

Evidence-based practice implementation in healthcare in China: a living scoping review

Junqiang Zhao,^{a,*} Wenhui Bai,^b Qian Zhang,^a Yujie Su,^c Jinfang Wang,^d Xiaoning Du,^b Yajing Zhou,^e Chang Kong,^d Yanbing Qing,^e Shaohua Gong,^e Meiqi Meng,^e Changyun Wei,^e Dina Li,^e Jian Wu,^e Xuejing Li,^e Wenjun Chen,^{a,f,*} and Jiale Hu,^g

^aSchool of Nursing, Faculty of Health Sciences, University of Ottawa, Ottawa, Canada

^bDepartment of nursing, Henan Provincial Key Medicine Laboratory of Nursing, Henan Provincial People's Hospital, Zhengzhou, China

^cSchool of Nursing, Lanzhou University, Lanzhou, China

^dSchool of Nursing, Shandong University of Traditional Chinese Medicine, Jinan, China

^eSchool of Nursing, Beijing University of Chinese Medicine, Beijing, China

^fXiangya School of Nursing, Central South University, Changsha, China

^gDepartment of Nurse Anesthesia, Virginia Commonwealth University, Richmond, USA

Summary

Background Evidence-based practice (EBP) implementation plays a crucial role in bridging the knowledge-action gaps and reducing health inequities. Little is known about its development in China. This study aims to provide an overview of the EBP implementation research progress in healthcare in China and identify gaps for future studies.

Methods We conducted a scoping review following the Joanna Briggs Institute scoping review methodology and the Cochrane Collaboration's guidance on living reviews. We performed a literature search in four Chinese databases (i.e., China National Knowledge Infrastructure, Wan Fang Database, The VIP Database, and China Biology Medicine) and three English databases (i.e., Ovid MEDLINE, the Cumulative Index to Nursing and Allied Health Literature, and EMBASE), Google scholar, and Baidu scholar from 1996 to 2021. We included EBP implementation studies conducted in healthcare settings in China and were published in Chinese and English literature. The search will be run on a regular basis to monitor the development of new literature and determine when to update the review.

Findings Of the 11,276 records identified, we finally included 309 papers. The publications were on a sharp rise since 2013 and were predominantly from the nursing field (292/309, 94.50%). The commonly researched areas were symptom management (75/309, 24.27%), tube care (46/309, 14.89%), perioperative care (43/309, 13.92%), and fundamental care (43/309, 13.92%). Joanna Briggs Institute model was the most frequently used model to guide the implementation process (92/159, 59.75%). A median number of 8 people often comprised an implementation team, with 113 studies (36.57%) taking a multidisciplinary approach. 204 studies reported utilizing audit criteria to assist evaluation of evidence implementation rate with diversified methods measuring the criteria. Lack of knowledge, skills, and resources, and incomplete procedures or pathways were top barriers impeding EBP implementation. Leadership support was considered the most common facilitator. Education and training were the most frequently described implementation strategies for healthcare professionals and patients. Optimizing workflows and developing evaluation tools were the primary strategies adopted by organizations. 291 studies measured patient outcomes and 174 studies measured healthcare professional outcomes.

Interpretation To our knowledge, this scoping review is the first one to systematically examine the EBP implementation research progress in healthcare in China. Based on this review, we identified contributions that Chinese EBP implementation research made to the global community, and provided eight recommendations for Chinese researchers in conducting implementation studies in the future.

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*Corresponding authors: Junqiang Zhao and Wenjun Chen, School of Nursing, Faculty of Health Science, University of Ottawa, 451 Smyth Road, Ottawa, Canada K1H 8M5. Telephone: +01 819 212 4678, +01 343 777 8968.

E-mail addresses: jzhao126@uottawa.ca (J. Zhao), wchen140@uottawa.ca (W. Chen).

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Introduction

One of the most consistent findings from clinical and health services research is the slow progress of applying research evidence into practice and decision-making.¹

Research in context

Evidence before this study

Despite the increased attention on evidence-based practice (EBP) implementation in Chinese healthcare in recent years, limited evidence is available on its overall development. A literature search using a broad search strategy (“evidence-based practice implementation” [Mesh term and search term] AND Review [publication type] AND Chin* [setting]) within the seven databases mentioned in the manuscript failed to identify any reviews on this topic. We only retrieved two scoping reviews (one in English and one in Chinese) on evidence implementation in Chinese nursing field.

Added value of this study

This is the first scoping review to systematically examine the EBP implementation research progress in Chinese healthcare. It enriches and strengthens the evidence base of EBP implementation research in low- and middle-income countries. This review provides a big picture of the basic characteristics, research designs, theory use, determinants, implementation strategies, and outcomes reported in EBP implementation studies and may play a foundational role to inform future implementation studies in China. Based on the review findings, we identified gaps between Chinese EBP implementation research and the global status and offered corresponding recommendations on how to advance Chinese implementation research to promote healthcare quality and equity.

Implication of all the available evidence

1) Healthcare professionals from non-nursing disciplines should also engage in and lead implementation projects to narrow the evidence-practice gaps in all healthcare domains; 2) Using rigorous research designs to evaluate EBP implementation outcomes; 3) Engaging knowledge users into the implementation process and establishing partnerships; 4) Harnessing the power of theories and theorizing in implementation research; 5) Understanding the interrelationship among implementation determinants from a complexity science perspective; 6) Using systematic and theory-informed approaches to develop implementation strategies and describing the development process and content adequately; 7) Developing a common nomenclature for implementation strategy terms, definitions, and categories; 8) Paying more attention to healthcare professional's behavior change and implementation outcomes in EBP implementation projects.

Within the last 20 years, the field of knowledge translation has thrived with the aim of reducing knowledge-action gaps. Knowledge translation is defined as “a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge to improve the health, provide more effective health services and products and strengthen the health care system”.² It has been used interchangeably with other terms to express nuanced meanings, such as knowledge transfer, knowledge uptake, and knowledge utilization, which has caused confusion.³ We referred to the operationalization of knowledge translation by Strifler and colleagues⁴ and considered it to include both “implementation practice (i.e., implementation research evidence into practice) and implementation science (P. 93)”. To make it explicit that our focus was on the knowledge application and to avoid confusion, we used the term *evidence-based practice (EBP) implementation* in our review.

Nowadays academic institutions, educational programs, training opportunities, and funding policies have emerged to facilitate the EBP implementation globally,^{5,6} especially in developed countries, such as the United States,⁷ UK,⁸ and Canada.⁹ EBP implementation not only helps to bridge the knowledge-action gaps at the local level but also plays a crucial role in reducing health inequities globally.¹⁰ To achieve the goal of health for all, implementation evidence should not only be accumulated from high-income countries but also be generated from low- and middle-income countries, so that more contextualized and cost-effective strategies can be developed and applied to the local context.¹¹ Despite the considerable efforts taken to implement EBP in low- and middle-income countries,¹² recent reviews^{13,14} and primary studies¹⁵ revealed various barriers at the individual and organizational levels in conducting implementation research and practice, such as inadequate knowledge and skills, and insufficient funding. China, as one of the largest low- and middle-income countries, faces some unique features that further complicate EBP implementation, such as the large population, the high burden of diseases, and the extreme shortage of healthcare providers. Yet, up to now, no reviews have been done to understand the EBP implementation status in healthcare in China.

In China, EBP implementation has gained increased attention among policymakers and healthcare researchers since the last decade. It can date back to 2003¹⁶ or even earlier. In recent years, the Chinese government has issued a series of policies to promote the “Healthy China” national strategy with the goal of improving health for all. Under those policies, various knowledge mobilization initiatives by different level organizations have been implemented to make healthcare knowledge accessible to the general population.^{17,18} In the academic field, affiliation centers of the globally recognized EBP

implementation organizations (e.g., World Health Organization Collaborating Centre for Guideline Implementation and Knowledge Translation, Joanna Briggs Institute (JBI), Best Practice Spotlight Organizations) have been established to adapt the most up-to-date knowledge into Chinese healthcare and boost local implementation research and practice.^{19,20} The national planning textbook *Evidence-Based Nursing* for graduate nursing students has added chapters on evidence implementation theories and case studies, alongside the evidence synthesis methodologies. Open access online courses on knowledge translation in healthcare were also developed to improve researchers' and healthcare providers' knowledge and capacity on EBP implementation.^{21,22}

Along with the increased recognition and embracement of EBP implementation is its publication growth. Based on our rough search in the China Biology Medicine database, using the subject headings "evidence-based practice implementation" or "evidence implementation", we retrieved approximately 9000 papers published from 1996 (EBP implementation publications had become prevalent since 1996²³) to 2021 with a rising tendency. Surprisingly, even with such proliferation in publications, we did not find even one review published in Chinese or English systematically examining the development status of EBP implementation in healthcare in China. Two scoping reviews were located synthesizing China's implementation literature in nursing.^{16,24} Cheng et al. identified 95 papers from 2001 to 2015 after searching eight databases.¹⁶ Another review is a recent publication by Zhou et al. in 2020. They retrieved 152 nursing evidence implementation studies from the inception of databases to January 2020 after searching four Chinese databases.²⁴ These two papers offered rich information on the EBP implementation research progress in Chinese nursing field, such as study designs, theory use, and implementation strategies. However, several limitations existed in the two reviews. First, Cheng et al.'s review limited the research setting to tertiary care, which resulted in the exclusion of 385 papers at the full-text screening stage. While it is understandable to restrict the settings to make the review manageable, the rationale for such a criterion was not justified. Second, Zhou et al.'s review excluded all case reports on EBP implementation without justifying the rationale. To our knowledge, case report was an extensively used method in Chinese implementation research in the past few years and Cheng's review confirmed our assumption in that 60 of the included 95 papers (63%) were case studies.¹⁶ Third, some inconsistent findings were identified between the two reviews: a) the overall number of publications retrieved in these two reviews contradicted each other. Zhou et al.'s review only found seven nursing implementation papers published before 2015. Whereas Cheng et al. included 95 papers from 2001 to 2015 (when excluding case reports, they still got 35 papers); b) the contradictory number of publications further led to

the inconsistency in other research findings, such as the numbers and proportions of different study designs and different theories used.

Considering the lack of a big picture of the extent of EBP implementation research in healthcare, and the limitations of the two reviews in nursing field, it becomes very essential to conduct a scoping review to have an overview of the EBP implementation research progress in healthcare in China and identify knowledge gaps for future research.

Methods

We conducted this research following the JBI scoping review methodology²⁵ and reported the research findings in accordance with the PRISMA Extension for Scoping Reviews.²⁶ Scoping review methodology can assist researchers in identifying available evidence and examining the research progress in a certain field.²⁷ This methodology is appropriate for our study in that we aim to characterize the nature of EBP implementation research and identify research gaps to inform future studies. We did not register the protocol for this review. This scoping review is a precursor to a scoping review examining the theory use in knowledge translation studies in healthcare in China, the protocol of which has been published.²⁰ The six steps below delineated the research procedures for this scoping review.

Review question

The purpose of this scoping review is to have an overview of the EBP implementation research progress in healthcare in China. Based on this purpose, the following research questions are formulated:

- 1) What is the extent of EBP implementation research in healthcare in China?
- 2) How is the EBP implementation research conducted?
- 3) What are the outcomes reported in those EBP implementation studies?

Inclusion criteria

We developed the eligibility criteria based on EBP implementation literature and several rounds of discussion within the research team, and presented the criteria from the four aspects (i.e., participants, concept, context, and types of sources) suggested by JBI.²⁵

- 1) Participants

Any healthcare professional, healthcare administrator, patient, or consumer of health care products were eligible in our study.

2) Concept

We considered EBP implementation to include not only implementation practice which is about applying research evidence into practice but also implementation science that aims to investigate the effectiveness of implementation strategies.⁴ Studies meeting all the following criteria were considered an EBP implementation study in our review:

- a) Reported the content of interventions and the evidence sources.
- b) Described the EBP implementation processes, namely how the evidence was implemented.
- c) Reported at least one outcome of interest from patients, healthcare professionals, and/or healthcare organizations.¹⁶

Studies were not eligible if they:

- a) Merely investigated the barriers/facilitators of evidence implementation.
- b) Only assessed stakeholder readiness for evidence implementation.
- c) Described the development of implementation strategies and/or implementation protocol without actual implementation and evaluation.
- d) Evaluated the effectiveness of EBP implementation training programs.
- e) Developed or described an implementation theory or a research method.

We should clarify that barriers/facilitators analysis, implementation readiness evaluation, and implementation strategies development are all essential preparation work before implementing EBP. While based on our research interest in implementation and the practicality consideration, our review excluded studies that only focus on these components. Nevertheless, these studies are all traceable in our next-step systematic reviews on these specific topics.

3) Context

All the EBP implementation studies should have been conducted in a healthcare setting (e.g., primary care, tertiary care, public health setting) in China. We included those multinational EBP implementation studies which involve study settings in China.

4) Types of sources

We only included English and Chinese literature published between 1996 and 2021. No restrictions were

made on the study designs. We excluded all the primary studies (i.e., effectiveness studies), evidence synthesis studies (i.e., reviews, guideline/standard development studies), and study protocols. We also excluded book chapters, conference abstracts, commentaries, editorials, duplicate studies, and studies without full text. When one thesis and one journal publication reported the same EBP implementation project, we only included the thesis in that it provided richer information compared with the journal publication.

Search strategy

We searched four Chinese databases (i.e., China National Knowledge Infrastructure, Wan Fang Database, The VIP Database, and China Biology Medicine) and three English databases (i.e., Ovid MEDLINE, the Cumulative Index to Nursing and Allied Health Literature, and EMBASE) from the year 1996 to January 19th, 2021 to locate relevant literature. The year 1996 was chosen as the starting year because EBP implementation publications had become prevalent since 1996.²³ The search strategy was developed separately for English and Chinese literature as many of the search terms for EBP implementation in English were seldom used in Chinese. Yet overall, “evidence-based practice implementation” and “Chinese or China” were the two key guiding terms in our search. We also narrowed the amount of literature by excluding those with the title of “review”, “meta”, “summary” or “synthesis”.

To our knowledge, EBP implementation publications in healthcare in China are predominately in the nursing field. However, based on Cheng et al.’s study, only two nursing EBP implementation papers were published in English journals during 2001-2015.¹⁶ We presumed that limited EBP implementation papers were likely to be retrieved in English databases. We conducted a preliminary search of the literature in Medline using a list of synonym terms for EBP implementation⁵ and limited the search to studies in China after 1996. It turned out that the amount of literature was extremely unmanageable. To ensure the precision as well as the comprehensiveness of our search, we narrowed the search terms by only including those that were commonly used in China and limited the search field to title and abstract. For Chinese literature, we combined the search strategy used in Zhou et al.’s review²⁴ with the research team’s expertise and created our search strategy for Chinese literature. See appendix 1 for the search strategies in Ovid MEDLINE and CNKI.

In addition, We performed the grey literature search in Baidu Scholar (<https://xueshu.baidu.com/>) and Google Scholar (<https://scholar.google.com/>) on April 1st, 2021 to complement the database search. See appendix 1 for the search strategy and procedures in Baidu Scholar and Google Scholar.

Study selection

All the retrieved literature was imported to Covidence (<https://www.covidence.org/>) for further screening. Six reviewers (YZ, BQ, SG, WB, JW, and CK) participated in the literature screening process. We held a group meeting to discuss and familiarize the eligibility criteria and piloted 25 randomly selected titles/abstracts to check discrepancies. We performed the title/abstract screening and full-text screening after reaching a consensus on screening criteria. As pre-determined by the Covidence, each study was reviewed by any two of the six reviewers independently. The discrepancies during the screening process were resolved by third-party adjudication (JZ or XL).

Data extraction

We developed the preliminary data extraction form based on the research questions. The form was piloted with 15 included studies independently by two reviewers (JW and WB). We revised and finalized the form based on a research group meeting on the pilot extraction. The final data extract form encompassed three sections corresponding to the three review questions: 1) basic characteristics of studies (i.e., the extent of EBP implementation research): year, type of publication, journal, funding source, clinical discipline, and research area; 2) study methods (i.e., how the research was conducted): study design, research team, intervention participants, number of participants, ethics, theory (or model/framework) use, evidence sources, implementation determinants, and implementation strategies; and 3) study outcomes. We developed a data extraction dictionary to guide and standardize extraction. All the research team members participated in the data extraction. Due to the large number of papers included, the data extraction for each paper was only performed by one person and cross-checked by team members.

Data analysis and presentation

Five reviewers (WB, QZ, YS, WC, and JZ) participated in the data synthesis and the results were cross-checked. To determine the extent of EBP implementation research, the extracted data from included studies were charted using frequencies and proportions for the following variables: the number of publications in total and per year, type of publication, English/Chinese journal, funding, disciplines, ethics, research area. To determine how the EBP implementation research was designed and implemented, we calculated the number of studies for different study designs, theories, implementation team members, intervention participants, evidence sources, implementation strategies and their development approaches. The number of studies that reported EBP implementation outcomes were mapped to the domains of the Core Outcome Measures in Effectiveness Trials and counted the number of studies for each domain.²⁸

Living review approach

The living review approach was selected in that we considered there would be a dynamic body of literature emerging in the Chinese EBP implementation field with the introduction of implementation science in recent years. Different implementation research designs,²⁹ theoretical frameworks,^{30–32} and the implementation reporting standards³³ have been introduced to guide the undertaking of implementation research and its reporting. Increased attention has been paid to implementation sustainability,³⁴ scaling up, and de-implementation. We believe the emerging literature will largely advance China's EBP implementation studies and thus, impact the conclusion of our review.

Following the Cochrane guidance on living reviews,³⁵ we will re-run our search strategy 12 months after the original search date (April 1st, 2021) to monitor the emergence of new literature and determine when to update the review. We have uploaded all the study materials into a Cloud Disk which allows the team members to have simultaneous access to the data and conduct data extraction and analysis at any time. We (WB and XD) will search literature from the same seven databases and grey literature sources monthly and import the included papers to the Cloud Disk. Two reviewers (QZ and YS) will extract data using the same extraction form and conduct statistical analysis. The team will have a meeting after the analysis to determine whether to update the review. We will update the review when new evidence identified is likely to largely impact the review conclusions from three key aspects: research designs, theory use, and implementation strategies development. We will assess the appropriateness of continuing to maintain living mode on an annual basis and at least one update is planned. However, the number of subsequent updates will depend on the team's capacity to complete the work.

Results

Basic characteristics

Of the 10, 576 and 700 records retrieved from database and grey literature search respectively, 259 and 97 papers were included after screening. After eliminating the duplicates, we finally included 309 papers. The literature search and screening process was shown in [figure 1](#). The summarized basic characteristics of those 309 papers were presented in [Table 1](#). Overall, the publication has been growing during the last decade with the first publication dating back to 2005 and a sharp rise since 2013. The studies were published predominately in Chinese journals (298/309, 96.44%) and in the nursing field (292/309, 94.50%). Half (50.16%) of the included studies got funding support. 75.60% of the included studies did not explicitly describe the ethical considerations. The commonly used study designs were

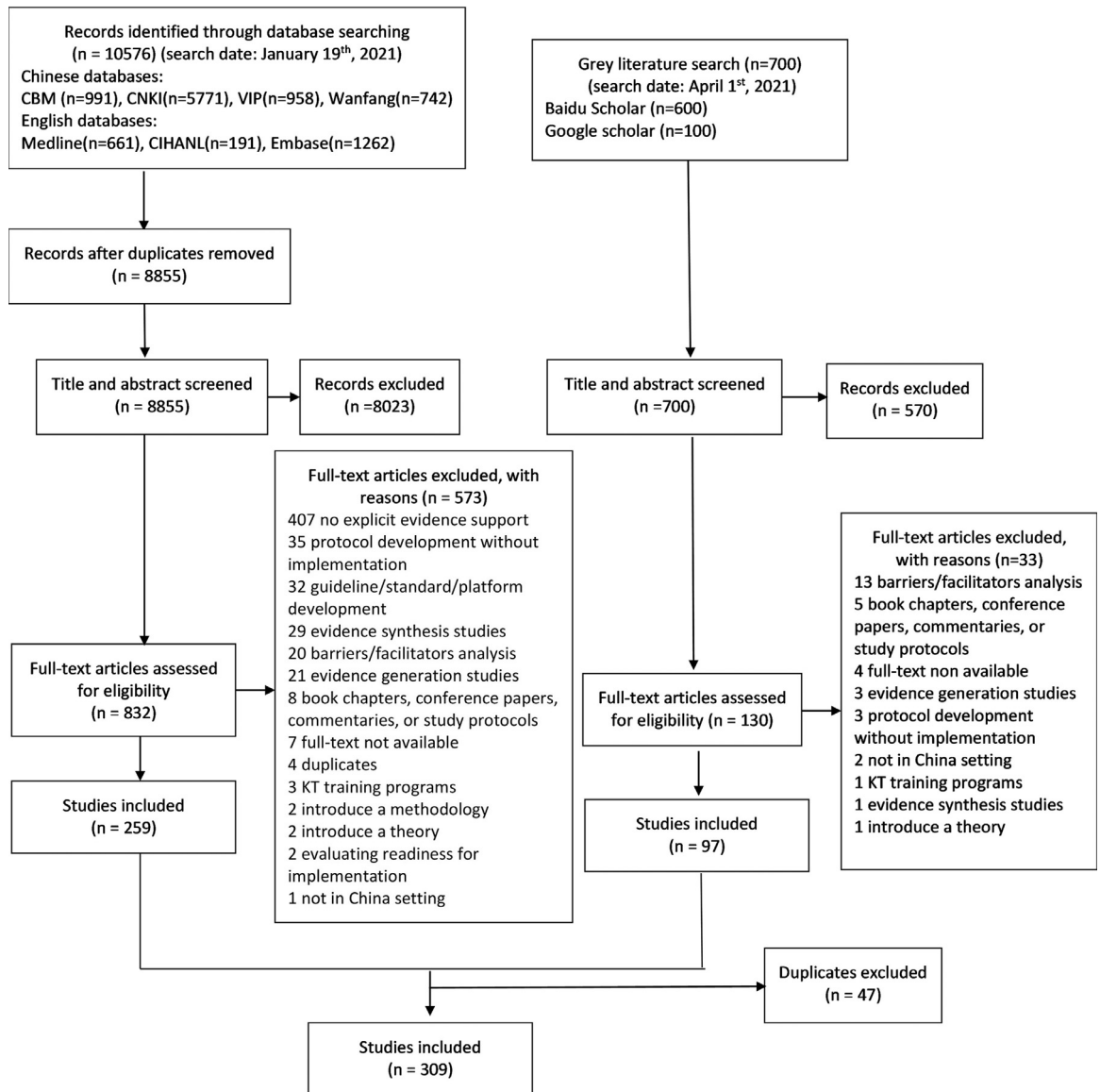


Figure 1. Literature search and screening diagram

before-after study (199/309, 64.40%), randomized controlled trial (52/309, 16.83%), and case report (42/309, 13.59%).

Research areas

Those EBP implementation research mainly focused on symptom management (e.g., constipation; 75/309, 24.27%), tube care (e.g., catheter maintenance; 46/309, 14.89%), perioperative care (e.g., bowel preparation; 43/309, 13.92%), and fundamental care (e.g., oral care, 43/309, 13.92%) (see Supplementary material table 1).

Implementation team composition and research participants

Implementation team composition was shown in Supplementary material table 2. Staff nurses were reported as the team members in 164 studies (53.07%) with a median number of three nurses involved in each project. In general, 113 studies (36.57%) took a multidisciplinary approach for implementation practice. 30.74% of studies reported the participation of unit physicians; 21.04% of studies reported the involvement of researchers. While only two studies explicitly reported patients as team members. 59 studies (19.09%) stated the

Basic characteristics	No. of studies (n (%))	Basic characteristics	No. of studies (n (%))
Year of publication		Publication type	
2005	1 (0.32%)	Journal article	245 (79.29%)
2007	2 (0.65%)	Master thesis	58 (18.77%)
2008	1 (0.32%)	PhD thesis	6 (1.94%)
2009	3 (0.97%)	Language	
2010	2 (0.65%)	Chinese	298 (96.44%)
2011	3 (0.97%)	English	11 (3.56%)
2012	4 (1.29%)	Funding support	
2013	11 (3.56%)	Yes	155 (50.16%)
2014	11 (3.56%)	No	154 (49.84%)
2015	15 (4.85%)	Ethics	
2016	29 (9.39%)	Not sure	134 (43.36%)
2017	29 (9.39%)	No	99 (32.04%)
2018	50 (16.18%)	Yes	76 (24.60%)
2019	59 (19.09%)	Discipline classification	
2020	82 (26.54%)	Nursing	292 (94.50%)
2021	7 (2.27%)	Clinical medicine	10 (3.24%)
		Public health	4 (1.29%)
		Chinese medicine	2 (0.65%)
		Physiotherapy	1 (0.32%)
		Research design	
		Before-after study	199 (64.40%)
		Randomized controlled trial	52 (16.83%)
		Case report	42 (13.59%)
		Non-Randomized controlled trial	12 (3.88%)
		Other study designs	4 (1.30%)

Table 1: Basic characteristics of included studies.

participation of organizational leaders; 110 studies (35.60%) described the unit leader participation. A median number of 8 people comprised an implementation team. Patients and nurses were the primary intervention participants with a median study sample of 70.5 and 30 people, respectively.

Theory use

159 studies (51.46%) reported using theories/models/frameworks to guide implementation, among which JBI model was the most frequently used one (92/159, 59.75%), followed by Fudan Evidence-based Continuous Quality Improvement Pathway (17/159, 10.69%), Johns Hopkins Nursing Evidence-Based Practice Model and Guidelines (12/159, 7.55%), and Knowledge to Action Framework (12/159, 7.55%) (see Supplementary material table 3).

Evidence sources

The top four evidence sources underpinned EBP implementation were clinical practice guidelines (199/309, 64.40%), systematic reviews (135/309, 43.69%), randomized controlled trials (106/309, 34.30%), and

evidence summaries (96/309, 31.07%). For each of the four types of evidence sources, a median number of 2.5, 3, 5, and 2 documents were referred to by implementation teams (see Supplementary material table 4).

Audit criteria development

204 of 309 studies reported the use of audit criteria to assist the understanding of evidence implementation rate at baseline and after implementation, in which 174 studies reported the number of audit criteria with the median (IQR) of 6.5 (5, 10). Diversified approaches have been used to measure those criteria, e.g., observation (123/204, 60.29%), questionnaire survey (109/204, 53.43%), nursing/medical records review (99/204, 48.53%), and interviews (67/204, 32.84%) (see Supplementary material table 5).

Barriers and facilitators to implementation

147 of 309 studies reported the assessment of barriers and/or facilitators in these EBP implementation studies, in which 145 studies assessed barriers and 21 studies assessed facilitators (see Table 2). We categorized the barriers and facilitators into four different levels:

Barriers	No. of studies (n (%))	Facilitators	No. of studies (n (%))
Total	145 (100%)	Total	21 (100.00%)
Organizational level	133 (91.72%)	Organizational level	17 (80.95%)
Lack of resources (human, financial, training, education, space or time)	85 (58.62%)	Leadership support	16 (76.19%)
Incomplete procedures or pathways	69 (47.59%)	Sufficient resources	8 (38.10%)
Lack of documentation/assessment tools	44 (30.34%)	Previous implementation experience and achievements	5 (23.81%)
Inadequacy of current work	20 (13.79%)	Multidisciplinary team support	4 (19.05%)
Lack of multidisciplinary team collaboration	16 (11.03%)	Evidence-based practice culture	2 (9.52%)
Lack of auditing mechanisms	7 (4.83%)	Educational resources and support	2 (9.52%)
Lack of leadership support	6 (4.14%)	Mentor support	2 (9.52%)
Environmental constraints	6 (4.14%)	Environmental facilitator	1 (4.76%)
Health professional-patient relationship and communication	6 (4.14%)	Incentives and rewards	1 (4.76%)
Imperfect information system	5 (3.45%)	Strategic dissemination	1 (4.76%)
Cultural/religious factors	5 (3.45%)		
Lack of evidence-based practice culture	3 (2.07%)		
Lack of reminders	2 (1.38%)		
Lack of organizational incentives and rewards	1 (0.69%)		
Healthcare professional level	130 (89.66%)	Healthcare professional level	11 (52.38%)
Lack of knowledge/skills	121 (83.45%)	Adequate skills	4 (19.05%)
Increased workload	27 (18.62%)	Highly motivated	4 (19.05%)
Insufficient understanding/recognition of the evidence	24 (16.55%)	Close teamwork	3 (14.29%)
Poor communication	23 (15.86%)	Willingness to change	2 (9.52%)
Influence of ingrained beliefs and habits	18 (12.41%)	Strong execution	1 (4.76%)
Low compliance	12 (8.28%)	High recognition of EBP implementation	1 (4.76%)
Not current priority	14 (9.66%)	Other factors	4 (19.05%)
Lack of time	8 (5.52%)		
Lack of motivation	7 (4.83%)		
Lack of evidence-based practice consciousness	7 (4.83%)		
Unclear division of work	4 (2.76%)		
Insufficient work experience	2 (1.38%)		
Lack of accountability	2 (1.38%)		
Low confidence in change	1 (0.69%)		
Patient and family level	66 (45.52%)	Patient and family level	6 (28.57%)
Lack of knowledge/skills	40 (27.59%)	High support/ active participation	5 (23.81%)
Poor cooperation	15 (10.34%)	Adequate knowledge and skills	2 (9.52%)
Lack of motivation/awareness	15 (10.34%)	Peer support	1 (4.76%)
Safety concerns	10 (6.90%)	Value the change	1 (4.76%)
Lack of effective education	9 (6.21%)		
Not current priority	9 (6.21%)		
Low compliance	7 (4.83%)		
Poor health condition	7 (4.83%)		
Insufficient understanding/recognition of the evidence	7 (4.83%)		
Psychological or emotional concerns	5 (3.45%)		
Influence of ingrained beliefs	2 (1.38%)		
Financial factors	2 (1.38%)		
Instability of family members/caregivers	2 (1.38%)		
Evidence level	22 (15.17%)	Evidence level	8 (38.10%)
Poor actionability	9 (6.21%)	High actionability	5 (23.81%)
Conflicts with existing standards/ processes	6 (4.14%)	High-quality	2 (9.52%)
Poor accessibility	3 (2.07%)	Perceived benefits for patients	2 (9.52%)
Not applicable to current context	2 (1.38%)	Accessibility	1 (4.76%)
Low quality	1 (0.69%)		

Table 2: Barriers and facilitators (147 of 309 studies reported).

Healthcare provider level		Patient level		Organizational level	
Implementation strategy	No. of studies (n (%))	Implementation strategy	No. of studies (n (%))	Implementation strategy	No. of studies (n (%))
Education lectures	155 (68.28%)	Education materials	67 (29.52%)	Optimize workflows and regulations	88 (38.77%)
Skills training	88 (38.77%)	Face-to-face education	59 (25.99%)	Develop evaluation tools	44 (19.38%)
Knowledge/skills test	41 (18.06%)	WeChat posts	18 (7.93%)	Resource investment	30 (13.22%)
Education leaflets	38 (16.74%)	Videos	17 (7.49%)	Multidisciplinary collaboration	22 (9.69%)
Clinical practice demonstration	24 (10.57%)	Clinical demonstration	8 (3.52%)	Reminder	13 (5.73%)
Video training	22 (9.69%)	Informal caregiver training	3 (1.32%)	Leadership support	11 (4.85%)
One-on-one coaching	10 (4.41%)	Rehabilitation plan development	3 (1.32%)	Audit and feedback	11 (4.85%)
Multimedia use	9 (3.96%)	Informal caregiver assessment	1 (0.44%)	Optimize information system	8 (3.52%)
Professional learning	5 (2.20%)	Seminar	1 (0.44%)	Quality control	6 (2.64%)
				Rewards/incentives	5 (2.20%)
				Check doctor's orders	3 (1.32%)
				Hire more nurses	2 (0.88%)
				Specialist clinics	1 (0.44%)
				Reinforce communication	1 (0.44%)
				Improve the environment	1 (0.44%)

Table 3: Implementation strategies (227 of 309 studies reported).

organizational, healthcare professional, patients and families, and evidence levels.

For barriers, lack of resources (85/145, 58.62%), incomplete procedures or pathways (69/145, 47.59%), and lack of documentation and assessment tools (44/145, 30.34%) were the organizational level barriers; lack of knowledge/skills (121/145, 83.45%), increased workload (27/145, 18.62%), and insufficient understanding/recognition of the evidence (24/145, 16.55%) were barriers from healthcare professionals; lack of knowledge/skills (40/145, 27.59%), poor cooperation (15/145, 10.34%), and lack of motivation/awareness (15/145, 10.34%) were barriers from patients and families perspective; poor actionability (9/145, 6.21%) was the main concern from the evidence level.

Generally, the top facilitators for EBP implementation were leadership support (16/21, 76.19%), sufficient resources (8/21, 38.10%), and previous EBP implementation experience and achievements (5/21, 23.81%) from the organizational level, the high support (5/21, 23.81%) from patients and families, and the high actionability of evidence (5/21, 23.81%).

Implementation strategies

166 studies described the methods used to develop implementation strategies (see Supplementary material table 6), in which 55 studies (33.13%) used audit group meeting; 41 studies (24.70%) were through discussion with key stakeholders, followed by expert consultation (38/166, 22.89%) and brainstorming (36/166, 21.69%).

227 studies illustrated the implementation strategies (see Table 3). We categorized these strategies into three

levels: healthcare provider, patient, and organizational level. For healthcare providers, education lectures were the main strategies (155/227, 68.28%), followed by skills training (88/227, 38.77%), knowledge/skills test (41/227, 18.06%), and educational leaflets (38/227, 16.74%). For patients, different forms of education were employed ranging from printed materials (67/227, 29.52%), face-to-face (59/227, 25.99%) to social media (WeChat) (18/227, 7.93%) and videos (17/227, 7.49%). For organizations, implementation strategies became more diversified. Workflows and regulations optimization (88/227 38.77%), evaluation tools development (44/227, 19.38%), resources investment (30/227, 13.22%), and multidisciplinary collaboration (22/227, 9.69%) were the top four strategies utilized.

EBP implementation outcomes

Of the 309 studies, 291 studies (94.17%) measured the patient-level outcomes, 174 studies (56.31%) measured outcomes from healthcare professionals, 36 studies (11.65%) measured family member outcomes, and 18 studies (5.83%) measured organizational outcomes. See details in Table 4.

We used Core Outcome Measures in Effectiveness Trials taxonomy to organize the patient outcomes.²⁸ Overall, the general outcomes (49/309, 15.86%), skin and subcutaneous tissue outcomes (34/309, 11.00%), gastrointestinal outcomes (29/309, 9.39%), and renal and urinary outcomes (19/309, 6.15%) were the top four reported outcome categories in the physiological/clinical outcome domain. In the life impact domain, 28

Outcomes	No. of studies (n (%))	Outcomes	No. of studies (n (%))
Patient outcomes	291 (94.17%)	Healthcare professional outcomes	174 (56.31%)
Mortality/survival	3 (0.97%)	Knowledge	108 (34.95%)
Physiological/ clinical outcomes	181 (58.58%)	Audit criteria implementation rate	102 (33.01%)
General outcomes	49 (15.86%)	Skills	15 (4.85%)
Skin and subcutaneous tissue outcomes	34 (11.00%)	Satisfaction	11 (3.56%)
Gastrointestinal outcomes	29 (9.39%)	Evidence-based practice ability	6 (1.94%)
Renal and urinary outcomes	19 (6.15%)	Other outcomes	36 (11.65%)
Respiratory, thoracic and mediastinal outcomes	14 (4.53%)	Family member outcomes	36 (11.65%)
Vascular outcomes	14 (4.53%)	Knowledge	21 (6.80%)
Musculoskeletal and connective tissue outcomes	10 (3.24%)	Satisfaction	18 (5.83%)
Metabolism and nutrition outcomes	9 (2.91%)	Skills	3 (0.97%)
Reproductive system and breast outcomes	8 (2.59%)	Other outcomes	4 (1.29%)
Nervous system outcomes	7 (2.27%)	Organizational outcomes	18 (5.83%)
Pregnancy, puerperium and perinatal outcomes	6 (1.94%)	Healthcare procedures	7 (2.27%)
Hepatobiliary outcomes	2 (0.65%)	Healthcare quality	4 (1.29%)
Immune system outcomes	2 (0.65%)	Infection control	4 (1.29%)
Eye outcomes	2 (0.65%)	Organization environment	3 (1.44%)
Outcomes relating to neoplasms	1 (0.32%)		
Blood and lymphatic system outcomes	1 (0.32%)		
Nervous system outcomes	1 (0.32%)		
Life impact	79 (25.57%)		
Delivery of care	28 (9.06%)		
Physical functioning	25 (8.09%)		
Global quality of life	16 (5.18%)		
Emotional functioning/wellbeing	6 (1.94%)		
Cognitive functioning	4 (1.29%)		
Role functioning	3 (0.97%)		
Resource use	51 (16.50%)		
Hospital	39 (12.62%)		
Economic	20 (6.47%)		
Need for further intervention	2 (0.65%)		
Adverse events/effects	75 (24.27%)		

Table 4: EBP implementation outcomes (309 of 309 reported).

studies (9.06%) reported the outcome on delivery of care and 25 studies reported the outcome on physical functioning (8.09%). 51 studies (16.50%) reported resource use. 75 studies (24.27%) reported adverse events.

For healthcare providers, knowledge (108/309, 34.95%) and audit criteria implementation rate (102/309, 33.01%) were the two main outcomes measured. Knowledge (21/309, 6.80%) and satisfaction (18/309, 5.83%) were the commonly evaluated outcomes around family members. The organizational level outcomes primarily focused on healthcare procedures (7/309, 2.27%) and healthcare quality (4/309, 1.29%).

Discussion

We performed a scoping review in this study to systematically examine the development progress of EBP implementation in healthcare in China. Generally, the

publication was on a sharp rise since 2013 with most studies from the nursing field. The commonly researched areas were symptom management, tube care, and perioperative care. A median number of 8 people often comprised an implementation team with 36.57% of studies taking a multidisciplinary approach, 19.09% and 35.60% of studies reporting participation of organizational and unit leaders respectively. JBI model was the most frequently cited model to guide EBP implementation. 204 studies reported the use of audit criteria to assist evaluation of evidence implementation rate with diversified methods adopted to measure the criteria (e.g., observation, questionnaire survey, nursing/medical records review). Lack of knowledge/skills, lack of resources, and incomplete procedures or pathways were the top three barriers impeding evidence implementation. Leadership support was considered the most common facilitator. Education and training were the most frequently adopted implementation

strategies for healthcare professionals and patients. Optimizing workflows, developing evaluation tools, and investing resources were the primary strategies used at the organization level. Almost all studies measured patient outcomes and 56.31% of studies measured healthcare professional outcomes.

Nursing as the most common EBP implementation field

94.50% of our included studies came from the nursing field. There has been an upsurge in EBP implementation in the Chinese nursing field. Up to now, nine JBI affiliated centers,³⁶ seven Best Practice Spotlight Organizations³⁷ have been established in mainland China to promote the implementation science and practice in nursing. China also has the largest number of nursing trainees in the JBI Evidence-based Clinical Fellowship program outside Australia in the last 15 years.³⁸ Not only in China, EBP implementation has been flourishing in nursing globally. An early scoping review published in 2014 showed that a sufficiently high number of studies had been identified on implementation strategies for enhancing nurses' evidence-informed decision making.³⁹ EBP implementation is highly endorsed by nurses for its close linkage with quality improvement initiatives and its transformative role in promoting nursing excellence.

However, only ten and four studies were found from the medical and public health field respectively, which explained the scarcity of EBP implementation reviews in these two fields. Despite a large number of practice guidelines in the medical and public health field having been developed over the last two decades in China, few studies focused on guideline implementation.⁴⁰ A hand-search of papers published in the Chinese Journal of Evidence-Based Medicine (a highly representative journal of evidence-based medicine in China) only identified two papers relevant to guideline implementation from its inception.⁴⁰ In recent two years, implementation science becomes a buzzword in China with healthcare professionals from different disciplines actively attending implementation science training programs. Our living scoping review approach will presumably locate more EBP implementation studies in the non-nursing field in the coming years.

Lack of high-quality research design

64.40% (199/309) of included studies used before-after design, many of which measured patient outcomes but with no actual control performed on patients. 42 (13.59%) studies used case report design. These results were similar to the two scoping reviews in nursing field.^{16,24} Such low strength research designs have serious limitations to test the effectiveness of implementation strategies and thus build little knowledge. With the advancement of implementation science, different experimental and non-experimental studies designs have been used in EBP implementation.^{41,42} More

rigorous study designs should be adopted for effect evaluation.⁴³

Multidisciplinary implementation team without patient engagement

A multidisciplinary approach for EBP implementation research has been manifested in one-third of Chinese publications with staff nurses, head nurses, nursing directors, physicians, implementation researchers as the common team members. Ge and colleagues proposed a Researcher-Manager-Practitioner Collaborative Working Model of Evidence-Based Practice to illustrate the significant roles of the three parties in promoting evidence implementation and call for the partnership among them.⁴⁴ Yet, a very limited number of papers described patient engagement in Chinese EBP implementation. Patient engagement in healthcare research, also known as integrated knowledge translation or co-production, is about doing research with knowledge users throughout the research process.⁴⁵ It aims to generate relevant and applicable knowledge and improve capacity for and the likelihood of successful implementation.⁴⁶ This approach places end-user value at its very heart and seeks to establish an ongoing and long-term collaborative partnership between researchers and end-users.⁴⁷ The current unidirectional implementation approach is not unique in China. A scoping review published in 2015 only identified 13 integrated knowledge translation studies, all of which were conducted in high-income countries.⁴⁸ Global efforts have been taken in recent years to advance understanding of integrated knowledge translation, including its processes, roles, determinants, impact, and research design.⁴⁹

Process model as the most used type of theory to guide implementation

Implementation theories play a significant role in guiding the implementation process, identifying implementation determinants, and understanding change mechanisms.^{50,51} In our study, 159 studies (51.46%) reported theory use to guide implementation research. It is a significant improvement compared with that only 19 studies reported theory use before 2015.¹⁶ Nevertheless, most studies in our review only used process models⁵¹ to gain step-by-step guidance for EBP implementation, in which the JBI model^{52,53} was the most frequently cited one. Very few studies turned to classic theories⁵¹ to develop implementation strategies. Only three studies in our review reported the use of social cognitive theory, health promotion model, or health belief model. Interestingly, those models were the most frequently used ones in knowledge translation research globally according to a scoping review by Striffler and colleagues in 2018.⁴ No studies were located in our review that use implementation theories⁵¹ (e.g., Normalization Process Theory) to understand the change

mechanism. As healthcare context and implementation process are complex, it is well-needed to adopt explanatory theories to inform the development of context-fit implementation strategies and advance our understanding of implementation successes and failures.⁵¹

Similar barriers and facilitators with other low- and middle-income countries

Currently, no review has been done to understand the barriers and facilitators for EBP implementation in China healthcare. Two cross-sectional studies investigated nurses' perceived barriers and facilitators of research utilization in China^{54,55} The two studies reported the insufficiency of time and resources, lack of authority, nonrecognition of implementation value, and language barriers as the most common barriers. Both studies revealed the same facilitators on managerial support, educational resources, availability and accessibility of implementation reports. Gifford and colleagues found in their qualitative study in Hunan China that the inaccessibility of evidence in Chinese, poor understanding of evidence-based practice, and perceived poor collaboration with patients were common barriers for evidence-based nursing.⁵⁶ Our study provided a preliminary overview of the barriers and facilitators that implementation teams came across during implementation processes. Consistent with the previous studies, our review found that lack of knowledge or skills from healthcare professionals and the lack of resources from organizations were the two most prominent barriers, and leadership support was the common facilitator. Whitehorn and colleagues identified the evidence implementation barriers in low- and middle-income countries and found the same two top barriers with our review.¹⁵ In addition, we also recognized the interrelations between barriers or facilitators across the four domains in our review, for example, lack of multidisciplinary collaboration often interlinked with poor communication and unclear division of responsibility; leadership support often associated with high motivation of healthcare professionals. Such patterns imply that a system approach to understand the complex relationships between implementation determinants, which has been practiced in some reviews,^{57,58} might help us identify key factors and gain an in-depth understanding of the structural problems in implementation process.

Unsystematic implementation strategies development process

Powell et al. proposed four methods that could be used to select and tailor implementation strategies: concept mapping, group model building, conjoint analysis, and intervention mapping.⁵⁹ Yet these strategies were seldom used in Chinese EBP implementation projects. In our review, audit group meetings, discussions with key

stakeholders, expert consultation, and brainstorming were the primary methods used to develop implementation strategies. These are all very practical and informal approaches, aiming to make the most of collective wisdom. However, such approaches often take the risk of developing strategies intuitively and generate the "It seems a great idea at the time" strategies. Only eight papers reported literature review as the method to develop implementation strategies. Currently, various resources have been developed to support local implementation strategy development, e.g., the Cochrane effective practice and organization of care taxonomy,⁶⁰ the expert recommendation for implementing change taxonomy,⁶¹ and the behavior change techniques taxonomy.^{62,63} These taxonomies were rarely referred to in Chinese EBP implementation projects. There are no magic bullets or one-size-fits-all approaches to implementation strategy development. The team should integrate multiple methods when developing strategies and be ready to adjust these strategies during the implementation process.

Inconsistent language and inadequate descriptions of implementation strategies

Education was the most frequently used strategy for healthcare professionals and patients, which has also been seen in multiple reviews on implementation strategies.^{64,65} Even with such popularity, education has been notoriously reported as a low-value improvement intervention, which is often necessary but rarely sufficient.⁶⁶ Other more effective implementation strategies, like reminders⁶⁷ and local opinion leaders⁶⁸ were rarely used in Chinese EBP implementation projects. In addition, inconsistent language and inadequate descriptions of implementation strategies were salient problems in those EBP implementation studies, which complicated the synthesis work and limited their replications in research and practice. We did not find any study that explicitly mentioned the use of reporting frameworks, such as the template for Intervention Description and Replication checklist,⁶⁹ Aims-Ingredients-Mechanisms-Delivery framework,⁷⁰ to depict implementation strategies. Powell et al. developed the Expert Recommendations for Implementing Change, a refined compilation of implementation strategies to improve the conceptual clarity, relevance, and comprehensiveness of implementation strategies,⁶¹ which can be referred to in our future EBP implementation studies.

Limited reporting on healthcare professional behavior changes and implementation outcomes

Healthcare professional behavior is often considered the key determinant of patients' achieving optimal health outcomes.⁷¹ Through the delivery of high-quality evidence-based recommendations by healthcare professionals, patients' health outcomes are likely to be

improved.⁷¹ Thus, EBP implementation studies often primarily focus on measuring the implementation of targeted interventions by healthcare professionals.⁷² However, in our study, only half (56.31%) of the studies measured healthcare providers' outcomes. In addition, very limited studies reported the EBP implementation outcomes, which are defined as changes relating to the implementation process.⁷³ Only 20 studies reported the cost associated with implementation. No outcomes on the acceptability, adoption, appropriateness, feasibility, fidelity, penetration, and sustainability were explicitly measured.

Contributions and recommendations

From this review, we identified some contributions that Chinese EBP implementation research made to the global community: 1) funding agencies support contributed to the advancement of EBP implementation; 2) the multidisciplinary collaborative team facilitated evidence implementation; 3) nursing professionals led and contributed extensively to the implementation science and practice.

In addition, we provided eight recommendations for Chinese researchers to conduct EBP implementation studies in the future: 1) The scarcity of EBP implementation publications in non-nursing fields requires healthcare professionals from other disciplines to engage in and lead implementation projects, and fill the evidence-practice gaps in all healthcare domains. 2) Using rigorous research designs to evaluate EBP implementation outcomes, such as randomized trials, hybrid designs, etc.^{72,3} 3) Engaging knowledge users into the implementation process and establishing partnerships. 4) Harnessing the power of theories and theorizing in implementation research.⁷⁴ Researchers need to not only develop implementation strategies in a theory-informed approach but also use empirical studies to test and further develop implementation theories. 5) Understanding the interrelationship among implementation determinants from a complexity science perspective.⁷⁵ 6) Using systematic and theory-informed approaches to develop the implementation strategies and describing the development process and content adequately. 7) Developing “a common nomenclature for implementation strategy terms, definitions, and categories that can be used to guide implementation research and practice” (p 1).⁷⁶ 8) Paying more attention to healthcare professional's behavior change⁷¹ and implementation outcomes.⁷³

Limitations and future research

This scoping review has several limitations. First, due to the extensive terms used to describe EBP implementation and the targeted search strategies we used in English databases, there are chances that some implementation studies in healthcare in China were not retrieved. However, we

turned to a large amount of grey literature to complement the database search, which helped us to further identify implementation papers. Second, even though there has been literature comparing the differences between implementation studies and effectiveness studies,⁷⁷ we still feel the greyness in between and have come across a few papers that were difficult to make the judgment on their inclusion or not. Third, our review only included studies that had an EBP implementation and evaluation phase. We, therefore, excluded stand-alone implementation readiness assessment studies, barrier/facilitator analysis studies, and protocol development studies. Those studies were also important data sources for our understanding of the EBP pre-implementation phases and were all traceable in our database for future studies on these specific topics. Lastly, since most of the included 309 studies did not follow established reporting guidelines, it was inevitable that some key information was not reported in some papers. We calculated all the statistics based on what was reported and there are some possibilities that our findings did not reveal the full picture of the real-world situations.

For our future research, we will re-run the literature search on a regular basis to monitor the emergence of new literature and determine when to update the scoping review. We will also conduct several systematic reviews to gain an in-depth understanding of the implementation determinants, strategies, and outcomes in healthcare in China.

Conclusion

To our knowledge, this scoping review is the first one to systematically examine the EBP implementation research progress in healthcare in China. 309 papers were included with the first study conducted in 2005 and a sharp growth since 2013. Multidisciplinary teams have been built for implementation research with different levels of leadership support, while few studies described the engagement of patients. Lack of knowledge, skills, and resources, and incomplete procedures or pathways were the top barriers. Leadership support was considered the most common facilitator. Education and training were the most frequently used implementation strategies for healthcare professionals and patients. Optimizing workflows, developing evaluation tools, and investing resources were the primary strategies used at the organization level. Most of the studies measured patient outcomes. Based on this review, we identified contributions that Chinese implementation research made to the global community, and provided eight recommendations for Chinese researchers in conducting implementation studies in the future.

Contributors

All authors have contributed to the production of this review. JZ and WC conceptualized and designed the study and are the guarantor of the paper. JZ, WB, WC

conducted the literature search. YZ, BQ, SG, WB, JW, and CK were involved in the study screening. All team members participated in the data extraction. WB, QZ, YS, WC, and JZ conducted the data analysis. JZ drafted the manuscript. WC and JH revised the manuscript. All authors participated in the review of the manuscript and approved the final manuscript.

Declaration of Competing Interest

All authors declare no competing interests.

Data sharing statement

All data generated or analyzed during this study are included in this published article and its supplementary information files.

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Not applicable

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.lanwpc.2021.100355.

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