described in figure 2.

Development of items

We developed a preliminary instrument containing 31 items across five domains: self-efficacy, behaviour, attitudes, results/benefits to the patient, and knowledge/skills

(online supplemental appendix 1). The instrument was named I-SABE.

Content validity

Three rounds of expert panels were carried out to assess the preliminary instrument. Of the 15 potential experts selected, 12 (80%) agreed to participate in the study. The second and third rounds of instrument evaluation had the participation of 10 (66.7%) experts. Most respondents completed the questionnaire between 15 and 20 min.

In the first round, the experts identified items that were not clear. This process resulted in the exclusion and convergence of items according to the consensus adopted. Thus, 4 items out of 31 instrument items were removed, resulting in 27 remaining items (item 6 was incorporated in the item 2, items 7, 13 and 14 were excluded).

Some experts highlighted the need to include new items, for example, in the ‘Attitude’ domain, the following items were included: ‘The practice of EBP increases the satisfaction of the person in my care’ and ‘The practice of EBP provides an outlet of decision shared with the person in my care’ (item 32 and 33 were added).

In the second round, a consensus was reached for 100% of the domains selected. However, experts emphasised the importance of characterising the health professional’s practice, suggesting the inclusion of items that reflect clinical practice. Thus, after the second round, four items were added, resulting in a total of 31 items. These items, item 21 from the Attitude domain and all items from the Knowledge/Skill domain were not included in the analysis stage of psychometric characteristics, as these questions are not measuring latent variables.

In the third round, experts reached a consensus on the four items suggested in the previous round. Thus, they were included in the instrument. At the end of the content validity, the instrument I-SABE was finalised with

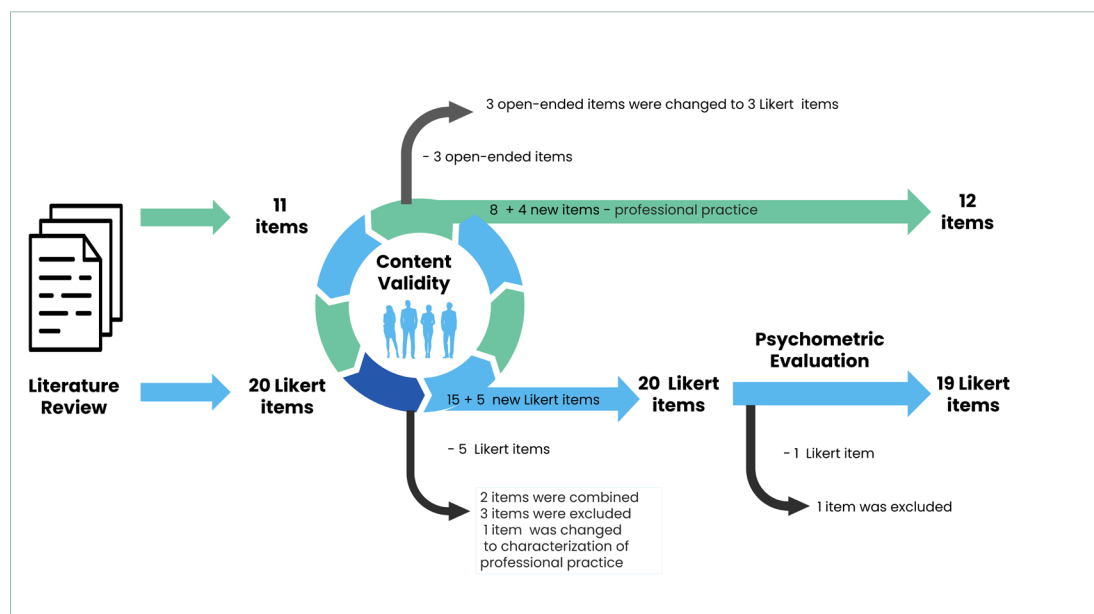


Figure 2 Results of development and validation of the instrument.

31 items across five domains. All changes, inclusion, and exclusion of the items are described in online supplemental appendix 2.

Pilot study

After determining the content validity, the instrument was applied to a sample of 28 health professionals which included physicians, nurses and pharmacists. Based on responses from health professionals, we modified item 19 'Time is a factor that favours my use of EBP'. This item was considered incomprehensible item. The item was reevaluated with members of the expert committee and changed to 'I don't use EBP because I don't have time'. At the end of this stage, 77.7% of the participants reported not feeling any difficulty in filling out the I-SABE instrument and the average completion time was 12 min.

These modifications were included in the new version of I-SABE included which was submitted to the assessment of validity and reliability. The time of each participant took to complete the questionnaire varied between 24 and 66 min. The mean time that participants took to complete the questionnaire was 12 min. The perceived length of the same was deemed appropriate for most participants (88%). The mean perceived difficulty of the questionnaire was 2 (0=very easy; 10=very difficult).

Evaluation of psychometric characteristics

Participants

Of the 2550 health professionals listed, 1380 subjects were recruited from a random sampling. At the end of this stage, the response rate was 15% (figure 3).

The demographic and academic characteristics of 217 Brazilian health professionals who participated in the study were summarised in table 1. The majority of sample were women (n=148; 68.2%), pharmacist (n=84; 38.7%), have specialisation degree (n=90; 41.5%) and work in primary care (n=70; 32.2%). Detailed characteristics of survey respondents are presented in table 1.

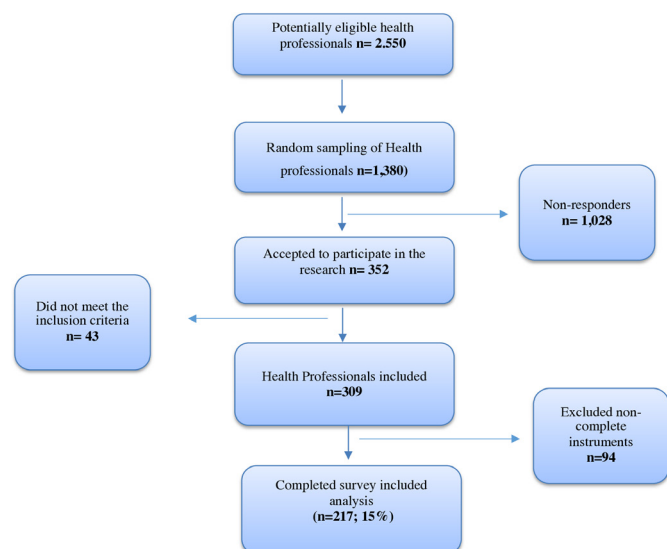


Figure 3 Flow chart of sample composition.

Table 1 Demographic, academic and setting of work characteristics of participants

Characteristics	N=217 (%)
Sex	
Female	148 (68.2)
Male	69 (31.8)
Profession	
Physician	67 (30.8)
Pharmacist	84 (38.7)
Nurse	37 (17.1)
Dentist	4 (1.8)
Physiotherapist	10 (4.6)
Others	15 (6.9)
Time since graduation	
<10 years	95 (43.8)
11–20 years	88 (40.5)
>20 years	34 (15.7)
Education/highest professional degree	
Postdoctoral	14 (6.5)
Doctorate	23 (10.6)
Master's degree	57 (26.3)
Specialisation degree	90 (41.5)
Graduate degree	33 (15.2)
Setting of work	
Primary care	70 (32.2)
Hospital	54 (24.9)
Outpatient clinic	35 (16.1)
University	43 (19.8)
Others	15 (6.9)

Psychometric sensitivity

Sk and Ku are within the commonly agreed-upon thresholds of lower than 1 for Sk and lower than 3 for Ku, indicating a normal distribution of the I-SABE, and, therefore, an adequate psychometric sensitivity (table 2).

Factorial validity

The sample suitability indices presented good conditions for the factorial analysis: Kaiser-Meyer-Olkin of 0.847 and Bartlett's sphericity with $p < 0.001$ (table 3). Visual inspection of the scree plot (figure 4) revealed that the point of inflexion in the plot occurred at the fifth factor, indicating that four factors should be retained.

Varimax orthogonal rotation allowed a more precise classification of each of the factors (domains) (table 4).

The analysis revealed four factors whose eigenvalues were >1 , accounting for 52.6% of the total variance in the measure. After the completion of this step, item 12 was removed because it presented a confounding factor and with a factor load below 0.4. The final instrument is described in

Table 2 Summary and shape measures of I-SABE

Items	Mean	Median	SD	Skewness	Kurtosis
1	1.98	2.00	1.02	1.30	2.95
2	2.18	2.00	1.22	1.43	2.17
3	2.35	2.00	1.06	0.80	0.76
5	2.49	2.00	1.06	0.83	0.75
8	1.61	1.00	0.83	1.49	2.37
9	2.10	2.00	1.06	0.96	0.67
10	2.55	2.00	1.44	1.29	1.37
11	3.10	3.00	1.69	0.66	-0.62
12	4.25	4.00	1.48	0.12	-1.09
15	5.20	6.00	1.45	-0.43	-0.99
16	5.30	6.00	1.42	-0.76	-0.13
17	2.10	2.00	1.05	1.21	2.88
18	3.05	3.00	1.37	0.73	0.13
19	5.05	5.00	1.59	-0.06	-0.56
20	6.04	6.00	1.14	-1.69	3.65
22	2.26	2.00	1.11	1.15	1.77
23	2.22	2.00	0.96	0.91	1.44
24	2.36	2.00	1.00	0.92	1.38
32	2.48	2.00	1.12	0.86	0.69
33	2.69	3.00	1.14	0.66	0.39

I-SABE, Instrument to assess Evidence-Based Health.

online supplemental appendix 3 (Portuguese version) and (online supplemental appendix 4) (English version).

Reliability

The reliability of the I-SABE instrument was assessed by Cronbach's alpha, the values were calculated for each factor, as described in table 5.

DISCUSSION

The robustness of the results of a study depends on the quality and validity of the instrument used. This study presented the development and the initial validation process of an instrument (I-SABE) to verify different aspects of EBP, using a rigorous methodology. Our findings demonstrated that the I-SABE has an overall good level of psychometric properties measured as content and factorial validity, internal consistency reliability in order

Table 3 Value of Kaiser-Meyer-Olkin and Bartlett's tests

Tests	Results
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.847
Bartlett's test of sphericity approx. χ^2	1455.810
Df	210
Sig.	0.000

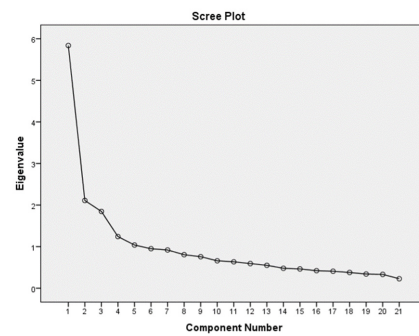


Figure 4 Scree plot graphic.

to measure the four domains of EBP among the different types of health professionals (mainly pharmacists, physicians and nurses), indicating that this instrument is an efficient and effective instrument for use in research and public health settings.

Although several tools combine more than one domain of EBP assessment in a single instrument, these predominantly focus on certain domains (ie, knowledge and skills) and EBP steps (ie, appraise).^{6 9 37-39} To our knowledge, I-SABE is the first tool that has addressed the following five domains in a single instrument: (1) self-efficacy; (2) behaviour; (3) attitude; (4) results/benefits and (5) knowledge/skills.^{6 9}

The I-SABE was designed to evaluate EBP implementation among healthcare professionals with different levels of experience in Brazilian Public Health. Two instruments that assess EBP competencies have been culturally adapted and validated in Brazil.^{40 41} However, these instruments were developed to assess EBP in specific populations such as medical students and nurses. Furthermore, in the literature, few validation studies were developed with a multidisciplinary sample.⁴² However, for EBP to be fully implemented, it is essential to clarify possible differences among healthcare professionals since the EBP is a shared competency.

Regarding the five domains evaluated, the 'self-efficacy' domain had a high factor load for the items and demonstrated a good correlation with the items, suggesting an adequate construction that allows measuring the self-efficacy of health professionals in the use of EBP. The domain 'results/benefits for the patient' accurately also reflects the content of the item and the direction of the I-SABE. This domain is considered an important aspect of EBP since it focuses on the impact of EBP on practice and results.¹³

The internal consistency of I-SABE was assessed by Cronbach's alpha. Some authors recommend that Cronbach's alpha value must be at least between 0.60 and 0.70 to have a reliable instrument.^{43 44} Based on this evidence, it can be observed that self-efficacy, results/benefits to the patient and attitude domains show adequate internal consistency.

On the other hand, we observed a lower internal consistency of the 'behaviour' domain. Low internal

Table 4 Factor structure matrix with orthogonal varimax rotation of I-SABE

Item	Factorial analysis			
	1	2	3	4
1. I am able to incorporate evidence from scientific literature into my practice.	0.171	0.611	-0.183	0.359
2. I am able to access the best evidence of scientific literature in the time I need them.	-0.021	0.773	-0.155	-0.063
3. I am able to critically evaluate the evidence from the scientific literature.	0.133	0.762	-0.12	-0.05
5. I am able to keep up to date with the evidence	0.177	0.778	0.029	0.029
8. I am sure that the implementation of evidence-based health improves my clinical or professional practice.	0.623	0.039	-0.179	0.094
9. I use evidence from research to support my clinical decisions	0.41	0.303	-0.224	0.539
10. I ask colleagues for help in consulting the scientific literature to find answers to my clinical questions.	0.015	0.059	0.068	0.641
11. When the research evidence doesn't support my reliable clinical routines, I feel uncomfortable.	-0.092	-0.034	0.062	0.650
12. I prefer to use my experience to make clinical decisions	0.373	-0.063	0.369	0.370
15. I adopt the EBP practice because my colleagues do it.	0.104	0.007	0.631	0.265
16. It is difficult to change my practice to use EBP	-0.375	-0.375	0.582	0.078
17. EBP makes me feel confident in my clinical decisions.	0.668	0.048	-0.206	0.116
18. I feel that EBP considers my clinical or professional experience.	0.538	0.321	0.204	0.109
19. I don't use EBP because I don't have time	0.023	-0.399	0.633	-0.021
20. I feel that EBP worsens the quality of my clinical decisions.	-0.325	-0.085	0.582	-0.019
22. EBP positively affects my clinical decisions.	0.667	0.070	-0.466	0.094
23. EBP positively affects the health results of the person under my care.	0.701	0.048	-0.323	0.032
24. New research evidence results in a change in my practice.	0.609	0.042	-0.222	0.149
32. EBP provides a decision-making shared with the person under my care.	0.725	0.160	0.101	-0.101
33. EBP increases the satisfaction of the person under my care.	0.754	0.121	-0.021	-0.152
Values	5.838	2.110	1.847	1.242
Explained Variance	27.801	10.048	8.795	5.913

I-SABE, Instrument to assess Evidence-Based Health.

consistency suggested that the items within the construct of 'behaviour' were low correlated. A possible explanation might be the low number of items (n=3) in this domain. Cronbach's alpha values are quite sensitive to the number of items in the scale, and with short scales (<10 items) it is common to find quite low Cronbach's alpha values.

This limitation is in agreement with the findings reported for other studies. For instance, in the validation study of the ACE scale (Assessing medical trainees' competency in evidence-based medicine), the authors

identified a low internal consistency to questions about a critical appraisal, with specific reference to selection and performance bias.⁴⁵ Findings from the evidence-based practice -knowledge, attitude, behavior questionnaire (EBP-KABQ) also observed lower internal consistency of the 'knowledge' domain compared with other items, suggesting that the six items within this construct were not adequately correlated.⁴⁶

Finally, although the 'knowledge and skill' domain was not included in the analysis stage of psychometric characteristics since these questions are not measuring latent variables. The I-SABE considered the requirements from the CREATE framework, examining user knowledge and skills across steps 1–4 of the EBP process.¹³

Strengths and limitations

This study was developed through a rigorous process, which involved the integration of evidence from the literature using a theoretical framework, a Delphi survey for the validity of the content and psychometric assessments. As a strength, we use the CREATE taxonomy as

Table 5 Cronbach's alpha values for each factor (domain)

Factor	Cronbach's alpha	Cronbach's alpha based on standardised items	No of items
Self-efficacy	0.762	0.764	4
Behaviour	0.302	0.322	3
Attitudes	0.644	0.650	4
Results	0.835	0.840	5

a framework to elaborate and the instrument.¹³ This framework has been developed by a specialist group and describes seven areas of evaluation of EBP educational interventions, out of which five were used as a framework for the I-SABE. Second, the content of the instrument was based on a literature review and was validated by a panel of experts, and was pretested, which strengthened its validity. Third, we performed a simple random sampling of Brazilian healthcare professionals to select the participants of the study. Although the sample was relatively low when compared with the total number of professionals previously selected, the number of 217 healthcare professionals was sufficient to perform factors analysis since sample size calculation was based on a participant to item ratio of 5:1.³²

However, there are some limitations to be considered. Web surveys are known to produce lower response rates compared with other data collection modalities.⁴⁷ Although the response rate was 15%, this survey presented a good number of respondents from different types of healthcare professionals (physicians, nurses and pharmacists) coming from diverse practice settings with different levels of experience, thus providing a better idea of the overall knowledge and use of EBP in public health settings than many previous studies, frequently focused on a specific profession and a particular setting. Additionally, we had a higher proportion of pharmacists (38.7%) compared with other healthcare professionals (30.8% physicians: 17.1% nurses and 13.4% other healthcare professionals). It is important to note that we only included clinical pharmacists who work with healthcare teams in patient care and who was involved in the selection of intervention or medication for patients. Pharmacists have a crucial role in the health system to maintain the rational use of medicine and provide pharmaceutical care to patients.⁴⁸ EBP is an essential approach to promote the rational use of medications, making sure that patients receive the right medicine in the right dose for the right diagnosis at the right time at the lowest possible cost suitable to their requirements.⁴⁸ Finally, the composite reliability was not performed in this research. It is suggested that it be verified using future studies to assess reliability with greater robustness, as well as confirmatory factor analysis, which makes it necessary to compose a larger sample of health professionals to administer the instrument.

Implications for clinical practice and future research

The I-SABE was found to be a valid and reliable instrument to assess self-efficacy, behaviour, attitude and results/benefits towards EBP in Brazil. This tool can be used to measure the EBP competencies of healthcare professionals in Brazil and to identify barriers to and facilitators of EBP in clinical practice in order to improve the implementation of this practice. In addition, the instrument can be used in educational activities, as well as an assessment tool among healthcare professionals in different public healthcare settings.

CONCLUSION

The I-SABE is a valid and reliable instrument to assess the EBP among healthcare professionals. The application of this instrument is simple, quick, and provides a reliable assessment of the EBP in the main stages of the execution of the EBP in order to favour their implementation. Future research is required to further examine other psychometric properties of I-SABE and its utility in patient care.

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APPENDIX 1 - Definition of domains in SBE practices.

Domain	Definition
Self-efficacy	It refers to people's judgments regarding their ability to perform a certain activity (BANDURA, 1977). For example, an individual's confidence in his or her ability to search for evidence may be related to his or her efforts to search for scientific evidence (SALBACH et al., 2009).
Knowledge	It is attributed to the concepts about SBE. Knowledge assessments can measure an individual's ability to define SBE concepts, list basic EBP principles or characterize levels of scientific evidence. Thus, knowledge assessment questions can ask health professionals to define the "Number Needed to Treat" or identify the "type of study" most appropriate to answer a given clinical question (TILSON et al., 2011).
Behavior	It refers to the individual's real performance in his practice. As for example, the professional changes his service after analyzing a synthesis of evidence (TILSON et al., 2011)
Attitudes	Attitudes are strong indicators of future behavior (AJZEN, 1991) There is evidence that individuals' confidence in the benefits of evidence-based practices are related to the degree that they implement the practice of EBP in their work (MEINYK et al., 2017).
Results / Benefits to the patient	The goal of EBP is to improve health care outcomes for patients. Therefore, it is essential to assess the impact of EBP on the benefit of patients (STRAUS et al., 2004) (NABULSI et al., 2007).
Skills	Skills refer to the application of knowledge, ideally in a practical environment (FREETH et al., 2006) Skill assessment would require clinicians to "do" a task associated with EBP, such as conducting research, use a critical assessment tool to summarize the quality of the study, for example, or

	calculating the number needed to treat (TILSON et al., 2011).
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APPENDIX 2 - Changes to the items that make up the I-SABE, during content validation.

I-SABE preliminary	I-SABE after content validity
Self-efficacy	
1- I am confident in my ability to adopt evidence-based health practice.	1- I am able to incorporate evidence from the scientific literature into my practice.
2- I feel able to find the best available evidence	2- I am able to access the best evidence from the scientific literature, in the time I need them.
3- I feel that I am able to critically assess the evidence coming from my search of the scientific literature.	3- I am able to critically assess evidence from the scientific literature.
4- I feel I am able to apply the evidence from the research to the care of individual patients.	This item was excluded.
5- I feel able to keep up with the evidence.	5- I am able to keep up to date with the evidence.
6- I feel able to access (search and find) the best clinical evidence at the time I need it	This item was Incorporated in the item 2.
7- I am unsure about how to measure the results of my own clinical practice.	This item was excluded.
8- I am sure that implementing Evidence Based Health (SBE) improves my clinical or professional practice.	8- I am sure that implementing Evidence Based Health improves my clinical or professional practice.
Attitude	
9- I often use research evidence to support my clinical decisions.	9- I use research evidence to support my clinical decisions
10- I ask colleagues for help in searching the scientific literature to find answers to my clinical questions.	10- I ask colleagues for help in consulting the scientific literature to find answers to my clinical questions.
11- When the research evidence does not support my reliable clinical routines, I feel uncomfortable.	11- I feel uncomfortable when research evidence does not support my clinical or professional practices.
12- I prefer to use my own experience to make my clinical decisions.	12- I prefer to use my own experience to make my clinical decisions.
13- I rarely look for available research evidence to answer my daily clinical question.	This item was excluded.
14- I frequently, at least twice a week, access evidence provided by Cochrane	This item was excluded.
Behavior	
15- I use the EBP because my peers do.	15- I adopt the EBP because my peers do.

16- I don't use EBP because it's hard to change my practice.	16- It is difficult to change my practice to use EBP.
17- EBP makes me feel autonomous in my clinical decisions	17-EBP makes me feel confident in my clinical decisions
18- I feel that SBE disregards my clinical experience.	18- I feel that EBP considers my clinical or professional experience.
19- I don't use EBP because I don't have time.	19- I don't use EBP because I don't have time.
20- I feel that EBP worsens the quality of my clinical decisions.	20- I feel that EBP worsens the quality of my clinical decisions.
21- I do not use EBP in my clinical practice for another reason (please specify).	21- I do not use EBP in my clinical practice for another reason (please specify).
Results/Benefits to the patient	
22- How much has the use of the EBP affected patient outcomes?	22- The EBP positively affects the health outcomes of the patient under my care.
23- How much has the use of the EBP practice affected your clinical decisions?	23 - The EBP positively affects my clinical decisions
24- How often does new research evidence result in a change in your practice?	24 - New research evidence results in change in my practice.
25- The institution where I work (in cases of working in two institutions, answer considering the one that devotes the most hours) has already implemented EBP.	This item has been changed to characterization of professional practice.
	32.The EBP provides a shared decision-making with the person under my care
	33. The EBP increases the satisfaction of the person under my care.
Knowledge/Skills	
26- Clinical trials and observational methods are equally valid in establishing the effectiveness of a treatment.	26- Randomized controlled trials and observational studies are equally valid in determining the effectiveness of a treatment.
27- Publication bias (Funel plot) in a meta-analysis represents selection bias	27-Publication bias in a meta-analysis represents selection bias.
28- Randomization in a clinical trial helps to reduce sample size.	28- Randomization in a clinical trial helps to reduce sample size.
29- Cross-sectional studies are the best designs to assess prognostic factors.	29- Cross-sectional studies are the best designs to assess prognostic factors.
30- A recent randomized clinical trial found that 29% of diabetics with coronary heart disease treated with	30- A recent randomized clinical trial found that 29% of diabetics with coronary heart

pravastatin had a recurrent coronary event during five years of follow-up. Whereas, in the placebo group, 37% suffered recurrent coronary events. The absolute risk reduction for recurrent events is 8%. The relative risk reduction for recurrent events is 22%. The number needed to treat to prevent a recurrent event is 12.5.

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31- The recent HERS study compared women using estrogen replacement hormone versus women using a placebo. The results revealed a relative risk of thromboembolic events of 2.89 for women who used estrogen. This suggests that estrogen treatment poses a coronary risk. For this difference to be statistically significant, the confidence interval must be checked. An example of a confidence interval that would lead us to conclude that the rate of venous thromboembolic events was indeed (statistically) different for these two treatment groups would be something that encompasses 2.89 and includes the 1.0 within the interval.

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Characterization of professional practice

25- The institution where I work (in cases of working in two institutions, answer considering the one that devotes the most hours) has already implemented EBP.

34- Check the options that reflect your challenges to implement SBE practices (select the three most important options)

- There is no culture of SBE practice in my workplace
- Insufficient evidence for many everyday health problems
- Lack of institutional support
- Lack of time
- Lack of access to information source

35. In my practice I use clinical protocols developed by (Select the possible options):

- Ministry of Health
- Brazilian Scientific Societies
- International Guidelines (eg: NICE)
- By the Hospital, Institute or place where I work
- By myself, based on readings from scientific studies and my background
- I do not use protocols in my practice

36- Below are some terms related to the presentation of the results of clinical investigations. Please, check your degree of familiarity with the following terms:

37- There are several platforms available aimed at EBP. Please, check your degree of familiarity with the following platforms:

APPENDIX 3 - FINAL INSTRUMENT - PORTUGUESE VERSION

I-SABE

Autoconfiança

Por favor, circule a resposta mais apropriada:	Concordo plenamente	Concordo	Concordo parcialmente	Neutro	Discordo parcialmente	Discordo	Discordo plenamente
1. Eu sou capaz de incorporar na minha prática a evidência proveniente da literatura científica.	7	6	5	4	3	2	1
2. Eu sou capaz de acessar (buscar em bases eletrônicas, usando estratégias de busca e encontrar) as melhores evidências da literatura científica, no tempo que necessito delas.	7	6	5	4	3	2	1
3. Eu sou capaz de avaliar criticamente a evidência proveniente da literatura científica.	7	6	5	4	3	2	1
4. Eu sou capaz de manter-me atualizado em relação às evidências.	7	6	5	4	3	2	1
5. Estou certo de que a implementação da Saúde Baseada em Evidência (SBE) melhora minha prática clínica ou profissional	7	6	5	4	3	2	1

Atitudes

Por favor, circule a resposta mais apropriada	Concordo plenamente	Concordo	Concordo parcialmente	Neutro	Discordo parcialmente	Discordo	Discordo plenamente
6. Eu uso as evidências provenientes de pesquisa para apoiar as minhas decisões clínicas.	7	6	5	4	3	2	1
7. Eu peço ajuda aos colegas na consulta à literatura científica para encontrar respostas às minhas perguntas clínicas.	7	6	5	4	3	2	1
8. Eu me sinto desconfortável quando as evidências de pesquisa não sustentam minhas práticas clínicas ou profissionais.	7	6	5	4	3	2	1

Comportamento

Por favor, circule a resposta mais apropriada: atitude	Concordo plenamente	Concordo	Concordo parcialmente	Neutro	Discordo parcialmente	Discordo	Discordo plenamente
9. Eu adoto a prática da SBE porque meus colegas o fazem.	7	6	5	4	3	2	1
10. É difícil mudar a minha prática para usar a SBE	7	6	5	4	3	2	1
11. A SBE me faz sentir confiante em minhas decisões clínicas	7	6	5	4	3	2	1
12. Eu não uso SBE porque eu não tenho tempo	7	6	5	4	3	2	1
13. Eu sinto que a SBE piora a qualidade das minhas decisões clínicas.	7	6	5	4	3	2	1
14. Eu sinto que a SBE considera minha experiência clínica ou profissional.	7	6	5	4	3	2	1
15. Eu não adoto a prática da SBE por outra razão (especifique):							

Resultados/Benefícios para o paciente

Por favor, circule a resposta mais apropriada:	Completamente	Muito	Moderadamente	Mais ou menos	Um pouco	De nenhum modo
16. A prática da SBE afeta positivamente minhas decisões clínicas.	6	5	4	3	2	1
17. A prática da SBE afeta positivamente os resultados em saúde da pessoa sob meus cuidados.	6	5	4	3	2	1
18. Novas evidências de pesquisa resultam em mudança na minha prática.	6	5	4	3	2	1
19. A prática da SBE propicia uma tomada de decisão compartilhada com a pessoa sob meus cuidados.	6	5	4	3	2	1
20. A prática da SBE aumenta a satisfação da pessoa sob meus cuidados.	6	5	4	3	2	1

Conhecimento/Habilidades

Por favor, assinale a resposta mais apropriada:

	Correto	Incorreto	Não sei
21. Ensaios clínicos controlados, randomizados e os estudos observacionais são igualmente válidos na determinação da efetividade de um tratamento.			
22. Viés de publicação em uma metanálise representa viés de seleção.			
23. A randomização em um ensaio clínico ajuda a reduzir o tamanho amostral.			
24. Estudos transversais são os melhores delineamentos para avaliar fatores prognósticos.			
25. Um recente ensaio clínico randomizado descobriu que 29% dos diabéticos com doença coronariana tratados com pravastatina, apresentaram evento coronariano recorrente durante cinco anos de seguimento. Enquanto que, no grupo placebo, 37% sofreram eventos coronarianos recorrentes. A redução absoluta do risco para eventos recorrentes é 8%. A redução do risco relativo para eventos recorrentes é 22%. O número necessário para tratar para prevenir um evento recorrente é 12,5.			
26. O estudo recente HERS comparou mulheres que utilizam reposição hormonal com estrogênio versus mulheres que utilizaram placebo. Os resultados revelaram um risco relativo de eventos tromboembólicos de 2,89 para as mulheres que usaram estrogênio. Isso sugere que o tratamento com estrogênio representa risco coronariano. Para que esta diferença seja estatisticamente significativa, deve-se verificar o intervalo de confiança. Um exemplo de intervalo de confiança que nos levaria a concluir que a taxa de eventos tromboembólicos venozos foi de fato (estatisticamente) diferente para estes dois grupos de tratamento seria algo que englobe 2,89 e inclui o 1,0 dentro do intervalo.			

Caracterização da prática profissional

27. Marque as opções que traduzem os seus desafios para implementar as práticas da SBE (selecione as três opções mais importantes)

- Não existe cultura da prática da SBE em meu local de trabalho
- Evidências insuficientes para muitos dos problemas de saúde cotidianos
- Falta de apoio institucional
- Falta de tempo
- Falta de acesso às fontes de informação

- Método complexo de aprender e de dominar
 Não tenho dificuldades para tomar decisões de acordo com os fundamentos propostos pela prática da SBE
 Nenhuma das anteriores, pois não utilizo a prática da SBE.

28 . Na minha prática utilizo protocolos clínicos elaborados por (Selecione as opções possíveis):

- Ministério da Saúde
 Sociedades Científicas Brasileiras
 Guidelines Internacionais (ex.: NICE)
 Pelo Hospital, Instituto ou local que trabalho
 Por mim mesmo, com base em leituras de estudos científicos e meu *background*
 Não utilizo protocolos na minha prática

29. Abaixo estão alguns termos relacionados com a apresentação dos resultados das investigações clínicas.

Marque o seu grau de familiaridade com os mesmos.	Eu entendo e utilizo	Eu entendo mas não utilizo	Eu não entendo
Revisão sistemática			
Metanálise			
Intervalo de confiança			
Grade			
Odds ratio, Risco relativo, Risco absoluto			
Número de pacientes necessários para tratar (NNT)			
Razão de verossimilhança (likelihood ratio)			

30. Existem vários recursos disponíveis voltados para as práticas da SBE.

Informe as plataformas que você já consultou.	Não conheço	Conheço mas nunca utilizei	Conheço e utilizei apenas algumas vezes	Conheço e utilizo regularmente na minha prática
Cochrane Library (ou Cochrane plus ou Biblioteca Cochrane)				
UptoDate				
Pubmed				
Trip Database				
Dynamed				
Scielo				

BMJ Best Practice							
NICE Clinical Guidelines							
Biblioteca Virtual em Saúde (BVS)							
Portal Saúde Baseada em Evidências do Ministério da Saúde							
Health Systems Evidence e Health Evidence							
Outro (especifique:							
31. Por favor, circule a resposta mais apropriada	Concordo plenamente	Concordo	Concordo parcialmente	Neutro	Discordo parcialmente	Discordo	Discordo plenamente
A instituição onde trabalho (nos casos de atuar em duas instituições, responda considerando aquela à qual dedica maior número de horas) implementa as práticas de SBE.	7	6	5	4	3	2	1

APPENDIX 4 - FINAL INSTRUMENT – ENGLISH VERSION

Self-efficacy

Please circle the most suitable answer:	Strongly Agree	Agree	Somewhat Agree	Neutral	Somewhat Disagree	Disagree	Strongly Disagree
1. I am able to incorporate evidence from the scientific literature into my practice.	7	6	5	4	3	2	1
2. I am able to access the best evidence from the scientific literature, in the time I need them.	7	6	5	4	3	2	1
3. I am able to critically assess evidence from the scientific literature.	7	6	5	4	3	2	1
4. I am able to keep up to date with the evidence.	7	6	5	4	3	2	1
5. I am sure that implementing EBP improves my clinical or professional practice	7	6	5	4	3	2	1

Attitude

Please circle the most suitable answer:	Strongly Agree	Agree	Somewhat Agree	Neutral	Somewhat Disagree	Disagree	Strongly Disagree
6. I use research evidence to support my clinical decisions.	7	6	5	4	3	2	1
7. I ask colleagues for help in consulting the scientific literature to find answers to my clinical questions.encontrar respostas às minhas perguntas clínicas.	7	6	5	4	3	2	1
8. I feel uncomfortable when research evidence does not support my clinical or professional practices.	7	6	5	4	3	2	1

Behavior

Please circle the most suitable answer:	Strongly Agree	Agree	Somewhat Agree	Neutral	Somewhat Disagree	Disagree	Strongly Disagree
9. I adopt the EBP because my peers do.	7	6	5	4	3	2	1
10. It is difficult to change my practice to use EBP.	7	6	5	4	3	2	1
11. EBP makes me feel confident in my clinical decisions	7	6	5	4	3	2	1

12. I feel that EBP worsens the quality of my clinical decisions.	7	6	5	4	3	2	1
13. I feel that EBP considers my clinical or professional experience.	7	6	5	4	3	2	1
14. I do not use EBP because I don't have time.	7	6	5	4	3	2	1
15. I do not use EBP in my clinical practice for another reason (please specify).							

Results/Benefits to the patient

Please circle the most suitable answer:	Strongly Agree	Agree	Somewhat Agree	Neutral	Somewhat Disagree	Disagree
16. The EBP positively affects my clinical decisions	6	5	4	3	2	1
17. The EBP positively affects the health outcomes of the patient under my care.	6	5	4	3	2	1
18. New research evidence results in change in my practice.	6	5	4	3	2	1
19. The EBP provides a shared decision-making with the person under my care	6	5	4	3	2	1
20. The EBP increases the satisfaction of the person under my care.	6	5	4	3	2	1

Knowledge/Skills

Please tick (✓) the most appropriate option	Correct	Incorrect	I do not Know
21. Randomized controlled trials and observational studies are equally valid in determining the effectiveness of a treatment.			
22. Publication bias in a meta-analysis represents selection bias.			
23. Randomization in a clinical trial helps to reduce sample size.			
24. Cross-sectional studies are the best designs to assess prognostic factors.			
25. A recent randomized clinical trial found that 29% of diabetics with coronary heart disease treated with pravastatin had a recurrent coronary event during five years of follow-up. Whereas, in the placebo group, 37% suffered recurrent coronary events. The absolute risk reduction for recurrent events is 8%. The relative risk reduction for recurrent events is 22%. The number needed to treat to prevent a recurrent event is 12.5.			
26. The recent HERS study compared women using estrogen replacement hormone versus women using a placebo. The results revealed a relative risk of thromboembolic events of 2.89 for women who used estrogen. This suggests that estrogen treatment poses a coronary risk. For this difference to be statistically significant, the confidence interval must			

be checked. An example of a confidence interval that would lead us to conclude that the rate of venous thromboembolic events was indeed (statistically) different for these two treatment groups would be something that encompasses 2.89 and includes the 1.0 within the interval.

Characterization of professional practice

27 . Check the options that reflect your challenges to implement EBP (select the three most important options)

- There is no EBP culture in my workplace
- Insufficient evidence for many health problems
- Lack of institutional support
- Lack of time
- Lack of access to information sources
- Complex method of learning and mastering
- I have no difficulties in making decisions according to the fundamentals proposed by the EBP.
- None of the above, I do not use the EBP

28 . In my practice I use clinical protocols developed by (Select the possible options):

- Ministry of Health
- Brazilian Scientific Societies
- International Guidelines (ex.: NICE)
- Hospital, Institute or place where I work
- By myself, based on readings from scientific studies and my background
- I don't use protocols in my practice

29. Below are some terms related to the presentation of the results of clinical investigations.

Please, check your degree of familiarity with the following terms:	I understand and use	I understand but I don't use	I do not understand
Systematic review			
Meta-analysis			
Confidence interval			
Grade			
Odds ratio, Relative risk, Absolute risk			

Number of patients needed to treat (NNT)			
Likelihood ratio			

30. There are several platforms available aimed at EBP

Please, check your degree of familiarity with the following platforms:	I don't know	I know but I've never used it	I know and I've only used it a few times	I know and use it regularly in my practice
Cochrane Library (ou Cochrane plus ou Biblioteca Cochrane)				
UptoDate				
Pubmedyu				
Trip Database				
Dynamed				
Scielo				
BMJ Best Practice				
NICE Clinical Guidelines				
Biblioteca Virtual em Saúde (BVS)				
Portal Saúde Baseada em Evidências do Ministério da Saúde				
Health Systems Evidence e Health Evidence				
Outro (especifique)_____				

31. Please circle the most suitable answer:

The institution where I work (in the case of working in two institutions, answer considering the one to which you dedicate the most hours) implements EBP..

Strongly Agree	Agree	Somewhat Agree	Neutral	Somewhat Disagree	Disagree	Strongly Agree
7	6	5	4	3	2	1