Mapping research findings on change implementation in nursing practice: A scoping literature review

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SYSTEMATIC ARTICLE

Mapping research findings on change implementation in nursing practice: A scoping literature review

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Abstract

Aims: The aim of this study was to map the diverse factors impacting change implementation in nursing practices and investigate different implementation strategies.

Design: Scoping literature review following PRISMA-ScR extension.

Methods: Data were collected from PubMed, Ebsco, Scopus and ScienceDirect databases from 1990 onwards. Only English peer-reviewed studies reporting an implementation of change in nursing practice were included. Of 9,954 studies, 425 abstracts were scanned and 98 full-text articles were screened. Finally, 28 studies were selected.

Results: A multifaceted approach, with a tailored intervention, was the most effective implementation strategy. Most identified factors were considered systematic, for example resource availability, leadership and knowledge. However, others related to local social and material context were identified in fewer number of studies. These seem to be operational elements for implementation processes. Both types of factors are essential and must be considered for successful implementation.

Conclusion: We advocate the development of framework including systematic factors and which capture the local context flexibility.

KEYWORDS
implementation, implementation strategies, nursing practices, social–material factors, systematic factors

1 | INTRODUCTION

In the last decades, quality improvements (QI) initiatives and guidelines have been expanded widely in nursing practices to improve patient care quality and outcomes (Margonary et al., 2017; Singh et al., 2021). However, integrating these initiatives into routine practice is reported to be difficult and complex, and the results are often unpredictable (McArthur et al., 2021; Rycroft-Malone et al., 2012), as it requires to change the current behaviour of professionals to develop a new one (Holleman et al., 2009). Thus, considerable evidence has been observed in terms of implementation strategies and interventions to drive optimal and successful implementation of quality improvement initiatives or research findings into professionals' practices (Phelan et al., 2018; Spoon et al., 2020). For instance, interactive educational approach, audit and feedback strategy, involving frontline professionals, presence of opinion leadership (Jeffs et al., 2013; Wensing et al., 2020). In addition to, a thoughtful consideration of anticipated barriers (Jabbour et al., 2018) and/or facilitators, which promote or hinder implementation processes (Curtis et al., 2017; González-María et al., 2020). This approach allows leaders to develop and apply tailored interventions responding to each contextual situation, thereby reach successful implementation processes (Bauer et al., 2015; Renolen et al., 2018). In the same vein,

several studies have advocated the use of models and change management theories to design effective implementation processes (Jabbour et al., 2018). In nursing, 47 knowledge translation models have been developed for the subject of implementation, and from different perspectives (Mitchell et al., 2010). However, although these efforts, there is a lack of empirical evidence to support only one particular theory or framework in guiding strategies' development to implement a change in nursing practices (Davies, 2002). Also, there is no clear basis to suggest which specific interventions are useful for which barriers in order to improve change implementation (Koh et al., 2008). Additionally, recent reflections have been raised calling for the impact of the local context of the professional's activity on implementation processes; and how it can lead to a successful intervention in one setting and its failure in others (Squires et al., 2019).

To summarize, in nursing, understanding the different elements hindering or supporting an innovation integration in practice is primarily based on individual empirical research, as well as is directed towards specific interventions or innovations. There is a need to compile these efforts in overall comprehensive vision in order to identify literature gaps and requirements, and also to help researchers better understand implementation processes for practice changes initiatives in different contexts. In this study, we used "change in nursing practice" to refer the changes based on scientific evidence.

2 | THE REVIEW

2.1 | Aim

This scoping review aim to answer the following questions:

1. What are the different factors previously identified impacting the implementation of change in nursing practices? As well as, what are the most effective used implementation strategies?
2. How these factors were interrelated in terms of their different types?
3. What change models were used for implementation initiatives in nursing practice?

2.2 | Design

A scoping review of the literature was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) extension checklist (PRISMA-ScR, 2018; Appendix S1).

2.3 | Methods

Relevant studies were investigated using PubMed (MEDLINE), ScienceDirect (scientific, technical and medical research), Scopus (Elsevier database of peer-reviewed literature for science, technology, medicine and the social sciences) and CINHAL Ebsco (cumulative index for nursing and allied health literature) databases from 1990 onwards. This time point was chosen as the implementation research in health care has grown considerably since the earlier 1990s (Damschroder et al., 2009). Study collection step was conducted by one author (blinded for review) and revised by a second author (blinded for review).

2.4 | Keywords and eligibility criteria

A structured database search was conducted to identify peer-reviewed articles related to implementation processes or strategies for change based on scientific evidence in nursing. This was including innovations, evidence-based practice (EBP) and quality procedures (accreditation or certification procedures or QI initiatives) in nurse practices. Also, we used predefined keywords and eligibility criteria by both authors, prior to databases search. Keywords were Implementation, integration, adoption, dissemination, introduction, certification, accreditation, or quality evaluation mechanisms, quality assurance, professionals, caregivers and nurse. We used medical subject headings (MeSH) terms with Boolean operators ("OR" and "AND") to perform searches in PubMed, and similar combinations were used for other databases. Also, some "additional filters" were added during the database search process, for example subject, field or domain, and journal topic (Tables 1 and 2).

2.5 | Study outcomes

Study selection process was presented following the PRISMA flow diagram (Figure 1) (Moher et al., 2010). The initial search strategy generated 9,950 articles and then 9,369 after removing duplications. The title scan based on the predefined terms yielded 425 potentially relevant abstracts. The abstract inspection yielded 94 studies for full-text assessment. Finally, 28 studies were selected as adhering to inclusion and exclusion criteria and study objectives (Table 3). The selection process and final output were discussed and approved by both authors.

2.6 | Quality appraisal

We used two critical appraisal tools to minimize the risk of bias in evaluating methodologies and results. One author (blinded for review) conducted the quality assessment in the first step, and then, it was discussed and revised by the second author (blinded for review) in the second step.

1. The Mixed Methods Appraisal Tool (MMAT; Hong et al., 2018) was used to assess the methodological quality of different studies. The MMAT is designed for the appraisal stage of reviews

TABLE 1 Databases search queries

Databases source	Search query	Output.
PubMed	(("Implementation Science" [MeSH] OR "Health Plan Implementation" [MeSH] OR "Social Planning" [MeSH] OR "integration" OR "dissemination" OR "introduction" OR "adoption") AND ("Quality of Health Care" [MeSH] OR "Health Care Quality, Access, and Evaluation" [MeSH] OR "Quality Assurance, Health Care" [MeSH]) OR "innovation") AND ("Nurses" [MeSH] OR "caregiver")	1,018
Scopus	(("Implementation" OR "integration" OR "dissemination" OR "introduction" OR "adoption") AND ("Quality of Health Care" OR "certification" OR "accreditation" OR "quality" OR "innovation") AND ("Nurses" OR "caregiver")) **after using additional filters**	4,448
Science Direct	(("Implementation OR "integration" OR "dissemination" OR "introduction" OR "adoption") AND ("Quality of Health Care "OR "innovation "OR certification OR accreditation) AND ("Nurses" OR "caregiver")) **after using additional filters**	4,364
Ebsco	(("Implementation OR "integration" OR "dissemination" OR "introduction" OR "adoption") AND ("Quality of Health Care "OR "innovation "OR certification OR accreditation) AND ("Nurses" OR "caregiver")) **after using additional filters**	129
Total		9,950

Table 1 presents the search queries for each database source aligned with the output of articles. The "after using additional filters" term refers to added selection criteria to the search output, for example subject, field or domain and journal topic.

TABLE 2 Databases eligibility criteria

Eligibility criteria	
Inclusion criteria	• Studies which reported the implementation of quality improvement processes and evidence-based practices at nurse levels. • Studies disclosing models, theories and hypothetical implementation frameworks as well as facilitators and barriers. • Full texts comprising English-language peer-reviewed journal articles (including reviews, experimental studies, observational and case studies).
Exclusion criteria	• Conference abstracts, abstracts only of published literature, articles in languages other than English (without available translation) and grey (non-peer-reviewed) literature. • Studies which reported the sustainability of change, the evaluation of an impact of an implementation, the implementation of an educational programme, or studies which reported on practice quality or quality in general. • Studies focused on implementation processes for other nursing professions and contexts outside hospitals or a nurses' professional position or work organization

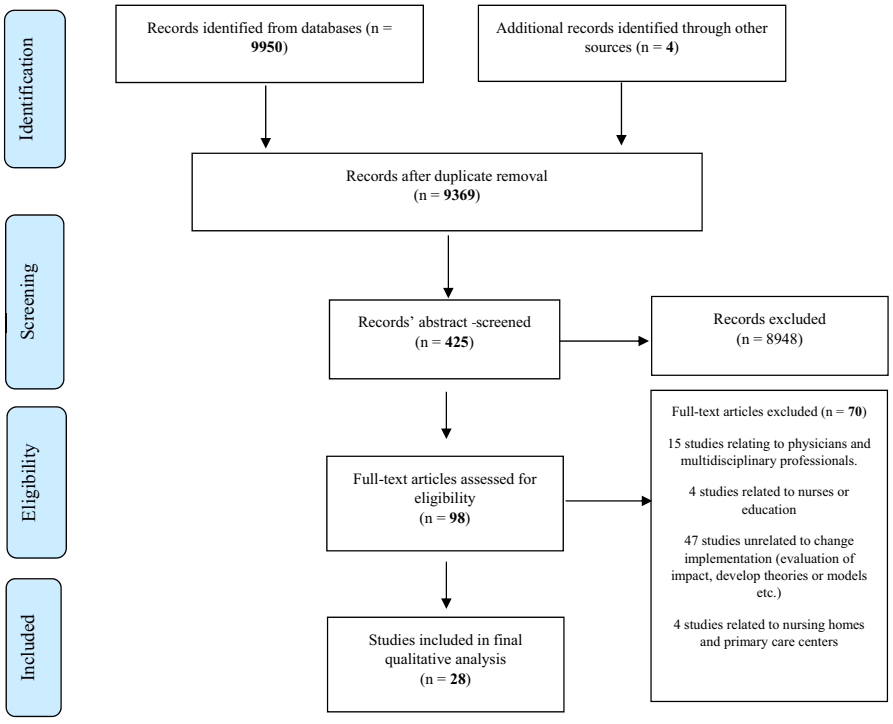

FIGURE 1 Study identification, screening and eligibility based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol (Moher et al., 2010)

TABLE 3 Included studies: A summary of the included studies in the review

Authors/year	Subject	Aim	Country	Methodology / design	Model	Participant or sample /settings	Type of results	Main findings	Quality score over 100
Kite (1995)	Changing mouth care practice	To identify the prerequisites for achieving research-based mouth care practice in a district general hospital intensive care unit	UK	qualitative design / Action research approach design Before and after	Rogers' model (1983)	10 Nurses / Intensive care unit (ICU) unit in general hospital	Facilitator and barriers	Facilitators: eliciting the perceptions of nurses (tailored intervention and information); presence of Context relevant information and practical instruction; influence of role models and the availability of suitable brushes. Inhibiting factors: the misconceptions about the risk to patient safety associated with tooth-brushing	90
Barr (2002)	Information Systems	To examine the social forces underlying computer technology diffusion into nursing	USA	Qualitative description	Rogers' model (1995)	Perioperative nurses/ acute care facility in the mid-Atlantic region	Factors	Effective communication among individuals, professional culture and work environment. Innovation acceptance: key determinant in fostering positive attitudes and facilitating successful learning	60
Dulko (2007)	clinical practice guideline (CPG)/cancer pain	to evaluate available research evidence about the effectiveness of audit and feedback as a guideline implementation strategy	USA	systematic review	Lewin's Change Theory	16 articles are included in this literature review	Recommendations	Educational material combined with A & F strategy to promote CPG adoption. Lewin's change theory as model for operationalizing interventions	65
Christensen and Christensen (2007)	CPG for patients with a Sengstaken–Blakemore tube	focuses on the application of Lewin's transitional change theory used to introduce a change in nursing practice	UK	Qualitative Description	Lewin's theory of transitional change	Nurses/ general intensive care unit	Effectiveness of the model	Lewin's theory of transitional change: useful for change process, help in the application of logical process through problem identification implementation plan development and clear monitoring and evaluation at all stage	80

TABLE 3 (Continued)

Authors/year	Subject	Aim	Country	Methodology / design	Model	Participant or sample /settings	Type of results	Main findings	Quality score over 100
Koh et al. (2008)	Fall-Prevention CPG	To assess the perceived barriers to implementation of the fall-prevention CPG in acute care hospitals in Singapore	Singapore	Quantitative/ survey study	practice change theory	1,467 (80.2%) Nurses / acute care general hospitals (n = 5) in Singapore	Barriers/ Interventions	Major barriers: knowledge and motivation, availability of support staff, access to facilities, health status of patients and education of staff and patients/ A multifaceted strategy, with tailored interventions designed to target the identified perceived barriers for Fall CPG implementation	80
Aitken et al. (2011)	evidence-based practice (EBP)	To describe the implementation of a multidimensional EBP programme and examine the benefits and challenges of each implemented strategies	Australia	Qualitative description	Advancing Research and Clinical practice through close Collaboration (ARCC) model	intensive care unit (ICU) nurses/ in a public, tertiary hospital in Australia	Implementation strategies	Successful implementation of the multidimensional EBP programme Implementation strategies: Development of EBP champions; Use of EBP mentors; Provision of resources such as time and money; Creation of a culture and expectation related to EBP; Use of practical strategies including EBP work groups, journal club and nursing rounds	80
Jansson et al. (2011)	individual care plans (ICP)	To capture the factors and conditions that impacted on the successful implementation of individual care plans in hospital care	Sweden	qualitative study/ exploratory and retrospective	PARIHS as a guide during the data collection and analysis	15 informants (8 Nurses and 7 managers)/ regional hospital in Western Sweden	Factors	Factors: Clear instructions and objective; clear roles and mandates for those involved; internal facilitators for the continuation of the process. PARIHS framework as guide to capture a complete picture of implementation process	100
Yagasaki and Komatsu (2011)	CPG	To understand oncology nurses' perceptions of guideline implementation and to learn their views on how their experiences affected the implementation	Japan	Qualitative exploratory study/ grounded theory.	-	11 Oncology nurses university-affiliated, general or cancer hospitals in Japan	Preconditions for successful implementation	consider preconditions at the organizational, multidisciplinary, individual and guideline levels based on nurses' perceptions Prioritizing strategies to address these preconditions	100

(Continues)

TABLE 3 (Continued)

Authors/year	Subject	Aim	Country	Methodology / design	Model	Participant or sample /settings	Type of results	Main findings	Quality score over 100
Robert et al. (2011)	quality improvement (QI) programme: The Productive Ward (PW) in England	To explore the local adoption, implementation and assimilation of one such innovation into routine nursing practice	UK	Mixed methods	diffusion of innovations in health service organizations framework	5 case studies 389 health service staff	interactions of key factors	The Interactions between several factors contribute to the rapid adoption of the PW programme. Particular organizational contexts where both "formal" and "informal" adoption decisions are made for implementing and assimilating an innovation into routine practice	70
Solomons and Spross (2011)	EBP	To examine barriers and facilitators to EBP using Shortell s framework for continuous quality improvement (CQI)	USA	Integrative review	Shortell et al., framework	23 studies	Facilitators and barriers	Barriers and facilitators can occur on the individual and institutional levels Common barriers: lack of time; lack of autonomy to change practice (strategic and cultural dimensions) Tailored Interventions directed to the dimension where the barrier occurs. A multidimensional approaches	70
Allen (2013)	ICP	This paper explores a dimension of context not typically taken into account in the improvement literature: the socio-material infrastructure	UK	Qualitative case study/ Researches analysis/ ethnography	-	two parallel empirical research projects	concept	Consider the "affordances" of interventions and how these relate to the socio-material infrastructure into which they are to be implemented	80
Abbott et al. (2014)	health information technology (IT)	To examine health IT implementation processes, the barriers and facilitators of successful implementation, identification of a beginning set of implementation best practice	Western Australia	Qualitative Descriptive design for two Case studies Theoretical analysis	modified CFIR	Two case studies Fall tips intervention EHR adoption	Best practice IT implementation	Beginning set of Health IT innovation implementation best practices. CFIR is a good framework for implementation research	70

TABLE 3 (Continued)

Authors/year	Subject	Aim	Country	Methodology / design	Model	Participant or sample /settings	Type of results	Main findings	Quality score over 100
May et al. (2014)	CPG	To investigate the dynamics of nurses' work in implementing CPG	UK	systematic review of qualitative studies	Normalization Process Theory (NPT)	Seven studies met the inclusion criteria of the review	Model Propositions	the study suggests dynamic conceptual model of CPG implementation (set of propositions which are related to mechanisms that are already known to be important in contributing to implementation processes and their outcomes)	75
Breimaier et al. (2015)	CPG fall prevention	to evaluate the comprehensiveness, applicability and usefulness of the CFIR in the implementation of a fall-prevention CPG	Austria	Before and after, mixed-methods study design	CFIR	graduate and assistant nurses in two Austrian university teaching hospital departments	Model usefulness and applicability	CFIR framework is useful as a tool to assess the different states of CPG implementation. It should be supplemented with other important factors and local features	80
Keiffer (2015)	CPG	to seek an understanding of what factors promote or prevent the implementation of evidence-based clinical practice guidelines at the point of care delivery	USA	Non-experimental, cross-sectional, Mixed-method descriptive design	social cognitive theory	65 Nurse practitioners and 35 physician's assistant/ community hospitals	Factors and implementation strategies	3 types of factors: Behavioural beliefs; Environmental Factors and Cognitive Factors Use of multifaceted approach; and identify barriers for clinical practice guidelines usage; set of recommendation	80
Jun et al. (2016)	CPG	to appraise and synthesize the current literature on barriers to and facilitators in the use of clinical practice guidelines (CPGs) by Registered Nurses	USA	integrative review	-	16 studies (7 quantitative, 9 qualitative)	Factors	Internal factors: attitudes and perceptions and knowledge External factors: format and usability of CPGs, resources, leadership and organizational culture Nurses must have an active role in the development, implementation and updating of clinical practice guidelines	75

(Continues)

TABLE 3 (Continued)

Authors/year	Subject	Aim	Country	Methodology / design	Model	Participant or sample /settings	Type of results	Main findings	Quality score over 100
Kirk et al. (2016)	New screening tool in an emergency department (ED)	to identify the factors that were perceived as most important to facilitate or hinder the introduction and intended use of a new screening tool in an ED	Denmark	Qualitative study	Theoretical Domains Framework (TDF) guided data collection and analysis	8 nurses and a geriatric and 5 and managers/ medical section of the ED in Danish university hospital	Factors under emergent theme	3 themes: professional role and identity (expert culture and professional boundaries) Beliefs about consequences (time and threat to professional identity) preconditions for a successful implementation (meaning and making sense and leadership and resources). The importance of understanding the local culture before any implementation strategy	100
Lam et al. (2016)	CPG	To explore the experience of frontline emergency nurses about guideline implementation and	China	A qualitative descriptive design	-	12 frontline emergency nurses/ Five local acute care hospital in Hong Kong	emerged key categories	The guideline-practice gaps cases: inadequate provision of corresponding administrative and organizational support, in terms of manpower, facilities and policies; environmental context and top-down planning approach. It is important to consider intra- and inter-organizational coordination and communication and the nurses' experiences	90
Munroe et al. (2018)	patient-assessment framework	To determine potential facilitators and barriers and tailor interventions to optimize future implementation of a patient-assessment framework into emergency nursing practice	Australia	A convergent parallel mixed-method study Before and after	The Knowledge to Action (KTA) TDF Change Wheel/ COM-B model	38 emergency nurses from five Australian hospitals participated in an education workshop on the HIRAID assessment framework	Facilitators and barriers Implementation	A multimodal implementation strategy to address facilitators and barriers and tailor intervention, the KTA Cycle recommends identifying barriers to knowledge use in order to tailor interventions the application of behaviour change theory recommended to address the facilitators and barriers	90

TABLE 3 (Continued)

Authors/year	Subject	Aim	Country	Methodology / design	Model	Participant or sample /settings	Type of results	Main findings	Quality score over 100
Stewart and Bench (2018)	confusion assessment method	to implement the use of a delirium assessment tool into three adult critical care units in the same hospital using a QI approach	UK	Qualitative description	Model for Improvement, which incorporates the Plan, Do, Study, Act (PDSA) framework	nurses doctors and other professionals Critical care unit in a large Central London hospital	Framework usefulness And recommendations	Use of a QI method to address potential barriers prior to project implementation. The importance of ongoing regular compliance monitoring shared with the whole critical care team	60
Lin et al. (2019)	CPG	To identify the facilitators of and barriers to nurses' adherence to evidence-based wound care CPGs	Australia	exploratory qualitative study used ethnographic data collection techniques	Theoretical Domains Framework	Nurses / Surgical ward in an Australian tertiary hospital	Facilitators and barriers	Facilitators: participants' active information-seeking behaviour and a clear understanding of the importance of technique and patient participation in wound care. Barriers: knowledge deficits about intervention and lack of resources and administrative support. Evidence-based interventions and implementation strategies should be initiated to address barriers	90
Isaac et al. (2019)	aseptic non-touch technique (ANTT)	To gain insight into the challenges faced by clinical staff in NHS child health services when adopting practices in relation to ANTT and intravenous therapy	UK	Qualitative research. Ethnography	-	23 Registered Nurse / medical and a surgical ward in the paediatric department on a single hospital site	Barriers	lack of clarity and standardization of intervention; Lack of knowledge; Confused terminology; Lack of skill and knowledge; individual preference; Organizational cultural challenges Organizational culture is a statistically significant modifier of healthcare worker behaviour	100
Grealish et al. (2019)	Delirium prevention	to systematically identify the enablers and barriers to delirium prevention for older hospitalized patients in	Australia	Interpretive qualitative ethnography, in a constructivist paradigm	the general theory of implementation social mechanisms: potential and capability	15 nurses, other staff, 11 hospitalized older people and their families; general medical ward/ tertiary hospital Australia	enablers and barriers recommendations	Implementing delirium prevention requires consideration of team practices, review of policy document design and identification of outcomes data, support collaborative reflexive practice in addition standard implementation strategies. Using a systematic assessment approach informed by theory for implementation planning	100

(Continues)

TABLE 3 (Continued)

Authors/year	Subject	Aim	Country	Methodology / design	Model	Participant or sample /settings	Type of results	Main findings	Quality score over 100
Colson et al. (2019)	Safe Infant Sleep Recommendations	To identify facilitators and barriers to the implementation of safe sleep recommendations from the perspective of hospital staff	USA	Qualitative design grounded theory	Grol and Wensing (2004) framework	46 who cared for infants on inpatient hospital units nurses and other staff member / 3 medical centres	facilitators and barriers under different levels	facilitators and barriers could be identified at the level of the innovation itself, the individual healthcare professional, the patient, the social context, the organizational context and the economic and political context	90
Renolen et al. (2019)	EBP	to explore the processes involved in two different strategies applied to integrate EBP in clinical nurses' daily work	Norway	Classical grounded theory methodology Qualitative	-	63 Interviews, 18 nurses/ 4 focus groups in two medical wards. Norwegian hospitals	Framework. Challenges	Multidimensional EBP integration framework Central findings: challenges about EBP as a parallel to daily work; use of standardization and routinization to promote EBP at the systems level; and the movement from the systems level to the individual level	80
Wolak et al. (2020)	QI Activities	Ito design a sustainable process that enable small-scale improvement efforts to be consistently replicated and spread throughout the department of nursing	USA	Qualitative description design	spread of innovation model (SOI) model	medical intermediate care unit & surgical acute care unit/ medical centre USA	Implementation strategies	Effectiveness of SOI model Key aspects: initiative supported by hospital leadership, project was visible, tools and resources availability, multimodal information (communication channels) Shared governance structure was foundational to the development and execution of the interventions. Spread happens when: one is intentional about it/ spread process In place/ dedicated resources to manage the spread process	70

TABLE 3 (Continued)

Authors/year	Subject	Aim	Country	Methodology / design	Model	Participant or sample /settings	Type of results	Main findings	Quality score over 100
Qin et al. (2020)	EBP Venous thromboembolism (VTE)	To describe how to integrate the "best" evidence into clinical VTE nursing in the ICU under the guidance of the i-PARIHS framework	China	Mixed-method Implementation study design	i-PARIHS	Comprehensive ICU (Unit A) and Neurological ICU (Unit B) / Hospital of Kunshan	Implementations step	Evidence implantation (EI): (i) simplify the innovation strategies to promote their operability; (ii) close attention by hospital administrators to the EI can facilitate the EI process effectively; (iii) after the EI programme, making the well-integrated evidence part of the standards for routine care to promote sustainability. The updated i-PARIHS framework may provide more instructive guidance for incorporating evidence into practice	70
Katowa-Mukwato et al. (2021)	EBP	To determine whether implementation of Evidence-Based Practice interventions using the Plan-Do-Study- Act model would improve the outcomes identified in the hacks	Zambia	Qualitative Description design	Plan Do Study Act (PDSA) Model	12 Nurses / medical ward Teaching University Hospital	Effectiveness of strategy Enablers and detractor	Enablers: team involvement in the planning process; need for champion (s); need for management support and Ongoing supportive supervision. Detractor: the comfort with status. Lewin's theory of transitional change can be useful in the change process, it aids in the application of logical process	60

Abbreviation: A & F, audit and feedback; CFIR: Consolidated Framework for Implementation Research; PARIHS, Promoting Action on Research Implementation in Health Service; NHS, National Health Services.

Table 3 presents a summary of the included studies. It compromises the studied subject, the aim of study, the country, the study design and methodology, the used model or framework if presents, the context where the study was carried out, the main results with brief description of main findings, in addition to the quality appraisal score.

with mixed type studies: qualitative research, randomized controlled trials, non-randomized studies, quantitative descriptive studies and mixed-methods studies (Lotfi et al., 2019).

2. To assess the quality of included reviews, we used the Critical Appraisal Skills Program (CASP) checklist for systematic reviews. The appraisal process consisted of three steps: (1) article validity, (2) summary of study results and (3) determining the usefulness of results (CASP, 2018). It was useful to appraise articles by transparently evaluating study quality and the evidence within. The CASP tool is a user-friendly option for researcher and is endorsed by the Cochrane Library and the World Health Organization for qualitative evidence synthesis (Long et al., 2020).

Both tools consisted of checklist questions and criteria. Each question was answered with "yes," "no" or "cannot tell" if the criteria were met, unmet or partially met, respectively. Summary tables (1, 2, 3 and 4) for the study appraisal checklist are shown (Appendix S2). An overall score was accorded to each study based on the following met criteria. To ensure that only medium and high-quality studies are included, we decided for both tools that studies with a score <50 will be excluded.

2.7 | Ethics

Research Ethics Committee approval was not required given the documentary nature of this study and the lack of human participants.

3 | RESULTS

3.1 | Study characteristics: design, settings and subjects

The 28 studies were conducted in 11 countries: the United States ($n = 7$), the United Kingdom ($n = 7$), Australia ($n = 5$), Sweden ($n = 1$), Japan ($n = 1$) China ($n = 2$), Austria ($n = 1$), Norway ($n = 1$), Denmark ($n = 1$), Singapore ($n = 1$) and Zambia ($n = 1$). In terms of study topics, those reporting implementation changes in clinical practice such as evidence-based practice (EBP) and clinical practice guidelines (CPG) were over the half ($n = 15$), whereas only two studies reported the implementation of informatics technology. The majority of studies focused on the identification of barriers and facilitators or factors impacting implementation process ($n = 25$). In terms of study design and methodology, the majority of studies ($n = 17$) were qualitative in nature (Abbott et al., 2014; Aitken et al., 2011; Allen, 2013; Barr, 2002; Christensen & Christensen, 2007; Colson et al., 2019; Grealish et al., 2019; Isaac et al., 2019; Jansson et al., 2011; Katowa-Mukwato et al., 2021; Kirk et al., 2016; Kite, 1995; Lam et al., 2016; Lin et al., 2019; Renolen et al., 2019; Wolak et al., 2020; Yagasaki & Komatsu, 2011). Five studies have used mixed-methods approaches (Breimaier et al., 2015; Keiffer, 2015; Munroe et al., 2018; Qin et al., 2020; Robert et al., 2011). Two have followed a quantitative design, with data collection based on cross-sectional surveys (Koh et al., 2008; Stewart & Bench, 2018). The four remaining studies were reviews (Dulko, 2007; Jun et al., 2016; May et al., 2014; Solomons & Spross, 2011), comprising integrative and systematic reviews (two each). Studies reporting innovation implementations in critical care units ($n = 9$) and medical wards ($n = 5$) were more frequent than other sectors. Twenty-two studies used at least one theoretical model as part of the research methodology (Abbott et al., 2014; Aitken et al., 2011; Barr, 2002; Breimaier et al., 2015; Christensen & Christensen, 2007; Colson et al., 2019; Dulko, 2007; Grealish et al., 2019; Jansson et al., 2011; Katowa-Mukwato et al., 2021; Keiffer, 2015; Kirk et al., 2016; Kite, 1995; Koh et al., 2008; Lin et al., 2019; May et al., 2014; Munroe et al., 2018; Qin et al., 2020; Robert et al., 2011; Solomons & Spross, 2011; Stewart & Bench, 2018; Wolak et al., 2020). These models were used either as a guide for study methodology ($n = 15$) and/or to guide change implementation ($n = 8$). Further information is shown in (Tables 3 and 4).

In terms of study quality, all studies achieved an overall quality score of ≥50 (Table 3); thus, they all were included. All studies were clear in terms of objectives and research questions. However, some qualitative studies required better justification for design and methodology choice (Aitken et al., 2011; Allen, 2013; Barr, 2002; Christensen & Christensen, 2007; Katowa-Mukwato et al., 2021; Lin et al., 2019; Renolen et al., 2019). In some quantitative studies, we queried whether the selected sample was representative or not, and whether confounders were accounted for in the design (Stewart & Bench, 2018). Additionally, in some mixed-methods studies, the rationale for a mixed-method design approach was unclear (Breimaier et al., 2015; Keiffer, 2015; Robert et al., 2011). For reviews, we observed a lack of quality assessments for studies (Dulko, 2007; May et al., 2014; Solomons & Spross, 2011). In addition, information about results precision was absent; however, this could be related to the type of the included reviews.

3.2 | Analysis of findings

Our review included multiple study designs with different aims and findings. In the following sections, we describe results according to study findings type.

3.2.1 | Implementation strategies

Multiple implementations strategies and interventions were identified for successful process of change integration. The majority of studies used multifaceted approaches, which combined two or more strategies (Foy et al., 2005). In addition, tailored interventions target identified or perceived barriers to promote implementation (Abbott et al., 2014; Breimaier et al., 2015; Grealish et al., 2019; Kite, 1995; Koh et al., 2008; Lam et al., 2016; Lin et al., 2019; Munroe

TABLE 4 Different models used across studies

Methodology and/or model	Methodology	Implementation process	Articles
Rogers' model for diffusion of innovations (1983)/ (1995)	2	-	Kite (1995) Barr (2002)
Advancing Research and Clinical practice through close Collaboration (ARCC) model	-	1	Aitken et al., 2011
Consolidated Framework for Implementation Research (CFIR)	-	1	Breimaier et al. (2015)
Social cognitive theory	1	-	Keiffer (2015)
Plan Do Study Act (PDSA) Model	-	2	Stewart and Bench (2018) Katowa-Mukwato et al. (2021)
Lewin's theory of transitional change	1	1	Christensen & Christensen, 2007Dulko (2007)
Modified CFIR	1	-	Abbott et al. (2014)
Normalization Process Theory (NPT)	1	-	May et al. (2014)
Shortell et al. framework	1	-	Solomons & Spross (2011)
The Theoretical Domains Framework (TDF)	2	1	Kirk et al. (2016), Munroe et al. (2018) Lin et al. (2019)
Behaviour Change Wheel/COM-B model	-	1	Munroe et al. (2018)
Adapted diffusion of innovations of health Services in Organizations framework	1	-	Robert et al. (2011)
General theory of implementation social mechanisms: potential and capability	1	-	Grealish et al. (2019) (41)
Grol and Wensing (2004) framework	1	-	Colson et al. (2019) (42)
Practice Change Theory	1	-	Koh et al. (2008) (28)
Spread of Innovation Model (SOI)	1	-	Wolak et al. (2020) (35)
Promoting Action on Research Implementation in Health Service PARIHS/i-PARHIS	2	-	Jansson et al. (2011) (45), Qin et al. (2020) (52)

A summary of the different frameworks and/or models in each study. The table shows the frequency of each model according to how it was used.

et al., 2018; Qin et al., 2020; Yagasaki & Komatsu, 2011). Different interventions and implementation strategies from 26 out of the 28 studies are shown in Appendix S3. The most frequently used or recommended strategies were training and ongoing education and resource allocation; ongoing communication between different participants; process monitoring; outcome evaluations; providing policies and administrative support; a leadership approach; and participant involvement. Some studies proposed specific interventions, such as partnering with patients or families (Grealish et al., 2019; Lin et al., 2019), the use of role models or opinion leaders (Jansson et al., 2011; Kite, 1995; Munroe et al., 2018; Qin et al., 2020) and pilot schemes to test intended changes (Abbott et al., 2014; Aitken et al., 2011; Christensen & Christensen, 2007; Grealish et al., 2019; Kite, 1995; Stewart & Bench, 2018; Wolak et al., 2020). The use of an appropriate change model was also suggested by more than half of the studies (54%), either to guide an implementation process or as a tool to identify and understand what factors could influence a change practice implementation (Abbott et al., 2014; Aitken et al., 2011; Breimaier et al., 2015; Christensen & Christensen, 2007; Colson et al., 2019; Dulko, 2007; Grealish et al., 2019; Jansson et al., 2011; Katowa-Mukwato et al., 2021; Koh et al., 2008; Munroe et al., 2018; Qin et al., 2020; Stewart & Bench, 2018; Wolak et al., 2020).

3.2.2 | Identified factors, their types and interrelationship

The majority of studies (25 of 28) provided a wide range of factors that are considered transversal, as they are seen across multiple organizational settings and in multiple type of practice change implementation. (Appendix S1-S4). The top five recurrent transversal elements were (1) resource availability, for example time, materials, administrative duties and staff, (2) knowledge and/or education, (3) participants' perception, attitude, skills, experiences and motivation, (4) organizational culture and participant involvement and (5) leadership and communication, and associated channels. Koh et al., 2008 reported that 73.3% of respondents (nurses) perceived a lack of facilities and materials as major barriers to the implementation of all-prevention guidelines. However, the availability of such materials and tools did not guarantee their use (Kite, 1995). Kirk et al., 2016, explained that new tools brought change and potentially threatened the daily responsibilities of professionals. This is because these tools affected their relative power, resources and identities. Therefore, users tended to resist change. Thus, it was essential to consider not only the organizational level, but also the individual level (Colson et al., 2019). We

TABLE 5 Synthesis of different elements

	Facilitators	Barriers	Implementation strategies
Macro level	• Linkage between external change agency and adopter	-	-
Meso level/ Organizational	• Organization culture • Structural preparedness • Change measurement and supervision • Management and organizational support • Appropriate learning environment mentorship • Resources (time, materials, finances administrative) • Supporting shared objectives • Stakeholders aim and needs • Leadership at multilevel • Opinion leader and role model • Champion or facilitator • Communications and its channels	• Lack of resources (human resources, financial, materials) • Lack of administrative support • Lack of managerial support • Lack of policy and guidelines	• Multifaceted approach† • Tailored interventions‡ • Creating organizational structure • Allocation of resources (Time, money equipment) • Presence of policy and administration support • Providing organizational support • Creating a culture/ organizational culture • Stakeholder engagement • Use leadership approach • Opinion leader / role modes • Process evaluation regulatory monitoring and audit and providing feedbacks • Use of change champions. / internal facilitator • Reminder and identification system • Develop an action plan / clear instruction • Consider the existing conditions at the point innovation introduced • Use appropriate change model
Individual level	• Involvement in the change • perception of participants and attitude • Acceptance and commitment • Experience skills and motivation • Educational, knowledge • Practices / experience the change and feedback	• Workload and time constraint • Resistance to change • Lack of authority to change practice	• Pilot scheme (Test and experience the change) • Participants involvements • Ongoing education / information and trainings
Innovation level	• Innovations or intervention itself attractiveness • Feasibility / affordance of innovation	-	• Customize guideline to the need of professionals • Identifies the affordances of innovation
Patient level	• Patient implication	• Patient level (knowledge, status attitude)	• Partnering with patient or family
Activity level socio-material factors	• Socio-material context • team dynamic or approach	-	• Meaning and sense making in nursing practices • Have dedicated team or multidisciplinary team approach • Consider the socio-material infrastructural features (relations among (1) artefacts, (2) artefacts and their context and (3) artefacts and professional's action)

Note: A summary of the overall synthesis of previous results in terms of barriers and facilitators as well as the most effective implementation interventions to consider in implementing change in nursing practice.

†Multifaceted approach intervention: simultaneous use of several implementation strategies two or more (Suman et al., 2016).

‡Tailored interventions (intervention tailored to the implementation context the existing barriers Kwok et al., 2020).

observed factors that were related to the subject of innovation itself, for example credibility in terms of safety and feasibility in practice and its attractiveness for patients and families (Colson et al., 2019). Understanding the meaning and sense of new innovation was identified as an important precondition for successful implementation (Kirk et al., 2016). Similarly, the implemented changes must be in the interest of professionals and seen as valuable agents for care improvement (Allen, 2013). The lowest cited factors were links between external change agencies, developers and adopters of change (Breimaier et al., 2015; Colson et al., 2019;

Robert et al., 2011; Yagasaki & Komatsu, 2011); stakeholder aims and needs (Breimaier et al., 2015; Jansson et al., 2011; Solomons & Spross, 2011; Yagasaki & Komatsu, 2011); and supporting shared objectives (Allen, 2013; Katowa-Mukwato et al., 2021; Wolak et al., 2020; Yagasaki & Komatsu, 2011).

We identified also another type of factors related to activity level, but this was seen in fewer number of studies (20%), for example socio-material contexts were identified in only three studies (Allen, 2013; Grealish et al., 2019; May et al., 2014). Socio-materiality "arises from the interplay between particular configurations of not only material phenomena, but also material arrangements set up by individuals to discover these phenomena and the knowledge practices established in time" (Parmiggiani & Mikalsen, 2013). Also, team dynamics or approaches were identified in only three studies (Breimaier et al., 2015; May et al., 2014; Yagasaki & Komatsu, 2011), and the major seen barriers to practice change implementation (by 56%) were time constraints and increased workloads (McKee et al., 2017). Other barriers were similarly identified such as the lack of participant authority to change practices (Keiffer, 2015; May et al., 2014; Renolen et al., 2019; Solomons & Spross, 2011; Wolak et al., 2020; Yagasaki & Komatsu, 2011); professional resistance to change and reduced staffing (Jun et al., 2016; Katowa-Mukwato et al., 2021; Kirk et al., 2016; Munroe et al., 2018; Yagasaki & Komatsu, 2011). These barriers can create an imbalance between the integration of practice innovation and daily professional responsibilities (Aitken et al., 2011; Allen, 2013; Breimaier et al., 2015; Grealish et al., 2019; Isaac et al., 2019; Jun et al., 2016; Katowa-Mukwato et al., 2021; Keiffer, 2015; Lam et al., 2016; Lin et al., 2019; Renolen et al., 2019; Robert et al., 2011; Solomons & Spross, 2011; Wolak et al., 2020; Yagasaki & Komatsu, 2011).

4 | DISCUSSION

In this scoping literature review, we mapped previous research on change implementation in nursing practices. This is in order to identify what type of factor can impact implementation processes; how these factors were interrelated in terms of their different types and investigated different implementation strategies.

Firstly, we showed that previous research on change implementation in nursing practices predominantly has followed a qualitative design. This can be explained by the type of study subject, which is "implementation science" that requires consideration of study context. In addition, research efforts in implementation science have been limited. However, improvement guidelines and requirements for nursing practices have been steadily increasing. It is acknowledged that the dissemination of desired changes could not guarantee their integration into professional practice (Francke et al., 2008; Spoon et al., 2020; Yagasaki & Komatsu, 2011). It takes approximately 17 years to translate 14% of all evidence-based research into nursing practice (Beauchemin et al., 2019). Additionally, critical care units were the most frequently studied environments when compared to other hospital departments. This may have been related to environmental complexity about patient status and care, and also the potentially challenging incorporation of practices changes in these critical environments (Phelan et al., 2018). Intensive care units were shown struggling with the integration of screening and management strategies (Stewart & Bench, 2018). Meanwhile other contexts were poorly addressed, we suggest further empirical research on change implementation in nursing practices and investigating multiple organizational contexts. This will undoubtedly identify more challenges and factors impeding or enabling implementation processes.

Secondly, we reported different suggested and used implementation strategies, and mapped different types of factors impacting implementation processes on multiple organizational levels. As a result, this study contributes with a practical outline for both implementers and researchers (Table 5). The latest summarizes the studies' output, which can be useful to support knowledge in implementation sciences. Our contribution gives insights on different elements, barriers or facilitators, and the most effective implementation interventions to consider when implementing change in nursing practice. This is regardless to multiple type of clinical practice changes and contextual settings as well.

In terms of implementation strategies, a multifaceted approach with tailored interventions was identified as the most effective way to generate change (Abbott et al., 2014; Breimaier et al., 2015; Grealish et al., 2019; Kite, 1995; Koh et al., 2008; Lam et al., 2016; Lin et al., 2019; Munroe et al., 2018; Qin et al., 2020; Yagasaki & Komatsu, 2011). Multiple factors were interacting with each other requiring multiple strategies to generate effective implementation and positive results. Prevalent interventions were the allocation of resources (time, staff and materials); policy allocation and administrative support; knowledge provision; education and training; monitoring and evaluation; frequent and ongoing communications; leadership approaches; participant involvement; organizational culture and support creation; the use of key actors as champions; role models and opinion leaders (Aitken et al., 2011; Grealish et al., 2019; Jansson et al., 2011; Katowa-Mukwato et al., 2021; Koh et al., 2008; Lam et al., 2016; Lin et al., 2019; Qin et al., 2020; Solomons & Spross, 2011; Wolak et al., 2020). Also, some specific interventions were related to contextual implementation such as partnering with patients and families (Grealish et al., 2019; Lin et al., 2019) and using reminder systems (Aitken et al., 2011; Barr, 2002; Colson et al., 2019; Katowa-Mukwato et al., 2021; Koh et al., 2008; Lin et al., 2019; Munroe et al., 2018; Solomons & Spross, 2011; Stewart & Bench, 2018). These interventions confirmed the implementation strategies identified by Cochrane's Effective Practice and Organization of Care (EPOC) taxonomy guidelines (EPOC, 2015). In addition, the use of appropriate change models was highly promoted. They can be used either as supports to operationalize implementation strategies, or to guide implementation processes. Also, they can be considered as tools to identify what barriers and facilitators could impact an implementation process (Abbott et al., 2014; Breimaier et al., 2015; Christensen & Christensen, 2007; Colson et al., 2019; Dulko, 2007; Grealish et al., 2019; Jansson et al., 2011; Katowa-Mukwato et al., 2021; Koh et al., 2008; Munroe et al., 2018;

Qin et al., 2020; Stewart & Bench, 2018; Wolak et al., 2020). However, we observed potential flaws in some models related to the specificity of local contexts for change implementation (Yagasaki & Komatsu, 2011). For example, Breimaier et al. (2015) suggested adding "stakeholder aims and stakeholder wishes/needs" to the Consolidated Framework for Implementation Research. This was in order to adapt them to local contexts and identify and manage barriers and facilitators when implementing innovations. This confirms Nilsen (2015) who stated that there is no grand implementation theory, since implementation was too multifaceted and complex a phenomenon to facilitate universal explanation. These observations demonstrated a requirement to build integrated approaches while considering robust factors and local implementation contexts.

In terms of the identified factors' types and how they are interrelated, this work showed that the majority of studies adopted a strategic perspective, which emphasized transverse elements. These are considered as systematic factors in our review. These components were important and generic as they could be useful in multiple contexts and different management levels. Although, they remained outside the parameters of the local implementation context. Among these systematic factors, we identified distinct and robust elements regardless of the implementation context and type of change. These were divided mainly across two levels: first, the organizational level (resource availability, leadership approaches, organizational culture, effective communications, and managerial and organizational support). Second, the professional level (knowledge, education and skills, participant perceptions and involvement) (Aitken et al., 2011; Colson et al., 2019; Keiffer, 2015; Lam et al., 2016; Qin et al., 2020; Robert et al., 2011; Wolak et al., 2020; Yagasaki & Komatsu, 2011). The lack in any of these factors could generate major barriers to effective change integration. For example, organizational cultures were considered as learning contexts, not only as facilitators for change implementation processes (Kirk et al., 2016). An absence of leadership support could also induce hesitation in nurses to integrate new or unusual practices; practitioners reported the need for support from nurse leaders, who in turn required support from their leaders (Gifford et al., 2018). However, our findings showed that champions, expert clinicians but with informal leader roles (Mark et al., 2014), were identified in less than half of studies (36%; Abbott et al., 2014; Aitken et al., 2011; Christensen & Christensen, 2007; Grealish et al., 2019; Kite, 1995; Stewart & Bench, 2018; Wolak et al., 2020). This may be explained by the presence of other actors as role models and/or opinion leaders (Barr, 2002; Breimaier et al., 2015; Colson et al., 2019; Keiffer, 2015; Kirk et al., 2016; Kite, 1995; Lin et al., 2019; Qin et al., 2020). Opinion leaders are respected, influential, passionate and competent personnel (Mark et al., 2014) whose decisions and behaviours are generally accepted by other peer professionals (Qin et al., 2020). Additionally, staff engagement in the design and implementation process promoted ownership and made it more probably to be accepted in practice (Lin et al., 2019). This occurred through favourable professional attitudes, perceptions (Jun et al., 2016), motivation and practice preferences (Colson et al., 2019; Isaac et al., 2019). Staff buy-in generated benefits at the onset of improvement projects in terms of managing and sharing results (Wolak et al., 2020). The widespread participation of professionals in change processes was acknowledged as the most frequently used approach to avoid resistance to change (Nilsen et al., 2020). Also, factors related to the patient and family were observed, including knowledge, attitudes, health status and ethnicity (Colson et al., 2019; Grealish et al., 2019; Jun et al., 2016; Keiffer, 2015; Koh et al., 2008; Lam et al., 2016; Lin et al., 2019; Munroe et al., 2018). Koh et al. (2008) reported that the inability to reconcile patient health status and ethnicity with guidelines was a barrier to change. In other contexts, the links between the adopter of change and an external change agency and/or researcher were essential for the change adoption (Breimaier et al., 2015; Colson et al., 2019; Robert et al., 2011; Yagasaki & Komatsu, 2011). This may be related to the effects of these external agencies (i.e. the role of accreditation agencies) in imposing such knowledge and requirements into practice. Also, other healthcare-provider competencies promoted change adoption and integration (Colson et al., 2019; Yagasaki & Komatsu, 2011).

However, the operationalization of these previous cited factors in the local context was challenging. Therefore, other researchers investigated the implementation of change in nursing practice from an activity-level perspective (Allen, 2013; Grealish et al., 2019; May et al., 2014). These factors highlighted other types of elements related to local socio-material context. For example, when implementing multidisciplinary guidelines for cancer care, an equal working partnership between multidisciplinary team members was important for effective integration. In a previous study, teamwork factors were essential in creating and supporting a work culture between professionals (Yagasaki & Komatsu, 2011). Other studies argued the importance of multiple "affordances" of innovations or technologies in understanding general mechanisms of an artefact and its unintentional consequences (Allen, 2013). In other words, how innovation affordances were related to the socio-material infrastructures into which they were introduced (Allen, 2013). May et al. (2014) suggested that nurses' capability to implement and embed a CPG depended on the degree to which guidelines were workable. This way, the inter-relations between the implemented change, actor and context must be considered. Moreover, importantly, it accounted for how these relationships were reciprocally adapted to generate positive effects for different purposes (Allen, 2013).

To conclude, we indicated two different types of factors, systematic and contextual factors. Generally, these factors were elaborated independently in previous studies. Systematic factors were identified by the majority of studies, with strategic perspectives identified in terms of elements impacting on change implementation. As well as, these studies were based on cross-sectional models, which agreed with the previous literature (May et al., 2016; Melo & Bishop, 2020). Contextual factors were related to social and material interactions. This separation between factors could be problematic for management, especially in terms of manager's roles, where a strategic perspective differs from a nurses' local reality (Salma & Waelli, 2022). However, considering both factor types and how they

are interrelated could be challenging for managers. Therefore, we need to develop operational framework which considers both implementation approaches; combining both systematic and contextual factors (Salma & Waelli, 2021). Finding the best practices for effectively implementing changes into routine practices is beneficial for healthcare system. Especially, in front of critical situations where we need implementing a change in the best effective way, for example pandemic, nursing shortage, increasing cost of care and other looming factors impacting our health care system.

4.1 | Limitations

This study had several limitations. Firstly, in terms of research output, we were limited to four research databases, which may have contributed to the low number of selected studies. However, to address this and identify maximum, quality studies, a robust three-step study selection method was incepted. Secondly, the subject of change was not specified, potentially leading to diverse and unsynchronized results. However, our interest was to map different factors and interventions, and not compare literature findings. Thus, factors responding to the same perspective were classified together, for example mentorship programmes, ongoing education and training were combined as staff skills and information under the factor or element.

4.2 | Recommendations and perspectives

On the strength of our review, we recommend for managers and implementers to explore and adapt the key elements for implementation processes, as well as to consider the specificity of local context of implementation. This can be through the identification of different factors related to the socio-material context during implementation processes. In these perspectives, it seems essential to develop an integrated framework that considers both types of factors. In order to develop this framework, the whole process of change implementation must be investigated, and in different types of hospital sectors. This can also be beneficial to identify more specific factors, as well as problems or challenges that can emerge during implementation processes in the real context of work. Accordingly, we can identify more pragmatic and directed solutions supporting implementation initiatives in nursing practice.

5 | CONCLUSION

This scoping review provides a contemporary summary of studies on the implementation of change in nursing practices; therefore, it fills an important knowledge gap in the literature. Previous research had focused on the universal concept of systematic components underpinning implementation processes. However, our review helped to identify the importance to contextualize these elements in the local context. By exploring social–material factors combined with systematic factors, managers acquire a broader vision for what may impact the implementation of change in nursing practice. Also, they understand how the local context which involves professionals and their activities, content and actions are interrelated in implementation process. This supports the importance to create an organizational culture where change implementation and evidence are valued.

AUTHOR CONTRIBUTIONS

IS and MW: Idea conception, critical feedback, shaping research analyses and manuscript and final version approval. IS with the help of MW: Study design. IS: Data collection and selection according to inclusion and exclusion criteria and writing—first draft and final draft generation in collaboration with MW. MW: Selected studies approval, analytical methods verification, correction proposal and overall supervision. All steps were reviewed and verified by MW.

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CONFLICT OF INTEREST

The authors declare no competing interests.

DATA AVAILABILITY STATEMENT

Datasets used and/or analyzed during this study (i.e., the study database and extracted data) are available from the corresponding author upon reasonable request

RESEARCH ETHICS COMMITTEE APPROVAL AND CONSENT TO PARTICIPATE

Research Ethics Committee approval was not required given the documentary nature of this study and the lack of human participants (see www.ucd.i.e/researchethics).

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SUPPORTING INFORMATION

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

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