

SYSTEMATIC REVIEW

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The race to retain nursing workforce in healthcare: an umbrella review of effectiveness of retention interventions and strategies

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Abstract

Background The global healthcare industry is facing a critical challenge in recruiting and retaining skilled nursing workforce. In recent decades, several retention interventions and strategies have been documented in numerous systematic literature reviews worldwide. However, the available information remains broad and fragmented due to the absence of dedicated umbrella reviews to synthesize and consolidate this top-notch evidence together.

Aim To summarize from systematic literature reviews, the effectiveness of various interventions and strategies in retaining the nursing workforce in healthcare.

Design An umbrella review.

Methods This umbrella review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A comprehensive literature search of systematic reviews published within the past ten years was performed in July 2024, using PubMed, Ovid Medline, EMBASE, CINAHL, Scopus, and gray literature databases. Eligible studies were screened using Covidence, and A Measurement Tool to Assess Systematic Reviews (AMSTAR) was used to assess the methodological quality.

Results The search yielded 1,094 articles, of which 14 met the inclusion criteria. A narrative synthesis categorized effective retention strategies into five primary groups: (1) onboarding and early career interventions (e.g., externships, internships, extended orientation, transition-to-practice programs, nursing residency, special track programs, preceptorship, mentorship, and clinical ladder programs); (2) leadership; (3) work environment and organizational factors; (4) individual factors; and (5) the use of innovation, technology, and robotization. These interventions demonstrated effectiveness in enhancing nurse retention and lowering turnover.

Conclusions Nurse retention is a complex and multifaceted issue. No single intervention works in isolation; but rather, a network of strategies and interventions is necessary to effectively reduce turnover and retain nursing staff. Future research should focus on retention strategies in Low- and Middle-Income Countries and explore the impact of technological innovations and robotization to align nurses' retention with the evolving healthcare landscape.

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Implications for nursing and health policy Urgent and coordinated action is needed to address nurse retention. Nurse managers and policymakers must adopt an early robust onboarding program, transformative leadership styles, supportive nursing work environments while embracing innovation, technology, and robotization to achieve better retention.

Keywords Nurses, Nurses' retention, Nurses' turnover, Nursing workforce, Retention interventions, Strategies, Umbrella review

Introduction

The global healthcare industry is facing an unprecedented challenge with recruiting and retention of skilled nursing workforce [1–4]. Recent studies have highlighted worryingly increasing global trends in nurse turnover. According to a systematic review by the World Health Organization (WHO) done in collaboration with the International Council of Nurses (ICN) [5], with over 100 included studies, 40% of nurses worldwide intended to leave their careers or the professions in 2020. Additionally, it is noted that 12.5% of currently employed nurses are working outside their country of birth or where they trained. In Sub-Saharan Africa, a review by Ayalew et al. [6] found that 50.74% of African nurses intended to exit their positions in 2021 [6]. Research documented over the years from the USA shows rising turnover rates: 17% in 2006 [7], 19.5% in 2015 [8] and 27.65% in 2018 [9]. In addition, research results from the United Kingdom [10, 11], Australia [12], Japan [13], South Korea [14–16], and Canada [17], show that turnover is continuing to threaten healthcare systems and the countries in part have employed immigrant nurses to cover the shortage. Similar trends are evident globally, with high turnover and turnover intentions of 22.3% in China [18], 36.5% in Hong Kong [19], 56.1% in Saudi Arabia [20], 49.5% in Turkey [21], and 77% in Ethiopia [22]. Despite these country-specific variations, the alarmingly high nurse turnover rates underscore a significant global public health and nursing problem. This situation climaxes the urgent need to understand and implement effective nurse retention strategies. Our umbrella review therefore seeks to summarize from systematic literature reviews, the identified effective strategies and interventions for retaining the nursing workforce in healthcare and mitigating high global nurse turnover.

Background

Global research has extensively documented the burden of nurse turnover. The WHO has termed the shortage of nurses a "ticking time bomb" if immediate action is not taken [23]. The "State of the World's Nursing 2020" report by WHO and its partners, points out nursing as the largest healthcare workforce, with nearly 27.9 million members, representing about 59% of the global healthcare workforce [5]. However, there is a 5.9 million nurse shortage [5], which is predicted to rise almost double by

2030 and possibly triple by 2050 [24]. With the soaring nurse turnover, understanding and implementing effective interventions to retain nurses in their current positions is imperative and urgent.

Nurse retention is defined as the ability of a healthcare organization to keep its nursing staff employed over a prolonged time [25]. Achieving this requires the implementation of a comprehensive array of interventions, programs and practices designed to foster a supportive and engaging work environment. Retaining nurses is paramount for several reasons. High turnover rates lead to increased recruitment, replacement, training and orientation costs for new staff, disrupt service delivery, and compromise patient safety and quality of nursing care [1, 26–28]. Moreover, nurse shortages occasioned by turnover place additional burdens on remaining staff who must work extra hours to cover those who have exited, leading to burnout, job dissatisfaction, and further turnover, a vicious cycle that jeopardizes the stability and functionality of healthcare systems [14, 29, 30]. Additionally, nurse turnover is associated with increased medical errors occasioned by work-related stress and burnout, causing high patient morbidity and mortality. Retaining the nursing workforce is therefore a crucial way to address high turnover rates and mitigate its negative consequences in healthcare.

There are several identified interventions and strategies to retain nurses in the workplace. These include; preceptorship programs [31], mentorship programs [32], residency and internship programs [33, 34], externship programs [35], orientation and transition to practice programs [36], clinical ladder and career advancement education opportunities [37]. Other vastly mentioned strategies include good leadership, organizational support, positive organizational culture and climate, enhancing job satisfaction, competitive salary, bonuses and incentives, professional support, innovation and technological use, social support and most importantly improving the work environment [1, 38–40]. However, the big debate remains, of all the strategies, what works? Where, when and how?

In medical evidence-based practice, systematic literature reviews are considered the highest source of scientific evidence in the research "evidence pyramid" [41, 42]. To date, several systematic reviews on nurses' retention interventions and strategies have been conducted

globally. However, there are few dedicated umbrella reviews to summarize this top-notch scientific evidence. Our review therefore sought to fill this gap. By examining a wide range of systematic reviews, this study seeks to identify common themes, successful strategies, and gaps in current literature. The comprehensive synthesis will not only inform different healthcare stakeholders, policymakers and healthcare managers but also guide future research in addressing the critical issue of retaining the nursing workforce in healthcare.

Aim of the review

- i. To summarize from systematic literature reviews, the effectiveness of identified strategies and interventions in retaining the nursing workforce in healthcare settings

Material and methods

This study was conducted in accordance with the guidelines for reviews as stipulated in the Cochrane Handbook for Systematic Reviews of Interventions [43]. The selection process is reported in the PRISMA flow chart (The Preferred Reporting Items for Systematic Reviews and Meta-Analysis) [44]. Before commencing the study, its priori protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO) with registration number: CRD42024570115.

Research question

The PICO framework [45] was used to formulate the research question for this study.

Research Question: What interventions/strategies are effective in the retention of nurses in healthcare?

P: Population: nurses of all cadres.

I: Intervention: nurses retention interventions e.g. nurses' residency, mentorship, leadership etc.

C: Comparator: not applicable.

O: Outcome: increased retention rates/intention to stay, decreased turnover, increased job satisfaction.

Study design

This study was an umbrella review, also known as a review of reviews, overview of reviews, review of systematic reviews, summary of systematic reviews, or synthesis of reviews [46]. This design was chosen to comprehensively aggregate and synthesize evidence from systematic reviews, which are considered the topmost source of evidence in the medical research 'evidence pyramid,' fitting well the agender of our study to provide highly valuable nursing retention information for clinical research and policy decisions.

The search strategy

The search strategy for this review was adapted from a previous systematic review [46] and verified using PubMed-indexed Mesh terms. The final search string was as follows:

1. nurs* OR nurses OR nursing
2. AND
3. Retain* OR retention OR intention to stay'
AND
4. 'Systematic Review' OR 'systematic literature review'

Searching

A comprehensive literature search was conducted in July 2024, using the following electronic databases: PubMed, Ovid Medline, EMBASE, CINAHL and Scopus. Additionally, the search was also performed in grey literature (Google Scholar, ProQuest Dissertations & Theses Global and ResearchGate). We employed both extensive electronic and manual search techniques. For articles that were not accessible, we reached out to the authors via email, ResearchGate, or other available communication methods to request the articles. The search was restricted to the English language and studies conducted between 2014 to 2024 to maintain consistency. The complete search results from each database are presented in the supplementary file Table S1.

Inclusion and exclusion criteria

We included an article if it met the following criteria: (a) was a rigorously conducted systematic literature review focusing on nursing personnel of any cadre, (b) written in the English language, (c) conducted within the last 10 years (2014–2024), and (d) it examined nurse retention or intention to stay as the main outcome variable or aimed to reduce turnover through the implementation of specific interventions or strategies. Systematic literature reviews that focused on nursing students or included mixed healthcare professionals and where the results did not primarily focus on nurses were excluded.

Screening of the articles

The search results from databases were all transferred to EndNote to collect and pool them together and initial deduplication was done. They were then exported into the Covidence software for further deduplication and screening. With Covidence's blinding setting activated, two authors, EKK and ME, working independently conducted first title and abstract screening, followed by full-text screening to evaluate each study for inclusion eligibility. Disagreements on the articles were resolved through discussion and consensus at each screening level. In cases where no agreement was reached MZ or AUS as a third screener and supervisor was involved.

Data extraction

The two authors independently extracted data using a pre-designed, standardized extraction sheet, which was piloted prior to use to ensure clarity and consistency. From the included articles, the following data were extracted: author, year of publication, review title, objectives/aims, type of review, countries of the primary articles included in the review, searched databases, number of screened articles (N), number of included articles (n), setting, type of nurse participants, data appraisal tool used, method of data synthesis, details of nurses retention intervention/strategies, and the main outcomes. Discrepancies were resolved through discussion and consensus.

Quality appraisal of the included studies

Authors EKK and ME, assessed the quality of the included studies using A Measurement Tool to Assess Systematic Reviews (AMSTAR) [47]. The AMSTAR tool has been extensively utilized in similar previous umbrella reviews and is recognized as one of the most valid and reliable instruments for this kind of study [48–50]. There are two versions of AMSTAR: the original version with 11 questions, which primarily focuses on systematic reviews, and AMSTAR-2, an updated and expanded version with 16 questions that includes consideration for both systematic reviews and meta-analysis. We chose the original AMSTAR 11-question tool because our included studies were all systematic literature reviews without meta-analysis. Responses to questions are given as “Yes”, “No”, “Can’t tell”, or “Not applicable”. Yes, is scored 1, and ‘no’, ‘can’t tell’ and ‘not applicable’ are all scored 0. In many studies, can’t tell, not applicable are classified as one. To determine the quality of a study, the responses are summed up. Studies with a total score of 8 to 11 i.e. all scores above 8 are considered “high quality”, scores 4–7 are “moderate quality”, and 0–3 are “low quality”.

Data synthesis

Due to the heterogeneity in the PICO criteria (mainly on the population and interventions) in the included reviews, and previous performance of narrative or thematic analysis in all our included studies, a meta-analysis could not be done. Therefore, a narrative synthesis was chosen as the right method for our data synthesis. To enhance reliability, replicability, quality, rigour and transparency in the synthesis, we followed the 4- key point guidelines of narrative synthesis as laid down by Cochrane Consumers and Communication Review Group [51]. Table 3 provides evidence of the results of the narrative synthesis guided by the 4-key points of (1) developing a theory of how the intervention works, why and for whom, (2) developing a preliminary synthesis of the findings of the included studies, (3) exploring

relationships in the data within and between studies and (4) assessing the robustness of the synthesis by checking quality and bias in the included studies. Researchers have opined that the logical preliminary starting point of a narrative review is data tabulation [52], and thus we first tabulated the results in an intervention model i.e. population, intervention, and outcome table. This was followed by step 3 which involved analyzing, describing each study, summarizing results, and making comparisons based on interventions and previous narratives/themes of the included reviews. This was to identify key patterns across studies and organize studies into small manageable clusters. Consequently, from the studies, we categorized the retention interventions into five main groups: Early career interventions, leadership, work environment and organizational factors, individual factors and innovation, technology and robotization.

Results

Search outcome

The comprehensive search yielded a total of 1,094 articles. Following the deduplication process, 508 articles were removed, leaving 586 studies for title and abstract screening. Of these, 42 review articles were deemed relevant and underwent full-text screening. Subsequently, 25 studies were excluded for various reasons, resulting in 14 studies being included in the review. The PRISMA flow diagram Fig. 1 illustrates the search and the screening process. The details of the 25 excluded studies and the 3 that were not retrieved are presented in the supplementary file table S3.

Characteristics of the included studies

The 14 included studies were all systematic literature reviews without meta-analysis. All the reviews used the CINAHL database for their search. The other most used databases were Ovid Medline ($n=10$), EMBASE ($n=7$), and PubMed ($n=7$). Collectively, the reviews screened a total of 49,155 articles and included 674 studies. These articles were distributed globally, with the top ten countries of origin being the USA ($n=169$), Canada ($n=21$), Jordan ($n=17$), UK ($n=16$), China ($n=14$), Taiwan ($n=12$), Australia ($n=9$), Iran ($n=4$), and Japan, Ghana, Turkey, and Thailand each contributing 3 articles each (supplementary table S4). One review, which included the largest number of studies ($n=345$) [53], did not specify the countries of the included studies, noting only that 308 studies were from non-European Union countries and 37 were from the European Union countries. Almost all the studies were conducted in hospital settings. Study participants were primarily classified into three categories of nurses: early career/newly graduated nurses [54–58], generally experienced staff nurses [46, 53, 59–64], and nurse managers [65]. Of the 14 reviews,

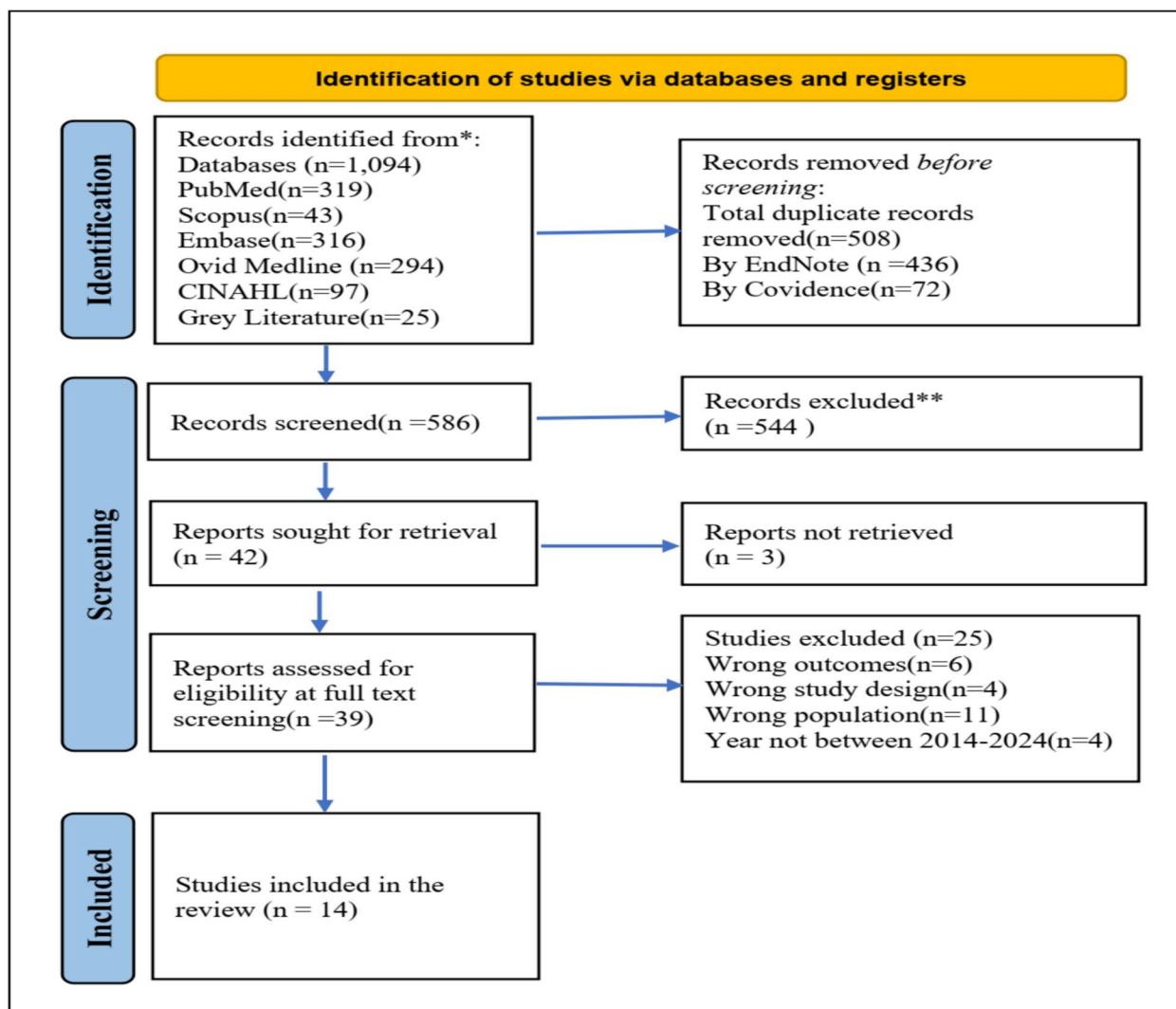


Fig. 1 PRISMA flow diagram showing search strategy for the systematic review

13 conducted rigorous quality appraisals of the included studies, predominantly using the Mixed Methods Appraisal Tool (MMAT)($n=4$) and Joanna Briggs Institute Critical Appraisal tools($n=4$). The studies were conducted between 2014 and 2024 with the majority ($n=10$) being conducted in the last 5 years (2021–2024) See Fig. 2. All studies performed narrative data synthesis Table 1.

The quality of the included studies

Using the AMSTAR tool to assess the methodological quality of the included studies, we found that the majority ($n=9$) were of high quality (scored above 8), while five were of moderate quality (4–7). No study was deemed to be of poor or low quality. Detailed quality assessment results and the AMSTAR questions are presented in Table 2. Results indicate that Question 1 (regarding the registration of a systematic review before commencing), Question 4 (utilizing grey literature in addition to major

databases for search), Question 5 (providing a list of both included and excluded studies), and Question 10 (assessing the risk of bias, which was mostly not applicable in our studies) scored poorly.

Effectiveness of the identified interventions to retain nursing workforce

Table 3 presents a summary of the findings for this umbrella review while supplementary Table S2 contains the full raw data and mathematical measurement of change on the effectiveness of the interventions. In the analysis, the interventions were classified into 5 groups as summarized in Fig. 3.

Early career Interventions

More than half of the studies [53–58, 62, 63]; identified early career stage as the riskiest period in a nurse's career retention. It is during this stage that the majority of nurse

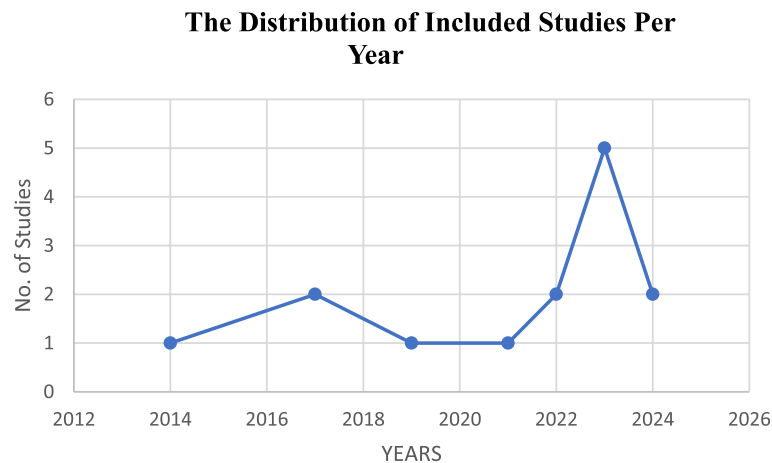


Fig. 2 The distribution of included studies per year

turnover occurs. At this early stage, the identified retention interventions include:

a) Externship and internship programs

Externships also referred to as clinical practicums, clinical rotations or clinical placements are programs and opportunities for student nurses (first year to fourth year) to undertake experimental learning in a new clinical area within hospital environment on a short placement time (few weeks to few months) [66]. Internships on the other hand are typically programs for recent graduates who have completed their nursing education and are preparing for their licensure exams. These internships generally last longer, often up to a year or more, and offer more extensive clinical experience compared to externships. On the pretest–posttest examinations of externship [62], found that externship was significant ($P < 0.001$), and retention increased from 80% pretest to 86% post-test. Brook et al. [55] opined that the application of externship/clinical rotation can be done together with residency and internship programs whereby while in internship or residency, graduate nurses perform rotations in different clinical departments. When done with a residency program, he found that externship decreased nurses' turnover by 4% in the first one year and 14% in two years while when done with internship, it achieved 89% nurses' retention.

b) Extended orientations and transition to practice/unit programs

Orientation involves introducing newly employed nurses to a unit through job-specific training on technology, procedures, policies, and general unit know-how [67]. This process boosts nurses' confidence, fosters a positive work culture, enhances job satisfaction, supports professional development, and increases patient safety. Results from Brook et al. [55], 15 studies found that orientation decreased nurse turnover by average 18% and increased retention by 13% [54]. Additionally, three interventional studies [62] showed that turnover dropped from 12% in the control group to 9% in the interventional group. Extending orientation of between 8 weeks for experienced nurses and 12 weeks for new hires reduced turnover by 17.6% over four years [62].

c) Nurse residency programs

Predominantly established in the USA, Canada and Australia in response to retention challenges in the 1980s, Nursing Residency Programs (NPRs) is defined as evidence-based curricula that deliver content on leadership, patient safety, and professional development as new nurses enter into practice [54, 68]. In our study, the highest nurses' retention rates 24% and 18% turnover was through the residency program [54]. [55], found in its 5 included studies that with residency, retention rates were significantly increased while turnover rates were decreased. On the other hand [56, 57], found that residency increased nurses' confidence, leadership abilities, organizational communication, care prioritization, job satisfaction, organizational commitment, work engagement, and nurses retention.

d) Special tracks programs and training

Table 1 Characteristics of the included studies($n = 14$)

Sn	Authors, Year	Databases Searched	Total Screened (N)	In-cluded Studies (n)	Setting	Participants	Appraisal Method	Data Synthesis
1.	Adams et al. 2021 [60]	CINAHL, PsychINFO, MEDLINE, Web of Science (Core collection), EMBASE and the British Nursing Index)	4,428	23	Mental Health unit	Mental Health Nurses	The Mixed Methods Appraisal Tool (MMAT)	Thematic narrative
2.	Al Yahyaei et al. 2022 [61]	Allied and Complementary Medicine Database (AMED), Excerpta Medica dataBASE (EMBASE), ProQuest Nursing & Allied Health Source, ProQuest theses and dissertations, Cumulative Index to Nursing and Allied Health Literature (CINAHL) Plus, MEDLINE (Ovid) and PsycINFO	4,968	29	Hospital	Acute care nurses	Modified Appraisal Tool for Cross-Sectional Studies (AXIS tool)	Narrative synthesis
3.	Brook et al. 2019 [55]	Academic Search Complete, Medline, Health Policy reference Centre, EMBASE, Psychinfo, CINAHL and the Cochrane Library	11,656	53	Hospital	Early career nurses	Joanna Briggs Institute Critical Appraisal tools	Narrative synthesis
4.	Conroy et al. 2023 [62]	CINAHL, MEDLINE, PubMed, PsychInfo, Cochrane Central Register, and Embase	427	12	Hospital	General nursing staff	the Critical Appraisal Checklist (EBL)	Narrative description
5.	De Vries et al. 2023 [54]	PubMed, Embase, and CINAHL	3,521	345	Hospital	General nurses & Physicians	Mixed Methods Appraisal Tool (MMAT)	Narrative-thematic analysis
6.	De Vries et al. 2023 [63]	PubMed, Embase, CINAHL	5,177	55	Hospital	General nurses and physicians	Mixed Methods Appraisal Tool (MMAT)	Thematic Narrative
7.	Ke et al. 2017 [59]	The Index of Taiwan Periodical Literature System, Airiti Library, Cumulative Index to Nursing and Allied Health (CINAHL), Cochrane Library & PubMed/MEDLINE	358	6	Hospital	Newly employed nurses	Joanna Briggs Institute critical appraisal Tool	Narrative
8.	Lartey et al. 2014 [64]	CINAHL, PsychInfo,, EMBASE, Medline, Cochrane library & SCOPUS	2,199	12	Healthcare settings	Registered Nurses	Quality assessment tool (adapted)	Narrative
9.	Mohamed et al. 2024 [56]	CINAHL, MEDLINE, Academic Search Complete, PubMed	189	5	Healthcare facilities- Hospital, long term care	New graduate nurses	The Joanna Briggs Institute (JBI) SUMARI critical appraisal tool	Narrative
10.	Penconek et al. 2024 [66]	MEDLINE, EMBASE, PsychINFO, CINAHL Plus with Full Text, ERIC, Health Source Nursing/Academic Edition, Scopus, ProQuest Dissertations and Theses & LILACS	10,814	35	Hospital	Nurse managers	Critical Appraisal Skills Programme checklis	concurrent synthesis approach, integrating qualitative and quantitative data
11.	Pressley et al. 2023 [47]	CINAHL, Medline and Cochrane library	2,105	34	healthcare/ social settings	Registered nurses	NICE quality appraisal checklist (National Institute for Health and Care Excellence) tool	A narrative synthesis
12.	Van Camp et al. 2017 [57]	CINAHL, Health Source Nursing/Academic Edition, Ovid Journals Online, and Academic Search Complete	48	22	Hospital settings	New graduate nurses	Not mentioned	Narrative
13.	Vázquez-Calatayud et al. 2023	PubMed, CINAHL, Scopus, PsycINFO and Cochrane Library	2,788	9	hospital setting	Newly graduated registered nurses	The Joanna Briggs Institute Critical Appraisal tools	Narrative
14.	Woodward et al. 2022 [65]	PubMed and CINAHL	477	34	Hospital	Registered nurse	Mixed Methods Assessment Tool (MMAT)	Narrative

Table 2 Quality appraisal using AMSTAR

Sn	STUDIES	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Total Score/11
1.	Adams et al.,2021	CT	CT	Y	Y	Y	Y	Y	Y	Y	N	N	7/11
2.	AlYahyaie et al., 2022	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	10/11
3.	Brook et al.,2019	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	9/11
4.	Conroy et al.,2023	N	Y	Y	N	N	Y	Y	Y	Y	N	Y	7/11
5.	deVries et al.,2023	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	9/11
6.	DeVries et al.,2023	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	9/11
7.	Ke et al.,2017	N	Y	Y	N	Y	Y	Y	Y	Y	N	Y	9/11
8.	Lartey et al., 2014	N	Y	Y	Y	N	Y	Y	Y	Y	N	N	7/11
9.	Mohamed et al.,2024	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10/11
10.	Penconek et al., 2024	N	Y	Y	Y	N	Y	Y	Y	Y	N	Y	9/11
11.	Pressley et al.,2023	N	Y	Y	N	N	Y	Y	Y	Y	N	Y	8/11
12.	VanCamp et al., 2017	N	CT	Y	Y	N	Y	N	N	Y	N	N	5/11
13.	Vázquez-Calatayud et al.,2023	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	9/11
14.	Woodward et al., 2022	N	Y	Y	N	N	Y	Y	Y	Y	N	N	6/11

Key: Y=Yes: ■ N=No: ■ CT= Can't tell: ■

AMSTAR Tool Adoption from BJ Shea et al., 2017:

Q1 Was an "a Priori" design provided?	Q7. Was the scientific quality of the included studies assessed and documented?
Q2 Was there a duplicate Study selection and data extraction?	Q8 Was the scientific quality of the included studies used appropriately in formulating conclusion?
Q3 Was a comprehensive Literature search conducted?	Q9 Were the methods used to combine the findings to studies appropriate?
Q4 Was status of publication (i.e., grey literature) used as an inclusion criterion?	Q10 Was likelihood of publication bias assessed?
Q5) Was List of studies (included and excluded) provided?	Q11 Was the conflict of interest included?
Q6 Were the characteristics of included studies provided?	

Nursing is a profession of over 39 special tracks [69], including critical care, paediatrics, geriatrics, emergency care, oncology, cardiac care, neonatal care, surgical care, psychiatry, midwifery, and anesthesiology, among other tracks. In nursing schools, general knowledge of nursing is often given to students which might not be enough at the time of posting and offering extra training cannot be over-emphasized. Brooks et al. [55], 12 studies report found average 9% decrease in turnover and 16% increase in retention while de Vries et al. [54] found that continued updates and teaching/training resulted in significant retention rates between intervention and comparison groups ($\beta = -0.33, p < 0.005$).

e) Preceptor programs

A preceptor program for nurses is a structured training program for a specific period where experienced nurses (preceptors) mentor and guide newly hired or newly graduated nurses (preceptees) as they transition into their professional roles [70]. Preceptorship is different from mentorship in that mentorship could be lifelong while preceptorship is one-on-one on-job training with specific timelines. From our study, Ke et al. [59] found that through preceptorship, competency & confidence of newly employed

nurses (3 studies pre-test post-test) rose from study 66.8% to 90.4%, 83.3% to 82.2% and the third study indicated a general increase. Similarly, retention in two of the included studies in this review increased on average from 78% to 88.46%. Brooks et al. (2019) and de Vries et al. [54] recorded positive effects of preceptorship on nurses' retention.

f) Mentorship programs

Mentorship programs are structured initiatives within healthcare organizations designed to pair experienced nurses (mentors) with less experienced or novice nurses (mentees) to facilitate professional growth, enhance clinical skills, and provide support throughout the mentees' career development [71]. Results from this study [54], analyzed out of 5 included studies found that mentorship reduced nurses' turnover by 12% and increased retention by 17%. The impact of mentorship on nurse retention was not clearly stated in [63].

g) Clinical ladder programs

Clinical ladder programs (CLPs) have been part of the nursing profession for nearly 4 decades [72]. CLPs originated from the works of Patricia

Table 3 The umbrella review results

Sn	Authors, Year	Objective/aim	Population	Intervention/ Variables studied	Outcome
1.	Adams et al. 2021 [60]	To identify the individual factors that affect the retention of Mental Health Nurses	Mental Health Nurses	Individual characteristics, working within mental health services, Training & skills, and Work environment	Factors such as demographic characteristics, working in mental health, training and skills, and work environment influence both the retention of nurses and turnover
2.	Al Yahyaee et al. 2022 [61]	To synthesize and evaluate the evidence of the factors which may have an effect on intention to stay and role of the work environment in enhancing nurses' intention to stay in the work environment in acute healthcare	Acute care nurses	Individual indicators (personal and professional), Organization/profile, Work environment and Patient-related factors	31 factors impacting nurses' intention to stay, categorized into individual indicators, organization factors, supportive work environment, teamwork, leadership practices, and organizational support enhance nurse retention rates
3.	Brook et al. 2019 [55]	To evaluate the characteristics of successful interventions to promote retention and reduce turnover of early career nurses	Early career nurses	Preceptor program, mentorship program, Residency and mentorship program, Externships, Orientation and transition to practice program, Special tracks, Clinical ladder programs	Various programs like preceptorship, mentorship, residency, externships, orientation, special tracks, and clinical ladders significantly decreased turnover rates and substantially increased retention rates among early career nurses
4.	Conroy et al. 2023 [62]	To synthesize the relationship between transformational leadership style and staff nurse retention in hospital settings	General nursing staff	Transformational Leadership (TL)	Transformational leadership (TL) greatly increased nurse retention rates and reduced turnover rates
5.	De Vries et al. 2023 [54]	To investigate the prevalence and key factors influencing job retention among nurses and physicians in hospitals within Europe and beyond	General nurses & Physicians	Personal characteristics, Job demands, Employment services, working conditions, Working relationships and Organizational culture	Personal characteristics, job demands, employment services, working conditions, working relationships, and organizational culture influence nurse and physician retention, with negative factors like burnout and inadequate resources increasing turnover
6.	De Vries et al. 2023 [63]	To identify and analyze the current interventions aimed at retaining healthcare workers, specifically nurses and physicians, in hospital settings	General nurses and physicians	Onboarding, Transition program to a different unit, Stress coping, social support, Extra staffing, Coping with the demands of patient care, Work relationships, Development, opportunities and department resources, Job environment, Work organization and Recruitment approach Technological innovations	Various interventions such as onboarding, mentorship, stress coping, social support, extra staffing & resources, development opportunities, flexible work schedules, work environment factors, and innovation, technology and robotization impact retention positively, with significant decreases in turnover for intervention groups
7.	Ke et al. 2017 [59]	To investigate how nursing preceptorship impacts the competence, job satisfaction, professional socialization, and retention of newly hired nurses	Newly employed nurses	Nursing preceptorship	Preceptorship programs increased competence, confidence, professional socialization, and retention of newly hired nurses. It also decreased turnover rates
8.	Lartey et al. 2014 [64]	To evaluate the effectiveness of strategies for retaining experienced Registered Nurses	Registered Nurses	Teamwork, Mentoring, Leadership and In-depth orientation	Strategies like teamwork, mentoring, leadership, and in-depth orientation improved retention, with specific models like the magnet hospital model showing greater retention compared to traditional models
9.	Mo-hamed et al. 2024 [56]	To evaluate the impact and effectiveness of Nurse Residency Programs on the retention rates of new graduate nurses	New graduate nurses	Nurse Residency Programs	Nurse residency programs significantly increase retention rates of new graduate nurses across various studies

Table 3 (continued)

Sn	Authors, Year	Objective/aim	Population	Intervention/ Variables studied	Outcome
10.	Penconek et al. 2024 [66]	To understand factors influencing nurse manager retention or departure, develop a theoretical model, and identify workforce planning strategies	Nurse managers	Job satisfaction, Empowerment, Decision making and Resilience	Factors such as job satisfaction, empowerment, decision making, autonomy, resilience, and supportive work environment & positive relationships enhance nurse manager retention
11.	Pressley et al. 2023 [47]	To explore factors that influence registered nurses' intention to stay working in the healthcare sector	Registered nurses	Environmental factors Individual factors	Job satisfaction and organizational commitment are key factors influencing registered nurses' intention to stay, with leadership, work environment, and professional dynamics being crucial
12.	Van Camp et al. 2017 [57]	To examine new graduate nurse residency programs, residents' perceived satisfaction, and retention rates	New graduate nurses	Nurse Residency Programs	Nurse residency programs improve retention rates, confidence, competence, job satisfaction, and organizational commitment among new graduate nurses
13.	Vázquez-Calata-yud et al. 2023	To determine the effective interventions and their components that promote the retention of newly graduated registered nurses in hospital settings	Newly graduated registered nurses	Residency program Individualized mentorship program Combined program	Residency and mentorship programs increase retention and reduce turnover of newly graduated nurses, with combined programs showing significant improvements
14.	Woodward et al. 2022 [65]	To explore factors associated with registered nurse (RN) work outcomes in the United States (turnover and stay)	Registered nurse	Individual factors Unit level factors Organizational factors	Individual, unit-level, and organizational factors, including leadership, peer relations, work environment, and geographical location, influence nurse retention and turnover intentions. Negative experiences like workplace hostility increased turnover

Benner's "novice to expert" theory in 1982/1984 [73] which centers around nurses' competence through 5 stages novice, advanced beginner, competent, proficient and expert. CLPs are defined as structured systems implemented in healthcare settings, particularly hospitals, to provide a clear pathway for career advancement and professional development for nurses [72]. These programs are designed to recognize and reward nurses for education and certification, clinical expertise, skills, leadership, and contributions to patient care and organizational goals. As nurses climb up the clinical ladder, they get more rewards and compensation. From our research, Brook et al., [55] found that the availability of a clear clinical ladder reduced nurses' turnover by 11%.

Leadership

Five systematic reviews [60, 61, 63–65] examined the role of leadership in nurse retention. Al Yahyaei et al. [61] found that leadership practices of empowerment and support increase nurses' retention. Conroy et al. [62] analyzed 12 studies on the role of Transformative Leadership (TL) in nursing retention and turnover and revealed that, on average from 4 studies, there was a negative relationship between turnover average $R^2 = (-0.267)$ and TL. It found further that positive relationship between nurses' retention and TL average $R^2 = 0.340$). The studies further highlighted apart from transformative leadership, other

leadership styles that promote nurses' retention include authentic leadership, democratic leadership, supportive leadership and servant leadership while paternalistic leadership, autocratic, toxic leadership and bureaucratic leadership lead to high rates of nurses' turnover.

The work environment and organizational factors

Nine of the included reviews in this umbrella review [46, 53, 56, 59, 60, 62–65] highlighted the power of work environment in nurses' retention and turnover. A positive work environment can be the difference between a nurse staying long-term or seeking opportunities elsewhere. The studies found that positive working relations, supportive leadership, positive organizational culture and climate, competitive salary and remuneration, organizational justice, flexible work schedules/self-scheduling, adequate resources and staffing, nurses' empowerment, availability of opportunities for education and career progression, good communication, team work and collaboration, positive collegial nurse-physician and other inter-cadre relationships, staff appreciation, respect and reciprocity, autonomy, inclusion in decision making, professional/job- family/life balance, availability of emotional support programs, resilience, social support and safe practice environments were associated with high rates of nurses retention while lack of these thereof increased nurses' turnover. Relating to organizational culture, [62] and [63] examined two nursing models Magnet Recognition Program® and The European Foundation for Quality Management (EFQM). While EFQM was highly

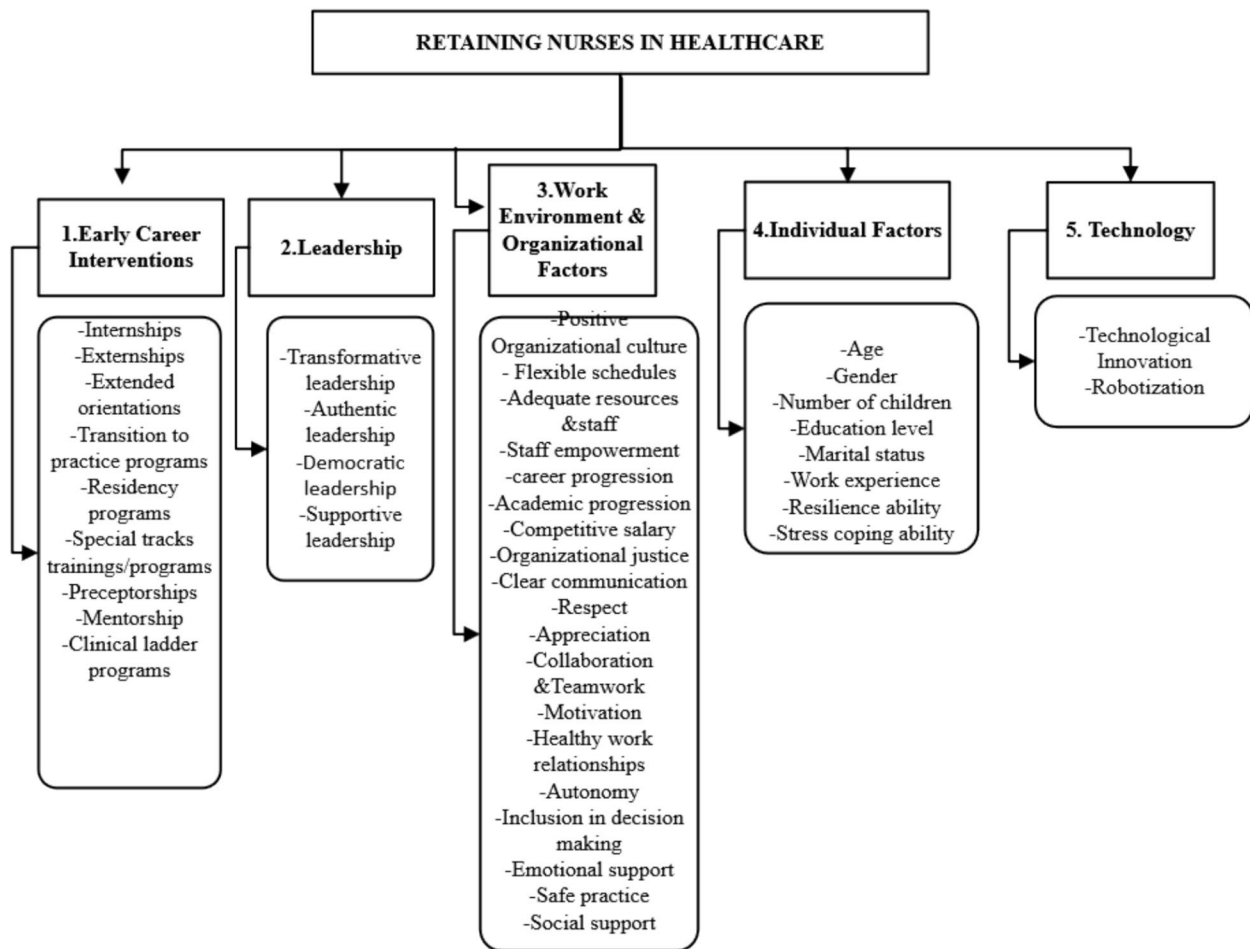


Fig. 3 Effective Interventions to retain nursing workforce in healthcare

significant in nurses' retention, results from two comparative studies Magnet versus non-magnet found (80% vs 68%) and 83% vs 73%) retention respectfully.

Individual factors

Although specific interventions targeting individual factors were not clearly identified in the studies, it was evident that individual attributes such as age, gender, number of children, education level, marital status, years of work experience, resilience and ability to cope with stress influenced nurses' retention and turnover [53, 59, 60, 64, 65]. The studies found that being young, male, highly educated, single and without children is highly associated with nurse turnover.

Innovation, technology and robotization

One study [62] found that integration of technological innovations and robotization in nursing practice reduces turnover and enhances retention. From the review, two studies examined the use of robots and found that robots increased overall job satisfaction ($r=0.31$, $p<0.05$) and perceived health improvement ($r=0.34$, $p<0.05$). The

job satisfaction and perception of health improvement reduced turnover intention ($r = -0.41$, $p<0.05$ and $r = -0.18$, $p<0.05$).

Discussion

To the best of our knowledge, this is the first umbrella review examining the effectiveness of interventions and strategies of nurses' retention. Our objective was to provide an overall summary of the body of evidence documented in systematic literature reviews on the effectiveness of interventions in retaining the nursing workforce in healthcare.

We included a total of 14 high-quality systematic reviews (based on AMSTAR appraisal), representing 674 original papers. We identified from the studies, nine onboarding and early career interventions that include externships, internships, extended orientation, transition to practice programs, Nursing Residency Programs, special track programs, preceptorship, mentorship and clinical ladder programs as effective strategies to retain early career nurses in the workplace [53–58, 62, 63]. These results were similar to those of other studies across the

world [31, 68, 72, 74–77] who similarly pointed out these interventions as important in nurses' retention. Early career is the riskiest stage in nurses' exiting their job and the profession [12, 19, 54, 70]. Several studies [33, 78–80] have further found that many student nurses exit training in large numbers, highlighting the need for retention interventions that begin early in nursing school and continue through various stages of a nurse's career to ensure effective retention. These programs provide novice nurses with the necessary support and guidance, helping them transition smoothly with competence, confidence, passion and the right mindset into their roles and reducing the likelihood of turnover. The common debate within the studies was the intervention duration. Brook et al. [55] found that promising interventions appear to be either internship/residency programs or orientation/transition to practice programs, lasting between 27–52 weeks, with a teaching, preceptor and mentor component. Other studies gave prolonged intervention duration between 3 months to as long as 3 years. de Vries et al. [54] concluded that there is a need to identify and combine multifactorial interventions to maximize retention. Therefore, it was clear that no intervention worked in isolation.

Apart from onboarding interventions, leadership was also identified to play a crucial role in nurses' retention. Conroy et al. [62] established that Transformational Leadership (TL), defined as a leadership style where leaders stimulate, inspire and motivate their team members to exceed their own self-interests for the good of the group [81], significantly increased nurses' retention and lowered turnover. Leadership holds a pivotal role in increasing nurse retention by providing the needful inspiration, mentorship, and robust support, fostering professional growth, and ensuring a positively thriving work environment. The other forms of leadership styles found to enhance nurses' retention include authentic leadership, democratic leadership, supportive leadership and servant leadership while paternalistic leadership, autocratic, toxic leadership and bureaucratic leadership were associated with high rates of nurses' turnover.

Moreover, almost all our studies [46, 53, 56, 59, 60, 62–65], highlighted the element of the work environment, underscoring its unique and crucial role in nurse turnover and retention. Nurses spend almost half of their lifetime working in a hospital environment, making it not just a place of employment, but a second home. The work environment's quality directly impacts their job satisfaction, work-related stress burnout, and the overall nurses' well-being, making it a critical factor in retaining nursing staff. The studies identified more than 21 potential areas of intervention to enhance nurse retention such as positive working relations, supportive leadership, positive organizational culture and climate, competitive salary,

rewards and remuneration, organizational justice, flexible work schedules/self-scheduling, adequate resources and staffing, nurses' empowerment, availability of opportunities for education and career progression, good communication, team work and collaboration, positive collegial nurse-physician and other inter-cadre relationships, staff appreciation, respect and reciprocity, professional autonomy, inclusion in decision making, professional/job-family/life balance, availability of emotional support programs, social support and safe practice environments, increased job security among other variables. These results were similar with research findings by [19, 82–87] which highlighted the powerful effects of nursing work environment on nurses turnover and retention. In addition, personal characteristics were found to influence retention, with being young, male, highly educated, single, and without children, having limited work experience and poor resilience being more prone to turnover. Understanding these demographic factors can help tailor retention strategies to address specific needs.

Furthermore, the fundamental role of innovation, technology and robotization was identified by [62] in our review. It is evident that technology is taking the world by storm with technological breakthroughs occurring at an ever-increasing rate in healthcare. There is already a robotic revolution happening in nursing and healthcare wherein robots have made nursing tasks and procedures more efficient, easier and safer [88]. Technology has enabled electronic data filing and documentation, reduced medical errors made by nurses, reduced work straining and enabled remote monitoring. In addition, a lot of non-nursing roles previously performed by nurses are now done by robots and digital equipment such as smart beds, smart infusion pumps, digital thermometers and oximeters, automated medication dispensing systems, wearable health devices and Barcode Medication Administration (BCMA) systems, just to mention but a few. From this study, it was found that integration of technological innovations and robotization in nursing practices was strongly effective in reducing nurse turnover and enhancing retention.

While this umbrella review highlights several effective retention strategies, it is important to note that the vast majority of these interventions originate from high-income countries. The reviews and the original studies were of high-income countries. Low- and Middle-Income Countries remain stark underrepresented in the evidence base. Studies such as [89–96] examining nurse turnover and retention in LMICs, highlight LMICs-specific, unique, high-impact retention strategies as: financial and non-financial incentives, increased production and training of nurses, steering students to shortage specialties, adequate rural housing, facility level improvements, availability of career and professional progression

opportunities, nurses' recognition and involvement, employment terms, transparency and predictable management of human resources, supportive work environments, leadership, religious factors, and stakeholders' collaborations. Comparing and contrasting these interventions, it can be noted that high-income countries use organized, resource intensive interventions such as technological innovations, residency programs and robotization while LMICs tend to rely on more fundamental, basic and context-sensitive measures.

Conclusion

This umbrella review sought to summarize from systematic literature reviews, the identified effective strategies and interventions for retaining the nursing workforce in healthcare and mitigating the high global nurse turnover. We found that retaining nursing workforce is a complex and multifaceted issue. No single intervention works in isolation; rather, a network of strategies and interventions is necessary to effectively reduce turnover and retain nursing staff. Effective retention programs need to begin early in nursing school and continue throughout various stages of a nurse's career. Future research should focus on longitudinal studies to assess the long-term effectiveness of retention strategies. Additionally, there is a need for more studies examining the impact of individual attributes on nurse retention to develop targeted interventions. Further exploration of technological innovations and their role in nurse retention is also recommended to keep pace with the evolving healthcare landscape.

Strengths and limitation

The studies included in this umbrella review were rigorously appraised and of high quality. However, some limitations exist. The review was limited to English-language studies published in the last ten years, introducing potential language and publication bias, including the underreporting of unsuccessful interventions. Important articles with vital information might have also been excluded. The included reviews were also based on primary articles from high-income countries, with limited representation from LMICs. Therefore, generalization to LMIC settings should be made with caution, as interventions may not accurately reflect the situation in these regions and these retention interventions may primarily apply for High-Income Countries. Finally, due to substantial heterogeneity across studies and lack of statistical data across studies, a meta-analysis was not feasible. While narrative synthesis was appropriate, it limits the precision of pooled effect estimates.

Abbreviations

AMSTAR	A Measurement Tool to Assess Systematic Reviews
BCMA	Barcode Medication Administration
CINAHL	Cumulated Index in Nursing and Allied Health Literature

CLPs	Clinical Ladder Programs
EFQM	European Foundation for Quality Management
EMBASE	Excerpta Medica Database
JBI	Joanna Briggs Institute
ICN	International Council of Nurses
LMICs	Low-and Middle-Income Countries
MMAT	Mixed Methods Appraisal Tool
NICE	National Institute for Health and Care Excellence
NPRs	Nursing Residency Programs
PICO	Population Intervention Comparison Outcome
PRISMA	Preferred Reporting Items for Systematic Review and Meta-Analysis
PROSPERO	Prospective Register of Systematic Reviews
TL	Transformational Leadership
UK	United Kingdom
USA	United States of America
WHO	World Health Organization

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12913-025-13365-6>.

Supplementary Material 1: Supplementary File Table S1. Contains the full Search Strategy and results from databases search.

Supplementary Material 2: Supplementary Table S2. Contains the raw full data from all included studies that was finally summarized in Table 3.

Supplementary Material 3: Supplementary Table S3. Contains studies the 25 excluded after full text screening and the 3 studies not retrieved.

Supplementary Material 4: Supplementary File Table S4. List of countries of the primary articles included in the reviews.

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Author's contributions

EKK conceived the idea, did registration, searching, screening, data extraction, quality assessment, analysis, manuscript writing and proofreading while ME and AS did searching, screening, data extraction, quality assessment, data analysis and table editing and MZ and AUS was the project supervisor, did manuscript final review, editing and formal approval for publication.

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Data availability

In addition to the data provided within this manuscript, other datasets supporting the conclusions are available in the supplementary files. Supplementary Files Description Supplementary File Table S1: Contains the full Search Strategy and results from databases search. Supplementary Table S2: Contains the raw full data from all included studies that was finally summarized in Table 3. Supplementary Table S3: Contains studies the 25 excluded after full text screening and the 3 studies not retrieved. Supplementary File Table S4: List of countries of the primary articles included in the reviews.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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