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#### What is known about nurse retention in peri- and post-COVID-19 work environments: A scoping review of factors, strategies, and interventions.

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## TITLE

What is known about nurse retention in peri- and post-COVID-19 work environments: A scoping review of factors, strategies, and interventions.

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# ABSTRACT

**Background:** The COVID-19 pandemic highlighted the deterioration of nurses' working conditions and a growing global nursing shortage. Little is known about the factors, strategies, and interventions that could improve nurse retention in the peri- and post- COVID-19 period. An improved understanding of strategies that support and retain nurses will provide a blueprint for sustaining the nursing workforce.

**Objectives:** The aim of this scoping review is to investigate and describe: i) factors associated with nurse retention; ii) strategies to support nurse retention; and iii) interventions that have been tested to support nurse retention, during and after the COVID-19 pandemic.

**Eligibility Criteria:** Qualitative, quantitative, mixed-methods and grey literature studies of nurses including factors, strategies and/or interventions to support nurse retention in the peri- and post- COVID-19 period were included. Systematic reviews, scoping reviews, and meta-syntheses were excluded, but their reference lists were hand screened for suitable studies.

**Sources of Evidence:** This scoping review was performed according to PRISMA Guidelines Scoping Review Extension. MEDLINE, EMBASE, CINAHL and Scopus were searched on April 17, 2024.

**Charting and Analysis:** The following data items were extracted: title, journal, authors, year of publication, country of publication, setting, population (n=), factors that mitigate intent to leave (or other retention measure), strategies to address nurse retention, interventions that address nurse retention, tools that measure retention/turnover intention, retention rates and/or scores.

Data were evaluated for quality and synthesized qualitatively to map the current available evidence.

**Results:** Our search identified 129 studies for inclusion in the analysis. The majority measured some aspect of nurse retention. A number of factors were identified as impacting nurse retention including nurse demographics, safe staffing and work environments, psychological well-being and COVID-19 specific impacts. Nurse retention strategies included ensuring safe flexible staffing and quality work environments, enhancing organizational mental health and wellness supports, improved leadership and communication, more professional development and mentorship opportunities, and better compensation and incentives. Unfortunately, only nine interventions that address nurse retention were identified.

**Conclusions:** Given the importance of nurse retention for a variety of key outcomes, it is imperative that nursing leadership, healthcare organizations, and governments work to develop and test interventions that address nurse retention.

## STRENGTHS AND LIMITATIONS OF THE STUDY:

- This scoping review addresses multiple facets of nurse retention including factors associated with retention, suggested strategies employed to improve retention, and interventions trialled, offering a fulsome understanding of the subject.
- Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews guidelines were employed to provide a structured and transparent approach to the review process, enhancing its reliability and reproducibility.
- By searching multiple databases, the scoping review captured a wide range of relevant literature, minimising the risk of missing key studies.

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- Studies with statistically significant results or positive outcomes related to nurse retention may be more likely to be published, potentially skewing the overall findings.
- Given the short timeframe between the start of the pandemic and now, the number of published interventional studies may be limited

## **KEY POINTS:**

What is already known on this topic: The COVID-19 pandemic significantly worsened working conditions for nurses, contributing to an ongoing global nursing shortage. Prior to this study, factors such as safe staffing, work environment quality, mental well-being, and effective leadership were recognized as influencing nurse retention. However, comprehensive evidence on specific strategies and interventions to support and retain nurses during and after the COVID-19 period has been limited.

What this study adds: This scoping review identifies and synthesizes key factors impacting nurse retention and catalogues existing retention strategies and interventions during the peri- and post-COVID-19 periods. It reveals that while numerous strategies—such as safe, flexible staffing, mental health support, leadership development, and incentives—have been proposed, only a small number of targeted interventions have been tested. This study provides an evidence-

based blueprint, highlighting areas that require further intervention and testing to effectively retain nurses.

How this study might affect research, practice or policy: The study emphasizes the urgent need for healthcare leadership, organizations, and policymakers to develop and implement evidence-based interventions to address nurse retention. Future research could focus on testing and refining these interventions, while policy changes may prioritize creating supportive work environments, enhancing mental health support, and offering competitive compensation. This focus on retention is critical for sustaining the nursing workforce, which is essential for healthcare system stability and quality patient care. for oper to lie work

# INTRODUCTION

The COVID-19 pandemic affected health systems globally, created new issues and uncovered and exacerbated existing challenges for the nursing workforce. As integral members in the provision of safe, quality patient care, nurses have faced work circumstances and job demands that have diminished their job satisfaction and their desire and capacity to remain nurses <sup>1</sup>. These circumstances and conditions have escalated the already concerning global nursing shortage, with nurses increasingly citing burnout, compassion fatigue, and poor work environments as drivers for their intent to leave <sup>23</sup>.

The nurse retention crisis has both financial and human implications for health care delivery. A recent study reported a direct relationship between how well hospitals were staffed with nurses and their number of patient deaths from COVID-19<sup>4</sup>. As well, turnover is estimated to cost a hospital between \$11,000 to \$90,000 USD per bedside nurse <sup>5</sup>, and the adverse consequences of the nursing shortage continue to grow.

This worsening crisis has pushed governments, policy makers, and health systems administrators to understand the complexities of nurse retention and develop strategies and solutions to renew the nursing workforce <sup>67</sup>. However, it is yet to be seen if previously identified factors, strategies, and interventions for nurse retention are effective in the peri- and post- COVID-19 work environment. Due to the altered landscape of the healthcare system emerging from the pandemic, an improved understanding of strategies implemented to support and retain nurses is needed to strengthen and sustain the nursing workforce.

The purpose of this scoping review is to explore what is known about nurse retention in peri- and post- COVID-19 work environments and gather relevant information to inform healthcare leaders, organizations and policy makers. More specifically, this scoping review aims to investigate and describe: i) factors associated with nurse retention; ii) strategies suggested to support nurse retention; and iii) interventions already tested to support nurse retention, during and after the COVID-19 pandemic. This scoping review will serve as an organized collation of relevant factors, strategies and interventions to reduce nurse turnover.

## METHODS

## Protocol and registration

This scoping review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR)<sup>8</sup>. The protocol was registered on Open Science Framework on April 4, 2024 and can be accessed at: <u>https://doi.org/10.17605/OSF.IO/XWH45</u>. Additionally, the protocol was published in September 2024 <sup>9</sup>.

## Information sources and search strategy

In consultation with an experienced academic librarian, the following electronic databases were searched on April 17, 2024, limited to a publication date of '2019 to present' to ensure the

studies occurred during or after the COVID-19 pandemic: MEDLINE, EMBASE, CINAHL and Scopus. Main search concepts included "nurses", "retention", and "COVID-19 pandemic" All electronic database search strategies can be found in **Appendix A**. We excluded studies focused on advanced practice nurses, nurse educators, and nurse managers as these nursing populations had different responsibilities from bedside nurses, particularly during the COVID-19 pandemic.

#### Eligibility criteria

All qualitative, quantitative, mixed methods studies, professional commentaries, and governmental/organizational reports in English (or translated into English) that examined factors, strategies, or interventions associated with retention of nurses in the peri- and post-COVID-19 period were included. Dissertations were excluded but their corresponding publications were screened for inclusion. Meta-analyses and other reviews were excluded but studies in their reference lists were hand screened for inclusion criteria.

#### Selection of Sources of evidence

All citations retrieved from the four databases were uploaded into *Covidence th*(Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia) and duplicates removed. Titles and abstracts were independently reviewed by the research team (LB, LMH, SP, SV, CM) against criteria for inclusion in a blinded process where agreement was required by two independent reviewers. Any disputes were resolved by a third research team member. The remaining citations were reviewed as full-text articles.

#### Data charting process

The following data items were extracted from included articles and entered into a Microsoft Excel spreadsheet: title, journal, authors, year of publication, country of publication, setting, population (n=), factors that mitigate intent to leave (or other retention measure), strategies to address nurse retention, interventions used to address nurse retention, tool used to measure retention/turnover intention, retention prevalence and/or scores. Extraction was performed by one research team member (LB) and reviewed and confirmed by additional team members (LMH, SP, SV, CM).

#### Synthesis of results

A quantitative synthesis specific to intent to leave/intent to stay was completed based on articles that included these measurements. For all other study aims, data was synthesized qualitatively to map the current evidence. Factors and strategies associated with nurse retention were synthesized using content analysis. Interventions to address nurse retention were grouped together by similar types, descriptively summarizing the specific interventions and results.

## **Quality appraisal**

Applicable qualitative, quantitative, and mixed methods studies were evaluated using the Mixed Methods Appraisal Tool (MMAT) Version 2018<sup>10</sup>. The MMAT was selected for its ability to evaluate different types of research designs within the same framework. Each study was appraised independently by two different reviewers (LB, LMH), and any discrepancies were

resolved by a third team member. The quality criteria were converted to a percentage (0-100%) where a higher percentage indicates a higher methodological quality.

#### RESULTS

#### **Description of the Search and Demographics of Studies Included**

The initial database search generated 2539 papers. After deduplication, 1658 titles and abstracts were screened, and 263 papers were assessed for eligibility at the full-text level. After applying the inclusion and exclusion criteria, 129 studies were retained for analysis (Figure 1). The characteristics of the included studies are provided in **Table 1**. The number of nurses who participated in observational or experimental based studies ranged from 16 to 13,966.

The majority (36%) of the selected studies were published in 2023 (N=47), followed by 2022 (n=40), 2021(n=25), and 2024 (n=17). The most common study design was cross-sectional (n=93), with 12 studies being some form of a report, six qualitative, five mixed methods, three quality improvement or program evaluations, three editorials, and one each of a sequential survey design, commentary, interventional, case control, multifactorial analysis, health policy paper, government report, and human resource evaluation. The studies came from 32 different countries with the majority coming from USA (n=37), followed by China (n=12), Canada (n=11), Iran (n=8), Philippines (n=6), UK (n=5), Korea (n=5), Japan (n=5), Australia (n=4), Turkey (n=4), Egypt (n=3), Lebanon (n=2), Saudi Arabia (n=2), Taiwan (n=2), Finland (n=2), Greece (n=2), India (n=2), Romania (n=2), Belgium (n=2), plus 13 other countries where only 1 study was conducted.

#### **Quality Appraisal**

Of the included studies, 109 (85%) could be appraised for methodological quality using the MMAT as outlined in the quality appraisal results displayed in **Table 1**<sup>10</sup>. Within the selected 109 studies – 96 were quantitative (descriptive), two were quantitative (non-randomized), six were qualitative, and five were mixed methods. There were no randomized quantitative studies. In the descriptive quantitative studies (96/109), the scores ranged from 2 to 5 (out of 5) with a mean of 4.83. The main weaknesses of these studies were lack of clarity around their sampling strategies and risk of non-response bias. In the qualitative studies (6/109), the quality scores were all 5 out of 5. For the mixed methods studies (5/109), the quality scores ranged from 11 to 14 (out of 15) with a mean of 12.8. The main weaknesses of the mixed methods studies were limited attention to addressing the divergences between quantitative and qualitative results and lack of rationale for using mixed methods.

#### **Retention Rates**

The majority of studies (N=111, 86%) included some measurement of nurse retention (**Table 1**). Different constructs were used to assess retention including intent to leave, intent to stay, desire to quit, duration of intention to stay, and actual numeric staff retention rate. Intent to leave varied across job position; i.e., intent to leave the unit, a specific job, a work specialty, an organization and the profession. Tools used to measure retention ranged from standardized questionnaires like the Turnover Intention Scale (TIS-6) to self-developed questionnaires and binary single-item

questions. Due to the diversity of retention constructs and measurement tools, a numerical metaanalysis of these results is not possible.

## Factors Associated with Nurse Retention

Of the included studies, the majority 103 (80%) focused on factors associated with nurse retention (**Table 2**). These were categorized into four areas: 1) personal and demographic factors; 2) safe staffing and quality work environments; 3) psychological well-being; and 4) COVID-19 specific impacts.

## 1) Personal and Demographic Factors

Personal and/or demographic factors identified included nurses' age, level of work experience, gender, marital status, level of education, being a parent, and physical health. Six studies found turnover intention was higher for younger nurses <sup>11-16</sup>, while one reported a higher correlation in turnover intention with older nurses <sup>17</sup>. Medvec et al. found intent to leave was the highest in nurses in the youngest age categories followed by those at or above age 65<sup>12</sup>. The results examining years of experience and turnover intent were mixed almost equally. Seven studies found that increased years of experience was correlated with intent to leave <sup>2 17-22</sup>. However, Shayestehazar et al. found work experience had a significant positive relationship with job retention<sup>23</sup>, and five studies found that fewer years of experience was associated with intention to quit <sup>19</sup> <sup>24-27</sup>. Five studies found turnover intention was higher in women than men <sup>13</sup> <sup>18</sup> <sup>19</sup> <sup>28</sup> <sup>29</sup>. Marital status differences were noted, with four studies reporting turnover intentions were stronger for single nurses <sup>13 30-32</sup>, while one reported that unmarried nurses were more likely to intend to stay in nursing <sup>33</sup>. Two described married nurses reporting higher turnover intention <sup>34</sup> <sup>35</sup>, and one found divorced nurses had higher intention to stay over married and unmarried nurses <sup>36</sup>. Education attained was also notable, with two studies finding turnover intention to be higher in Bachelors and Masters prepared nurses compared to diploma nurses <sup>37 38</sup>. However, Han et al., found turnover intention was higher in nurses with Associate and Bachelor's degrees than in those with Masters degrees <sup>13</sup>. Finally, one study found that nurses who had no children were more likely to exhibit intent to stay <sup>33</sup> and one that nurses who reported better physical health were less likely to report intent to leave the profession <sup>39</sup>.

## 2) Safe Staffing and Quality Work Environments

Safe staffing, scheduling, and compensation were all identified as factors associated with turnover intention: inadequate staffing <sup>12</sup><sup>18</sup>, high patient/nurse ratios, and scheduling of mandatory overtime <sup>12</sup> were all correlated with nurses' intention to quit. Similarly, changes in work schedules, including working long shifts with quick turnarounds <sup>40</sup>, working more hours per week (both scheduled and overtime hours) <sup>19</sup><sup>30</sup>, and working more night shifts <sup>19</sup><sup>41</sup> contributed to turnover intention. Pay satisfaction was negatively related to turnover intention <sup>42</sup> <sup>43</sup> while financial incentives were a motivational factor for continuing to work <sup>27</sup>.

Many other aspects of the work environment were also identified as influencing nurse retention, including the physical environment, general workload and job stress, work engagement,

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incivility and violence, leadership communication and support, quality of work-life, and job satisfaction.

A positive work environment was consistently found to reduce nurses' intent to leave <sup>12 44-49</sup>. Conversely, factors such as changing workplaces or working in multiple places <sup>26 50</sup>, as well as working in inpatient settings providing direct patient care, particularly in the intensive care unit or emergency department <sup>2 19 51-53</sup>, were associated with increased turnover intention. Nurses who felt unable to provide patient care that aligned with their values were more likely to leave there jobs than those who could <sup>54</sup>.One study found that nurses who worked on units that employed Nurse Practitioners had lower rates of turnover than those without them <sup>55</sup>.

In terms of workload, seven studies demonstrated that a high level of workload was correlated with intent to leave <sup>51 52 56-60</sup>, and five studies found a link between job stress and turnover intention <sup>29 61-64</sup>. On a more positive note, seven studies identified that higher employee engagement was consistently associated with lower turnover intention <sup>38 65-70</sup>.

Nine studies addressed workplace safety. Four of these found workplace violence (psychological, verbal and physical) perpetrated by patients/families was associated with increased turnover intention <sup>12 57 71 72</sup> and one study found horizontal violence between nurses was associated with increased turnover intention <sup>71</sup>. Workplace incivility from both colleagues and patients/families <sup>35</sup> and decreased safety related to COVID-19 practices <sup>73</sup> were associated with increased turnover intention. Furthermore, two studies found better quality of work-life to be negatively correlated with turnover intention <sup>20 74</sup>.

Effective communication with nursing managers and organizational leaders was found to be a significant predictor of nurses' turnover intention in five studies <sup>33 54 75-77</sup>. Additionally, six studies highlighted that feeling supported by leadership and the organization was inversely correlated with intent to leave <sup>42 56 78-81</sup>

Finally, eight studies identified that job satisfaction was negatively associated with turnover intention <sup>20 42 59 69 82-85</sup>. These studies found that higher levels of job satisfaction were systematically correlated with lower intentions among nurses to leave their positions.

## 3) Psychological Well-being

Several facets of psychological well-being were identified as factors that influence nurse retention. These include resilience, burnout, compassion fatigue, depression, post-traumatic stress disorder, negative coping, moral distress, fatigue, work life balance, organizational commitment, psychological capital, psychological empowerment, emotional intelligence, and professional identity.

Burnout was consistently positively related with intent to leave <sup>2</sup> <sup>12</sup> <sup>21</sup> <sup>43</sup> <sup>76</sup> <sup>82</sup> <sup>83</sup> <sup>86-88</sup>, as was compassion fatigue <sup>2</sup> <sup>60</sup>. Additionally, depression <sup>21</sup> <sup>50</sup>, post-traumatic stress disorder (PTSD) <sup>29</sup> <sup>89</sup>, negative coping <sup>69</sup>, and moral distress <sup>22</sup> <sup>90</sup> were all associated with greater turnover intention.

Fatigue, not having time to relax and lack of work-life balance were associated with intent to leave as well <sup>17 82 86</sup>. Conversely, increased resilience <sup>11 91-96</sup>, organizational commitment <sup>23</sup>, psychological capital (hope, efficacy, resilience, optimism) <sup>97-99</sup>, psychological empowerment <sup>100</sup>, and emotional intelligence <sup>101</sup> reduced the risk of turnover.

Finally, nurses' self-perception was found to influence retention. A nurse's professional identity <sup>36 102</sup>, sense of calling <sup>85</sup>, and desire to serve their country <sup>103</sup> were all negatively associated with intention to quit. In line with this, one study found that lower pride with being an Emergency Department nurse was associated with intention to leave <sup>53</sup>.

## 4) COVID-19 Specific Impacts

It was found that the COVID-19 pandemic generally influenced nurses' intent to leave <sup>21 31 46 56</sup> <sup>104 105</sup> particularly among nurses who cared for COVID positive patients <sup>15 53 106</sup>. Pandemic specific concerns that influenced nurse turnover included fear of the virus <sup>19 24 27 32 107-109</sup>, fear of future waves or pandemics <sup>63</sup>, being infected or knowing a teammate was infected <sup>110</sup>, feeling overwhelmed and not being prepared to care for COVID -19 patients <sup>62 110</sup>, lack of resources/PPE <sup>16 34</sup>, how they perceived the safety climate of their unit <sup>99 111</sup>, experiencing COVID -19 related discrimination <sup>95</sup>, and not feeling heard by managers and organizations when voicing concerns related to the pandemic <sup>54</sup>.

## **Strategies Suggested to Support Nurse Retention**

Nineteen of the 129 studies (15%) identified strategies to address nurse retention (**Table 3**). These strategies can be categorized as : 1) ensuring safe flexible staffing and quality work environments, 2) enhancing organizational mental health and wellness supports, 3) improved leadership and communication, 4) increasing professional development and mentorship opportunities, and 5) better compensation and incentives.

## 1) Ensuring Safe Flexible Staffing and Quality Work Environments

Several strategies focused on safe staffing and flexible ways of working. Implementing flexible scheduling allows for adjustments in work hours and shift patterns to accommodate nurses' diverse needs and preferences <sup>6</sup>112-117. Ensuring safe patient:nurse ratios, adequate staffing and skill mix allows nurses to safely meet patient needs <sup>6</sup>112 114 117-120. Innovative roles and task rotation provide nurses opportunity to diversify their skills and responsibilities <sup>6</sup>115 116 121 122. One study suggested banning mandatory overtime, where nurses are forced to work hours above their full-time equivalent <sup>119</sup>, in order to improve nurse retention. Finally, two papers suggested optimizing nurses' ability to work to their full nursing capabilities by reducing the burden of administrative tasks <sup>6</sup>118.

Strategies to improve the work environment include reducing workplace discrimination and violence <sup>6</sup> <sup>112</sup> <sup>121</sup> <sup>123</sup> and creating a positive environment by improving team culture <sup>112</sup> <sup>114</sup> <sup>120</sup>. Efforts aimed at optimizing the work setting and working conditions, such as through improvements in hospital design and technological integration, were also reported <sup>114</sup>.

## 2) Enhancing Organizational Mental Health and Wellness Supports

Several strategies related to improving psychosocial supports available to nurses were suggested <sup>6 90 114 117 121 123</sup>. These included improved access to mental health recourses <sup>6 117 121 123</sup>, embedded wellness and debriefing activities and programs <sup>6 90 114 117</sup>, and programs to enhance and support interprofessional communication and relationships <sup>114</sup>. 'Stay' interviews, that leaders conduct with individual staff members to learn specific ways to strengthen their engagement and likelihood of remaining with the organization, are another strategy <sup>124</sup>.

## 3) Improved Leadership and Communication

Three studies identified strategies for improved leader and organizational support and communication. These included improved accountability for well-being at an organizational level <sup>6</sup>, for example, through the establishment of a Mental Wellbeing Commission <sup>123</sup>, the provision of positive and constructive feedback <sup>117</sup>, and recognition and acknowledgement of exceptional skills, commitment and dedication of staff <sup>117</sup>.

#### 4) Increasing Professional Development & Mentorship Opportunities

Career development support can be an important incentive for retention <sup>6 80</sup> <sup>112-118</sup> <sup>121</sup> <sup>122</sup> <sup>125</sup>. Strategies included transition-to-practice programs for new graduate nurses <sup>80</sup> <sup>112</sup> <sup>115</sup> <sup>116</sup> <sup>121</sup> <sup>122</sup> <sup>125</sup>; transition programs for moving to a new unit <sup>6</sup> <sup>114</sup>; support and availability of continuing professional education <sup>6</sup> <sup>114</sup> <sup>117</sup> <sup>118</sup>; career reinvention supports <sup>121</sup>, cross-training opportunities <sup>6</sup> <sup>113</sup>; and support and opportunities for experienced nurses (rather than new graduate and intermediate nurses), such as elevating their responsibilities within the care team <sup>6</sup> <sup>112</sup> <sup>117</sup> <sup>122</sup>. Buerhaus et al. suggest matching retention resources with highest-risk groups such as new graduate nurses, and trending data about attrition, reentry, and their patterns and causes <sup>121</sup>.

## 5) Better Compensation and Incentives

Financial incentives to promote nurse retention included ensuring staff had a competitive base compensation, pension, adequate time off <sup>115</sup> <sup>123</sup>, as well as 'incentive' pay based on unit needs, such as shift premiums based on the functional vacancy rate of the unit <sup>113</sup> <sup>120</sup> <sup>126</sup>. Retention bonuses <sup>113</sup> <sup>127</sup>, supplementary responsibility pay for preceptors and mentors <sup>6</sup> <sup>121</sup>, and support from internal travel programs where nurses are provided competitive compensation to stay at their organization but move to a high needs unit for a defined period of time <sup>113</sup> <sup>120</sup> <sup>126</sup> <sup>127</sup> are other financial incentives. Indirect financial incentives to promote retention include loan repayment programs, incentives for hospitals from the government to provide childcare, and on-site graduate school program offerings to retain experienced nurses <sup>119</sup>.

#### **Interventions to Support Nurse Retention**

Nine of the 129 studies (7%) included interventions to address nurse retention (**Table 4**). These interventions included 1) new graduate nurse residency/transition to practice programs <sup>128-130</sup>; 2) mentorship programs <sup>131 132</sup>; 3) psychological coaching programs <sup>133 134</sup>; 4) clinical process support systems <sup>135</sup>; and 5) the creation of a Nurse Retentionist role <sup>135</sup>.

## 1) New Graduate Nurse Residency Programs

Three studies highlighted new graduate nurse residency programs that used a structured, longterm approach to transition to practice, all of which reported positive impacts on nurse retention <sup>128-130</sup>. One program focused on all new graduate nurses across one hospital <sup>128</sup>, another focused on all new graduate nurses of all disciplines across several hospitals <sup>129</sup>, and one program focused specifically on emergency room new graduate nurses across a system of hospitals <sup>130</sup>. All three programs included structured orientation education as well as an element of preceptorship or mentorship. Two of the programs included formalized debriefing and reflection <sup>128 129</sup>, and one program included a progressive integration plan into leadership roles such as preceptor and Charge Nurse <sup>130</sup>. All three programs were located in the Northeastern United States.

#### 2) Mentorship Programs

Nurse mentorship programs with mixed results were reported in two studies reported <sup>131 132</sup>. A mentorship program for new registered nurses hired into medical-surgical units in a small community-based hospital during the unfolding of COVID-19 pandemic did not result in improved intent to stay <sup>132</sup>. Yet a mentorship program offered individualized mentorship through culturally congruent, customized pairing for the participating 96 mentees (divided into four cohorts) had a more positive outcome. Mentees in all four cohorts reported that the mentorship program positively influenced their decision to stay in nursing <sup>131</sup>.

#### 3) Psychological Coaching Programs

Two psychological coaching programs, RISE and reboot, showed positive results. RISE (resilience, insight, self-compassion, and empowerment) is a voluntary psychoeducational group intervention based on an integrative theoretical framework of acceptance and commitment therapy, cognitive behavioral therapy, and mindfulness. It was provided to 108 direct care nurses to reduce burnout and improve well-being. It involved 8 weekly 90-minute in-person group sessions developed and delivered by a licensed mental health counselor <sup>133</sup>. A higher percentage of direct care nurses who participated in RISE remained employed compared with the matched control subjects who did not participate <sup>133</sup>. Reboot was a tailored psychological coaching program aimed at increasing resilience for 84 critical care nurses <sup>134</sup>. The intervention consisted of two 2-hour online group workshops hosted via Zoom (each pair of workshops was termed a 'cycle'), and two 1-hour individual coaching calls delivered by a Cognitive-behavioral therapist. There was a significant difference in nurses' reports of intention to leave pre-intervention (mean=11.50, SD = 2.64) and post-intervention (mean=13.56, SD=1.63) <sup>134</sup>, showing a significantly lower intention to leave nursing after completing the program than before.

## 4) Implementation of Clinical Process Support System

Two Japanese hospitals implemented clinical process support computer systems for nurses and compared retention results with a third, control hospital that did not implement these systems. The clinical process support system based on structured clinical knowledge (Team Compass with the Patient Condition Adaptive Path System; TC-PCAPS) and the COVID-19 clinical management system (COVID-19-CMS) were developed and implemented at the two intervention site hospitals <sup>135</sup>. These systems were designed to increase efficiency in clinical documentation

as 50% of Japanese nurses' overtime is related to record-keeping <sup>136</sup>. The hospitals that implemented either process support system saw a reduction in nurse turnover, while the hospital that had not implemented such systems saw an increase in turnover <sup>135</sup>.

#### 5) Creation of the Nurse Retentionist Role

The Nurse Retentionist role is a new nursing leadership position that uses evidence-based strategies, with measurable outcomes, to personalize retention of a multigenerational workforce according to personal and professional development preferences. This role was developed and implemented at a large health system in the US. It provides a centralized point of contact to implement and evaluate retention strategies. The Nurse Retentionist in the large health system used five key strategies to support nurse retention: 1) Meeting individually with nurses contemplating leaving their positions or seeking career guidance; 2) Building intentional relationships with key stakeholders at the organizations, such as Chief Nursing Officers, Human Resources, and the nurse residency program director; 3) Refining clinical ladder program and expanded the peer mentor program; 4) Developing a system-wide retention committee; and 5) Creating focused recognition efforts to celebrate nurses' professional achievements <sup>137</sup>. Two years after implementation of the nurse retentionist role, nurse turnover was reduced to 11.8% from 13% <sup>137</sup>. Beyond nurse turnover, there were additional outcomes that also support nurse retention. There was a 27% increase in clinical ladder participation, a 43% increase in clinical ladder advancement, a 187% increase in ambulatory nurse recognition, a 31% increase in internal promotions; participation in nursing career development programs increased 294%, and participation in the extern program increased 420%<sup>137</sup>.

## DISCUSSION

While there has already been substantial research on nurse retention, this is the first scoping review to focus on summarizing what is known about nurse retention in the peri- and post COVID-19 period. Although many studies in this review reported measuring some form of retention, how retention was defined varied, as did the instruments used to measure it, making numeric retention score comparisons a challenge. This finding is consistent with previous research <sup>138-140</sup>.

The majority of included studies used cross-sectional study designs that identified correlational relationships, limiting our ability to make causal inferences. There were few interventional studies. This may be due to the short time between the COVID-19 pandemic and the writing of this review, as interventional studies require a substantial amount of time for identification, design, implementation, evaluation and publishing. Future research should focus on testing the strategies identified in this review and studying the identified successful interventions in more nursing settings.

#### Factors Associated with Nurse Retention

The main themes identified for nurse retention included personal and demographic factors; safe staffing and quality work environments; psychological well-being; and specific COVID-19 factors.

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Although our review did find correlations between retention and personal factors such as gender, marital status, being a parent etc., these factors should not be targeted for change: retention strategies should not take an approach that implies that it is the individual nurse's fault for wanting to leave their position. Instead, it would be more effective to address modifiable factors of the work environment and health care system <sup>141</sup>. Nevertheless, demographic factors such as age, phase of career, and level of education attained can be useful to target retention strategies to more vulnerable career phases and populations <sup>142</sup>.

The majority of the factors identified in this scoping review related to the work environment, safe staffing, scheduling and compensation, and psychological well-being. These results align theoretically with the effort-reward imbalance (ERI) model which aims to identify psychologically stressful work environments and their negative effects on stress-related health risks. The ERI postulates that the imbalance between the demands (effort) and rewards an employee experiences can increase negative outcomes, including job dissatisfaction and intent to leave <sup>143</sup> <sup>144</sup>. Work demands such as workload, physical and psychological safety, poor staffing and overtime outweigh rewards such as compensation, leadership support, and quality of work-life – resulting in a higher intention to leave. These have been repeatedly reported in the literature on nurse retention <sup>145-147</sup> and continue to be important to consider for future interventions.

The COVID-19 pandemic had an unprecedented impact on the lives and work of nurses globally. Some of the retention factors specific to the pandemic included fear, feeling overwhelmed/unprepared, and a lack of support and resources. These issues have been echoed in the literature <sup>148</sup>, as nurses were redeployed to unfamiliar work areas, faced unknown risks that were exacerbated by the COVID-19 pandemic, and were failed by the healthcare system, which itself was not adequately prepared and did not prepare its staff (including nurses) adequately, and the absence of a safe environment and necessary resources. The consequences of these shortcomings persist – and are likely to continue to persist – in healthcare workplaces, leading to not only the loss of nurses from the profession, but the loss of people considering nursing as a profession.

## **Strategies to Support Nurse Retention**

The main strategies our review identified that would support nurse retention included ensuring safe flexible staffing and quality work environments; enhancing organizational mental health and wellness supports; improved leadership and communication; increasing professional development and mentorship opportunities; and better compensation and incentives.

These strategies are not novel to the peri- and post-COVID-19 period. Previous literature has emphasized that the nursing practice environment directly impacts nurse retention, as well as the quality of patient care <sup>149</sup>. Positive work environments require engaged leadership, cross-disciplinary collaboration, and strong organizational culture <sup>150</sup>. It is important to note that strategies to address factors in the work environment can be hard to link directly to nurse retention as they do not exist in a vacuum: other unit, organizational, and systemic factors come

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into play as well. A positive work environment can only be achieved when strategies such as safe staffing, adequate wellness supports, and strong leadership, are also present.

Safe staffing has been a prominent issue in recent nurse retention discourse. It was identified as a main priority by the Canadian government in the 2024 release of the Health Canada Nursing Retention Toolkit aimed at supporting and retaining the nursing workforce <sup>6</sup>. Several countries have developed safe staffing frameworks and initiatives, some of which include legislative approaches <sup>151</sup>. In 2019, California was the only US state with mandated nurse to patient ratios across all specialties. Since then, more US states and other countries have begun to pursue legislative or mandated nurse staffing approaches <sup>151</sup> and transparency with nurse staffing ratios <sup>152</sup>.

Although the issues and strategies identified in this review pre-existed the COVID-19 pandemic, our review found that the peri- and post-COVID-19 pandemic landscape substantially amplified the issues and emphasized the need to implement strategies urgently. The risk to our global nursing workforce has never been greater, making it crucial to shift focus from merely identifying factors influencing retention and proposing strategies to reduce it, to actions and interventions that will have an immediate and direct effect on nurse retention.

#### **Interventions to Support Nurse Retention**

Interventions identified to support nurse retention included: new graduate nurse residency/transition to practice programs; mentorship programs; psychological coaching programs; clinical process support systems; and the creation of a Nurse Retentionist role. Of note, 7 out of the 9 interventional studies took place in the US and the remaining two took place in the UK and Japan.

We identified few interventional studies, which may reflect the time it takes to plan, implement, evaluate and publish such studies. The most visible gaps were the lack of interventions focused on developing safe staffing, flexible scheduling, compensation, and improving work environments, even though these were consistently identified as priorities within the literature. This may be due in part to the fact that altering staffing ratios, scheduling guidelines and compensation requires approval by multiple jurisdictions (i.e. province/state, unions, institution etc.), making them difficult to implement. Unsurprisingly, transition to practice, mentorship, and psychological coaching programs were interventions that had positive impacts on nurse retention, as previously identified in the literature <sup>153-156</sup>.

The two novel interventions our review identified were the implementation of clinical process support systems (i.e., a computerized system based on clinical knowledge and a COVID-19 specific clinical management system) and a Nurse Retentionist role. Clinical process support systems can help anticipate and identify a patient's clinical pathway; where structured nursing knowledge can streamline nursing work and reduce administrative burden <sup>136</sup>. This type of intervention may have high potential for implementation given the increasing integration of artificial intelligence (AI) into healthcare <sup>157</sup>. The nurse retentionist role brings a prioritized, nursing-centered focus to addressing nurse retention. Having a point person to assess an

organization's nursing workforce needs and provide curated solutions for that workforce allows for addressing specific staffing populations and career phases <sup>158</sup>.

Our review highlighted that psychological wellbeing is essential for a healthy nursing workforce and interventions to enhance nurses' psychological wellbeing are important nurse retention strategies. Just as important was improving the work environment and reducing workloads. Other aspects of work life such as improved leadership and communication, safe staffing, flexible scheduling, and incentives and fair compensation were highlighted in the literature, but interventions that address these have not yet been developed or studied. Further research is needed to see if these strategies translate into effective solutions when implemented and evaluated in practice.

## **Study Limitations**

The search strategy was limited to publications in English or those translated into English, potentially excluding relevant studies in other languages. The quality of the included studies varied. However, a scoping review aims to provide an overview of emerging evidence, therefore the variable quality is acceptable, as it is outweighed by the goal to identify and map available evidence <sup>159</sup> <sup>160</sup>. The extreme heterogeneity of retention measurement definitions and tools prohibited accurate comparisons across studies.

## CONCLUSION

This scoping review provides an overview of relevant factors, strategies and interventions to reduce nurse turnover during the peri- and post-COVID-19 period. Studies were primarily correlational, and there were few studies of interventions. Factors associated with nurse retention were similar to those reported pre-pandemic, and in fact may have worsened, and new factors directly related to the pandemic have emerged. Inconsistent measurement and interpretation of nurse retention scores was noted. Interventional studies were limited but several effective options were identified. A greater emphasis on interventional research is needed to develop and test effective mechanisms for nurse retention in the post-COVID-19 work environment. Rigorously addressing nurse retention has the potential to strengthen the nursing workforce, improve nurse well-being, enhance quality patient outcomes, and improve the longevity and sustainment of our global health systems.

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measur Including for uses r	emonation for the second secon	Mir Me Apj Too (M Sco
Alameddine et al., 2021 <sup>92</sup> (Lebanon)	All registered nurses affiliated with the Order of Nurses in Lebanon and working in patient care positions in hospitals	Cross Sectional Study	Factors	Yes	"How likely are you to quit your current job in the next 1-3years?" (single item, 5 point Likert scale)	43.1% too	20 20 20 20 20 20 20 20 20 20 20 20 20 2	5/5
Alameddine et al., 2021 <sup>91</sup> (Lebanon)	Nurses practicing at a major public hospital and referral center in Lebanon	Cross Sectional Study	Factors	Yes	Turnover intention (single item, 4 point Likert scale)	23.80% AI training, and	p//bmjopen.bmj.com	5/5
Alenazy et al., 2023 <sup>44</sup> (Saudi Arabia)	Registered critical care nurses working in King Khalid Hospital (KKH), Ha'il, KSA	Cross Sectional Study	Factors	Yes	Turnover Intention Scale (6 items, 5 point Likert scale)	(M=17. with 48 sample thresholog	54, 9D = 4.94) $5\%_{20}f$ the $5\%_{20}f$ this 50, 000 50, 000 50	5/5 (10
Alsaif et al., 2023 <sup>35</sup> (Saudi Arabia)	Foreign female nursing professionals employed at the time of this study either in private or government hospitals	Cross Sectional Study	Factors	Yes	Turnover Intentions Scale (6 items, 5 point Likert scale)	Not dir	ctlygen Agence Biblio	3/5

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	92440 02440 Measurencluding for uses r	Mixed Methods Appraisal Tool (MMAT) Score
Amicucci et al., 2023 <sup>128</sup> (USA)	First year new graduate nurses transitioning into practice	Case Report	Intervention	Yes	Post intervention retention rate	retention and to text and text an	4/5 (80%)
Anderson et al., 2021 <sup>123</sup> (UK)		Health Policy Paper	Strategies	Yes	Nurse Turnover	Registered furse turnoves An rate non	n/a
Andrews et al., 2024 <sup>59</sup> (USA)	Newly licensed nurses working across 51 metropolitan areas within 35 U.S. states	Cross Sectional Study	Factors	Yes	Turnover Intention (4 items, 5 point Likert scale)	(M=2.6 Ar Speen.bm).cc	5/5 (100%)
Aslan et al., 2022 <sup>79</sup> (Turkey)	Nurses working in state hospitals in Turkey	Cross Sectional Study	Factors	Yes	Intention to Quit Scale (3 items)	(M=2.79, SD=1.17) (M=2.79, SD=1.17) (M=2.79, SD=1.17)	5/5 (100%)
Baumann et al., 2024 <sup>127</sup> (Canada)		Report	Strategies	No		2025 at Age logies.	n/a
Boudreau & Rheaume,	Nurses working in state hospitals in Turkey	Cross Sectional Study	Factors	Yes	Intent to Leave	73% Bibliogra	5/5 (100%)
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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	44nt 44996333 on 4 March 20 1410 trencluding for uses re	Mi Me Ap To (M Sco
2024 <sup>46</sup> (Canada)		h.				025. Dow gnement lated to	
Boulton et al., 2023 <sup>90</sup> (UK)	Nurses from four adult ICUs across the UK	Mixed Methods Study	Factors; Strategies	Yes	Intent to leave the profession due to moral distress (two items)	37% Superieur (AB text and data m	14/ (93
BowenXue et al, 2024 <sup>66</sup> (China)	Nurses from three esteemed tertiary Grade A hospitals in Hangzhou	Cross Sectional Study	Factors	Yes	Chinese version of the Turnover Intention Scale (2 items, 4 point Likert scale)	(M=14. SD=3. %) moderate to high training	5/5 (10
Boyle et al., 2022 <sup>118</sup> (USA)		Policy Forum Editorial	Strategies	No	0	jicom/ on , and simila	n/a
Brooks, 2022 <sup>12</sup> (USA)	<sup>6</sup> UW Health & Jefferson Health nurses	Report	Strategies	No		June 10, 202 ar technolog	n/a
Bruyneel et al., 2023 <sup>45</sup> (Belgium)	, All nurses working in Belgian ICUs	Cross Sectional Study	Factors	Yes	Intent to Leave (two questions, binary)	42.9% Interpled to leave their job, 228% intended to Reave the profession	5/5 (10

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Heasu Measu the mcluding for uses re	Mixed Methods Appraisa Tool (MMAT) Score
Buerhaus et al., 2023 <sup>121</sup> (USA)		Perspective Editorial	Strategies	No		025. Down gnement S ated to te	n/a
Cadmus, 2021 <sup>129</sup> (USA)	New graduate nurses in the US state of New Jersey	Case Report	Intervention	No		loaded from htt uperieur (ABES xt and data min	4/5 (80%)
Cakal et al., 2021 <sup>102</sup> (Iran)	Active duty Iranian nurses from across the country	Cross Sectional Study	Factors	Yes	Intent to Quit (4 items, 7 point Likert scale)	(M=4.2 <b>g</b> , S <b>B</b> =1.89) Al training	5/5 (100%)
Chen et al., 2021 <sup>62</sup> (Taiwan)	Nationwide survey of new graduate nurses in Taiwan	Cross Sectional Study	Factors	Yes	Stay in the Nursing Workplace Scale (10 items, 4 point Likert scale)	(M=2.08, SD= 0.46), which weas close to disagree ment tech =	5/5 (100%)
Chervoni- Knapp, 2022 <sup>113</sup> (USA)	Nationwide survey of new graduate nurses in Taiwan	Report	Strategies	No		0, 2025 at A nologies.	n/a
Choi et al., 2022 <sup>75</sup> (Hong Kong)	Full-time staff nurses currently practicing in hospital settings in Hong Kong	Cross Sectional Study	Factors	Yes	Turnover Intention (single item)	gence Bibliogr	5/5 (100%)

Author(s)	Sample Description	Study Design	Factors	Potention	Maasuramant	Moosui	T N A	Mi
Autnor(s), year, country	Sample Description	Study Design	ractors, Strategies or Interventions	measured?	scale	Measu	996333 on 4 March 2 Encluding for uses r	MB Me Apj Toc (MI Sco
Christianson et al., 2023 <sup>2</sup> (USA)	Hospital nurses in the states of Florida, Oregon, Rhode Island, and Wisconsin.	Mixed Methods Study	Factors	Yes	Intent to Leave (2 items, binary)	22%	2025. Downloade ignement Superi elated to text an	(73)
Christianson et al., 2024 <sup>43</sup> (USA)	Actively licensed United States registered nurses (RNs) and licensed practical nurses (LPNs)	Cross Sectional Study	Factors	Yes	Intent to Leave (single item, "Do you want to continue to work as a nurse? Why or why not?" This question was hand coded to categorize nurses into 3 groups: intend to leave (ITL), intend to stay (ITS), or uncertain)	22%	d from http://bmjopen.bmj.com/ on June leur (ABES) d data mining, Al training, and similar tec	5/5
Cole et al., 2021 <sup>34</sup> (Australia)	Frontline nurses	Cross Sectional Study	Factors	Yes	Intent to Leave (2 items, 5 point Likert scale)	(M=2.5	555 567 567 567 567 567 567 567	5/5
Conolly et al., 2024 <sup>54</sup> (UK)	Frontline nurses in the UK	Qualitative Research	Factors	No			ence Bibl	5/5

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measurcluding for uses relat	Mixed Methods Appraisa Tool (MMAT Score
Cornish et al., 2021 <sup>53</sup> (Australia)	Australian emergency room nurses	Cross Sectional Study	Factors	Yes	Intent to Leave (not specified)	48.2% of the second sec	4/5 (80%)
Costa & Friese, 2022 <sup>119</sup> (USA)		Policy Report	Strategies	No	6	open.bmj. training, a	n/a
Crowe et al., 2022 <sup>48</sup> (Canada)	Canadian critical care nurses working in an intensive care unit, high acuity unit, or intensive care step- down unit during the COVID-19 pandemic	Mixed Methods Study	Factors	Yes	Intent to Turnover Scale (7 items, 5 point Likert scale)	22.40% similar technologies.	12/15 (80%)
deCordova et al., 2022 <sup>87</sup> (USA)	New Jersey hospital nurses	Cross Sectional Study	Factors	Yes	Intent to Leave (single item, binary)	36.5% Agence Bil	5/5 (100%)

Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measure Measure Item 496333 on 4 March Ens Ens Ens Ens	M M Aj Ta (N Sc
Ding & Wu, 2023 <sup>100</sup> (China)	Nurses from different hospital in 8 cities in China	Cross Sectional Study	Factors	Yes	Turnover Intention Scale (3 item, 7 point Likert scale)	65.3% downlo	5/
Dino et al., 2022 <sup>103</sup> (Philippines)	Registered nurses working in a public hospital in Metro Manila - must have at least one year of work experience, and be between the ages of 25 and 65	Mixed Methods Study	Factors	Yes	Garbee and Killacky Intent to Stay Scale (GKISS)	(Mediaaberger (Mediaaberger 14) (modata mining, Al trainin	QR=12- 14 low) (91
Djupedal et al., 2022 <sup>40</sup> (Norway)	Norwegian nurses	Cross Sectional Study	Factors	Yes	Turnover intention (single question yes or no/I don't know)	9.7% and similar te	5/
Edmonson et al., 2022 <sup>76</sup> (USA)	Registered nurses in the United States who were active and practicing nurses in the past year and provided direct care to patients	Cross Sectional Study	Factors	Yes	How often they felt like quitting their jobs (Single item, Likert scale (unknown))	39% of Ern falt lik quitting the boost geiss at Agence	xe 2/: s (40

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Ekingen et al., 2023 <sup>19</sup> (Turkey)	Nurses working in seven hospitals in Turkey	Cross Sectional Study	Factors	Yes	Turnover Intention Scale (2 items, 5 point Likert scale)	Organized intention (M=3.228 Profession intention (M=2.361	S = 1.295 S = 1.295 S = 1.295 S = 1.295 S = 1.168	5/5 (100%)
Elhanafy et al., 2021 <sup>107</sup> (Egypt)	Nurses from all inpatient units (medical and surgical) and critical care units (N=15) of Damanhour National Medical Institute (Egypt)	Cross Sectional Study	Factors	Yes	Turnover intention (two single item measures, 5 point Likert scale)	(M=2.19, Al training, and	n Attp://bmjopen.bmj.cor	3/5 (60%)
Enwereuzor et al., 2023 <sup>49</sup> (Nigeria)	Nurses working in hospitals designated for caring for patients with COVID-19 across Nigeria.	Cross Sectional Study	Factors	Yes	Intent to Stay (ITS) scale (6 item, 5 point Likert scale)	(M=21 milar technolog)	7055D=8.283) June 10, 202	4/5 (80%)
Failla et al., 2023 <sup>58</sup> (USA)	All newly licensed nurses at six hospitals at a not-for-profit healthcare organization in southern California	Sequential Survey Design	Factors	Yes	Intent to Leave (two items, 5 point Likert scale)	2019: (M 1.18) 2020: (M SD=1.12) 2021: (M	5263, SD= =2263, SD= Age141, =256 Bib 100 100 100 100 100 100 100 10	5/5 (100%)
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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Aft Measurencluding for uses reig	Mi Me Ap Too (M Sco
FasihFar et al 2022 <sup>83</sup> (Iran)	, Nurses working in the emergency, medical, surgical, psychiatric, and special trauma wards from the hospitals in Sabzevar, Iran.	Cross Sectional Study	Factors	Yes	Turnover Intentions Scale (6 items, 5 point Likert scale)	SD=1.1 翻 Constraints Ement to the Superior of the Superior of Superior of Superior (ABES) · Management (ABES) · Management (ABES) · Al	e 4/5 (80
Flinkman et a 2023 <sup>98</sup> (Finland)	I., RNs across Finland	Cross Sectional Study	Factors	Yes	Intent to Leave (3 items, 5 point Likert scale)	(M=3.8 , Sp= 1.2)	5/5
Fronda & Leodoro, 2021 <sup>108</sup> (Philippines)	Frontline nurses from the Central Philippines	Cross Sectional Study	Factors	Yes	Turnover intention (2 items, 5 point Likert scale)	25.8% Exported a desire to leaves the figure of a desire 20.7% Exported a desire to leaves the sportes sion	5/5 (10
Gaffney, 2022 <sup>115</sup> (USA	American nurses	Report	Strategies	No		5 at Agenc	n/a
Galanis et al., 2023 <sup>18</sup> (Greec	Nurses in Greece who e) have been working for > 1 year	Cross Sectional Study	Factors	Yes	Turnover Intention (single item, 6 point Likert scale)	₩ Bibliograp	5/5
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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	9024-996333 on 4 March 202 9htencluding for uses reign	Mixed Methods Appraisal Tool (MMAT) Score
Galanis et al., 2024 <sup>11</sup> (Greece)	Nurses who have been working in healthcare services for at least two years, those who understood the Greek language, and those who have been working as clinical nurses	Cross Sectional Study	Factors	Yes	Turnover Intention (one item, 6 point Likert scale)	5. Downloaded from http://bmjope iement Superieur (ABES) . 58.10% text and data mining, Al trai	5/5 (100%)
Gedik et al., 2023 <sup>71</sup> (Turkey)	Nurses in Ankara, Turkey	Cross Sectional Study	Factors	Yes	Turnover Intention (3 item measure by Cammann et al. 1979)	Not directly reported	5/5 (100%)
Gherman et al., 2022 <sup>38</sup> (Romania)	Romanian nurses working in hospitals	Cross Sectional Study	Factors	Yes	Turnover Intentions (3 item scale from the Michigan Organizational Assessment Questionnaire)"	Not directly e 10, 2025 at Ager	5/5 (100%)
Gherman et al., 2022 <sup>30</sup> (Romania)	Romanian nurses working in hospitals	Cross Sectional Study	Factors	Yes	Turnover Intentions (3 item scale from the Michigan Organizational	Not directly reported	5/5 (100%)
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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measurement ncluding t	Mi Me Ap To
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		Or.			Assessment Questionnaire)"	25. Downloa nement Sup ated to text	
Government of Canada, 2024 <sup>6</sup> (Canada)		Government Report	Strategies	No		aded from htt berieur (ABEs and data mir	
Goyal & Kaur, 2023 <sup>65</sup> (India)	Nurses in 51 hospitals in the Northern Indian region	Cross Sectional Study	Factors	Yes	Retention	(M=2.5, SD=0.764) Al training,	5/5
Grubaugh et al 2023 <sup>97</sup> (USA)	, New graduate nurses	Cross Sectional Study	Factors	Yes	Turnover (binary; resigned or retained)	Not directly reported similar techn	5/5
Grubaugh et al 2023 <sup>80</sup> (USA)	, Versant NGN program participants between 2018 and 2021 across 45 acute care organizations, 1 outpatient service location, 4 pediatric hospitals, and 1 home	Cross Sectional Study	Factors; Strategies	Yes	Turnover Intent (12 items, 7 point Likert scale)	2018-2699 20.6%) 2020-2699 20.2%) Agence Bibliogr	5/5

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measu	124-596333 on 4 March 20 124-596333 on 4 March 20 124-596333 on 4 March 20 124-596333 on 4 March 20	Mixed Methods Appraisal Tool (MMAT) Score
	health organization, spanning 6 states						25. Dow nement	
Gularte-Rinaldo et al., 2023 <sup>131</sup> (USA)	New graduate nurses	Program Evaluation	Intervention	Yes	(Single item, binary) "Did mentorship influence the mentees' decision to remain in nursing?"	58.9% i mentori had pos influend to stay i	Construction Co	n/a
Habibzadeh et al., 2022 <sup>161</sup> (Iran)	Nurses working in five hospitals in the city of Urmia, with at least 1 year of work experience, working in the mentioned hospitals all through the COVID-19 pandemic	Cross Sectional Study	Factors	Yes	Turnover Intention Questionnaire (TIQ) (15 items, 5 point Likert Scale)	(M=52. (high)	training, and similar technolo	5/5 (100%)
Han et al., 2023 <sup>13</sup> (South Korea)	Nurses working at University Hospital in the Gyeonggi Province for more than one year during the COVID-19 pandemic, and working in 13 wards, 5	Cross Sectional Study	Factors	Yes	Turnover Intention, (4 items, 5 point Likert scale)	(M=13.	155=4.0)	5/5 (100%)
	F-		h. http://h.mian	27			phique de	

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measure Measure Including for uses re	4096333 on 4 March 2	Mi Me Ap To (M Sco
	ICUs, and 2 emergency centers, excluding special parts, operating rooms, and outpatient departments less related to COVID-19	or D	200			elated to text and data mi	025. Downloaded from ht	
Hanum et al., 2022 <sup>36</sup> (China)	Nurses who worked before and during the COVID-19 pandemic in the First Affiliated Hospital of Kunming Medical University	Cross Sectional Study	Factors	Yes	Intention to Stay Scale (6 items, 5 point Likert scale)	M=3.4/29, Al training, and	nedium level) modum level) mjopen.bmj.com	5/5
Havaei et al., 2023 <sup>39</sup> (Canada)	Actively working regulated nurses across the healthcare spectrum in British Columbia (BC), collected by the BC Nurses' Union	Cross Sectional Study	Factors	Yes	Turnover Intent, 2 items, (4 point and 8 point Likert scales)	intent toni SD=0.947) likely) for timing of (M=7.947 years	topover intent SS at Agen	5/5
Hodgson et al., 2024 <sup>120</sup> (USA)	National emergency department leaders	Report	Strategies	No			nce Biblic	n/a

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	024 nt 024 nt 96333 on 4 March 2 ghtencluding for uses re	Mixed Methods Appraisal Tool (MMAT) Score
Hwang, 2022 <sup>74</sup> (Korea)	Female nurses working in tertiary general hospitals with more than six months of clinical experience.	Cross Sectional Study	Factors	Yes	Turnover intention (6 items, 5 point Likert scale)	(M=3.447, ment Superieu to text and d	5/5 (100%)
Im & Koh, 2023 <sup>85</sup> (Korea)	Nurses who had direct contact with confirmed and suspected COVID-19 patients	Cross Sectional Study	Factors	Yes	"Are you willing to work during this COVID-19 pandemic?" (single item, 5 point Likert scale)	(M=3.64 mining, Al training,	5/5 (100%)
Jarden et al., 2023 <sup>56</sup> (Australia)	All registered nurses who resigned from two metropolitan healthcare organizations in Victoria, Australia in 2021 were eligible for recruitment	Qualitative Research	Factors	No	~~~~	jcom/ on June 10, 2025 at A and similar technologies.	5/5 (100%)
Kabir et al., 2022 <sup>37</sup> (Bangladesh)	Bangladeshi registered female nurses directly involved with clinical care	Cross Sectional Study	Factors	Yes	Turnover Intention Scale-6 (6 items, 5 point Likert scale)	(M=16.33, BD= 4.72) Bibliograp	5/5 (100%)
	Fo	r peer review on	ly - http://bmjope	<b>29</b> en.bmj.com/sit	:e/about/guidelines.xht	hique de l	

Author(s).	Sample Description	Study Design	Factors.	Retention	Measurement	Measurement	Mi
year, country	Sumpre Description	Study Design	Strategies or Interventions	measured?	scale	996333 on 4 March 2 Ensei	Me Apj Too (Ml Sco
	settings during the COVID-19 pandemic.	Ò.				025. Dow gnement ated to	
Kachie et al., 2023 <sup>60</sup> (China)	Frontline nurses working in designated hospitals across Zhejiang province in China	Cross Sectional Study	Factors	Yes	Turnover Intention (3 items, 7 point Likert scale)	(M=3.94 and data mini	1) 5/5 (100
Karakachian et al., 2024 <sup>22</sup> (USA)	RNs aged 18 to 80 years working in inpatient units and the emergency department in a Magnet hospital	Cross Sectional Study	Factors	Yes	Turnover Intention Scale (6 items, 5 point Likert scale)	(M=1697,SB=3.4	) 5/5 (100
Kitamura & Nakai, 2023 <sup>17</sup> (Japan)	Nurses working at two medical institutions in Ishikawa Prefecture, Japan	Cross Sectional Study	Factors	Yes	Turnover Intention (1 item, binary)	63.40% similar technolo	5/5 (100
Kleier et al., 2022 <sup>93</sup> (USA)	registered nurses (RNs) who were providing direct patient care in adult inpatient units with a high likelihood of admitting patients	Cross Sectional Study	Factors	Yes	Intent to leave the profession (3 items, 7 point Likert scale)	(M=3.24;, Stat Agence Bibliogr	7) 5/5 (100

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measurch 20 Measurcluding for uses re	Mixed Methods Appraisa Tool (MMAT Score
	diagnosed with COVID-19 employed by four hospitals in a multihospital system in the southeastern United States	or p	20			025. Downloaded from gnement Superieur (A lated to text and data	
Krofft & Stuart, 2021 <sup>132</sup> (USA)	Newly hired staff nurses in a 300 bed community hospital located in the Midwestern US	Quality Improvement Project	Intervention	Yes	Intent to Stay (part of a 26 item survey, 5 point Likert scale)	(M=67.115) MGGS Mining, Al trainnin	n/a
Kwon & Song, 2024 <sup>28</sup> (South Korea)	Nurses caring for patients with COVID- 19 at a university hospital in South Korea	Cross Sectional Study	Factors	Yes	Korean Nurse Turnover Intention Scale (10 items, 5 point Likert scale)	77.8% on June 1	5/5 (100%)
Labrague & Santos, 2021 <sup>109</sup> Philippines)	Frontline registered nurses employed in five hospitals in the Philippines	Cross Sectional Study	Factors	Yes	Intent to leave organization and profession (2 items, 5 point Likert scale)	organizational (M=1.86, SD=1.26); Sofessional (M=2.23, Sofessional	5/5 (100%)
Labrague & Santos, 2021 <sup>94</sup> Philippines)	Frontline nurses in selected hospitals	Cross Sectional Study	Factors	Yes	Intent to leave current organization	(M=1.93, Sb)=1.07)	5/5 (100%)

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measuncluding for uses re	24-0096333 on 4 March 2	Mix Met App Too (MI Sco	
					(single item, 5 point Likert scale)	gnement ated to t	025. Dow		
Labrague et al., 2021 <sup>95</sup> (Philippines)	Licensed registered nurses with at least 6 months of work experience in their current unit and who were directly involved in the care of coronavirus patients	Cross Sectional Study	Factors	Yes	Turnover Intention (single item, 5 point Likert scale)	SGperieur (ABES) . lext and data mining, Al trainin M=1.9	nD=1.07) Definition of the second sec	5/5 (100	
Lavoie- Tremblay et al., 2022 <sup>110</sup> (Canada)	Frontline nurses and licensed practical nurses in Quebec, Canada	Cross Sectional Study	Factors	Yes	Turnover intention for organization and profession (2 items, 7 point Likert scale)	organizatio profession: similar tec	29.5% 22.3% on June	5/5 (100	
Lee, 2024 <sup>130</sup> (USA)		Quality Improvement Project	Intervention	Yes	Retention statistics were garnered through the length of employment	Turnover ra from 46% t	1925 at Ag	n/a	
Lee et al., 2023 <sup>64</sup> (South Korea)	Registered nurses working in the COVID-19 wards of three tertiary general	Cross Sectional Study	Factors	Yes	Korean Nurse Turnover Intention Scale (10 item, 5 point Likert scale)	(M=41.65,	Bibliogr	5/5 (100	

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	124-5996333 on 4 March 2 Int Ensei Measuncluding for uses re	īt	Mixed Methods Appraisal Tool (MMAT) Score
	hospitals in Daegu and Gyeongbuk, South Korea	0				025. Downlo gnement Su ated to tex		-
Liu et al., 2021 <sup>96</sup> (China)	Nurses who came to Wuhan Mountain and Thor Mountain Square Cabin Hospital to treat COVID-19 patients from January to April 2020 and had returned to their home hospitals during the survey period	Cross Sectional Study	Factors	Yes	Nurse Intent to Stay Questionnaire (6 items, 5 point Likert scale)	dibid from http://bmjopen.bmj.com péfieur (ABES) . (M=3.8d data mining, Al training, and M=3.8d data mining, Al training, and	=0.6)	5/5 (100%)
Lofti et al., 2022 <sup>111</sup> (Iran)	Perioperative and anesthesia nurses in public hospitals of Mazandaran province in Iran	Cross Sectional Study	Factors	Yes	Anticipated Turnover Scale (12 items, 7 point Likert scale)	(M=32. militaria 70% hager model high tunde over 10, 2021	D=8.9), lerate or intention	5/5 (100%)
Lou et al., 2022 <sup>88</sup> (Canada)	Nurses from University-affiliated tertiary care hospital network (4 sites) in Montreal, Quebec, Canada	Cross Sectional Study	Factors	Yes	Intent to leave facility and profession (2 items, binary)	50% es. 50% es.		5/5 (100%)
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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measure Measure Measure Measure Measure Measure Measure Ensei Ensei Ensei Ensei Ensei Ensei Ensei	Mixed Metho Appra Tool (MMA Score
Matsuo et al., 2023 <sup>86</sup> (Japan)	Full-time nursing professionals in the Kanto/Koshinetsu region of Japan	Cross Sectional Study	Factors	Yes	Intention to Leave Scale (6 items, 4 point Likert scale)	(M=13.50 (M=13.50 to text and to text and	5/5
Medvec et al., 2023 <sup>12</sup> (USA)	Individuals who held a valid, unrestricted license as a registered nurse in the State of Michigan	Cross Sectional Study	Factors	Yes	intentions in the next year: to leave their current job, reduce their clinical hours from their current baseline, and/or pursue travel nursing.	(39%) provided to leave their current position within in the next year, 28% plan to reduce their clinical hours, and 18% plan to pursue trave nursing	5/5 (100%
Mehra et al., 2024 <sup>32</sup> (India)	Frontline nurses working in a tertiary care government hospital in North- Eastern India	Cross Sectional Study	Factors	Yes	Turnover Intention Scale (6 items, 5 point Likert scale)	43.70% similar technolo	5/5 (100%
Miller et al., 2023 <sup>63</sup> (UK)	Critical care nurses working in ICU in the UK NHS during the COVID-19 pandemic	Qualitative Research	Factors	No		25 at Agence Bit gies.	5/5 (100%

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Author(s), year, countrySample SampleMirzaei et al., 202129 (Iran)Nurs six m work empl pre-h emer educa medi	rses with more than months of clinical rk experience, ployed in Ardabil engency and	Study Design Cross Sectional Study	Factors, Strategies or Interventions Factors	Retention measured? Yes	Measurement scale Turnover Intention	Measure Measure Measure for uses related (M=41	24 24 24 24 296333 on 4 March 20 Enseign	Mixed Methods Appraisal Tool (MMAT) Score
Mirzaei et al., Nurs 2021 <sup>29</sup> (Iran) six m work empl pre-h emer educa medi	rses with more than months of clinical rk experience, ployed in Ardabil e-hospital ergency and	Cross Sectional Study	Factors	Yes	Turnover Intention	(M=41.₽3		ļ
were provi COV	acational and dical centres who re first line oviders of care for DVID-19 patients		201	24:	Questionnaire (15 items, 5 point Likert scale)	ed to text and data mining, Al trair	D−12.11) 5. Downloaded from http://bmjopen 5. Bownloaded from http://bmjopen	5/5 (100%)
Aitchell & Aaykut, 2021 <sup>125</sup> Canada)		Multifactorial Analysis Paper	Strategies	No	4	ing, and sim	.bmj.com/ o	n/a
Moons, 2024 <sup>114</sup> (Sweden)		Editorial	Strategies	No	7	nilar techn	n June 10,	n/a
Jakai et al., Nurs 2022 <sup>24</sup> (Japan) desig instit infec accep COV medi that y	rses from one signated medical titution of ectious diseases that cepts patients with DVID-19 and 2 dical institutions t were asked to	Cross Sectional Study	Factors	Yes	Desire to quite their job (single item, binary)	60.50%gies.	, 2025 at Agence Bibliograp	4/5 (80%)

Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measurch 2 Measurcluding for uses r	Mix Me Apj Too (Mi Sco
	accept patients with COVID-19 by the local government.	0,-				025. Downlc gnement Su elated to tex	
Nakic et al., 2023 <sup>105</sup> (Croatia)	Nurses who moved from their previous workplace and started working in a department caring for patients with COVID- 19 during the pandemic.	Cross Sectional Study	Factors	Yes	Intent to Leave (single item, binary)	aded from http://bmjopen.b perieur (ABES) . tagd data mining, Al trainin	4/5
Nam et al., 2023 <sup>72</sup> (Korea)	Working Korean RNs aged 18 years or older	Cross Sectional Study	Factors	Yes	Anticipated Turnover Scale (12 items, 7 point Likert scale)	mj.com/ on June g, and similar tec	5/5
Nashwan et al., 2021 <sup>31</sup> (Qatar)	Nurses working in the Hamad Medical Corporation in Qatar	Cross Sectional Study	Factors	Yes	Turnover Intention Scale (6 items, 5 point Likert scale)	Turnover intention before OVED-19: 13.24 (12.83-53.66) Turnover intention after COVID-19 15:54 (15.03-16.08)	5/5 1 (10

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	4nt Measurch 2 tem ncluding for uses r	
Noer et al., 2023 <sup>61</sup> (Denmark)	newly graduated nurses in Denmark	Cross Sectional Study	Factors	Yes	"Do you think that you will be working as a nurse in five years?" (Single item binary)	28% 28% 28% 28%	
Ohue et al., 2021 <sup>106</sup> (Japan)	Nurses from 5 hospitals in Japan	Cross Sectional Study	Factors	Yes	Intent to Leave (3 items, 5 point Likert scale)	m http://bmjoper ABES) . ta mining, Al trair	4
Pahlevan Sharif et al., 2023 <sup>42</sup> (Iran)	Nurses who worked in two public hospitals and had more than 6 months of working experiences as a nurse	Cross Sectional Study	Factors	Yes	Turnover Intention (3 items, 7 point Likert scale)	(M =3.39, SD=2.29); (M=3.39, SD=2.24); (M=3.66, SD=2.42) milar a un	
Peters, 2023 <sup>112</sup> (Australia)		Report	Strategies	No		e 10, 2025 ; schnologie:	]
Poku et al., 2022 <sup>20</sup> (Ghana)	Registered Nurses working in primary, secondary, and tertiary health- care in five hospitals	Cross Sectional Study	Factors	Yes	Turnover Intention Scale (3 items, 5 point Likert scale)	47.70% at Agence Biblio	

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	yright Measurcluding for uses rea	1-2024 396333 on 4 March 202	Mi Ma Ap To (M Sco
Putekova et al 2023 <sup>51</sup> (Slovakia)	In the Kumasi Metropolis ., Nation-wide nurses working in health care facilities of all levels and times of care, including social care facilities in Slovakia	Cross Sectional Study	Factors	Yes	"Did you think of leaving your job?" (single item, binary)	tement Superieur (ABES) . 70%	5. Downloaded from http:/	5/5
Rheaume & Breau, 2022 <sup>73</sup> (Canada)	ICU nurses from across Canada	Cross Sectional Study	Factors	Yes	"Have you considered leaving your employment as a result of COVID- 19?" single item, binary)	g, Al training, and simil	/bmjopen.bmj.com/ on	5/5
Rotenstein et al., 2023 <sup>52</sup> (USA)	Staff across 206 large healthcare organizations throughout the US	Cross Sectional Study	Factors	Yes	"What is the likelihood that you would leave your practice within two years?" (single item, binary)	41.00% technologies.	June 10, 2025 at Ager	5/5
Said & El- Shafei, 2021 <sup>41</sup> (Egypt)	Nurses from Zagazig Fever Hospital which is one of COVID-19 Triage Hospitals	Cross Sectional Study	Factors	Yes	"If possible, would you leave your current hospital within the next year	95.2% inte their prese intended to field of nu	Reled to leave biob, 24.8% Beave the rang (from	5/5
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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	4.0 4.0 4.0 4.0 5.0 1 4.0 5.0 1 4.0 5.0 1 4.0 5.0 1 4.0 5.0 1 4.0 5.0 1 4.0 5.0 1 5.0 1 4.0 5.0 1 5.0 1 4.0 5.0 1 5.0 1 4.0 5.0 5.3 3 1 5.0 1 4.0 5.0 5.3 3 1 5.0 1 4.0 5.0 5.3 3 1 5.0 1 4.0 5.0 5.0 1 1 5.0 1 1 1 5.0 1 5.0 1 5.0 1 1 1 1 5.0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Mixed Methods Apprais Tool (MMAT Score
	(Group I) and nurses from Zagazig General Hospital (ZGH) (Group II) which is neither triage nor isolation hospital; dealing only with suspected COVID-19 patients in emergency	0, p			as a result of job dissatisfaction?" (single item, binary)	site treated to text and data mining,	
Salaten et al., 2023 <sup>84</sup> (Egypt)	Paediatric nurses	Cross Sectional Study	Factors	Yes	Intention to Stay Scale (3 items, 5 point Likert scale)	<u>A</u> intentio <del>g</del> (M=8.499; S99=3.55) g, and s	4/5 (80%)
Sanner-Stiehr et al., 2022 <sup>81</sup> (USA)	Acute and ambulatory care nurses due to similarities in nurse characteristics, the nature of their nursing work, and exposure to COVID-19 patients	Cross Sectional Study	Factors	Yes	Intent to Stay (single item, 7 point Likert scale)	intent to stay with current emptoyer: 88.9% chnologies. Age	5/5 (100%)
Sat et al, 2021 (Turkey) <sup>57</sup>	Nurses working actively in public, private or university	Cross Sectional Study	Factors	Yes	Intention to leave profession during the COVID-19	52.10% Ce Bibliog	5/5 (100%)

Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measure ncluding fc
	health institutions in				pandemic (single	March 2025. Enseigner or uses relate
Satoko et al., 2023 <sup>135</sup> (Japan)	Turkey Registered nurses at three hospitals taking COVID-19 patients in	Interventional Study	Intervention	Yes	item, binary) Turnover Rate	2021: Hospitat 1.5%; Hospitat 1.5%;
Sattler et al., 2021 <sup>137</sup> (USA)	Japan Nurses at a large academic medical health system in the Southeastern US	Programmatic Report	Intervention	Yes	Turnover	Nurse terefore of 254 nurses and to 11.8% from 13% with the retention of 254
Sawyer et al., 2022 <sup>133</sup> (USA)	Direct care nurses who participated in the intervention were paired with direct care nurses who did not participate, matched on the following variables: age, gender, race, work setting, and campus.	Case Control Study	Intervention	Yes	employment status pre/post intervention	Matched control total occurrence of separation =49.6%
Schug et al., 2022 <sup>50</sup> (Germany)	Hospital nurses	Cross Sectional Study	Factors	Yes	Intent to Leave (5 items, binary)	Intent to que the medica field: 18.9%

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	open-20245096333 on 4 March 20 copyrightgincluding for uses re Measure	Mixed Methods Appraisal Tool (MMAT) Score
		Ò.				28.4%; to the p	
Shah et al., 2021 <sup>104</sup> (Pakistan)	Nurses working in Pakistani hospitals dealing with COVID- 19-related patients	Cross Sectional Study	Factors	Yes	Turnover Intention (4 items, 5 point Likert scale)	(M=3.64 and from htt Geographic and data min	5/5 (100%)
Shapiro et al., 2022 <sup>14</sup> (USA)	Hospital-based bedside nurses at 11 hospitals in Pennsylvania and Rhode Island	Cross Sectional Study	Factors	Yes	turnover intention (single item, yes/maybe/no)	approx, 77% (in age 20- 29) A J training, J	5/5 (100%)
Shayestehazar et al., 2022 <sup>23</sup> Iran)	Nurses who worked in COVID-19 wards of Imam Khomeini Hospital	Cross Sectional Study	Factors	Yes	Anticipated Turnover Scale (12 items, 5 point Likert scale)	37.70 (a) 3599 on June 10	5/5 (100%)
Sihvola et al., 2023 <sup>15</sup> Finland)	Nurses recruited via two Finnish hospitals and the Finnish Nurses Association	Cross Sectional Study	Factors	Yes	Intent to Leave: pre and post pandemic (2 items, 5 point Likert scale)	Pre panere 2% During sandtemic: 16%	5/5 (100%)
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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measure tem tem cluding for uses in Ense Ense Ense	Mi Ma Ap To (M Sca
Sinsky et al., 2021 <sup>21</sup> (USA)	Nurses from multiple health care organizations across 30 states in both rural and urban settings	Cross Sectional Study	Factors	Yes	"What is the likelihood that you would leave your practice within 2 years?" (single item, 5 point Likert scale)	2025. Downloaded from ignement Superieur ( <i>A</i> 40%	5/5
Slusser et al., 2022 <sup>116</sup> (USA)	Nurses 55 years or older, who had worked 24hrs or more per week, provide direct patient care, or retired within the last 2 years.	Qualitative Research	Strategies	No		n http://bmjopen.bmj. BES) . mining, Al training, a	(10
Squires et al., 2022 <sup>78</sup> (USA)	Nurses who worked in a frontline, clinical nursing role, having cared for COVID-19 patients, in the US	Qualitative Research	Factors	No	00	com/ on June 10, 2 and similar technol	5/5
Sun et al., 2023 <sup>82</sup> (China)	ICU nurses from across 15 provinces of China	Cross Sectional Study	Factors	Yes	(single item, 5 point Likert scale) "I am actively seeking alternative employment"	agree/seon by agree: 9.62% s at Agence Bit	5/5

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	Measurch 20 Measurch 20 Measurcluding for uses re	Mixed Methods Appraisa Tool (MMAT) Score
Sungbun et al., 2023 <sup>16</sup> (Thailand)	Emergency department nurses from pandemic and non-pandemic crisis areas	Cross Sectional Study	Factors	Yes	Turnover Intention Scale (6 items, 5 point Likert scale)	panden and participation of the participation of th	5/5 (100%)
Tang et al., 2022 <sup>67</sup> (China)	Registered nurses who are qualified to practice, >18 years old, with no mental or cognitive dysfunction	Cross Sectional Study	Factors	Yes	Turnover Intention Scale (6 items, 4 point Likert scale)	high and the by high turnoven mertion: 64.2% Al mio Al training n.	5/5 (100%)
Urban, 2024 <sup>25</sup> (USA)	Nurses over 18 years old, with >16 months of RN experience, who work in hospital settings	Cross Sectional Study	Factors	Yes	"I think about leaving my current job to work for another unit or employer" (1-10 visual analog scale)	Not directly reported and similar techno	5/5 (100%)
Varasteh et al., 2022 <sup>27</sup> (Iran)	Nurses with at least 6 months work experience, working in hospitals during the COVID-19 pandemic, and nurses who had previously left their job or had been absent	Qualitative Research	Factors	Yes	turnover intention for organization and profession (2 items, 7 point Likert scale)	,2025 at Agence Bibliogra ologies.	5/5 (100%)

Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	4496333 on 4 March 20 tem mcluding for uses re	Mi Me Ap To (M Sco
	from work for a period of time.					25. Dov nement ated to	
Vincent et al., 2022 <sup>117</sup> (Belgium)	Critical care nurses	Commentary	Strategies	No		vnloaded fro t Superieur ( text and dat	n/a
Virkstis et al., 2022 <sup>122</sup> (USA	Nursing leaders across the care continuum, human resource leaders, chief financial officers, and CEOs	Human Resource Evaluation	Strategies	No		m http://bmjopen.t ABES) . a mining, Al trainir	n/a
Vogt et al., 2024 <sup>134</sup> (UK)	Critical care nurses working in the National Health Service (NHS) in the UK	Mixed Methods Study	Intervention	Yes C	Intent to Leave (3 items, 5 point Likert scale)	post intervention: (M=13.36, SD=1.63) similar tec	13/ (87
Wang et al., 2021 <sup>99</sup> (China	Nursing staff in the aged care industry in aged care institutions in Anhui Province after the outbreak of COVID-19	Cross Sectional Study	Factors	Yes	Modified Willingness to Stay Scale (3 items)	(M=4.788, SD =1.502); (M=4.783, D=1.489); (M=4.889, D=1.406) Agence	5/5

Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	n-2024-096333 on 4 March ; pyrightem Measurcluding for uses r	Mixed Methods Appraisal Tool (MMAT) Score
Wang et al., 2023 <sup>101</sup> (Taiwan)	Nurses working in a medical centre hospital in northern Taiwan	Cross Sectional Study	Factors	Yes	Turnover Intention (7 items, 5 point Likert scale)	(M=1.8 (M=1.8 Ment Superie to text and	5/5 (100%)
Wang et al., 2023 <sup>124</sup> (Canada)	Canadian nurses	Report	Strategies	No		from http:/ wr (ABES) data mining	n/a
Wei et al., 2023 <sup>68</sup> (USA)	National survey of registered nurses in the US	Cross Sectional Study	Factors	Yes	"Do you plan to leave the unit in the next year?" (single item, 5 point Likert scale)	g, 28.40% Junjopen.bmj.com	5/5 (100%)
Yang et al., 2023 <sup>55</sup> (USA)	Nurses employed at nursing homes	Cross Sectional Study	Factors	Yes	turnover estimated from payroll-based journal	The doubly gobust estimated models reveale that facilities with NH-employed NPs had sign fice that (adjusted b, 55.40; 95% CI, 99.50 to 11.30) than ghose with no NH- employed NPs	5/5 (100%)

Author(s),	Sample Description	Study Design	Factors,	Retention	Measurement	Measure ment	Mi
year, country			Strategies or Interventions	measured?	scale	6333 on 4 March Ensi Icluding for uses	Me Ap Too (M Sco
Yu et al., 2023 (USA)	<sup>33</sup> Nurses from a New York City metropolitan area health system,(HS) four hospitals and ambulatory care center	Cross Sectional Study	Factors	Yes	Intent to Stay (2 items, 5 point Likert scale)	7.3% degraded or strongly description would be warking as ar RN in a the form of the form data mile	5/5
Zangiabadi & Ali-Hassan, 2023 <sup>26</sup> (Canada)	Nurses aged 18 and over who resided in the ten provinces of Canada during the COVID-19 pandemic	Cross Sectional Study	Factors	Yes	(single item, 5 points Likert scale) "How long are you planning to stay in your current job?"	Intention 10 guit job within 2 years: 33.5%	5/5
Zeiher et al., 2022 <sup>47</sup> (USA)	Nurses who were members of northeastern and midwestern state nurses' associations	Cross Sectional Study	Factors	Yes	Turnover Intention scale (6 items, 5 point Likert scale)	44.50% similar technol	5/5
Zeng et al., 2022 <sup>77</sup> (China)	Registered nurses working in various departments 17 hospitals in the Guangzhou, Shenzhen Huizhou, Maoming, Zhanjiang, and	Cross Sectional Study	Factors	Yes	Turnover Intention Scale (6 items, 6 point Likert scale)	clinical SD=0.643) at Gence Bibliog	0,5/5

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Author(s), year, country	Sample Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	N24-0196333 on 4 March 20 Neasurcluding for uses re	Mixed Methods Appraisal Tool (MMAT) Score
	Guangdong Province, China	Ò.				25. Dow nement ated to	
Zhang, 2024 <sup>89</sup> (China)	Nurses from three tertiary general hospitals, age >18 years; working in the clinical work during the epidemic; registered nurses with license	Cross Sectional Study	Factors	Yes	Turnover Intention Scale (6 items, 4 point Likert scale)	high=1 Superieur (ABES) . high=1 And data mining, Al trai	4/5 (80%)
Zhou et al., 2022 <sup>70</sup> (China)	Registered nurses formally or contract employed, on duty during the survey, who have been working for at least 6 months in their actual work unit and who have been directly involved in taking care of patients with coronavirus	Cross Sectional Study	Factors	Yes	Turnover Intention Scale (3 items, 7 point Likert scale)	Not direg, and similar technologies.	5/5 (100%)
Zhu et al., 2023 <sup>69</sup> (China)	Newly graduated nurses with less than one year of work experience n 31	Cross Sectional Study	Factors	Yes	Nurses' Intent to Stay Scale (6 items,	(M=3.433, D=0.731)	5/5 (100%)

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Author(s), year, country	Sample	Description	Study Design	Factors, Strategies or Interventions	Retention measured?	Measurement scale	-2024 ஆ yright Measu Measu Measu ding for uses	Mixed Metho Appra Tool (MMA Score
	tertiary l Shangha	nospitals in i, China	Or			5 point Likert scale)	2025. Downloa eignement Sup related to text a	
Author(s)	Number of nurses	Factors asso	ociated with ret	rention			.//bmjopen.l .g, Al trainii	
Alameddine e al.,	t511	Resilience w	as inversely con	related with inte	nt to quit	4	ng, and	
Alameddine e al.	t265	Resilience w	vas negatively as	ssociated with in	tention-to-qui	t Op	m∕ on , t simila	
Alenazy et al.	152	Nursing praces satisfaction	ctice environme	nt scores were ne	egatively corre	elated with ITL sco	ores, even when from	trolling for job
Alsaif et al.	191	Turnover int	ention correlate	d with workplace	e incivility an	d being married	0, 2 nol	
Andrews et al.	3370	indirect effection constraints of	ets of role overloon turnover inter	bad through job stations as mediate	satisfaction or d by job satis	n turnover intention faction were statist	is were sign ficknt; i ically signincant .>>	indirect effects o
Aslan et al.	110	High macro- organization	control percepti al support statis	on in COVID-19 tically significan	has a statisti tly affected th	cally significant ef	fect on less intertion	n to quit; Perceiv
Boudreau & Rheaume,	419	Negative con younger nurs emotional ex	relation betwee ses had increase khaustion	n the work envir d turnover intent	onment and in tion; impact o	ntent to leave; parti f COVID-19 on int	ally mediated by em ent to leave wage ful	notional exhausti ly medicated by
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Boulton et al.	145	Intent to leave was correlated with moral distress
BowenXue et al.	476	Turnover intention has a negative correlation with decent work, mediated by work engagement associated with lower turnover intention
Bruyneel et al.	2321	Better work environment resulted in lower risk of intent to leave the job or profession; higher patient/nurse ration was associated with higher intent to leave the profession
Cakal et al.,	462	Identifying as a nurse was negatively associated with intention to quit; identification as an as a mage was negatively and indirectly associated with intentions to quit via increased positive emotions and decreased active emotions
Chen et al.,	333	Intention to stay was negatively correlated with clinical stress; Intention to stay was posting of correlated with taking a course on infectious disease nursing; Intent to stay was correlated with frequency of care for infectious patients
Choi et al.,	688	Manager competencies of 'Staff Advocacy & Development' and 'Team Communication 愛達 gllaboration' were significant predictors of nurses' turnover intention.
Christianson et al.	1299	Intention to leave correlated with higher work-related burnout and compassion fatigue; intendion to leave correlated with >20 years of nursing experience (citing retirement); providing direct patient care correlated with intention to leave
Christianson et al.	843	Burnout was correlated with intention to leave their position; burnout and nursing pay satisfaction was correlated with intention to leave the profession
Cole et al.	111	Perceived resource loss in task autonomy, PPE, and psychosocial support increased turn time intention; Married and senior nurses gave a higher score for turnover intention
Conolly et al.	50	Exercised agency during the pandemic by "getting out" (leaving their jobs or job hoppine); not feeling heard by managers and organizations during COVID-19 was associated with "getting out"; inability to deliver patient care in line with their values and their own emotional response to this, led to job-hopping
Cornish et al.	526	Nurses in EDs who received COVID positive patients were more likely to express an intention to leave ED; intent to leave emergency nursing associated with not feeling more connected to their emergency nursing colleagues, the broader ED team, or their organization, since the onset of the pandemic; intention to leave ED nurse was statistically associated with lower pride in being an ED nurse
Crowe et al.	425	Qualitative: Mental health toll on critical care nurses that stemmed from, failed leadership and the traumatic nature of the work environment, that led to a sense of disillusionment, defeat, and an intent to leave
deCordova et al.	3030	Significant association between high levels of burnout and intent to leave
Ding & Wu	507	Psychological empowerment had a significantly effect on turnover intention through three significantly indirect pathways: (1) through job satisfaction (2) through emotional exhaustion (3) through the charge mediating effect of "job satisfaction" "emotional exhaustion"
Dino et al.	50	Qualitative: the intent to stay greatly lies in serving the people and the country
Djupedal et al.	694	Experiencing a change in the work schedule during the pandemic was associated with turno by intention; increase in long work days resulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by sulted in increased turnover intention; increase in quick shift turnarounds by subscription; increased turnover intention; increased turnover intention; increased turnover intention; increase in quick shift turnarounds by subscription; increased turnover intention; increase in quick shift turnarounds by subscription; increased turnover intention; increased
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	Edmonson et al.	6562	Expressing likelihood of leaving their work was associated with a more negative outlook, feeding burned out most days, feeling emotionally drained, worry that their jobs were affecting their health, less likely to be satisfied with their carrier
	Ekingen et al.	486	Being female, working more hrs/week, working duty shifts(nights) resulted in higher or anizational turnover intention; working at the hospital for less than 5 years, working in ICU resulted in higher professional furnover intention; fear of COVID-19 was positively associated with work stress and organizational and professional furnover intentions; fear of COVID-19 did not only have a direct effect on organizational and professional turnover intentions but also had an indirect effect on it via increased work stress.
	Elhanafy et al.	210	Fear of COVID-19 had significant positive correlations with organizational turnover intension and professional turnover intension
	Enwereuzor et al.	265	Negative relationship between organizational constraints and intent to stay; positive relationship between workplace status and intent to stay; the relationship between organizational constraints and intent to stay was moderated by workplace status such that it was more positive when workplace status was high rather
	Failla et al.	622	Workload, conflict with physicians, and lack of support were significant predictors of interval to leave; lower intent to leave in 2019 compared to 2020 and 2021 when COVID-19 was at its peak
	FasihFar et al.	300	Burnout was positively correlated with nurses turnover intention; job satisfaction was natively correlated with nurses turnover intention
	Flinkman et al.	514	Psychological capital had a negative direct effect in intent to leave the profession
	Fronda & Leodoro	687	Coronaphobia correlated positively with organizational and professional turnover intention; social support correlated negatively with organizational and professional turnover intention; coping skills correlated negatively with organizational and professional turnover intention and professional turnover intention.
	Galanis et al.	629	Turnover intention is positively correlated with level of quiet quitting; turnover intention was higher among females, shift workers, nurses in the private sector, years of clinical experience, and those who considered their workplace understaffed
	Galanis et al.	957	Increased levels of response to moral adversity were associated with lower probability of ture over intention; negative relationship between moral resilience and turnover intention
	Gedik et al.	513	Workplace violence has a partial mediating effect on the relationship between emotiona exhaustion and turnover intention; emotional exhaustion has a partial mediating effect on the relationship between workplace violence and turnover intention; as the workplace violence of nurses that working between 18.00 and 07. It turnover intention increased when nurses' anxiety about workplace violence increased
	Gherman et al.	463	Turnover intentions were stronger for single nurses compared to married nurses; turnover intentions were higher for nurses working 48hr weeks compared to nurses working; turnover intentions was significantly predicted by general need satisfaction at work; both self- and other-potentially morally injurious event memories were need thwarting, with autonomy and competence mediating their differential impact on burnout, and with relatedness-on turnover intentions
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Gherman et al.	634	Turnover intentions were higher for younger nurses; nurses with bachelor's studies had tower turnover intentions than participants with master's degrees; the higher their work engagement, the lower their turnover intention; the higher their turnover intentions, the lower their perceived supervisor support, self-disclosure, and need satisfaction
Goyal & Kaur	628	Nurse retention is positively correlated with employee engagement
Grubaugh et al.	4328	Efficacy scores increased and reduced the risk of turnover; optimism scores decreased and reduced the risk of turnover
Grubaugh et al.	4335	New graduate nurses that are a part of a comprehensive Transition To Practice program <b>Rep</b> in highly committed to their organization, have increased satisfaction working with their colleagues, and indicate by intent to leave their position
Habibzadeh et al.	295	Turnover intention was positively correlated with work-related bullying, person-oriented by
Han et al.	248	The turnover intention of women was significantly higher, those in their 20s and 30s had the gher turnover intention than those in their 40s; turnover intention was higher for the unmarried group, the no release group, and and those with associate's and bachelor's degrees than those with master's degrees; burnout had a significant impact on turnover intention
Hanum et al.	1425	Working year and job title were positively correlated with intention to stay; generation was negatively associated with intention to stay; marital status was correlated with intention to stay; professional identity displayed positive indirect effect on nurses' interview to stay through job satisfaction
Havaei et al.	3478	Healthier nurses (higher levels of mental and physical health and lower levels of stress) devergeless likely to intend to leave the profession of nursing
Hwang	207	Quality of worklife was negatively correlated with turnover intention; those that were satisfied with work had lower turnover intentions
Im & Koh	134	Intention to stay was correlated with the sense of calling, job-esteem, and job satisfaction, job satisfaction, job satisfaction partially mediates the positive relationship between the sense of calling and the intention to stay; to be atisfaction seemed to fully mediate the positive effect of job-esteem on the intention to stay $\exists d d d d d d d d d d d d d d d d d d $
Jarden et al.	39	Factors contributing to nurses resigning included COVID-19, uncertainty of role, workload and rostering, and finally, not feeling supported, respected and valued; factors that may have supported the nurses stery included flexible work patterns and opportunities, improved workplace relationships, workload management and support, and supportive systems and environments
Kabir et al.	881	Nurses working in a private job had higher turnover intention than those working in a gover ment job; turnover intention was higher in B.Sc. and Masters holding nurses compared to diploma nurses; nurses who did not receive any training against workplace violence scored significantly higher turnover intention
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achie et al.	527	Role demands positively and significantly impacted turnover intention; compassion fatigue agnificantly and positively affected turnover intention and mediated its relationship with role demands; vision and attrustic love moderated the relationship between compassion fatigue and turnover intention
arakachian al.	550	Moral distress related to team/system was a positive predictor of intent to leave; compared with nurses who had less than 1 year of experience, nurses' 11 to 15 years of experience was also a predictor of intention to leave; nurses' participation in hospital affairs and staffing are strongest negative predictors for nurses' <b>5</b> 1404 junction to leave
itamura & akai	227	Factors influencing turnover intention at the facilities were having less time to relax and withing to receive counseling; the following categories of nurses had higher turnover intention: aged ≥30 years; having years of experience; and those agreeing to "Difficulty falling asleep", "I have experienced increased night waking" tess time to relax", "Want to have a pay raise", "Want to receive counseling", and "Want to reduce my workload" a go
leier et al.	189	Affective commitment demonstrated a significant inverse relationship to the intention to the nursing profession; nurses who recorded as being more resilient were also less likely to intend to leave the profession
won & ong	155	Female nurses had a higher turnover intention score than male nurses; emotional labor had satisfically significant positive correlations with turnover intention
abrague & antos	261	Fear of COVID-19 had significant positive correlations with psychological distress, organizational turnover intention
abrague & antos	270	Compassion fatigue significantly positively correlated with organizational turnover intention resilience was negatively associated with organizational turnover intention; resilience partially mediated the relationship between compassion fatigue and organizational turnover intention
abrague et	259	Significant and positive correlation between COVID-19-associated discrimination and positive correlation between COVID-19-associated discrimination and positive correlations increased scores on the psychological resilience measure were associated with a lower spore on the professional-turnover intention measure; psychological resilience fully mediated the relationship between COVID-19-related discrimination and professional-turnover intention
avoie- remblay et	1705	Nursing staff poorly prepared and overwhelmed at work during the pandemic reported and be prepared and in control; a greater intergion to leave the setting was found in participants who reported self-infection with COVID-19 and/or infection of a team member at work
ee et al.	202	A statistically significant positive correlation was noted between occupational stress and turbover intention; a significant negative correlation was observed between recovery experience and turnover intention; there was a moderating effect of recovery experience on the relationship between occupational stress and turnover intention
iu et al.	200	Intent to stay was positively related to resilience, post-traumatic growth, and perceived professional benefits; resilience had the strongest direct effect on intent to stay; perceived professional benefits partially mediated the association between resilience and intent to stay; the serial multiple mediations of post-traumatic growth and perceived professional

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Lofti et al.	190	Safety climate had a significant reducing effect on nurses' turnover intention in the COVID 39 pandemic. An increase of one point in the total score safety climate led to a 0.6 reduction in the turnover intention spore of OR nurses;
Lou et al.	64	Burnout was associated with intention to quit
Matsuo et al.	975	Intention to leave was negatively correlated with sense of coherence and striving for work-life balance; Intention to leave was positively correlated with exhaustion, cynicism, and daily work-life balance ratio; burnout directly affected intention to leave
Medvec et al.	13687	Intention to leave was highest in the youngest age categories followed by nurses at or above the age of 65; factors were associated with an increased likelihood of leaving in the next year: reported any type of the age of 65; factors were bullying, or sexual) event in the past year and higher subscale exhaustion scores on the <b>Green</b> Burnout Inventory; nurses were less likely to plan to leave their position when they rated their practice envilonment as favorable (versus unfavorable), reported higher staffing and resource adequacy and good or excellent(verse green) quality of care; The most frequent reasons cited for departure in the past two years were retirement, stress of the position, and inadequate staffing; mandatory overtime was associated with a higher likelihood of departure from <b>Frequent</b> from
Mehra et al.	229	Marital status and fear of COVID-19 are significant factors influencing job turnover interfactors
Miller et al.	28	Several expressed intentions to leave due to sustained demands and the challenging work worries regarding further waves or future pandemics.
Mirzaei et al.	479	PTSD, general health, job demand, job strain, and job insecurity had a positive relations hip with nurses' turnover intention; a negative and significant relationship was found between the mean score of sciar support and nurses' turnover intention; multiple regression analysis showed that the variables of gender, magtal status, work position, decision latitude, social support, job strain, general health and post-traumatic stress disogler PTSD) were predictors of turnover intention
Nakai et al.	81	Variables significantly associated with nurses' desire to quit their current job: having les than 2 years of nursing experience; feeling anxious at work; not finding work meaningful; being afraid to go to work; always feeling frustrated; and having difficulty talking to people
Nakic et al.	120	Nurses who have an intention to leave the nursing profession had higher transition shock higher personal COVID-19 stressors, and higher professional COVID-19 stressors
Nam et al.	308	Workplace violence was positively related to nurses' turnover intention; psychological distress was positively related to their turnover intention; workplace violence was indirectly associated with turnover intention; via psychological distress in both nurses who cared for patients with COVID-19 and those who did not; caring for patients with COVID-19 enhanced the mediating effect of psychological distress in the relationship between workplace violence and turnover intention
Nashwan et al.	512	Turnover intentions were higher compared with before COVID-19; single nurses had higher urnover intentions than other marital statuses during COVID-19; participants with 5-10 years of experience have more turnover intentions during COVID-19 than the other groups who possess the same turnover intentions before and during COVID-19; participants with critical care and emergency expertise have more turnover intentions before COVID-19 than
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		participants with other expertise; turnover intentions during COVID-19 were high among the participants with 3-6 months of deployment in a COVID-19 facility; after 6 months, their turnover intentions during COVID-19 were less, reaching the same as those of the participants deployed for less than 2 months
Noer et al.	1318	Higher seniority was positively correlated with a higher risk of turnover intentions; working bart time compared with working full time also increased the likelihood of turnover intensions; the relationship barmen turnover intentions and general concerns about work pressure was positively correlated and statistically significant set.
Ohue et al.	56	Intent to leave was positively correlated with burnout symptoms, subthreshold depression in the anxiety disorder; the results indicated that when the number of COVID-19 patients increased, both nurses' and their intention to resign increased as well
Pahlevan Sharif et al.	305	Organization support was negatively correlated with turnover intention; pay satisfaction of a set energatively correlated with turnover intention; the set energative indirect effect between organization support; job satisfaction partially mediates the relationship between a set energy anization support and turnover intention
Poku et al.	348	There was a significant negative correlation between overall quality of worklife and turn there was a significant but weak positive correlation between stress at work and turnover intention; there was a setting, general well-being, job control and satisfaction, working conditions, and stress at work, were significant predictors of turnover intention
Putekova et al.	1170	The proportion of respondents intending to leave was significantly higher in hospitals compared to other facilities; factors associated with intention to leave were extreme workload (39%), inadequate pay 35%), and lack of appreciation (17%)
Rheaume & Breau	236	Main reasons for considering leaving were psychological safety ( $30.3\%$ , n= 27) and phygical safety ( $13.5\%$ , n = 12). Fifty percent ( $49.4\%$ , n = 44) of the participants indicated other reasons. Three main causes emerged from these qualitative responses: 1) lack of administrative support, 2) poor work environment and $3$ sagety issues.
Rotenstein et al.	11040	Work overload was associated with a 2.38 times greater risk of intent to leave; among nerses reporting work overload, more nurses working in the inpatient setting intended to leave their job in the next 2 years versus nurses in the outpatient setting
Said & El- Shafei	420	(> 3) night duties/week was associated with greater intent to leave
Salaten et al.	257	Job satisfaction was positively correlated with the intention to remain employed; profession didentity had a positive relationship with the intention to stay
Sanner-Stiehr et al.	399	Support from Work was significantly correlated with intent to stay with current employer
Sat et al.	263	The primary reason was stated to intending to leave the profession was severe working conditions; a statistically significant difference was found between the status of the nurses' exposure to physical violed ce, verbal violence, and
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		mobbing, working hours, number of patients given care, and their thoughts of quitting the profession; exposure to physical violence, thinking of quitting the profession and working hours decreased profesion and wo
Schug et al.	757	Lower reward levels, having changed work departments during the pandemic, working wart are and higher depression levels significantly predicted turnover intention; perceived reward seems to buffer both ack beave and turnover intention
Shah et al.	301	COVID-19-related job stress and state anger had a significant effect on nurses' turnover mentions; emotional exhaustion mediated the relationship between COVID-19 related job stress, state anger, and arrows intentions
Shapiro et al.	9520	Decade of age (20s vs all others) was a significant independent predictor of turnover inter by together, age and burnout are significant predictors of turnover intent
Shayestehazar et al.	172	Job retention and organizational commitment were positively and significantly correlated; wark experience had a positive significant relationship with job retention
Sihvola et al.	437	Age, working unit, experience as a nurse, vaccination status, and taking care of patients with COVID-19 disease were all found to significantly affect intention to leave nursing; older age (51 to 69 years) was firstically significant factor to remain in nursing during the pandemic while younger nurses had greater intention to the pandemic while younger nurses had greater intention to the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intention to be a state of the pandemic while younger nurses had greater intenti
Sinsky et al.	2301	Nurses who were in practice more than 20 year, burned out, had high fear of exposure/transition, had high anxiety/depression, or endorsed high workload or COVID-related stress were more like to intend to leave their practice within the next 24 months
Squires et al.	318	Place of work, specifically management/organizational support impacted nurses' turnov
Sun et al.	374	Fatigue was positively correlated with turnover intention; job satisfaction was negativel as ociated with turnover intention; burnout was positively correlated with turnover intention; turnover intention; fayed a moderating role in the relationship between burnout and job satisfaction
Sungbun et al.	322	Significant positive correlation between overall burnout score and turnover intention score in both groups; turnover intention in the pandemic crisis area group was significantly negatively correlated with addition and organization resources; turnover intention in the non-pandemic crisis area group was significantly negatively correlated with age, self-awareness, self-regulation, motivation, social skills, and organization resources
Tang et al.	2480	Turnover intention was negatively related to sense of security and work engagement; were kengagement had a significant negative predictive effect on turnover intention; the association between sense of security and turnover intention was partly mediated by work engagement
Urban	192	New graduate nurses with 9-12 months of experience reported the highest average score for thinking about leaving their current job to work for another unit or employer; higher ratings of incivility of coworkers, higher stress levels, and not having first choice of unit were associated with a higher likelihood of resignation ideation
Varasteh et al.	16	Main reasons for staying in the nursing profession, despite the fear of infection, was the nurses' sense of commitment and work conscience; those who left the service or were absent from work were mostly nurses with time-limited employment contracts and those with less work experience; fear of infecting their families in pacted their willingness to
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		work; organizational atmosphere within the hospitals (ex: having positive relationships with colleagues and supportive supervisors); motivational factors for continuing to work included organizational rewards, figure and incentives, and the hope of changing their employment status (particularly for young and novice nurses whe did not have stable employment)
Wang et al.	321	Transactional psychological capital has a significant positive impact on the willingness of mersing staff in the aged care industry to retain employment; safety climate has a positive significant impact on the willingness of nursing staff in the aged care industry to stay at work; the mediating role of transactional psychological capital between the safety climate and the willingness to stay is established between psychological capital and willingness to stay is also established
Wang et al.	673	Emotional intelligence was negatively significantly correlated with turnover intentions; bbeerformance negatively significantly correlated with turnover intentions; job performance had a significant indirect affect between emotional intelligence and turnover intentions
Wei et al.	900	Nurses with high intention to leave displayed significantly lower scores in Work Engagement compared to nurses wi
Yang et al.	13966	Facilities with nursing home-employed NPs had significantly lower registered nurse and turnover rates
Yu et al.	1600	Nurses who had poor communication with nurse managers and greater organizational constraints were less likely to intend to stay at the hospital system as were those who reported a high level of mastery; surses with no children, who had worked more hours the previous week, who thought that the hospital system was more supportive, thought RN-N relations were better, were more likely to intend to stay at the hospital system; nurses who reported worse communication with their nurse manger and lower mastery were less likely to intend to stay an nursing; nurses who reported lower stress, who were unmarried, who had no children, and better RN-MD relations were more likely to intend to stay in nursing
Zangiabadi & Ali-Hassan	3430	Reasons listed for intention to quit their job within 2 years: stress or burnout (18.8%) to gon erns about mental health (16.4%) to lack of job satisfaction (13.5%); compared to participants who provided in-person healthcare services, tho who delivered online or blended healthcare services were at decreased odds of intention or quit their job due to lack of job satisfaction; those who worked less than 10 years were at increased odds for intention to quit due to lack of job satisfaction than those who worked 20 years or more; participants who worked at multiple locations were at increased odds for intention to quit job for lack of satisfaction than those who worked at one location and location to quit due lack of job satisfaction was significantly lower among those who worked in outpatient and ambulatory care compared individuals who worked in acute care and significantly higher among those who did not receive formal training in Infection Prevention and Control (IPC) compared to those who received training
Zeiher et al.	56	Unfavorable nurses' practice environment accounted for 20.3% of nurses' intent to leave
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Zeng et al.	2299	Inclusive leadership has a significant effect on the overall turnover intention of nurses; of from psychological ownership to turnover intention is significant; indirect effect path colleadership to turnover intention is significant	firec fineffic udi	Seffect path coefficient Sent from inclusive
Zhang	2513	Post-traumatic stress disorder, social support, and presenteeism were significant predict support and attendance played a partially intermediate role in post-traumatic stress disor	<b>A</b> rs c <b>A</b> rs c	turnover intention; social
Zhou et al.	576	Distributive justice, procedural justice, and interpersonal justice had a significant positive turnover intention; informational justice had a significant negative influence on nurses' the engagement significantly negatively affected turnover intention; job engagement mediate organizational justice components and turnover intention	Enseigner	ver intention; job relationships between
Zhu et al.	759	Transition shock was negatively associated with intent to stay; negative coping was neg stay; job satisfaction was significantly and positively associated with intent to stay	drate text text text text text text text t	y associated with intent to
Table 2. Fac	tors associate	d with nurse retention.	uperieur kt and da	paded fr
Author(s)	Strategies fo	or Nurse Retention	ta A	0 H
Anderson et al.	Provide adec increase the Level; reduc conditions o	uate opportunities for career progression /post-registration career development opportun availability of psychological support, such as improving leadership and accountability for e workplace discrimination within the health sector; adequate pay and terms and f employment (ex: tax relief on pensions)	ining. Al tra	promote mental health and being at an organizational
Baumann et al.	Funding ince care)	entive programs to stay in specific areas, staying full time; funded bridging programs for	lipeo liping, an	alty care areas (ex: critical
Boulton et al.	Individualize professional	ed, informal support to create an organizational culture that provides a supportive environ s who are nominated to facilitate discussion to cope with moral distress within these team	omen Isingilar	e; embedding senior
Boyle et al.	Continuing p environment hours, chemi and not be b help nurses a	professional education, including professional certifications (with financial support); posi- s; prioritizing work-life integration and workplace safety, including minimizing physica cal exposures, heavy lifting, etc), safe nurse to patient ratios; allowing nurses to work to ogged down with administrative tasks; nephrology fellowship programs should incorpora and fellows learn with (and from) each other	det det det det det e in	avork ands and hazards (long full nursing capabilities derprofessional curricula to a
Brooks	Internal trav needed; ince	el program/float team, a way for in-house nurses to make more money by signing up for ntive pay based on functional vacancy rate of the unit	extr	shifts where they are
Buerhaus et al.	Match the w programs for workplace v	ork environment with expectations and nurses' expressed priorities and needs; Implemer new graduates and nurses switching practice areas; increase incentives for preceptors are olence and increase availability of mental health resources to ensure safety and reliabilit	it tra id m y ofe	in the second se
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	models of care (including new roles, task shifting, expanded scope of practice, and telehealth); match retertion	on resources with
	nignest-risk groups; Provide resources for career reinvention; gather data about attrition, reentry, and where pa	tterns and causes
Chervoni-	- Retention bonuses to permanent nursing staff; offering overtime rates and incentive hourly payments for heal	theare professionals
Knapp	who are deployed to areas that are considered high-risk such as COVID-19 units; internal travel agency program for a few staffing and a staffing area for a few staffing and a staffing area for a few staffing and a staffing area for a few staffing	rams; creating flexible
Casta P	starting schedules to include starting preferences (ex: 8 or 10nr snifts); cross-training programs for other purs	sing units
Costa &	<i>Federal Approach</i> : CMS rules to establish hospital safe-staffing ratios; financial penalties for exceeding safe	workloads; funding for
Friese	Agency for Healthcare Research and Quality to test healthcare delivery-system innovations; funding rog water Occurrentianal Sofatu and Health to tost innovations that immersus health are warken sofatu milemaking to 2 du	onal institute for
	regulatory standards and expectations from accrediting bodies	ice or eliminate onerous
	State Approach: Implementation of mandatory maximum patient-to-nurse ratios: prohibition of mandatory	vertime: loan renavment
	programs: incentives for hospitals to provide childcare on-site graduate school and other programs to reation	experienced nurses.
	innovation grants for hospitals to develop programs establishing safer more supportive work environitienes	experienced nuises,
Gaffney	<i>Flexible staffing</i> : options include reciprocal employment agreements flexible resource pools clinical agreeme	n opportunities and
Sumily	tiered options for part-time and late-career nurses	i opportanitios, and
	Organizational policies: Compensation, paid time off, stay interviews, employment, wages, pension, wages	ing, policies to address
	specific needs of the intergenerational workforce	0,1
	Innovative models of care: new graduate nurse transition programs, organization of nurse leaders	
Governmen	nt The toolkit focuses on eight core themes that impact nurses' day-to-day working life in the domain of climical	care and provide
of Canada	a corresponding tools that Canadian employers can implement.	-
	1. Inspired leadership: empower nurses of all levels, roles and settings to experience fulfilment in their	work and become
	leaders within their organizations. The initiatives include cultural change, leadership competations are	nd emerging nursing
	leaders.	
	2. Flexible and balanced ways of working: promoting nurse autonomy and flexibility in scheduling and	career progression;
	initiatives tied to this theme include flexible work design, scheduling systems and workplace gescource	es and amenities.
	3. Organizational mental health and wellness supports: increase timely and comprehensive access to ap	propriate and effective
	preventative and acute health and wellness supports, with an urgency and focus on mental headth Bup	ports. Initiatives include
	zero tolerance for violence, bullying and racism; moral distress and injury care; and best practices for	r vacation and time off.
	4. Professional development and mentorship: providing options for nurses across the entire career span	to help them enhance
	their skills and pursue their career goals. Initiatives include transition programs and mentors programs	rams, as well as career
	pathways and bridging programs.	killed to provide
	5. Reduced duministrative ourden. Het up hurses to focus on the tasks and care that they are uniques so	nents
	6 Strong management and communication: promote cultures of transparent leadership and mutual response	ect between
	management and point-of-care nurses. Initiatives to support huilding these cultures include nursing m	anagement
	competencies supporting nursing leaders and nurse engagement and listening	lanagement
L	- competencies, supporting nursing reducts and nurse engagement and insterning.	
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	7. <i>Clinical governance and infrastructure:</i> ensure that supportive clinical governance and infrastructure nurses have a core role in decision making and are at the forefront of driving the development Initiatives include structured participatory governance, nursing shared governance and nurse and practice standards.	of ed	Bure are in place so that Sustainable health system odels of care initiatives
	8. <i>Safe staffing practices:</i> support physically safe and psychologically brave workplaces by imperent reflect factors like patient acuity, nurse experience and work-life balance. Initiatives included clinical supports and safe staffing framework tools.	fer Finseigi	Stating staffing practices that pport this theme are
Grubaugh et al.	Formal, structured transition to practice programs to new graduate nurses	nement S	25. Down
Hodgson et al.	Improving RN pay either through temporary (retention or shift/incentive bonuses; internal higher-pair rate increases to match travelers)longer lasting (increasing RN base/hourly rates or creating an RN cla model) improvements; improvements in the work environment such as a twice daily physician-led "na huddle; promoting a team environment; improving nurse-patient ratios		el programs (time-limited pay ladder or RVU al minute" educational
Mitchell & Maykut	The establishment of healthy peer relationships, where seasoned RNs support and encourage new gratering trajectory in a humanistic manner in a structured educational program known as residencies, should provide clear expectations of responsibilities from the employer's persponsing contributions and be based on best practices; employers should seek input from new graduater and resources would foster engagement and satisfaction; Best practices should align with key docume the ongoing growth of the individual new graduate and the profession; they should include principles for nurses; provision and sustainment of a quality practice environment; An intentional partnership be professional practice must be further developed to strengthen best practices for the nursing profession.	ants of c twe	s; new graduates benefit mentorship programs, also to maximize quality o what identified needs and/or models to support ality and safety education on academia and an education and practice.
Moons	<i>Onboarding:</i> Implementing structured programmes and mentorships to introduce and integrate new in <i>Transition programme to a different unit:</i> implementing structured initiatives and support mechanisms moving from one nurses' specialty or department to another <i>Stress coping:</i> implementing stress-reducing and coping enhancing skills, such as empowerment program and mindfulness practices <i>Social support:</i> Emotional, esteem, and networking assistance provided through interventions such as digital interventions with text messaging, and the presence of facility dogs <i>Extra staffing:</i> Contracting additional personnel with a healthcare background (e.g. unlicensed assisti staffing <i>Coping with the demands of patient care:</i> Implementing specific teaching models and strategies to supeffectively managing and prioritizing patient care; Work relationships: implementing cognitive rehear communication strategies, inter-professional team training, smartphone applications for coping with w	ve j sal	to the organization assist nurses in smoothly mes, self-care guidelines, coning to staff' events, as pronnel) to support nurse novice nurses in programmes, allace bullying, and the
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	impact of inter-professional teamwork on intention to leave, to enhance the quality of interactions and consider among healthcare workers	ng
	Development opportunities and department resources: Providing employment options, rewarding performance, enhancing professional development and training, improving management practice, creating dual roles, and imprementing evidence-ba	sed
	Job Environment: Optimize the work setting and conditions, including factors such as hospital design anizational excel plans, electronic health record integration, and cultural change toolkits	lence
	<i>Work Organization:</i> implementing strategies and practices to affect work–life balance, flexibility, and statisfaction, such shift changes and self-scheduling	n as easy
	<i>Recruitment Approach:</i> Using provisional licensing for international healthcare graduates, establishing provisional rural recruit tracks, and restructuring recruitment strategies, to reduce turnover and improve workforce retention	ment
	<i>Technological Innovations:</i> Developing and implementing advanced technologies, such as robots, to the sign the statistic technologies, such as robots, to the sign the statistic technologies, such as robots, to the sign technologies in their tasks, improve job satisfaction, and reduce workload, while also ensuring smooth operation.	essionals
Peters	Strategies to enhance retention should be sensitive to demographic differences. For example, while transformed to practice provide and mentorship programmes appears effective for enhancing retention of new graduates, they are not and lifestyles would reasonable and practical approach in areas where policies currently limit staff rostering in ways that do not support flexibility ensuring that nurses can work—in line with relevant regulations—to the extent of their scope of practice and with optimum autonomy within multidisciplinary teams; policy improvements that address organizational culture are bullying and violence.	ogramm ing be a ty; ce in
	workplaces are also necessary to improve staff safety and wellbeing; policy reforms from employers and governments to en remuneration, workplace safety and appropriate staffing levels and skills mix.	sure fai
Slusser et al.	Work-life Balance: Flexible schedules, part-time work options, and eliminating or offering preferences for weekends and howere factors that would support senior nurses to continue to practice. Roles and Practice Models: mentor-preceptor role with younger nurses where they don't also have a patient assignment, esp address "just in time" education.	olidays becially
Vincent et	Alternative/Innovative nursing roles: ex a nurse navigator to support transition home	ekille
al.	situational awareness and crisis management skills, and personal qualities and commitment/ dedication as individuals <i>Role and responsibility:</i> Recognition of responsibilities in complex patient resuscitation and managementarecognition of deterioration and patient safety events, involvement in complex decision-making	381113,
	Intellectual stimulation and professional development: Encouragement, mentorship, and support in development of new knows skills career opportunities and growth <i>Teaching opportunities:</i> Encourage leadership role, mentor and support while creating teaching opportune es to other nurse deators at (interpreting) meetings	s,
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Good leadership and management: Positive, constructive feedback to encourage development of new expertise, promote en and encourage in quality of care, patient safety and research <i>Team work/collaborative practice:</i> Active involvement within team, participation in unit activities Clinical discussion and exchange: Sharing, initiating education opportunities and formal/informal open decussions about pathophysiology of illnesses, patient care, and safety <i>Good work-life balance/wellness/rehumanizing the workplace:</i> Explore, discuss acceptable working mess (part-time?), e supportive team structures to promote and allow safe workloads, adequate breaks and opportunities for self care <i>Psychological support:</i> Normalize mental health impact of care, promote team debriefings and indiv support, promote access to professional support, access to wellness initiatives <i>Humane care:</i> Promote recognition of the person in patient and family care, promote participation in motion of the person in patient and family care, promote participation in support, and divide and uning withholding/withdrawing of life-sustaining treatment or palliative careGood and implementation of the person in patient and family care and and during withholding/withdrawing of life-sustaining treatment or palliative careGood and implementation of the person in patient and family care and during withholding/withdrawing of life-sustaining treatment or palliative careGood the partice and the uniqueness of each situation/its impact on all involved and implement by formation and during withholding/withdrawing of life-sustaining treatment or palliative careGood and the professional development early in the RN tenure; accelerate the transition to competent by formatice for experiments (care team)Virkstis et al.Prioritize professional development early in the RN tenure; accelerate the transition to competent by formatice for experiments	
Good leadership and management: Positive, constructive feedback to encourage development of new expertise, promote en and encourage in quality of care, patient safety and research <i>Team work/collaborative practice:</i> Active involvement within team, participation in unit activities Clinical discussion and exchange: Sharing, initiating education opportunities and formal/informal opport good work-life balance/wellness/rehumanizing the workplace: Explore, discuss acceptable working supportive team structures to promote and allow safe workloads, adequate breaks and opportunities for self care <i>Psychological support:</i> Normalize mental health impact of care, promote team debriefings and indiv and support, promot support, promote access to professional support, access to wellness initiatives <i>Humane care:</i> Promote recognition of the person in patient and family care, promote participation in gradient goals an and during withholding/withdrawing of life-sustaining treatment or palliative careTeam work of the person and the uniqueness of each situation/its impact on all involved and impleted at the specific action of the person in patient or palliative careVirkstis et al.Prioritize professional development early in the RN tenure; accelerate the transition to competent by the for experimental provide the care team)Team the specific action that must be to action to the specific action of the care team)	
Good work-life balance/wellness/rehumanizing the workplace: Explore, discuss acceptable workingsupportive team structures to promote and allow safe workloads, adequate breaks andopportunities for self carePsychological support: Normalize mental health impact of care, promote team debriefings and indivsupport, promote access to professional support, access to wellness initiativesHumane care: Promote recognition of the person in patient and family care, promote participation in structure gatter and during withholding/withdrawing of life-sustaining treatment or palliative careVirkstis etPrioritize professional development early in the RN tenure; accelerate the transition to competent by the interview are structured discussions that leaders conduct with staff members to learn the specific actions that must beWang et al.Wang et al.Stay interviews are structured discussions that leaders conduct with staff members to learn the specific actions that must be	ngagement
<ul> <li>Virkstis et Prioritize professional development early in the RN tenure; accelerate the transition to competent by different accelerate for experimentation and schedules; different accelerate for experimentation ac</li></ul>	nsure
Virkstis et al.       Prioritize professional development early in the RN tenure; accelerate the transition to competent by for an interview and the responsibilities within the care team)         Wang et al.       Stay interviews are structured discussions that leaders conduct with staff members to learn the specific actions that must be	ns and cation and d limits,
Wang et al. Stay interviews are structured discussions that leaders conduct with staff members to learn the specific actions that must be	the 1st few erienced
strengthen their engagement with the organization.	e taken to
Table 2. Factors associated with nurse retention.	
Author(s) Strategies for Nurse Retention	
Anderson et Provide adequate opportunities for career progression /post-registration career development opportunifies promote mental increase the availability of psychological support, such as improving leadership and accountability for we being at an organ Level; reduce workplace discrimination within the health sector; adequate pay and terms and conditions of employment (ex: tax relief on pensions)	health and anizational
Baumann et Funding incentive programs to stay in specific areas, staying full time; funded bridging programs for speciality care areas ( al. care)	ex: critical
Boulton et Individualized, informal support to create an organizational culture that provides a supportive environment; embedding ser professionals who are nominated to facilitate discussion to cope with moral distress within these teams	nior
Boyle et al. Continuing professional education, including professional certifications (with financial support); positive work environments; prioritizing work-life integration and workplace safety, including minimizing physical demands and hazard hours, chemical exposures, heavy lifting, etc), safe nurse to patient ratios; allowing nurses to work to the full nursing cap	ls (long abilities
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	and not be bogged down with administrative tasks; nephrology fellowship programs should incorporate interprofessional curricula to help nurses and fellows learn with (and from) each other
Brooks	Internal travel program/float team, a way for in-house nurses to make more money by signing up for extra shifts where they are needed: incentive pay based on functional vacancy rate of the unit
Buerhaus et al.	Match the work environment with expectations and nurses' expressed priorities and needs; Implement transition-to-practice programs for new graduates and nurses switching practice areas; increase incentives for preceptors and mentors; work to prevent
	workplace violence and increase availability of mental health resources to ensure safety and reliability of staff; implement new models of care (including new roles, task shifting, expanded scope of practice, and telehealth); match definition resources with highest-risk groups; Provide resources for career reinvention; gather data about attrition, reentry, and definite patterns and causes
Chervoni- Knapp	Retention bonuses to permanent nursing staff; offering overtime rates and incentive hourly payments for bealthcare professionals who are deployed to areas that are considered high-risk such as COVID-19 units; internal travel agenover begrams; creating flexible staffing schedules to include staffing preferences (ex: 8 or 10hr shifts); cross-training programs for othe beaution units
Costa & Friese	<i>Federal Approach:</i> CMS rules to establish hospital safe-staffing ratios; financial penalties for exceed <b>b</b> f workloads; funding for Agency for Healthcare Research and Quality to test healthcare delivery-system innovations; funding <b>b</b> f ational Institute for Occupational Safety and Health to test innovations that improve healthcare worker safety; rulemaking to b duce or eliminate onerous regulatory standards and expectations from accrediting bodies <i>State Approach:</i> Implementation of mandatory maximum patient-to-nurse ratios; prohibition of mandatory overtime; loan repayment programs; incentives for hospitals to provide childcare, on-site graduate school, and other programs to retain experienced nurses;
Gaffney	<i>Flexible staffing:</i> options include reciprocal employment agreements, flexible resource pools, clinical rotation opportunities, and tiered options for part-time and late-career nurses <i>Organizational policies:</i> Compensation, paid time off, stay interviews, employment, wages, pension, well-being, policies to address specific needs of the intergenerational workforce
Grubaugh et al.	Formal, structured transition to practice programs to new graduate nurses
Hodgson et al.	Improving RN pay either through temporary (retention or shift/incentive bonuses; internal higher-paid travel programs (time-limited rate increases to match travelers)longer lasting (increasing RN base/hourly rates or creating an RN click pay ladder or RVU model) improvements; improvements in the work environment such as a twice daily physician-led "nfedical minute" educational huddle; promoting a team environment; improving nurse-patient ratios
Mitchell & Maykut	The establishment of healthy peer relationships, where seasoned RNs support and encourage new graduates; new graduates benefit from support in their own learning trajectory in a humanistic manner in a structured educational program; mentorship programs, also known as residencies, should provide clear expectations of responsibilities from the employer's perspective to maximize quality nursing contributions and be based on best practices; employers should seek input from new graduates as to what identified needs and resources would foster engagement and satisfaction; Best practices should align with key documents and/or models to support
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	the ongoing growth of the individual new graduate and the profession; they should include principles of quality and safety education for nurses; provision and sustainment of a quality practice environment; An intentional partnership between academia and professional practice must be further developed to strengthen best practices for the nursing profession between education and practice.
Moons	Obsoarding: Implementing structured programmes and mentorships to introduce and integrate new marked to the organization         Transition programme to a different unit: implementing structured initiatives and support mechanisme to assist nurses in smoothly         moving from one nurses' specialty or department to another         Stress coping: implementing stress-reducing and coping enhancing skills, such as empowerment programmes, self-care guidelines, and mindfulness practices         Social support: Emotional, esteem, and networking assistance provided through interventions such as the stress aging, and the presence of facility dogs         Extra staffing:       Contracting additional personnel with a healthcare background (e.g. unlicensed assists for enurses in effectively managing and prioritizing patient care; Work relationships: implementing cognitive reheased more nurses, communication strategies, inter-professional team training, smartphone applications for coping with the impact of inter-professional team training, improving management practice, creating dual roles, and implementing evidence-based practice to enhance workforce development and improve job satisfaction.         Job Environment:       Optimize the work setting and conditions, including factors such as hospital design.         Work Organization:       integration and rearing and provice stresses and reactices to affect work-life balance, flexibility, and jog satisfaction, such as easy shift changes and self-scheduling         Recruitment Approach:       Using provisional licensing for international healthcare graduates, establishing special arual recruitment tracks, and restructuring recruitment strategies, to reduce turnover and improve workforce retention of speci
Peters	Strategies to enhance retention should be sensitive to demographic differences. For example, while transition to practice programmes and mentorship programmes appears effective for enhancing retention of new graduates, they are not targeted towards keeping experienced nurses in jobs; ensuring that nurses can work shifts aligned to their individual preferences and lifestyles would be a reasonable and practical approach in areas where policies currently limit staff rostering in ways that do not support flexibility; ensuring that nurses can work—in line with relevant regulations—to the extent of their scope of practice and with optimum autonomy within multidisciplinary teams; policy improvements that address organizational culture and by lying and violence in
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	workplaces are also necessary to improve staff safety and wellbeing; policy reforms from employers and covernments to ensure fair remuneration, workplace safety and appropriate staffing levels and skills mix.
Slusser et al.	Work-life Balance: Flexible schedules, part-time work options, and eliminating or offering preference for weekends and holidays were factors that would support senior nurses to continue to practice.       9         Roles and Practice Models: mentor-preceptor role with younger nurses where they don't also have a patient assignment, especially to address "just in time" education.       9         Alternative/Innovative nursing roles: ex a nurse navigator to support transition home       9
Vincent et al.	<i>Recognition, respect, and value</i> : Acknowledgment of important role; recognition of high levels of trading knowledge and skills, situational awareness and crisis management skills, and personal qualities and commitment/ dedication of responsibility: Recognition of responsibilities in complex patient resuscitation and managers of individuals <i>Role and responsibility</i> : Recognition of responsibilities in complex patient resuscitation and managers of individuals and performance of the stafety events, involvement in complex decision-making intellectual stimulation and professional development: Encouragement, mentorship, and support in development of new knowledge, skills career opportunities: Encourage leadership role, mentor and support while creating teaching opportunities: Encourage leadership role, mentor and support while creating teaching opportunities. Constructive feedback to encourage development of new knowledge, and encourage in quality of care, patient safety and research <i>Team work/collaborative practice:</i> Active involvement within team, participation in unit activities food work- <i>life balance/wellness/rehumanizing the workplace:</i> Explore, discuss acceptable working for self care <i>Psychological support:</i> Normalize mental health impact of care, promote team debriefings and individual support, promote access to professional support, access to wellness initiatives <i>Humane care:</i> Promote recognition of the person in patient and family care, promote participation in and file fully fully being of the person in patient and family care, promote participation in and patients on communication and how the end-of-life should be approached to convey respect for patients in decision-making on the support. So all care to end we can be approached to convey respect for patients in decision-making on the decision of the person in patient are to end to be the support of the person in patient and family care, promote participation in and becussions and team collaboration to understand the uniqueness of each situation/its i
Virkstis et al.	Prioritize professional development early in the RN tenure; accelerate the transition to competent by grangatically scoping the 1st few months of practice; create flexibility by offering non-traditional nursing roles and schedules; differentiate practice for experienced nurses (ex: elevate their responsibilities within the care team)
Wang et al.	Stay interviews are structured discussions that leaders conduct with staff members to learn the specific actions that must be taken to strengthen their engagement with the organization.
Table 3. Str	ategies for nurse retention.
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Author(s)	Sampla	Intervention	Sopyright, 4-
Author(s) Amicucci et al.	Sample New graduate nurses at White Plains Hospital, White Plains, New York	Intervention A Nurse Residency Program to support transition to practice. Included; on-going support and assessment to address knowledge gaps, role of the Nursing Orientation Resource Coordinator (NORC) to support the practice environment for the new graduate RNs, monthly team check-ins, emotional intelligence education, routine Care Code Meetings to debrief stressful work situations, pairing with	Outcome(s) Together, all of these strategies ave positively impacted our retention rate. Our overall retention rate since the beginning of our residency or uses reigneent is 74% Enseigneent to the strategies and the strategies are strategies are strategies and the strategies are strateg
Cadmus	New graduate nurses in the US state of New Jersey	A statewide, new graduate residency program, implemented across 19 hospitals, lasting 12 months. The program included didactic education, 1:1 preceptor:mentor on-the-job hours, and residency reflections.	(evaluation in process). Juck by the feedback thus far the recruitment and retention are at participating facilities appears to be improved a participating a participating
Gularte- Rinaldo et al.	4335 Versant NGN program participants between 2018 and 2021 across 45 acute care organizations, 1 outpatient service location, 4 pediatric hospitals, and 1 home health organization, spanning 6 states.	A mentorship program offering individualized mentorship through culturally congruent, customized pairing for 96 mentees	The majority of mentees who are swered this question (58.9%, 56/95 mentees) reported that their mentoring relationship had positively fiftuenced their decision to stay in nursing, and the positive influence was reported b all 4 cohorts
Krofft & Stuart	18 newly hired staff nurses in a 300 bed community hospital located in the Midwestern US.	Implementation of an evidence-based mentoring program for new registered nurses (RNs) hired into medical-surgical units in a small community-based hospital during the unfolding of the SARS-Cov2 (COVID-19) pandemic	Intent to stay is slightly low $\mathbf{F}$ ; $\mathbf{GM} = 67.33$ , $\mathbf{SD} = 1.15$ ) than the previously reported day ( $\mathbf{M} = 72.7$ , $\mathbf{SD} = 7.3$ at the 3-month point $\mathbf{S}$ at $\mathbf{A}$
Lee	All new graduate emergency nurses across the Sentara Health (SH) system	The Emergency Department RN Transition To Practice Pathway was developed to have a structured, consistent orientation for the many New Graduate RNs being hired into the	Using the emergency department registered nurse transition to practice pathway, mirnover rates at Sentara Northern Virginia Medical Center dropped from 46% to 5.1%. Post expansion, the overall program retention rates
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		emergency department. The program included standardized orientation with ongoing mentoring and gradual professional growth opportunities	were 96% at 6 months, and 86% at 1 year. The 2-year retention rate prior to COVED- 89 was 82%, afterward, it dropped to 65% as many left to cake travel assignments o left emergency nursing for another specialty
Satoko et al.	All nurses across 3 hospitals	Between 2017 and 2019, a clinical process support system based on structured clinical knowledge (Team Compass with the Patient Condition Adaptive Path System; TC-PCAPS) was developed, and implemented in hospitals. In 2020, the COVID-19 clinical management system (COVID-19-CMS) was developed. In this study, the effectiveness of implementing both systems was analyzed.	The nurse turnover rates of both hospitals during the COVID-19 pandemic were for a rthan those seen in the prefectures in which the hopper is were located. In addition, there was a gradual second control of the COVID-19 clinical management system. In comparison, we can see that nurs turnover at hospital B, which a d not yet implemented th system, gradually increased the final for the study period
Sattler et al.	Nurses at a large academic medical health system in the Southeastern US	The implementation of a Nurse Retentionist Role to use evidence-based strategies, with measurable outcomes, to drive the retention of a multigenerational workforce according to their unique, personal and professional development preferences. Using 5 key strategies: 1) Planned individual meetings, 2) Intentional relationship building, 3) Revised clinical ladder, to include a peer mentor program expansion, 4) System-wide retention committee, 5) Focused recognition efforts	Nurse turnover dropped to from 13% with the retention of 254 nurses.
Sawyer et al.	108 direct care nurses who participated in the intervention were paired with direct care nurses who did not participate, matched on the following variables: age, gender, race, work setting, and campus.	RISE is a voluntary psychoeducational group intervention for RNs to reduce burnout and improve well-being. It is an acronym for the 4 themes of resilience, insight, self-compassion, and empowerment. The intervention is based on an integrative theoretical framework of acceptance and commitment therapy, cognitive behavioral therapy, and mindfulness. The intervention involves 8 weekly 90-minute in-	Higher percentage of directer nurses who participated in the intervention remained employed compared with the matched control subjects who of a not participate. The separation rate of the matched control subjects was 14.8% in 2019-2020 and 34.8% in 2020-2021 for a total of 49.6%. The actual separation rate of RNs who completed the intervention was 3% during the 1-year period after the intervention and 14.9% as of June 2021 for a total of 27.9%.
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		person group sessions developed and delivered by a licensed mental health counselor		ht. inclu	24 -09 60
Vogt et al.	84	A tailored Resilience-boosting psychological coaching programme [Reboot] for critical care nurses. Two 2-hour online group workshops hosted via Zoom (each pair of workshops was termed a 'cycle'), and two 1-hour individual coaching calls and was delivered by a Cognitive-behavioral therapist	A significant difference in Reboot (mean=11.50, SD = post-Reboot (mean=13.56, 4.93, p<.001, d=0.94], show significantly lower intentio after completing the progra	uding for uses related	to 1.63) was found [t (31) = that nurses reported eave critical care nursing than before.
<b>Fable 4.</b> Interve	entions trialled	for nurse retention.		ment S d to te	Down
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Figure 1. PRISMA diagram.

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**Contributions:** LB was involved in the study design, data collection, data analysis, data interpretation, and drafting and finalizing the manuscript. LMH, SP, SV and CM were involved in study design, data screening, data interpretation and substantively revised the manuscript for important intellectual content. All authors read and approved the final manuscript and agree both to be personally accountable for their own contributions and to ensure that questions related to the accuracy or integrity of any part of the work are appropriately investigated, resolved, and the resolution documented in the literature.

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## Appendences

Appendix A: Search strategy

Example Search Strategy for MEDLINE (OVID):

Set	Search Statement
1	exp Nurses/
2	(nurs*).tw,kf
3	1 OR 2
4	exp Personnel Turnover/
5	((personnel adj3 turnover) OR (turnover)).tw,kf
6	(retention or retain*).tw,kf.
7	((intent OR intending) adj3 (stay OR leave)).tw,kf
8	(quit or quitting).tw,kf.
9	4 OR 5 OR 6 OR 7 OR 8
10	exp COVID-19/
11	(COVID-19 or corona* or pandemic or coronavirus or SARS-CoV-2 or 2019-CoV-2).tw,kf
12	10 or 11
13	3 AND 9 AND 12
Search I Number	Date: April 1, 2024 of Hits: 637

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#### Nurse retention in peri- and post-COVID-19 work environments: a scoping review of factors, strategies, and interventions

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<b>Primary Subject Heading</b> :	Nursing
Secondary Subject Heading:	Health services research, Health economics
Keywords:	COVID-19, Nurses, Health Workforce, Human resource management < HEALTH SERVICES ADMINISTRATION & MANAGEMENT





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## Nurse retention in peri- and post-COVID-19 work environments: a scoping review of factors, strategies, and interventions

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## ABSTRACT

**Objectives:** The COVID-19 pandemic highlighted the deterioration of nurses' working conditions and a growing global nursing shortage. Little is known about the factors, strategies, and interventions that could improve nurse retention in the peri- and post- COVID-19 period. An improved understanding of strategies that support and retain nurses will provide a foundation for developing informed approaches to sustaining the nursing workforce. The aim of this scoping review is to investigate and describe: i) factors associated with nurse retention; ii) strategies to support nurse retention; and iii) interventions that have been tested to support nurse retention, during and after the COVID-19 pandemic.

Design: Scoping review.

**Data sources:** This scoping review was performed according to PRISMA Guidelines Scoping Review Extension. MEDLINE, EMBASE, CINAHL and Scopus databases were searched on April 17, 2024. The search was limited to a publication date of '2019 to present'.

**Eligibility criteria:** Qualitative, quantitative, mixed-methods and grey literature studies of nurses (RN, LPN, RPN, PHN) including factors, strategies and/or interventions to support nurse retention in the peri- and post- COVID-19 period in English (or translated into English) were included. Systematic reviews, scoping reviews, and meta-syntheses were excluded, but their reference lists were hand screened for suitable studies.

**Data extraction and synthesis:** The following data items were extracted: title, journal, authors, year of publication, country of publication, setting, population (n=), factors that mitigate intent to leave (or other retention measure), strategies to address nurse retention, interventions that address nurse retention, tools that measure retention/turnover intention, retention rates and/or scores. Data were evaluated for quality and synthesized qualitatively to map the current available evidence.

**Results:** Our search identified 130 studies for inclusion in the analysis. The majority measured some aspect of nurse retention. A number of factors were identified as impacting nurse retention including nurse demographics, safe staffing and work environments, psychological well-being and COVID-19-specific impacts. Nurse retention strategies included ensuring safe flexible staffing and quality work environments, enhancing organizational mental health and wellness supports, improved leadership and communication, more professional development and mentorship opportunities, and better compensation and incentives. Only nine interventions that address nurse retention were identified.

**Conclusions:** Given the importance of nurse retention for a variety of key outcomes, it is imperative that nursing leadership, healthcare organizations, and governments work to develop and test interventions that address nurse retention.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- This scoping review comprehensively explores key aspects of nurse retention, including factors influencing retention, proposed strategies to improve retention, and interventions that have been tested, providing an in-depth understanding of the topic.
- The review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines, ensuring a systematic, transparent, and replicable approach, thus strengthening the study's credibility and reproducibility.
- The search was comprised of studies in, or translated to, English which limits the inclusion of relevant studies published in other languages
- The number of published interventional studies may be moderated given the limited time between the start of the pandemic and the time of this search.
- Due to the heterogeneity of retention measurement definitions and tools, accurate comparisons across studies were not possible.

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## INTRODUCTION

The COVID-19 pandemic affected health systems globally, created new issues, and uncovered and exacerbated existing challenges for the nursing workforce. As integral members in the provision of safe, quality patient care, nurses have faced work circumstances and job demands that have diminished their job satisfaction and their desire and capacity to remain nurses <sup>1</sup>. These circumstances and conditions have escalated the already concerning global nursing shortage, with nurses increasingly citing burnout, compassion fatigue, and poor work environments as drivers for their intent to leave <sup>23</sup>.

The nurse retention crisis has both financial and human implications for health care delivery. A recent study reported a direct relationship between how well hospitals were staffed with nurses and their number of patient deaths from COVID-19<sup>4</sup>. As well, turnover is estimated to cost a hospital between \$11,000 to \$90,000 USD per bedside nurse <sup>5</sup>, and the adverse consequences of the nursing shortage continue to grow.

This worsening crisis has pushed governments, policy makers, and health systems administrators to understand the complexities of nurse retention and develop strategies and solutions to renew the nursing workforce <sup>67</sup>. However, it is yet to be seen if previously identified factors, strategies, and interventions for nurse retention are effective in the peri- and post- COVID-19 work environment. Due to the altered landscape of the healthcare system emerging from the pandemic, an improved understanding of strategies implemented to support and retain nurses is needed to strengthen and sustain the nursing workforce.

Although nurse retention is globally recognized as a crucial work outcome, the concept remains ambiguous in the literature<sup>8</sup>. Actual nurse retention, the number of nurses that stay in their position, is difficult to directly measure. Therefore, other related measures that have strong but imperfect correlations to retention, such as turnover or intentions to leave/stay are often used interchangeably<sup>9</sup>. Additionally, these measures are applied to heterogeneous contexts (job, organization, or profession) which further contributes to the ambiguity of the concept and limits generalization across studies. Scoping reviews are conducted to map the breadth and depth of relevant literature on a research topic, identify knowledge gaps, and collate key evidence<sup>10</sup>. The purpose of this scoping review is to explore what is known about nurse retention in peri- and post- COVID-19 work environments and gather relevant information to inform healthcare leaders, organizations and policy makers. More specifically, the research questions for this scoping review aim to investigate and describe: i) factors associated with; ii) strategies suggested to support; and iii) interventions already tested to support nurse retention, during and after the COVID-19 pandemic. This scoping review will serve as an organized collation of relevant factors, strategies and interventions to reduce nurse turnover.

## **METHODS**

The methodology outlined by Arksey and O'Malley (2005) and advanced by Levec et al. (2010) was used as a framework for this scoping review<sup>1011</sup>. This framework consists of six stages: 1) identifying the research question, 2) the scoping search process, 3) selecting studies, 4)

extracting data, 5) summarizing and reporting results, and 6) consultation with stakeholders for knowledge translation. Step six will be completed after the publication of this review.

#### **Protocol and registration**

This scoping review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR)<sup>12</sup>. The protocol was registered on Open Science Framework on April 4, 2024 and can be accessed at: <u>https://doi.org/10.17605/OSF.IO/XWH45</u>. Additionally, the protocol was published in September 2024 <sup>13</sup>. No deviations to the methods from the published protocol have been made.

#### Information sources and scoping search strategy

In consultation with an experienced academic librarian, the following electronic databases were searched on April 17, 2024, limited to a publication date of '2019 to present' to ensure the studies occurred during or after the COVID-19 pandemic: MEDLINE, EMBASE, CINAHL and Scopus. Main search concepts included "nurses", "retention", and "COVID-19 pandemic". As this paper aims to fully explore the concept of retention, we have also included search terms intrinsically related to "turnover" to capture different perspectives of the same underlying phenomena. Similarly, we also included the terms "intent to stay", "intent to leave" and "quitting" to mitigate the risk of excluding relevant studies indexed under related terms. All electronic database search strategies are provided in **Appendix A.** We excluded studies focused on advanced practice nurses, nurse educators, and nurse managers as these nursing populations had different responsibilities from bedside nurses, particularly during the COVID-19 pandemic.

#### **Eligibility criteria**

All qualitative, quantitative, mixed methods studies, professional commentaries, and governmental/organizational reports in English (or translated into English) that examined factors, strategies, or interventions associated with retention of nurses in the peri- and post-COVID-19 period were included in the study selection process. As this is a scoping review, it includes databased and non-data-based papers. Dissertations were excluded but their corresponding publications were screened for inclusion. Meta-analyses and other reviews were excluded but studies in their reference lists were hand screened for inclusion criteria.

#### Selection of sources of evidence

All citations retrieved from the four databases were uploaded into Covidence th (Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia) and duplicates removed. Titles and abstracts were independently reviewed by the research team (LB, LMH, SP, SV, CM) against criteria for inclusion in a blinded process where agreement was required by two independent reviewers. Any disputes were resolved by a third research team member. The remaining citations were reviewed as full-text articles.

#### **Data charting process**

The following data items were extracted from included articles and entered into a Microsoft Excel spreadsheet: title, journal, authors, year of publication, country of publication, setting, population (n=), factors that mitigate intent to leave (or other retention measure), strategies to address nurse retention, interventions used to address nurse retention, tool used to measure retention/turnover intention, retention prevalence and/or scores. Strategies were defined as recommendations or proposals in the literature that were not explicitly tested through interventional study designs. These included expert opinions, organizational guidelines, or theoretical frameworks aimed at addressing nurse retention. Interventions were defined as actions or programs explicitly tested using interventional methodology, such as quasi-experimental designs, or other structured approaches (QI projects, case reports etc.) where outcomes were measured to assess their impact on nurse retention. Extraction was performed by one research team member (LB) and reviewed and confirmed by additional team members (LMH, SP, SV, CM).

#### Synthesis of results

A quantitative synthesis specific to intent to leave was completed based on articles that included intent to leave measurements. For all other study aims, data was synthesized qualitatively to map the current evidence. Factors and strategies associated with nurse retention were synthesized using content analysis. Interventions to address nurse retention were grouped together by similar types, descriptively summarizing the specific interventions and results.

#### **Quality appraisal**

Applicable qualitative, quantitative, and mixed methods studies were evaluated using the Mixed Methods Appraisal Tool (MMAT) Version 2018<sup>14</sup>. The MMAT was selected for its ability to evaluate different types of research designs within the same framework. Each study was appraised independently by two different reviewers (LB, LMH), and any discrepancies were resolved by a third team member. The quality criteria were converted to a percentage (0-100%) where a higher percentage indicates a higher methodological quality.

## Patient and public involvement

None.

## RESULTS

## Search results and included studies

The initial database search generated 2541 papers. After deduplication, 1659 titles and abstracts were screened, and 264 papers were assessed for eligibility at the full-text level. After applying the inclusion and exclusion criteria, 130 studies were retained for analysis (Figure 1). The characteristics of the included studies (e.g., sample description, study design, retention measurement scale and result, and MMAT score) are provided in **Supplementary Table 1**. The number of nurses who participated in observational or experimental based studies ranged from 16 to 15,738.

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The majority (37%) of the selected studies were published in 2023 (N=48), followed by 2022 (n=40), 2021(n=25), and 2024 (n=17). The most common study design was cross-sectional (n=94), with 12 studies being some form of a report, six qualitative, six editorials, five mixed methods, three quality improvement or program evaluations, and one each of a sequential survey design, interventional, case control, and multifactorial analysis (**Supplementary Table 1**). The studies came from 32 different countries with the majority coming from USA (n=38), followed by China (n=12), Canada (n=11), Iran (n=8), Philippines (n=6), UK (n=5), Korea (n=5), Japan (n=5), Australia (n=4), Turkey (n=4), Egypt (n=3), Lebanon (n=2), Saudi Arabia (n=2), Taiwan (n=2), Finland (n=2), Greece (n=2), India (n=2), Romania (n=2), Belgium (n=2), plus 13 other countries where only 1 study was conducted. Of note, 38% (49/130) of all studies came from North America and 78% (7/9) of interventional studies came out of the US.

#### Quality appraisal

Of the included studies, 110 (85%) could be appraised for methodological quality using the MMAT as outlined in the quality appraisal results displayed in **Supplementary Table 1**<sup>14</sup>. Within the selected 110 studies – 97 were quantitative (descriptive), two were quantitative (nonrandomized), six were qualitative, and five were mixed methods. There were no randomized quantitative studies. In the descriptive quantitative studies (97/110), the scores ranged from 2 to 5 (out of 5) with a mean of 4.83. The main weaknesses of these studies were lack of clarity around their sampling strategies and risk of non-response bias. In the qualitative studies (6/110), the quality scores were all 5 out of 5. For the mixed methods studies (5/110), the quality scores ranged from 11 to 14 (out of 15) with a mean of 12.8. The main weaknesses of the mixed methods studies were limited attention to addressing the divergences between quantitative and qualitative results and lack of rationale for using mixed methods. When collated by group, the papers looking at 'factors' ranged from 40-100%. Four out of the nine papers looking at interventions could be scored and ranged from 80-100%. Most (15/20) of the strategy papers could not be scored with the MMAT due to their study designs not meeting criteria, out of the 5 that could be scored, scores ranged from 93-100%. As this is a scoping review, both data-based and non-data-based articles were included to capture the valuable insights contributing to understanding the landscape of strategies being proposed for improving nurse retention.

#### **Retention and turnover rates**

The majority of studies (N=107, 82%) included some measurement of nurse turnover (**Supplementary Table 1**). Different constructs were used to assess retention. Eighty-six studies measured some form of intent to leave/quit/turnover, 12 studies measured some form of intent to stay, 7 studies directly measured turnover, and only 2 studies directly measured retention. Most literature (N=101; 90%) focused on intent to leave from some aspect of a job position in an organization (i.e. intent to leave the unit, a specific job, a work specialty, the organization itself), while fewer specifically reported on intent to leave the profession (N=11; 10%) (**Supplementary Table 1**). Tools used to measure retention ranged from standardized questionnaires like the Turnover Intention Scale (TIS-6) to self-developed questionnaires and binary single-item questions. Out of the 13 studies that used the 6-item Turnover Intention Scale (TIS-6), six reported means (m=2.5-17.34), five reported percentages (32%-72.8%), and two studies did not

directly report results (**Supplementary Table 1**). Due to the diversity of retention constructs and measurement tools, a numerical meta-analysis of all results is not possible.

#### Factors associated with nurse retention

Of the included studies, the majority 104 (80%) focused on factors associated with nurse retention (**Supplementary Table 2**). These were categorized into four areas: 1) personal and demographic factors (N=31); 2) safe staffing and quality work environments (N=55); 3) psychological well-being (N=67); and 4) COVID-19-specific impacts (N=20).

#### 1) Personal and demographic factors

Thirty-one studies identified personal and/or demographic factors including nurses' age, level of work experience, gender, marital status, level of education, being a parent, and physical health. Six studies found turnover intention was higher for younger nurses <sup>15-20</sup>, while one reported a higher correlation in turnover intention with older nurses <sup>21</sup>. Medvec et al. found intent to leave was the highest in nurses in the youngest age categories followed by those at or above age 65<sup>16</sup>. The results examining years of experience and turnover intent were mixed almost equally. Seven studies found that increased years of experience was correlated with intent to leave <sup>2</sup><sup>21-26</sup>. However, Shayestehazar et al. found work experience had a significant positive relationship with job retention <sup>27</sup>, and five studies found that fewer years of experience was associated with intention to quit <sup>23 28-31</sup>. Five studies found turnover intention was higher in women than men <sup>17 22</sup> <sup>23 32 33</sup>. Marital status differences were noted, with four studies reporting turnover intentions were stronger for single nurses <sup>17 34-36</sup>, while one reported that unmarried nurses were more likely to intend to stay in nursing <sup>37</sup>. Two described married nurses reporting higher turnover intention <sup>38</sup> <sup>39</sup>, and one found divorced nurses had higher intention to stay over married and unmarried nurses <sup>40</sup>. Education attained was also notable, with two studies finding turnover intention to be higher in Bachelors and Masters prepared nurses compared to diploma nurses <sup>41 42</sup>. However, Han et al., found turnover intention was higher in nurses with Associate and Bachelor's degrees than in those with Masters degrees <sup>17</sup>. Finally, one study found that nurses who had no children were more likely to exhibit intent to stay <sup>37</sup> and one that nurses who reported better physical health were less likely to report intent to leave the profession <sup>43</sup>.

## 2) Safe staffing and quality work environments

Fifty-five studies identified safe staffing and work environment factors associated with nurse retention. Ten of these studies identified safe staffing, scheduling, and compensation as factors associated with turnover intention: inadequate staffing <sup>16 22 44</sup>, high patient/nurse ratios, and scheduling of mandatory overtime <sup>16</sup> were all correlated with nurses' intention to quit. Similarly, changes in work schedules, including working long shifts with quick turnarounds <sup>45</sup>, working more hours per week (both scheduled and overtime hours) <sup>23 34</sup>, and working more night shifts <sup>23</sup> <sup>46</sup> contributed to turnover intention. Pay satisfaction was negatively related to turnover intention <sup>47 48</sup> while financial incentives were a motivational factor for continuing to work <sup>31</sup>.

Many other aspects of the work environment were also identified as influencing nurse retention, including the physical environment, general workload and job stress, work engagement,

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incivility and violence, leadership communication and support, quality of work-life, and job satisfaction (**Supplementary Table 2**).

A positive work environment was consistently found to reduce nurses' intent to leave <sup>16 49-54</sup>. Conversely, factors such as changing workplaces or working in multiple places <sup>30 55</sup>, as well as working in inpatient settings providing direct patient care, particularly in the intensive care unit or emergency department <sup>2 23 56-58</sup>, were associated with increased turnover intention. Nurses who felt unable to provide patient care that aligned with their values were more likely to leave their jobs than those who felt they could <sup>59</sup>.One study found that nurses who worked on units that employed Nurse Practitioners had lower rates of turnover than those without them <sup>60</sup>.

In terms of workload, eight studies demonstrated that a high level of workload was correlated with intent to leave <sup>44 56 57 61-65</sup>, and five studies found a link between job stress and turnover intention <sup>33 66-69</sup>. On a more positive note, seven studies identified that higher employee engagement was consistently associated with lower turnover intention <sup>42 70-75</sup>.

Nine studies addressed workplace safety. Four of these found workplace violence (psychological, verbal and physical) perpetrated by patients/families was associated with increased turnover intention <sup>16</sup> <sup>62</sup> <sup>76</sup> <sup>77</sup> and one study found horizontal violence between nurses was associated with increased turnover intention <sup>76</sup>. Workplace incivility from both colleagues and patients/families <sup>39</sup> and decreased safety related to COVID-19 practices <sup>78</sup> were associated with increased turnover intention. Furthermore, two studies found better quality of work-life to be negatively correlated with turnover intention <sup>24</sup> <sup>79</sup>.

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Effective communication with nursing managers and organizational leaders was found to be a significant predictor of nurses' retention intention in five studies <sup>37 59 80-82</sup>. Additionally, six studies highlighted that feeling supported by leadership and the organization was inversely correlated with intent to leave <sup>47 61 83-86</sup>

Finally, eight studies identified that job satisfaction was negatively associated with turnover intention <sup>24 47 64 74 87-90</sup>. These studies found that higher levels of job satisfaction were systematically correlated with lower intentions among nurses to leave their positions.

## 3) Psychological well-being

Sixty-seven studies identified several facets of psychological well-being as factors that influence nurse retention. These include resilience, burnout, compassion fatigue, depression, post-traumatic stress disorder, negative coping, moral distress, fatigue, work life balance, organizational commitment, psychological capital, psychological empowerment, emotional intelligence, and professional identity.

Burnout was consistently positively related with intent to leave <sup>2</sup> <sup>16</sup> <sup>25</sup> <sup>44</sup> <sup>48</sup> <sup>81</sup> <sup>87</sup> <sup>88</sup> <sup>91-93</sup>, as was compassion fatigue <sup>2</sup> <sup>65</sup>. Additionally, depression <sup>25</sup> <sup>55</sup>, post-traumatic stress disorder (PTSD) <sup>33</sup> <sup>94</sup>, negative coping <sup>74</sup>, and moral distress <sup>26</sup> <sup>95</sup> were all associated with greater turnover intention.

Fatigue, not having time to relax and lack of work-life balance were associated with intent to leave as well <sup>21 87 91</sup>. Conversely, increased resilience <sup>15 96-101</sup>, organizational commitment <sup>27</sup>, psychological capital (hope, efficacy, resilience, optimism) <sup>102-104</sup>, psychological empowerment <sup>105</sup>, and emotional intelligence <sup>106</sup> reduced the risk of turnover.

Finally, nurses' self-perception was found to influence retention. A nurse's professional identity <sup>40 107</sup>, sense of calling <sup>90</sup>, and desire to serve their country <sup>108</sup> were all negatively associated with intention to quit. In line with this, one study found that lower pride with being an Emergency Department nurse was associated with intention to leave <sup>58</sup>.

## 4) COVID-19-specific impacts

Twenty studies identified COVID-19-specific impacts on nurse retention. The COVID-19 pandemic generally influenced nurses' intent to leave <sup>25 35 51 61 109 110</sup> particularly among nurses who cared for COVID positive patients <sup>19 58 111</sup>. Pandemic specific concerns that influenced nurse turnover included fear of the virus <sup>23 28 31 36 112-114</sup>, fear of future waves or pandemics <sup>68</sup>, being infected or knowing a teammate was infected <sup>115</sup>, feeling overwhelmed and not being prepared to care for COVID -19 patients <sup>67 115</sup>, lack of resources/PPE <sup>20 38</sup>, how they perceived the safety climate of their unit <sup>104 116</sup>, experiencing COVID -19 related discrimination <sup>100</sup>, and not feeling heard by managers and organizations when voicing concerns related to the pandemic <sup>59</sup>.

## Strategies suggested to support nurse retention

Nineteen of the 130 studies in this review (15%) identified strategies to address nurse retention (**Supplementary Table 3**). These strategies can be categorized as: 1) ensuring safe flexible staffing and quality work environments, 2) enhancing organizational mental health and wellness supports, 3) improved leadership and communication, 4) increasing professional development and mentorship opportunities, and 5) better compensation and incentives. Most studies presented strategies from multiple categories.

## 1) Ensuring safe flexible staffing and quality work environments

Thirteen studies identified strategies focused on safe staffing and flexible ways of working. Implementing flexible scheduling allows for adjustments in work hours and shift patterns to accommodate nurses' diverse needs and preferences <sup>6</sup>117-122</sup>. Ensuring safe patient-to-nurse ratios, adequate staffing and skill mix allows nurses to safely meet patient needs <sup>6</sup>117 119 122-125</sup>. Innovative roles and task rotation provide nurses opportunity to diversify their skills and responsibilities <sup>6</sup>120 121 126 127</sup>. One study suggested banning mandatory overtime, where nurses are forced to work hours above their full-time equivalent <sup>124</sup>, in order to improve nurse retention. Finally, two papers suggested optimizing nurses' ability to work to their full nursing capabilities by reducing the burden of administrative tasks <sup>6</sup>123.

Strategies to improve the work environment include reducing workplace discrimination and violence <sup>6</sup><sup>117</sup><sup>126</sup><sup>128</sup> and creating a positive environment by improving team culture <sup>117</sup><sup>119</sup><sup>125</sup>.

Efforts aimed at optimizing the work setting and working conditions, such as through improvements in hospital design and technological integration, were also reported <sup>119</sup>.

#### 2) Enhancing organizational mental health and wellness supports

Seven studies identified strategies involving enhancing organizational mental health and wellness supports. Several strategies related to improving psychosocial supports available to nurses were suggested <sup>6 95</sup> <sup>119</sup> <sup>122</sup> <sup>126</sup> <sup>128</sup>. These included improved access to mental health recourses <sup>6</sup> <sup>122</sup> <sup>126</sup> <sup>128</sup>, embedded wellness and debriefing activities and programs <sup>6 95</sup> <sup>119</sup> <sup>122</sup>, and programs to enhance and support interprofessional communication and relationships <sup>119</sup>. 'Stay' interviews, that leaders conduct with individual staff members to learn specific ways to strengthen their engagement and likelihood of remaining with the organization, are another strategy <sup>120</sup> <sup>129</sup>.

#### 3) Improved leadership and communication

Three studies identified strategies for improved leader and organizational support and communication. These included improved accountability for well-being at an organizational level <sup>6</sup>, for example, through the establishment of a Mental Wellbeing Commission <sup>128</sup>, the provision of positive and constructive feedback <sup>122</sup>, and recognition and acknowledgement of exceptional skills, commitment and dedication of staff <sup>122</sup>.

### 4) Increasing professional development & mentorship opportunities

Twelve studies identified retention strategies related to increasing professional development and mentorship opportunities. Career development support can be an important incentive for retention <sup>6 85 117-123 126 127 130</sup>. Strategies included transition-to-practice programs for new graduate nurses <sup>85 117 120 121 126 127 130</sup>; transition programs for moving to a new unit <sup>6 119</sup>; support and availability of continuing professional education <sup>6 119 122 123</sup>; career reinvention supports <sup>126</sup>, cross-training opportunities <sup>6 118</sup>; and support and opportunities for experienced nurses (rather than new graduate and intermediate nurses), such as elevating their responsibilities within the care team <sup>6 117 122 127</sup>. Buerhaus et al. suggest matching retention resources with highest-risk groups such as new graduate nurses, and trending data about attrition, reentry, and their patterns and causes <sup>126</sup>.

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#### 5) Better compensation and incentives

Nine studies identified retention strategies related to better compensation and incentives. Financial incentives to promote nurse retention included ensuring staff had a competitive base compensation, pension, adequate time off <sup>120</sup> <sup>128</sup>, as well as 'incentive' pay based on unit needs, such as shift premiums based on the functional vacancy rate of the unit <sup>118</sup> <sup>125</sup> <sup>131</sup>. Retention bonuses <sup>118</sup> <sup>132</sup>, supplementary responsibility pay for preceptors and mentors <sup>6</sup> <sup>126</sup>, and support from internal travel programs where nurses are provided competitive compensation to stay at their organization but move to a high needs unit for a defined period of time <sup>118</sup> <sup>125</sup> <sup>131</sup> <sup>132</sup> are other financial incentives. Indirect financial incentives to promote retention include loan repayment programs, incentives for hospitals from the government to provide childcare, and on-site graduate school program offerings to retain experienced nurses <sup>124</sup>.

#### Interventions to support nurse retention

Nine of the 130 studies (7%) included interventions to address nurse retention (**Supplementary Table 4**). These interventions included 1) new graduate nurse residency/transition to practice programs <sup>133-135</sup>; 2) mentorship programs <sup>136 137</sup>; 3) psychological coaching programs <sup>138 139</sup>; 4) clinical process support systems <sup>140</sup>; and 5) the creation of a Nurse Retentionist role <sup>140</sup>.

#### 1) New graduate nurse residency programs

Three studies highlighted new graduate nurse residency programs that used a structured, longterm approach to transition to practice, all of which reported positive impacts on nurse retention <sup>133-135</sup>. One program focused on all new graduate nurses across one hospital <sup>133</sup>, another focused on all new graduate nurses of all disciplines across several hospitals <sup>134</sup>, and one program focused specifically on emergency room new graduate nurses across a system of hospitals <sup>135</sup>. The programs were reported as two case reports and a quality improvement program, respectively; the total sample size was not reported in any of the reports. All three programs included structured orientation education as well as an element of preceptorship or mentorship. Two of the programs included formalized debriefing and reflection <sup>133 134</sup>, and one program included a progressive integration plan into leadership roles such as preceptor and Charge Nurse <sup>135</sup>. All three programs were located in the Northeastern United States.

## 2) Mentorship programs

Nurse mentorship programs with mixed results were reported in two studies<sup>136 137</sup>. Presented as a quality improvement project, Krofft and Stuart describe a mentorship program for 18 new registered nurses hired into medical-surgical units in a small community-based hospital during the unfolding of COVID-19 pandemic did not result in improved intent to stay <sup>137</sup>. A program evaluation of a mentorship program that offered individualized mentorship through culturally congruent, customized pairing for the participating 96 mentees (divided into four cohorts) had a more positive outcome. Mentees in all four cohorts reported that the mentorship program positively influenced their decision to stay in nursing <sup>136</sup>.

## 3) Psychological coaching programs

Two psychological coaching programs, RISE and reboot, showed positive results. The RISE program was presented as a matched case-control study of 54 nurses who participated and 54 who did not; power and statistical significance were not reported. RISE (resilience, insight, self-compassion, and empowerment) is a voluntary psychoeducational group intervention based on an integrative theoretical framework of acceptance and commitment therapy, cognitive behavioral therapy, and mindfulness. It was provided to 108 direct care nurses to reduce burnout and improve well-being. It involved 8 weekly 90-minute in-person group sessions developed and delivered by a licensed mental health counselor <sup>138</sup>. A higher percentage of direct care nurses who participated in RISE remained employed compared with the matched control subjects who did not participate <sup>138</sup>. The Reboot program was presented as a single arm, pre/post mixed-methods evaluation; the study was adequately powered and reported results were statistically significant. Reboot was a tailored psychological coaching program aimed at increasing resilience

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for 84 critical care nurses <sup>139</sup>. The intervention consisted of two 2-hour online group workshops hosted via Zoom (each pair of workshops was termed a 'cycle'), and two 1-hour individual coaching calls delivered by a Cognitive-behavioral therapist. There was a significant difference in nurses' reports of intention to leave pre-intervention (mean=11.50, SD =2.64) and post-intervention (mean=13.56, SD=1.63) <sup>139</sup>, showing a significantly lower intention to leave nursing after completing the program than before.

#### 4) Implementation of clinical process support systems

Using a pre-/post- interventional design, two Japanese hospitals implemented clinical process support computer systems for nurses and compared retention results with a third, control hospital that did not implement these systems. Sample size, power, and statistical significance of the results were not reported. The clinical process support system based on structured clinical knowledge (Team Compass with the Patient Condition Adaptive Path System; TC-PCAPS) and the COVID-19 clinical management system (COVID-19-CMS) were developed and implemented at the two intervention site hospitals <sup>140</sup>. These systems were designed to increase efficiency in clinical documentation as 50% of Japanese nurses' overtime is related to record-keeping <sup>141</sup>. The hospitals that implemented either process support system saw a reduction in nurse turnover, while the hospital that had not implemented such systems saw an increase in turnover <sup>140</sup>.

#### 5) Creation of the Nurse Retentionist role

The implementation of a Nurse Retentionist role at a large academic medical health system in the U.S. was reported using a program report. Sample size, power, and statistical significance of the results were not reported The Nurse Retentionist role is a new nursing leadership position that uses evidence-based strategies, with measurable outcomes, to personalize retention of a multigenerational workforce according to personal and professional development preferences. This role was developed and implemented at a large health system in the US. It provides a centralized point of contact to implement and evaluate retention strategies. The Nurse Retentionist in the large health system used five key strategies to support nurse retention: 1) Meeting individually with nurses contemplating leaving their positions or seeking career guidance; 2) Building intentional relationships with key stakeholders at the organizations, such as Chief Nursing Officers, Human Resources, and the nurse residency program director; 3) Refining clinical ladder program and expanded the peer mentor program; 4) Developing a system-wide retention committee; and 5) Creating focused recognition efforts to celebrate nurses' professional achievements <sup>142</sup>. Two years after implementation of the nurse retentionist role, nurse turnover was reduced to 11.8% from 13%<sup>142</sup>. Beyond nurse turnover, there were additional outcomes that also support nurse retention. There was a 27% increase in clinical ladder participation, a 43% increase in clinical ladder advancement, a 187% increase in ambulatory nurse recognition, a 31% increase in internal promotions; participation in nursing career development programs increased 294%, and participation in the extern program increased 420% 142.

## DISCUSSION

While there has already been substantial research on nurse retention, this is the first scoping review to focus on summarizing what is known about nurse retention in the peri- and post COVID-19 period. While many studies in this review reported measuring some form of retention, how retention was defined varied, as did the instruments used to measure it, making numeric retention score comparisons a challenge. This finding is consistent with previous research <sup>143-145</sup>.

The majority of included studies used cross-sectional study designs that identified correlational relationships, limiting our ability to make causal inferences. There were few interventional studies. This may be due to the short time period between the COVID-19 pandemic and the writing of this review, as interventional studies require a substantial amount of time for identification, design, implementation, evaluation and publication. Future research should focus on testing the strategies identified in this review and studying the identified successful interventions in more nursing settings.

#### Factors associated with nurse retention

The main themes identified for nurse retention included personal and demographic factors; safe staffing and quality work environments; psychological well-being; and specific COVID-19 factors. Over half of the studies identified psychological well-being factors (64%) and factors relating to safe staffing and the work environment (53%), 30% addressed personal/demographic factors, and 19% addressed COVID-19-specific factors. Most studies identified factors from more than one category.

Our review found studies reporting relationships between retention and personal factors such as gender, marital status, being a parent etc., all of which highlight the important role of personal work-life balance in nurse retention decisions. In addition, demographic factors such as age, phase of career, and level of education attained can be useful for addressing modifiable factors of the work environment and health care system <sup>146</sup> to target retention strategies to more vulnerable career phases and populations <sup>147</sup>.

The majority of factors identified in this scoping review related to the work environment, safe staffing, scheduling and compensation, and psychological well-being. These results align theoretically with the effort-reward imbalance (ERI) model which aims to identify psychologically stressful work environments and their negative effects on stress-related health risks. The ERI postulates that the imbalance between the demands (effort) and rewards an employee experiences can increase negative outcomes, including job dissatisfaction and intent to leave <sup>148 149</sup>. Work demands such as workload, physical and psychological safety, poor staffing and overtime outweigh rewards such as compensation, leadership support, and quality of work-life – resulting in a higher intention to leave. These have been repeatedly reported in the literature on nurse retention <sup>150-152</sup> and continue to be important considerations for future interventional evaluations. Addressing these critical factors falls within the purview of the healthcare system, organizational leadership, and nursing professional organizations, which must advocate for and implement these measures with urgency and resolute commitment.

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The COVID-19 pandemic had an unprecedented impact on the lives and work of nurses globally. Some of the retention factors specific to the pandemic included fear, feeling overwhelmed/ unprepared, and a lack of support and resources. These issues have been echoed in the literature <sup>153</sup>, as nurses were redeployed to unfamiliar work areas, and faced unknown risks that were exacerbated by the pandemic. Nurses felt unsupported by the healthcare system, which itself was not adequately prepared for a pandemic, and thus could not prepare its staff adequately, given the absence of safe environments and necessary resources. The consequences of these shortcomings persist, and have the potential to continue in healthcare workplaces, leading to not only the loss of nurses from the profession, but the loss of people considering nursing as a profession.

Despite the insights provided by the studies included in this review, several gaps in the literature regarding factors impacting nurse retention remain. There is limited retention research in diverse settings in which nurses work for example, ambulatory and community environments which employ a large proportion of the nursing workforce. While this scoping review provides important insights into some factors contributing to nurse retention, further research is needed to determine if these factors are applicable to non-hospital settings. In addition, although research from numerous countries is evident, there is overrepresentation of North American data, particularly in the interventional studies. The influence of contextual factors such as countryspecific healthcare structures and general cultural differences between countries and groups, are insufficiently addressed in existing literature. These gaps in current literature make it difficult to determine links between specific factors and nurse retention, either individually or collectively. Finally, the severe negative effect that COVID-19 has had on the global economy and on healthcare provision globally requires further study. Resource availability and constrained funding may have impacted nurses job intentions and decisions. Investigating these gaps in future research will strengthen the relevance of study findings, while developing in a more fulsome understanding of nurse retention across settings and in a global context.

#### Strategies to support nurse retention

The main strategies our review identified that would support nurse retention included ensuring safe flexible staffing and quality work environments; enhancing organizational mental health and wellness supports; improved leadership and communication; increasing professional development and mentorship opportunities; and improving compensation and incentives.

These strategies are not novel to the peri- and post-COVID-19 period. Previous literature has emphasized that the nursing practice environment directly impacts nurse retention, as well as the quality of patient care <sup>154</sup>. Positive work environments require engaged leadership, crossdisciplinary collaboration, and strong organizational culture <sup>155</sup>. It is important to note that strategies to address factors in the work environment can be hard to link directly to nurse retention as they do not exist alone: other unit, organizational, and systemic factors are important considerations as well. A positive work environment can only be achieved when strategies such as safe staffing, adequate wellness supports, and strong leadership, are also present.

Safe staffing has been a prominent issue in recent nurse retention discourse. It was identified as a main priority by the Canadian government in the 2024 release of the Health Canada Nursing

Retention Toolkit aimed at supporting and retaining the nursing workforce <sup>6</sup>. Several countries have developed safe staffing frameworks and initiatives, some of which include legislative approaches <sup>156</sup>. In 2019, California was the only US state with mandated nurse to patient ratios across all specialties. Since then, more US states and other countries have begun to pursue legislative or mandated nurse staffing approaches <sup>156</sup> and transparency with nurse staffing ratios <sup>157</sup>. Of note, the Magnet recognition program was only highlighted in two studies identified in this review<sup>26 44</sup> despite it being a longstanding, highly acknowledged organizational strategy to improve nurse retention. This may reflect Magnet organizations ability to retain staff and thus experience less nurse turnover.

Although the issues and strategies identified in this review pre-existed the COVID-19 pandemic, our review found that the peri- and post-COVID-19 pandemic landscape substantially amplified the issues and emphasized the need to implement strategies urgently. It is also essential that we determine if strategies are or are not working across different settings. The risk to our global nursing workforce has never been greater, making it crucial to shift focus from merely identifying factors influencing retention and proposing strategies to reduce it, to actions and interventions that will have an immediate and direct effect on nurse retention.

## Interventions to support nurse retention

Interventions identified to support nurse retention included: new graduate nurse residency/transition to practice programs; mentorship programs; psychological coaching programs; clinical process support systems; and the creation of a Nurse Retentionist role. Of note, 7 out of the 9 interventional studies took place in the US and the remaining two took place in the UK and Japan.

We identified few interventional studies, which may reflect the time it takes to plan, implement, evaluate and publish such studies. The most visible gaps were the lack of interventions focused on developing safe staffing, flexible scheduling, compensation, and improving work environments, even though these were consistently identified as priorities within the literature. This may be due in part to the fact that altering staffing ratios, scheduling guidelines and compensation requires approval by multiple jurisdictions (i.e. province/state, unions, institution etc.), making them difficult to implement. Unsurprisingly, transition to practice, mentorship, and psychological coaching programs were interventions that had positive impacts on nurse retention, as previously identified in the literature <sup>158-161</sup>.

The two novel interventions our review identified were the implementation of clinical process support systems (i.e., a computerized system based on clinical knowledge and a COVID-19-specific clinical management system) and a Nurse Retentionist role. Clinical process support systems can help anticipate and identify a patient's clinical pathway; where structured nursing knowledge can streamline nursing work and reduce administrative burden <sup>141</sup>. This type of intervention may have high potential for implementation given the increasing integration of artificial intelligence (AI) into healthcare <sup>162</sup>. The nurse retentionist role brings a prioritized, nursing-centered focus to addressing nurse retention. Having a 'point person' to assess an

organization's nursing workforce needs and provide curated solutions for that workforce allows for addressing specific staffing populations and career phases <sup>163</sup>.

Our review highlighted that psychological wellbeing is essential for a healthy nursing workforce and interventions to enhance nurses' psychological wellbeing are important nurse retention strategies. Just as important was improving the work environment and reducing workloads. Other aspects of work life such as improved leadership and communication, safe staffing, flexible scheduling, and incentives and fair compensation were highlighted in the literature, but interventions that address these have not yet been developed or studied. Further research is needed to determine if these strategies translate into effective solutions when implemented and evaluated in practice.

#### Implications for research, practice, and policy

This paper provides a comprehensive map of the evidence, highlighting areas that require further study, intervention, and testing to effectively retain nurses. There are a number of areas for further study and practice intervention. First, additional research is needed to further analyze differences between factors related to nurses' intention to leave their current job/area/ organization along with factors associated with intent to leave the profession of nursing. It is not clear from the current literature if these factors, and subsequent strategies and interventions, would be the same or different. Both aspects of retention are important to capture as they each have their own impacts on the health system. Further studies on factors related to retention that investigate non-hospital settings, contextual factors such as country-specific healthcare structures and general cultural differences between countries and groups, and COVID-19 related impacts on the global economy, health care provision, and resource availability are needed. Finally, further interventional research is required to further elucidate what suggested factors and strategies are actually effective in practice and across different practice settings.

There are several implications for policy going forward. It is imperative to establish a uniform measure of or a system-wide approach to capture/measure nurse turnover. Current methods are highly heterogeneous, not only in their metrics but also in the specific types of turnover they address, with most focusing exclusively on organizational turnover. Future policies must also prioritize the measurement and mitigation of professional turnover, as the strategies to address these two types of turnover may differ significantly. Moreover, professional turnover has profound implications for global human health resources, underscoring the need for targeted and effective interventions. Finally, policies can enforce known strategies such as mandating nurse-to-patient ratios.

This study emphasizes the urgent need for healthcare leadership, organizations, and policymakers to develop and implement evidence-based interventions to address nurse retention. Future research could focus on testing and refining these interventions, while policy changes may prioritize creating supportive work environments, enhancing mental health support, and offering competitive compensation. This focus on retention is critical for sustaining the nursing workforce, which is essential for healthcare system stability and quality patient care.

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#### **Study limitations**

The search strategy was limited to publications in English or those translated into English, potentially excluding relevant studies in other languages. The quality of the included studies varied. However, a scoping review aims to provide an overview of emerging evidence, therefore the variable quality is acceptable, as it is outweighed by the goal to identify and map available evidence <sup>10 164</sup>. The extreme heterogeneity of retention measurement definitions and tools prohibited accurate comparisons across studies and analysis within subgroups of job/unit/hospital/profession turnover, location (i.e. in-patient versus outpatient settings, standalone facilities versus health systems) or context (i.e. geographical, economic, financial, political).

## CONCLUSION

This scoping review provides an overview of relevant factors, strategies and interventions to reduce nurse turnover during the peri- and post-COVID-19 period. Studies were primarily correlational, and there were few studies of interventions. Factors associated with nurse retention were similar to those reported pre-pandemic, and in fact may have worsened, and new factors directly related to the pandemic have emerged. Further research is needed on contextual factors including application to non-hospital settings, country-specific healthcare structures and general cultural differences between countries and groups, and the severe negative impact of COVID-19 on the global economy and healthcare provision overall. Inconsistent measurement and interpretation of nurse retention scores was noted. Interventional studies were limited but several effective options were identified. A greater emphasis on interventional research is needed to develop and test effective mechanisms for nurse retention in the post-COVID-19 work environment. Rigorously addressing nurse retention has the potential to strengthen the nursing workforce, improve nurse well-being, enhance quality patient outcomes, and improve the longevity and sustainment of our global health systems.

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#### **FIGURE TITLE**

Figure 1. PRISMA diagram





## Appendix A.

# Search Strategy – Conducted April 17, 2024

3 AND 9 AND 12

### Medline

1	exp Nurses/
2	(nurs*).tw,kf
3	1 OR 2
4	exp Personnel Turnover/
5	((personnel adj3 turnover) OR (turnover)).tw,kf
6	(retention or retain*).tw,kf.
7	((intent OR intending) adj3 (stay OR leave)).tw,kf
8	(quit or quitting).tw,kf.
9	4 OR 5 OR 6 OR 7 OR 8
10	exp COVID-19/
11	(COVID-19 or corona* or pandemic or coronavirus or SARS-CoV-2 or 2019-CoV-
	2).tw,kf
12	10 OR 11
13	3 AND 9 AND 12
	<b>RESULTS= 640</b>
Embas	se
1	exp Nurses/
2	(nurs*).tw,kf
3	1 OR 2
4	exp Personnel Turnover/
5	((personnel adj3 turnover) OR (turnover)).tw,kf
6	(retention or retain*).tw,kf.
7	((intent OR intending) adj3 (stay OR leave)).tw,kf
8	(quit or quitting).tw,kf.
9	4 OR 5 OR 6 OR 7 OR 8
10	exp COVID-19/
11	(COVID-19 or corona* or pandemic or coronavirus or SARS-CoV-2 or 2019-CoV-
	2).tw,kf
12	10 or 11

**RESULTS=1265** 

# CINAHL

	(MH "Nurses+")
OR	TI nurs* OR AB nurs*
	(MH "personnel turnover")
OR	TI personnel turnover OR AB personnel turnover OR TI turnover OR AB
	turnover OR TI ( (retention or retain*) ) OR AB ( (retention or retain*) ) OR TI (
	(intent to leave OR intent to stay OR intending to leave OR intending to stay OR
	(intent N2 leave) OR (intent N2 stay)) ) OR AB ( (intent to leave OR intent to
	stay OR intending to leave OR intending to stay OR (intent N2 leave) OR (intent
	N2 stay)) ) OR TI ( (quit or quitting) ) OR AB ( (quit or quitting) )
	(MH "COVID-19+")
	(MH "COVID-19 Pandemic")
OR	TI ( (COVID-19 or corona* or pandemic or coronavirus or SARS-CoV-2 or
	2019-CoV-2) ) OR AB ( (COVID-19 or corona* or pandemic or coronavirus or
	SARS-CoV-2 or 2019-CoV-2))
	S1 AND S2 AND S3
	RESULTS = 614
SCOPUS	

TITLE-ABS-KEY (intent OR intending) w/3 (leave OR stay)
TITLE-ABS-KEY ( personnel w/3 turnover ) OR (turnover)
TITLE-ABS-KEY (retention OR retain*)
TITLE-ABS-KEY ( quit OR quitting )
COMBINE WITH OR
TITLE-ABS-KEY ( nurs* )
TITLE-ABS-KEY (covid-19 OR corona* OR pandemic OR coronavirus OR
SARS-CoV-2 OR 2019-CoV-2)
Combine 3 concepts with AND
RESULTS = 20

1 2 3 4 5			ВМЈ Ор	136/bmjopen-2024-0963; cted by copyright, inclu	Page 34 of 6
6 7	Author(s), year, country	Sample Description	Study	Retention Measurement, Scale & Result	Mixed Methods
8 9 10			Design	March 2 Ensei ruses r	Appraisal Tool (MMAT) Score
11 12			Factor	s stee	
13	Aiken et al, 2023 44	Nurses (60 Magnet hospitals)	Cross Sectional	Measurement: Hospital turnover rate	5/5 (100%)
14 15	(USA)			Result: 17% turnover	
16 17	Alameddine et al., 2021 97	All Order of Nurses registrants	Cross Sectional	Measurement: Intent to Quit	5/5 (100%)
18	(Lebanon)	(hospitals)	0.	Scale: Single item, Likert scale (5 po	
19 20				Result: 43.1% likely/very likely to que 12 months	
21 22	Alameddine et al., 2021 <sup>96</sup>	Public hospital nurses (major referral	Cross Sectional	Measurement: Turnover Intention $\geq$	5/5 (100%)
23 24	(Lebanon)	center)		Scale: Single item, Likert scale (4 pognts)	
25				Result: 23.8% turnover intention	
20 27	<b>Alenazy et al., 2023</b> 49	Critical care hospital registered nurses	Cross Sectional	Measurement: Turnover Intention Scale	5/5 (100%)
28 29	(Saudi Arabia)			Scale: 6 items, Likert scale (5 points)	
30 31				<b>Result:</b> M=17.34, SD=4.94; 48.6% b	
32	Alsaif et al., 2023 <sup>39</sup>	Foreign female nurses (private or	Cross Sectional	Measurement: Turnover Intention Seale	3/5 (60%)
33 34	(Saudi Arabia)	government hospitals)		Scale: 6 items, Likert scale (5 points)	
35 36				Result: not reported	
37 38	Andrews et al., 2024 64	Newly licensed nurses (51 metropolitar	Cross Sectional	Measurement: Turnover Intention	5/5 (100%)
39 ⊿∩	(USA)	areas/35 U.S. states)		Scale: 4 items, Likert scale (5 points)	
41 42 43 44 45 46 47	L	For peer review only -	http://bmjopen.bn	nj.com/site/about/guidelines.xhtml	

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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results	Mixed Methods Appraisal Tool (MMAT) Score
7			Result: M=2.62, SD=0.97         g         4	
Aslan et al., 2022 <sup>84</sup>	Hospital nurses	Cross Sectional	Measurement: Intention to Quit Scate	5/5 (100%)
0 1 (Turkey) 2 3	4		Scale: 3 itemsregin by tempResult: M=2.73, SD=1.17regin by temp	
4 5 6 2024 <sup>51</sup> 7 (Canada)	Hospitals nurses (Turkey)	Cross Sectional	Measurement: Intent to Leave     Superior       Result: 73% intent to leave     and drift	5/5 (100%)
8 <b>Boulton et al., 2023</b> 95	Adult ICU nurses (4 hospitals)	Mixed Methods	©≥ă Measurement: Intent to Leave Profe≧s∰g	14/15 <b>(93%)</b>
20 21 (UK) 22		10	Scale: 2 items (moral distress)	
<b>BowenXue et al, 2024</b> <sup>71</sup>	Nurses (3 Hangzhou hospitals)	Cross Sectional	Measurement: Turnover Intention Seale Chinese version)	5/5 (100%)
6 (China)			Scale: 2 items, Likert scale (4 points)	
7			<b>Result:</b> M=14.07, SD=3.8 (moderate $\frac{5}{30}$ high)	
9 0 1 2 3 4 Bruyneel et al., 2023 <sup>50</sup> (Belgium)	ICU nurses (123 hospitals)	Cross Sectional	Measurement: Intent to Leave         Scale: 2 items, binary         Result: 42.9% intend to leave job, 2368% intend to leave	5/5 (100%)
5 Cakal at al. 2021 107	Active duty Ironian nurses	Cross Sectional	Massurements Intent to Quit	5/5 (1009/)
6 Cakai et al., 2021	Active-duty framan nurses	Closs Sectional	Scale: 4 items. Likert scale (7 points)	5/5 (100 %)
8 ( <sup>(11,211)</sup> 9			Result: M=4.21, SD=1.89	
11 12 13 14 15 16	For peer review only -	http://bmjopen.bn	nj.com/site/about/guidelines.xhtml	

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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results	Mixed Method Appraisal Too (MMAT) Scor
Chen et al., 2021 67	New graduate nurses (Nationwide)	Cross Sectional	Measurement: Stay in the Nursing Corkplace Scale	5/5 (100%)
Taiwan)			Scale: 10 items, Likert scale (4 point and a grand a gr	
	$\mathbf{\wedge}$		Result: M=2.00, SD=0.46 (close to descent)	
Choi et al., 2022 <sup>80</sup>	Full-time hospital nurses	Cross Sectional	Measurement: Turnover Intention	5/5 (100%)
Hong Kong)			Scale: Single item	
	Č Da		Result: 36.3% turnover intention	
Christianson et al., 2023 <sup>2</sup>	Hospital nurses (Florida, Oregon,	Mixed	Measurement: Intent to Leave	11/15 (73%)
(USA) Rhode Island,	Rhode Island, & Wisconsin)	Methods	Scale: 2 items, binary	
			Result: 22% turnover intention	
Christianson et al., 2024 <sup>48</sup> USA)	Actively working registered nurses & licensed practical nurses	Cross Sectional	Measurement: Intent to Leave - intend to leave, intend to stay, uncertain         Scale: Single item         Result: 22% intent to leave	o 5/5 <b>(100%)</b>
Cole et al., 2021 <sup>38</sup>	Frontline nurses	Cross Sectional	Measurement: Intent to Leave	5/5 (100%)
Australia)			Scale: 2 items. Likert scale (5 points)	
,			Result: M=2.53, SD=1.56	
<b>Conolly et al., 2024</b> <sup>59</sup>	Frontline nurses	Qualitative	N/A	5/5 (100%)
UK)			lgenc	
Cornish et al., 2021 58	Emergency room nurses	Cross Sectional		4/5 (80%)
Australia)			Measurement: Intent to Leave	

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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results ncluding in o	Mixed Methods Appraisal Tool (MMAT) Score
7 8 9			Result: 48.2% likely to leave job within 5 years; 20.6% inter to leave profession within 5 years	t
10 11 12 (Canada) 14 <b>Crowe et al., 2022</b> <sup>53</sup> (Canada)	ICU and step-down unit nurses	Mixed Methods	Measurement: Intent to Turnover Scale: 0         Scale: 7 items, Likert scale (5 points)         Result: 22.4% turnover intention	12/15 (80%)
<ul> <li>15</li> <li>deCordova et al., 2022 92</li> <li>(USA)</li> <li>19</li> </ul>	New Jersey hospital nurses	Cross Sectional	Measurement: Intent to Leave       An eried         Scale: Single item, binary       Gar (An eried)         Result: 36.5% turnover intention       Missingle	5/5 (100%)
20 21 <b>Ding &amp; Wu, 2023</b> <sup>105</sup> 22 (China) 24	Hospital nurses (8 cities)	Cross Sectional	Measurement: Turnover Intention Scale Scale: 3 items, Likert scale (7 points) Result: 65.3% turnover intention	5/5 (100%)
26 <b>Dino et al., 2022</b> <sup>108</sup> 27 (Philippines) 29	Public hospital registered nurses	Mixed Methods	Measurement: Garbee and Killacky Interit to Stay Scale (GKISS)         Result: Median=12.5, IQR=12-14 (rejoderately low)	14/15 ( <b>93%</b> )
<ul> <li>30</li> <li>31</li> <li>32</li> <li>33</li> <li>34</li> <li>35</li> </ul>	Norwegian nurses	Cross Sectional	Measurement: Turnover Intention       Image: Comparison of the	5/5 (100%)
<ul> <li>335</li> <li>336</li> <li>Edmonson et al., 2022 <sup>81</sup></li> <li>337</li> <li>(USA)</li> <li>339</li> <li>400</li> <li>41</li> </ul>	Practicing registered nurses	Cross Sectional	Measurement: Turnover IntentionSeale: Single item (frequency of feeling like quitting; Likert scale, unknown)Result: 39% often felt like quitting	2/5 (40%)
42 43 44 45 46	For peer review onl	y - http://bmjopen.bn	nj.com/site/about/guidelines.xhtml	

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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results	>>> >>>	Mixed Methods Appraisal Tool (MMAT) Score
Ekingen et al., 2023 <sup>23</sup>	Hospital nurses (7 hospitals)	Cross Sectional	می Measurement: Turnover Intention Seale	2 2	5/5 (100%)
(Turkey)			Scale: 2 items, Likert scale (5 points)	March	
	4		<b>Result:</b> Organizational turnover: M=	SD=1.295;	
Elhanafy et al., 2021 <sup>112</sup>	Inpatient and critical care nurses	Cross Sectional	Measurement: Turnover Intention		3/5 (60%)
(Egypt)	(National Medical Institute)		Scale: 2 single-item measures, Likert	(5 points)	
			<b>Result:</b> M=2.10, SD=1.15		
Enwereuzor et al., 2023 <sup>54</sup>	Hospital nurses	Cross Sectional	ا فغ Measurement: Intent to Stay (ITS) S	2 	4/5 <b>(80%)</b>
(Nigeria)		The second	Scale: 6 items, Likert scale (5 points)	tp-//	
		9	Result: M=21.577, SD=8.283 ₽		
Failla et al., 2023 <sup>63</sup>	Newly licensed nurses (6 California	Sequential	Measurement: Intent to Leave		5/5 (100%)
(USA)	hospitals)	Survey	Scale: 2 items, Likert scale (5 points)		
			<b>Result:</b> 2019: M=2.63, SD=1.18; 2029: M=2.62, SD=1.14	=2.41, SD=1.12;	
FasihFar et al., 2022 <sup>88</sup>	Emergency, medical, surgical,	Cross Sectional	Measurement: Turnover Intentions Scale	D 0 1	4/5 (80%)
(Iran)	psychiatric, and special trauma hospital nurses		Scale: 6 items, Likert scale (5 points)		
			Result: M=14.77 (low intent to leave		
Flinkman et al., 2023 <sup>103</sup>	Registered nurses	Cross Sectional	Measurement: Intent to Leave		5/5 (100%)
(Finland)			Scale: 3 items, Likert scale (5 points)		
			<b>Result:</b> M=3.84, SD=1.2		
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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results	Mixed Method Appraisal Too (MMAT) Scor
Fronda & Leodoro, 2021 <sup>113</sup>	Frontline nurses	Cross Sectional	Measurement: Turnover Intention S	5/5 (100%)
(Philippines)			Scale: 2 items, Likert scale (5 points)	
			<b>Result:</b> 25.8% desire to leave job; 20 sesire to leave profession	
Galanis et al., 2023 <sup>22</sup>	Nurses	Cross Sectional	Measurement: Turnover Intention 😽 🖉	5/5 (100%)
(Greece)			Scale: Single item, Likert scale (6 points)	
			Result: 40.9% turnover intention	
Galanis et al., 2024 <sup>15</sup>	Nurses	Cross Sectional	Measurement: Turnover Intention	5/5 (100%)
(Greece)		1 Ka	Scale: Single item, Likert scale (6 poents)	
		9	<b>Result:</b> 58.1% turnover intention $\stackrel{P}{=}$	
Gedik et al., 2023 <sup>76</sup>	Nurses	Cross Sectional	Measurement: Turnover Intention	5/5 (100%)
(Turkey)			Scale: 3-item measure (Cammann et 🏭.; 📅79)	
			Result: Results not directly reported $\frac{s}{3}$	
Gherman et al., 2022 <sup>42</sup>	Hospital nurses	Cross Sectional	Measurement: Turnover Intentions	5/5 (100%)
(Romania)			Scale: 3-item scale (Michigan Organ gatignal Assessment Questionnaire)	
			Result: not directly reported	
Gherman et al., 2022 <sup>34</sup>	Hospital nurses	Cross Sectional	Measurement: Turnover Intentions	5/5 (100%)
(Romania)			Scale: 3-item scale (Michigan Organizational Assessment Questionnaire)	
			Result: not directly reported	

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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results nc 033 in 0	Mixed Methoo Appraisal Too (MMAT) Scor	
<b>Goyal &amp; Kaur, 2023</b> <sup>70</sup>	Hospital nurses (51 Northern hospitals)	Cross Sectional	Measurement: Retention of \$	5/5 (100%)	
(India)			Result: M=2.58, SD=0.764		
Grubaugh et al., 2023 102	New graduate nurses	Cross Sectional	Measurement: Turnover	5/5 (100%)	
(USA)			Scale: Binary (resigned or retained)		
			Result: Results not directly reported		
Grubaugh et al., 2023 <sup>85</sup>	New graduate nurse program	Cross Sectional	Measurement: Turnover Intent	5/5 (100%)	
(USA)	participants (51 organizations /6 states)	Pr	Scale: 12 items, Likert scale (7 point		
			<b>Result:</b> 2018–2019: 6.6%; 2020–202 <sup>3</sup> , 30, 30, 30, 30, 30, 30, 30, 30, 30, 30		
Habibzadeh et al., 2022 <sup>165</sup>	Hospital nurses (5 hospitals)	Cross Sectional	Measurement: Turnover Intention Ouestonnaire (TIQ)	5/5 (100%)	
(Iran)			Scale: 15 items, Likert scale (5 point		
			Result: M=52.50, SD=11.85 (high intent to leave)		
Han et al., 2023 17	Hospital nurses (13 wards, 5 ICUs, 2	Cross	Measurement: Turnover Intention	5/5 (100%)	
(South Korea)	emergency centers)	Sectional	Scale: 4 items, Likert scale (5 points)		
			Result: M=13.2, SD=4.0 ট		
Hanum et al., 2022 <sup>40</sup>	Hospital nurses (single hospital)	Cross Sectional	Measurement: Intention to Stay Scale	5/5 (100%)	
(China)			Scale: 6 items, Likert scale (5 points)		
			Result: M=3.47 (medium level)		
Havaei et al., 2023 43	Regulated nurses across sectors (one	Cross Sectional	Measurement: Turnover Intent	5/5 (100%)	
	province)		Scale: 2 items, Likert scales (4 points and spoints)		

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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results	Mixed Method Appraisal Too (MMAT) Scor
			Result: Intent to leave: M=2.11, SD= 0.96 (somewhat likely); Timing of turnover intent: M=7.99, Sp= 0.5 years	
<b>Hwang, 2022</b> <sup>79</sup> (Korea)	Female hospital nurses	Cross Sectional	Measurement: Turnover Intention       Feigure 1000         Scale: 6 items, Likert scale (5 points)       Feigure 1000         Result: M=3.48, SD=0.72       For month 1000	5/5 (100%)
<b>Im &amp; Koh, 2023</b> <sup>90</sup> (Korea)	Nurses	Cross Sectional	Measurement: Willingness to Work         Scale: Single item, Likert scale (5 possible         Result: M=3.66, SD=0.91	5/5 (100%)
<b>Jarden et al., 2023</b> <sup>61</sup> (Australia)	Registered nurses (Victoria)	Qualitative	Not available Not available Transport	5/5 (100%)
Kabir et al., 2022 <sup>41</sup> (Bangladesh)	Bangladeshi registered female nurses (clinical settings)	Cross Sectional	Measurement: Turnover Intention Scale         Scale: 6 items, Likert scale (5 points)         Result: M=16.33, SD=4.72	5/5 (100%)
<b>Kachie et al., 2023</b> <sup>65</sup> (China)	Hospital nurses (Zhejiang province)	Cross Sectional	Measurement: Turnover Intention       Image: Complexity of the second seco	5/5 (100%)
Karakachian et al., 2024 <sup>26</sup> (USA)	Magnet hospital nurses	Cross Sectional	Measurement: Turnover Intention Scale         Scale: 6 items, Likert scale (5 points)         Result: M=16.4, SD=3.4	5/5 (100%)
Kitamura & Nakai, 2023 <sup>21</sup>	Hospital nurses (two sites)	Cross Sectional	Measurement: Turnover Intention	5/5 (100%)

		BMJ Op	en en en en en en	Page 42
Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results	Mixed Method Appraisal Too (MMAT) Score
(Japan)			Scale: Single item, binary	
			Result: 63.4% turnover intention	
Kleier et al., 2022 <sup>98</sup>	Registered nurses (4 hospitals)	Cross Sectional	Measurement: Intent to Leave the Page Sion	5/5 (100%)
(USA)			Scale: 3 items, Likert scale (7 points)	
			Result: M=3.21, SD=1.47	
Kwon & Song, 2024 <sup>32</sup>	Hospital nurses	Cross Sectional	Measurement: Korean Nurse Turno E	5/5 (100%)
(South Korea)	9	0	Scale: 10 items, Likert scale (5 point	
			Result: 77.8% turnover intention	
Labrague & Santos, 2021	<sup>14</sup> Nurses (5 hospitals)	Cross Sectional	Measurement: Intent to Leave Organization and Profession	5/5 (100%)
(Philippines)			Scale: 2 items, Likert scale (5 points)	
			Result: Organizational: M=1.86, SD, 1.2g; Professional: M=2.23, SD=1.26	
Labrague & Santos, 2021 <sup>99</sup>	9 Hospital nurses	Cross Sectional	Measurement: Intent to Leave Curres to ganization	5/5 (100%)
(Philippines)			Scale: Single item, Likert scale (5 pomts)	
			Result: M=1.93, SD=1.07	
Labrague et al., 2021 <sup>100</sup>	Registered nurses	Cross Sectional	Measurement: Turnover Intention	5/5 (100%)
(Philippines)			Scale: Single item, Likert scale (5 points)	
			Result: M=1.93, SD=1.07	
Lavoie-Tremblay et al., 2022 <sup>115</sup>	Registered nurses and licensed practical nurses (Quebec province)	Cross Sectional	Measurement: Turnover Intention (organization and profession)	5/5 (100%)
2022 115	nurses (Quebec province) For peer review only -	http://bmjopen.bn	profession)	

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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results Retention Measurement, Scale & Results nc U33 U34 U34 U34 U34 U34 U34 U34 U34 U34	Mixed Method Appraisal Too (MMAT) Scor
(Canada)			Scale: 2 items, Likert scale (7 points) Result: Organization: 29 5: Profession 3%	
<b>Lee et al., 2023</b> <sup>69</sup> (South Korea)	Registered nurses (3 provinces)	Cross Sectional	Measurement: Korean Nurse Turno         Scale: 10 items, Likert scale (5 point)         Result: M=41.65, SD=6.66	5/5 (100%)
Liu et al., 2021 <sup>101</sup> (China)	Hospital nurses	Cross Sectional	Measurement: Nurse Intent to Stay Que Sionnaire         Scale: 6 items, Likert scale (5 points)         Result: M=3.84, SD=0.6	5/5 (100%)
<b>Lofti et al., 2022</b> <sup>116</sup> (Iran)	Hospital nurses (1 province)	Cross Sectional	Measurement: Anticipated Turnovei Scale         Scale: 12 items, Likert scale (7 points)         Result: M=32.14, SD=8.9; 70% moderate high turnover intention	5/5 (100%)
<b>Lou et al., 2022</b> <sup>93</sup> (Canada)	Hospital nurses (4 sites/1 province)	Cross Sectional	Measurement: Intent to Leave Facility and Profession         Scale: 2 items, binary         Result: 50% intent to leave	5/5 (100%)
<b>Matsuo et al., 2023</b> <sup>91</sup> (Japan)	Full-time nurses (1 region)	Cross Sectional	Measurement: Intention to Leave Scale         Scale: 6 items, Likert scale (4 points)         Result: M=13.8, SD=4.95	5/5 (100%)
<b>Medvec et al., 2023</b> <sup>16</sup> (USA)	Registered nurses (one state)	Cross Sectional	Measurement: Intentions for Next Year	5/5 (100%)

Author(s), year, country Sampl	le Description	Study Design	Retention Measurement, Scale & Results	Mixed Method
			ludin	(MMAT) Scor
			<b>Result:</b> 39% plan to leave current position, 28% plan to reduce clinical hours; 18% plan to pust aravel nursing	
Vehra et al., 2024 36     Hospit       India)     India	al nurses (1 site)	Cross Sectional	Measurement: Turnover Intention Science         Scale: 6 items, Likert scale (5 points)         Result: 43.7% turnover intention	5/5 (100%)
Willer et al., 2023 <sup>68</sup> Hospit (UK)	al ICU nurses	Qualitative	Not available	5/5 (100%)
Mirzaei et al., 2021 <sup>33</sup> Hospit Iran)	al nurses	Cross Sectional	Measurement: Turnover Intention Questionnaire         Scale: 15 items, Likert scale (5 points)         Result: M=41.73, SD=12.11	5/5 (100%)
Nakai et al., 2022 <sup>28</sup> Hospit (Japan)	al nurses (3 sites)	Cross Sectional	Measurement: Desire to Quit Job         Scale: Single item, binary         Result: 60.5% turnover intention	4/5 (80%)
Nakic et al., 2023 110       Nurses         Croatia)       Image: state sta	3	Cross Sectional	Measurement: Intent to Leave     Technologie       Scale: Single item, binary     10       Result: 39.2% turnover intention     2025	4/5 (80%)
Nam et al., 2023 <sup>77</sup> Emplo Korea)	yed nurses (>18 years of age)	Cross Sectional	Measurement: Anticipated Turnover Scale         Scale: 12 items, Likert scale (7 points)         Result: not directly reported	5/5 (100%)

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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results ncludin	Mixed Method Appraisal Too (MMAT) Scor
Nashwan et al., 2021 <sup>35</sup> (Qatar)	Hospital nurses (1 hospital corporation)	Cross Sectional	Measurement: Turnover Intention Scale Scale: 6 items, Likert scale (5 points) Result: Before COVID-19: M=13.24	5/5 (100%)
2 3 4 5 6 7 7	Newly graduated nurses	Cross Sectional	M=15.54 <b>Measurement:</b> Likelihood of Nursing Career in 5 Years Scale: Single item, binary Result: 28% likelihood	5/5 (100%)
3 9 9 1 1 (Japan)	Hospital nurses (5 sites)	Cross Sectional	Image: Scale: 3 items, Likert scale (5 points)	5/5 (100%)
<ul> <li>Pahlevan Sharif et al., 2023</li> <li>47</li> <li>(Iran)</li> <li>7</li> </ul>	Nurses (2 public hospitals)	Cross Sectional	Measurement: Turnover Intention Scale: 3 items, Likert scale (7 points) Result: M=3.54, SD=2.29; M=3.35, SD=2.24; M=3.64, SD=2.42	5/5 (100%)
<b>Poku et al., 2022</b> <sup>24</sup> (Ghana)	Hospital Registered Nurses (5 sites)	Cross Sectional	Measurement: Turnover Intention Scale         Scale: 3 items, Likert scale (5 points)         Result: 47.7% turnover intention	5/5 (100%)
Putekova et al., 2023 <sup>56</sup> (Slovakia)	Working nurses (across sectors)	Cross Sectional	Measurement: Likelihood of Leaving Job       Scale: Single item, binary       Result: 70% likelihood	5/5 (100%)
<b>Rheaume &amp; Breau, 2022</b> <sup>78</sup>	Hospital ICU nurses	Cross Sectional	Measurement: COVID-19 Turnover Integet	5/5 (100%)
2 3 4 5 6 7	For peer review only	- http://bmjopen.bn	nj.com/site/about/guidelines.xhtml	

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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results	Mixed Methoo Appraisal Too (MMAT) Scor
(Canada)			Scale: Single item, binary     of 4 Scale: Single item, binary       Result: 49% likelihood     Soft 1 Soft 1 Sof	
<b>Rotenstein et al., 2023</b> 57 (USA)	Staff nurses (206 large healthcare organizations)	Cross Sectional	Measurement: Likelihood to Leave       The second sec	5/5 (100%)
<b>Said &amp; El-Shafei, 2021</b> <sup>46</sup> (Egypt)	Hospital nurses (2 sites)	Cross Sectional	Measurement: Job Dissatisfaction Thereforer Intent         Scale: Single item, binary         Base of the second se	5/5 (100%)
Salaten et al., 2023 <sup>89</sup> (Egypt)	Paediatric nurses	Cross Sectional	Measurement: Intention to Stay Scale         Scale: 3 items, Likert scale (5 points)         Result: M=8.40, SD=3.55	4/5 (80%)
Sanner-Stiehr et al., 2022 <sup>86</sup> (USA)	Acute and ambulatory care nurses	Cross Sectional	Measurement: Intent to Stay Scale: Single item, Likert scale (7 points) Result: 88.9% intend to stay with the regerent employer	5/5 (100%)
<b>Sat et al, 2021</b> <sup>62</sup> (Turkey)	Hospital nurses	Cross Sectional	Measurement: Intention to Leave Prefersion During COVII         19         Scale: Single item, binary         Result: 52.1% turnover intention	D-5/5 (100%)
Schug et al., 2022 55	Hospital nurses	Cross Sectional	Measurement: Intent to Leave	5/5 (100%)

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1 2 3 4 5 6	ountry Sample Description	Study Design	Retention Measurement, Scale & Results Retention Measurement, Scale & Results nclud in o	Mixed Methods Appraisal Tool (MMAT) Score
7 (Germany) 9 10			Scale: 5 items, binary       5         Result: 18.9% intent to quit medical       5         reduce work hours       5	
<ul> <li>11</li> <li>12 Shah et al., 2021 <sup>10</sup></li> <li>13</li> <li>14 (Pakistan)</li> <li>15</li> <li>16</li> </ul>	9 Hospital nurses	Cross Sectional	Measurement: Turnover Intention         Scale: 4 items, Likert scale (5 points)         Result: M=3.60, SD=0.82	5/5 (100%)
<ul> <li>17 Shapiro et al., 202.</li> <li>18 (USA)</li> <li>20 21</li> </ul>	2 <sup>18</sup> Hospital nurses (11 hospital, 2	2 states) Cross Sectional	Measurement: Turnover Intention         Scale: Single item (yes/maybe/no)         Result: Approx. 17% among nurses	5/5 (100%)
<ul> <li>22 Shayestehazar et a</li> <li>24 (Iran)</li> <li>26</li> </ul>	<b>1., 2022</b> <sup>27</sup> Hospital nurses	Cross Sectional	Measurement: Anticipated Turnover Scale         Scale: 12 items, Likert scale (5 point)         Result: M=37.70, SD=3.35	5/5 (100%)
<ul> <li>27</li> <li>28</li> <li>Sihvola et al., 2023</li> <li>29</li> <li>(Finland)</li> <li>31</li> </ul>	<sup>19</sup> Hospital nurses (2 sites)	Cross Sectional	Measurement: Intent to Leave (pre- and post-pandemic)         Scale: 2 items, Likert scale (5 points)         Result: Pre-pandemic: 2%; During pandemic: 16%	5/5 (100%)
32 33 <b>Sinsky et al., 2021</b> 34 35 (USA) 36	<sup>25</sup> Rural and urban nurses (multi settings/30 states)	iple Cross Sectional	Measurement: Likelihood to Leave Brack ce Within 2 Years         Scale: Single item, Likert scale (5 points)         Result: 40% likelihood	5/5 (100%)
<ul> <li>38 Squires et al., 2022</li> <li>40 (USA)</li> </ul>	Hospital nurses	Qualitative	Not available	5/5 (100%)
42 43 44 45 46 47	For peer rev	view only - http://bmjopen.b	mj.com/site/about/guidelines.xhtml	

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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results	Mixed Method Appraisal Tool (MMAT) Score
Sun et al., 2023 <sup>87</sup>	Hospital ICU nurses (15 provinces)	Cross Sectional	Measurement: Alternative Employnent Intent	5/5 (100%)
(China)			Scale: Single item, Likert scale (5 po 🖣	
			Result: 9.62% agree/strongly agree	
Sungbun et al., 2023 <sup>20</sup>	Hospital emergency department nurses	Cross Sectional	Measurement: Turnover Intention Sease	5/5 (100%)
(Thailand)			Scale: 6 items, Likert scale (5 points) 2 2	
			Result: Pandemic crisis areas: 72.8% Berrisis areas: 55.3%	
<b>Tang et al., 2022</b> <sup>72</sup>	Registered nurses	Cross Sectional	Measurement: Turnover Intention Sanges	5/5 (100%)
(China)			Scale: 6 items, Likert scale (4 points)	
			Result: High/very high turnover intention 64.2%	
Urban, 2024 <sup>29</sup>	Hospital nurses	Cross Sectional	Measurement: Intent to Leave Curre	5/5 (100%)
(USA)			Scale: 1–10 visual analog scale	
			Result: not directly reported	
Varasteh et al., 2022 <sup>31</sup>	Hospital nurses	Qualitative	Measurement: Turnover Intention ( ganzation and	5/5 (100%)
(Iran)			profession)	
			Scale: 2 items, Likert scale (7 points)	
Wang et al., 2021 <sup>104</sup>	Long-term care nursing staff	Cross Sectional	Measurement: Modified Willingness to Stay Scale	5/5 (100%)
(China)			Scale: 3 items, Likert scale (unspecified points)	
			<b>Result:</b> M=4.738, SD=1.502; M=4.763, SD=1.489; M=4.879, SD=1.406	
Wang et al., 2023 <sup>106</sup>	Hospital nurses	Cross Sectional	Measurement: Turnover Intention	5/5 (100%)
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Sample Description	Study Design	Retention Measurement, Scale & Results nc udin 3 o	Mixed Methoo Appraisal Too (MMAT) Scor
		Scale: 7 items, Likert scale (5 points) 4	
		Result: M=1.81, SD=0.62	
Registered nurses (nationwide)	Cross Sectional	Measurement: Unit Turnover Intent	5/5 (100%)
		Scale: Single item, Likert scale (5 pound B	
		<b>Result:</b> 28.4% plan to leave their unit of Signature	
Nursing home nurses	Cross Sectional	Measurement: Turnover Estimated கோஜுayroll-Based	5/5 (100%)
	er r	<b>Result:</b> Facilities with NH-employed had significantly lower RN turnover (adjusted b, 55.40 States CI, 99.50–11.30)	
Hospital and ambulatory care nurses (one health system)	Cross Sectional	Measurement: Intent to Stay	5/5 (100%)
		remain working as an RN	
Nurses	Cross Sectional	Measurement: Intent to Stay in Current Bob	5/5 (100%)
		<b>Result:</b> 33.5% plan to quit within 2 years	
Nurses (members of northeastern/ midwestern state nurses' association)	Cross Sectional	Measurement: Turnover Intention Scale S	5/5 (100%)
		Result: 44.5% turnover intention	
Hospital registered nurses (17	Cross Sectional	Measurement: Turnover Intention Scale	5/5 (100%)
nospitals)		Scale: 6 items, Likert scale (6 points)	
	Sample Description         Registered nurses (nationwide)         Nursing home nurses         Hospital and ambulatory care nurses (one health system)         Nurses         Nurses         Nurses         Nurses         Hospital registered nurses (17 hospitals)	Sample DescriptionStudy DesignRegistered nurses (nationwide)Cross SectionalNursing home nursesCross SectionalHospital and ambulatory care nurses (one health system)Cross SectionalNursesCross SectionalNursesCross SectionalNurses (members of northeastern/ nidwestern state nurses' association)Cross SectionalHospital registered nurses (17 hospitals)Cross Sectional	sample Description       Study Design       Retention Measurement, Scale & Result Scale: 7 items, Likert scale (5 points) Result: M=1.81, SD=0.62         Registered nurses (nationwide)       Cross Sectional       Measurement: Unit Turnover Intenting Scale: Single item, Likert scale (5 points) Result: 28.4% plan to leave their unit Result: 7.3% disagreed of strongly design Result: 7.3% disagreed or strongly design Result: 7.3% disagreed or strongly design Result: 33.5% plan to quit within 2 years Result: 33.5% plan to quit within 2 years Result: 33.5% plan to quit within 2 years Result: 44.5% turnover Intention Result: 44.5% turnover Intention Result

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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results	Mixed Method Appraisal Tool (MMAT) Score
			Result: Clinical nurses: M=2.50, SD=0.6+3	
Zhang, 2024 <sup>94</sup>	Hospital nurses	Cross Sectional	Measurement: Turnover Intention Son	4/5 (80%)
(China)			Scale: 6 items, Likert scale (4 points)	
			Result: High intention: 32%; Very high intention: 12%	
<b>Zhou et al., 2022</b> <sup>75</sup>	Registered nurses	Cross Sectional	Measurement: Turnover Intention State	5/5 (100%)
(China)			Scale: 3 items, Likert scale (7 points)	
		6.	Result: not directly reported	
Zhu et al., 2023 <sup>74</sup>	Newly graduated nurses (31 hospitals)	Cross Sectional	Measurement: Nurses' Intent to Stay	5/5 (100%)
(China)			Scale: 6 items, Likert scale (5 points)	
			Result: M=3.433, SD=0.731	
		Strategi	es g j	I
Anderson et al., 2021 <sup>128</sup>		Report	and som	n/a
(UK)			simila	
Baumann et al., 2024 <sup>132</sup>		Report	r r tec	n/a
(Canada)			10, 20	
Boulton et al., 2023 <sup>95</sup>	Adult ICU nurses (4 hospitals)	Mixed Methods	Measurement: Intent to Leave Profession	14/15 (93%)
(UK)			Scale: 2 items (moral distress)	
			Result: 37% intent to leave	
Boyle et al., 2022 <sup>123</sup>		Editorial		n/a
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			que	
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1 2				opyrigh	
3 4 5 6	Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results	Mixed Methods Appraisal Tool (MMAT) Score
7 8	(USA)			g for for v	
9	Brooks, 2022 <sup>131</sup>	Nurses at (US health systems)	Report	uses	n/a
11	(USA)			2025 relat	
12 13	Buerhaus et al., 2023 <sup>126</sup>		Editorial	ed to	n/a
14 15	(USA)			t Sup	
16	Chervoni-Knapp, 2022 <sup>118</sup>		Editorial	and o	n/a
17	(USA)	0	0.	data r data r	
19 20	<b>Costa &amp; Friese, 2022</b> <sup>124</sup>		Report	minin	n/a
21 22	(USA)			g, Al	
23	Gaffney, 2022 <sup>120</sup>	American nurses	Report	train	n/a
24	(USA)			ing, s	
26 27 28	Government of Canada, 2024 <sup>6</sup>		Report	und simi	n/a
29 30	(Canada)			June ar te	
31 32	Grubaugh et al., 2023 <sup>85</sup>	New graduate nurses (45 acute care, 1	Cross Sectional	Measurement: Turnover Intent	n/a
33	(USA)	organization) 6 states		Scale: 12 items, Likert scale (7 point	
34 35				<b>Result:</b> 2018–2019: 6.6%; 2020–2021: 63%	
36 37	Hodgson et al., 2024 <sup>125</sup>	National emergency department	Report	lence	n/a
38 39	(USA)	leaders		Bib	
40 41 42 43 44 45 46 47		For peer review only -	http://bmjopen.br	nj.com/site/about/guidelines.xhtml	

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Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results	Mixed Methoo Appraisal Too (MMAT) Scor
Mitchell & Maykut, 2021 <sup>130</sup> (Canada)	D	Multifactorial Analysis	n 4 March Ens J for uses	n/a
<b>Moons, 2024</b> <sup>119</sup> (Sweden)	2	Editorial	related to	n/a
Peters, 2023 <sup>117</sup> (Australia)		Report	wnloaded t Superieu text and	n/a
Slusser et al., 2022 <sup>121</sup> (USA)	Employed nurses and recent retirees (within last 2 years)	Qualitative	data minin	5/5 (100%)
Squires et al., 2022 <sup>83</sup> (USA)	Hospital nurses	Qualitative	g, Al train	5/5 (100%)
Vincent et al., 2022 <sup>122</sup> (Belgium)	Critical care nurses	Editorial	.bmj.com	n/a
<b>Virkstis et al., 2022</b> <sup>127</sup> (USA)	Nursing and human resource leaders, chief financial and chief executive officers, (across sectors)	Editorial	on June 10	n/a
<b>Wang et al., 2023</b> <sup>129</sup> (Canada)	Canadian nurses	Report	1, 2025 at	n/a
		Interven	tions g	
<b>Amicucci et al., 2023</b> <sup>133</sup> (USA)	First year new graduate nurses	Case Report	Measurement: Post-intervention retention         Result: Retention rate: 74%	4/5 (80%)
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2 3 4 5 6	Author(s), year, country	Sample Description	Study Design	Retention Measurement, Scale & Results nc 63 u din o	Mixed Methods Appraisal Tool (MMAT) Score
7 8 9	Cadmus, 2021 <sup>134</sup> (USA)	New graduate nurses (New Jersey)	Case Report	-Not available of 4 March	n/a
10 11 12 13 14 15 16	Gularte-Rinaldo et al., 2023 136 (USA)	New graduate nurses	Program Evaluation	Measurement: Mentoring impact       To go of the second seco	n/a
17 18 19 20 21	<b>Krofft &amp; Stuart, 2021</b> <sup>137</sup> (USA)	Newly hired community hospital nurses	Quality Improvement Project	Measurement: Intent to Stay - Part of 526-item survey         Scale: Likert scale (5 points)         Measult: M=67.33, SD=1.15	n/a
22 23 24 25 26	Lee, 2024 <sup>135</sup> (USA)	New graduate emergency nurses (one large Virginia medical system)	Quality Improvement Project	Measurement: Retention statistics via length of employment Result: Turnover rate reduced from 45% to 5.1%	n/a
27 28 29 30 31	<b>Satoko et al., 2023</b> <sup>140</sup> (Japan)	Hospital nurses (3 hospitals)	Intervention	Measurement: Turnover Rate       Ning         Result: 2021: Hospital B: 12%; Hospital E: 11.5%; Hospital D: 12%; Hospital E: 11.5%; Hospi	4/5 (80%)
32 33 34 35 36	<b>Sattler et al., 2021</b> <sup>142</sup> (USA)	Hospital nurses (1 health system)	Report	Measurement: Turnover Rate Result: Nurse turnover reduced from <sup>91</sup> 3% to 11.8%; 254 nurses retained	n/a
37 38 39 40	<b>Sawyer et al., 2022</b> <sup>138</sup> (USA)	Direct care nurses (large Florida multi- campus healthcare system	Case Control	Measurement: Employment status pre/post intervention Result: Control group turnover: 49.6%; Intervention group turnover: 27.9%	5/5 (100%)
41 42 43 44 45 46 47		For peer review only - F	nttp://bmjopen.b	mj.com/site/about/guidelines.xhtml	1

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Mixed Methoo Appraisal Too (MMAT) Scor	14 14 14 14 14 14 14 14 14 14 14 14 14 1	Measurement, Scale & Re	Study Retention Design	uthor(s), year, country Sample Description Study Design						
13/15 (87%)	Critical care National Health Service nurses Mixed Methods Scale: 3 items, Likert scale (5 points) Result: Post-intervention: M=13.56, BB S.63		gt et al., 2024 <sup>139</sup> Critical care National Health Service nurses       Mixed Methods       Measurement: Intent to Leave Scale: 3 items, Likert scale (5 points)         K)       Result: Post-intervention: M=13.56, B				Critical care National Health Service Mixed Methods Measurement: Intent to Lea nurses Scale: 3 items, Likert scale ( Result: Post-intervention: N		139       Critical care National Health Service nurses       Mixed Methods       Measurement: Intent to Leave Scale: 3 items, Likert scale (5 points)         139       Result: Post-intervention: M=13.56.	
	W W W W W W W W W N W N W N N N N N N N N N N N N N	n included in the scoping	es exploring nurse retention	0 studie	Table 1. Characteristics of 130	ementary	Suppl			
COVID-Specific (N=20)	and data mi	d with retention Psychological Well-be (N=67)	Factors associate fe Staffing and Quality ork Environment (N=55)	Sat Wo	Personal and Demographic (N= 31)	Sample Size	Author(s)			
	ttp://bmjopen. S) .	ning, Al train	out, too few nurses, poor work onment, uncontrolled oad associated with intent to	Burno enviro workle leave		15,738	Aiken et al.			
	ned j.con	Resilience inversely correla	.6			511	Alameddine et al.			
	sted on Ju	Resilience negatively associate with intent to quit				265	Alameddine et al.			
	ne 10, 2025		ce environment scores sely correlated with intent to (adjusted for job satisfaction)	Practic inverse leave		152	Alenazy et al.			
	at Age	Ň	place incivility correlated urnover intent	Workp with tu	Marriage linked to lower turnover intent	191	Alsaif et al.			
		Work constraints indirectly li	overload and job satisfaction	Role c		3,370	Andrews et			

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Aslan et al.	110		Organizational support reduced intent to quit	High macro-control lowered integer to quit	
Boudreau & Rheaume	419	Younger nurses had higher turnover intent	Work environment negatively linked to intent to leave	Emotional exhaustion partiality mediated environment-turnoger 4 link	COVID's impact on turnover mediated by emotional exhausti
Boulton et al.	145			Moral distress linked to interference 2025	
BowenXue et al.	476	Or	Decent work negatively correlated with turnover intent, mediated by work engagement	Higher engagement linked to low returnover intent	
Bruyneel et al.	2,321		Better work environment resulted in lower risk of intent to leave job or profession; Higher patient-to- nurse ratio associated with higher intent to leave profession	ded from http://br rieur (ABES) . Ind data mining, <i>,</i>	
Cakal et al.	462		e l'e	Nurse identity negatively associated with intent to quit	
Chen et al.	333			Clinical stress negatively correlated with intent to stay techno 0, 10, 10, 10, 10, 10, 10, 10, 10, 10, 1	Intent to stay positively correlat with infectious disease nursing course and frequency of caring infectious patients
Choi et al.	688		Manager competencies of 'Staff Advocacy & Development,' 'Team Communication & Collaboration' were negatively correlated with turnover intent	2025 at Agence B logies.	
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	Work-related burnout and compassion fatigue correlated with intent to leave		>20 years of nursing experience correlated with intent to leave (retirement); Direct patient care correlated with intent to leave	1,299	Christianson et al.
	Burnout linked to intent to leave A position	Pay satisfaction linked to intent to leave profession		843	Christianson et al.
	2025. Down related to t	Resource loss in task autonomy, PPE, and psychosocial support increased turnover intent	Married and senior nurses reported higher turnover intent	111	Cole et al.
Nurses exercised agency during pandemic by leaving jobs or job- hopping	nloaded from Superieur (AB ext and data n	Not feeling heard by managers and organizations during COVID-19 and lack of alignment with values led to job-hopping	K	50	Conolly et al.
Nurses in EDs with COVID- positive patients more likely to express intent to leave ED; Lack o connection with colleagues, team, and organization since pandemic onset	ES) . hining, Al training, :	revie		526	Cornish et al.
	Mental health toll on critical are nurses	Traumatic work environment and failed leadership led to disillusionment and intent to leave		425	Crowe et al.
	High levels of burnout associated with intent to leave			3,030	deCordova et al.
	Psychological empowermente. influenced turnover via satisfaction, exhaustion, and mediating effects			507	Ding & Wu
	e Biblio		Intent to stay associated with feeling of duty to serve people and country (Qualitative)	50	Dino et al.

				n-2024 syright	
Djupedal et al.	694		Schedule changes, longer workdays, and quick shift turnarounds during pandemic increased turnover intent	t, including f	
Edmonson et al.	6,562		Intent to leave associated with feeling their voices weren't not heard, job dissatisfaction	Intent to leave associated with feelings of burnout, emotions in the exhaustion, job-related health can appendix worries	
Ekingen et al.	486	Female, long hours, night shifts, <5 years in hospital/ICU linked to higher turnover intent		bownloade to text an	Fear of COVID-19 associated work stress and turnover inter
Elhanafy et al.	210		90r	d from htt d data min	Fear of COVID-19 positively correlated with organizationa professional turnover intent
Enwereuzor et al.	265		Positive relationship between workplace status and intent to stay; organizational constraints negatively impacted intent to stay	Constraints moderated by <b>g</b> . <b>b</b>	
Failla et al.	622		Workload, physician conflict, lack of support predicted intent to leave	g, and simi	Lower intent to leave in 2019 compared to COVID-19 peak (2020-2021)
FasihFar et al.	300			Burnout positively correlated, jog satisfaction negatively correlated with turnover intent	
Flinkman et al.	514			Psychological capital negatively signature of the system o	
Fronda & Leodoro	687			Coronaphobia positively correlated with turnover intent; Social support and coping skills negatively correlated with turnover intent	t

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	Turnover intent positively , in 69 correlated with quiet quitting 433 uding 67 g 67 g 7 g 7 g 7 g 7 g 7 g 7 g 7 g 7 g 7 g		Higher turnover intent among females, shift workers, private sector nurses, those with more experience or perceiving understaffing	629	Galanis et al.
	Moral resilience negatively signatures for the second seco			957	Galanis et al.
	Emotional exhaustion mediates relationship between workplace violence and turnover intenter solo Anxiety about workplace visites increases turnover intent	Workplace violence mediates emotional exhaustion and turnover intent	<sup>r</sup> or	513	Gedik et al.
	Autonomy/competence need a for thwarting mediates burnout and so that turnover intent	CC+	Higher turnover intent among single nurses and those working 48-hour weeks	463	Gherman et al.
	, Al training, and	Perception of lower supervisor support, self-disclosure, and need satisfaction increases turnover intent	Higher turnover intent among younger nurses; Lower intent for Bachelor's vs. Master's degree holders; Higher engagement reduces turnover intent	634	Gherman et al.
	Nurse retention positively correlated with employee engagement			628	Goyal & Kaur
	Higher efficacy scores reduce <b>6</b> turnover risk; Lower optimisen <b>20</b> scores increase turnover risk			4,328	Grubaugh et al.
	Agence B	'Transition to Practice' program increased new graduate nurse commitment, job satisfaction, and reduced turnover intent		4,335	Grubaugh et al.

e 59 of 69			BMJ Open	36/bmjope cted by co	
Habibzadeh et al.	295		Turnover intent positively correlated with bullying (work- related, person-oriented, physically intimidating) and horizontal violence	n-2024-096333 on 4 oyright, including fo	
Han et al.	248	Higher turnover intent in females, unmarried, non-religious, ages 20s–30s vs. 40s, Associate's/Bachelor's vs. Master's degree holders		Burnout significantly impaces segmement 2025. Down to te	
Hanum et al.	1,425	Working year, job title, and marital status positively correlated with intent to stay; younger generation negatively associated with intent to stay		Professional identity positive a correlated with intent to staya be satisfaction mediated relations for mission	
Havaei et al.	3,478		evia	Healthier nurses (better	
Hwang	207		Quality of work-life negatively correlated with turnover intent	y, and si	
Im & Koh	134			Intent to stay correlated with sense of calling, job-esteem, and job satisfaction; Job satisfaction mediated relationship	
Jarden et al.	39		Flexible work, improved relationships, workload management, supportive environments supported retention	Not feeling supported, respected valued, uncertainty of role, " at workload, and rostering led to resignations	COVID-19 contributed to nurses resigning
Kabir et al.	881	Higher turnover intent in private- sector nurses vs. government	Lack of training against workplace violence increased turnover intent	Biblioç	
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		nurses; Turnover intent higher in B.Sc./Master's vs. diploma holders		ht, inclu	
Kachie et al.	527		Role demands significantly impacted turnover intent	Compassion fatigue impacted of turnover intent; Altruistic love and vision moderated the effect	
Karakachian et al.	550	Higher turnover intent in nurses with 11–15 years of experience vs. <1 year	Participation in hospital affairs and staffing reduced intent to leave	Moral distress related to team/system increased intenated to leave	
Kitamura & Nakai	227	Higher turnover intent in nurses aged $\geq$ 30 years and those with $\geq$ 15 years' experience	Reduced workload, pay raises, and counseling linked to turnover intent	Difficulty relaxing, falling a contract of the	
Kleier et al.	189		°°/	Affective commitment and the from resilience negatively linked the second secon	
Kwon & Song	155	Higher turnover intent in female nurses vs. males	0.	Emotional labor positively	
Labrague & Santos	261		0	ining, and sin	Fear of COVID-19 positively correlated with psychological distress, organizational, and professional turnover intent
Labrague & Santos	270			Compassion fatigue positively correlated with organization turnover intent. Resilience for to negatively correlated and patially mediated relationship	
Labrague et al.	259			Psychological resilience negatively correlated with professional turnover intent	COVID-19-related discrimination positively correlated with professional turnover intent
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		<b>F</b>	ouh. http://busics.com/com/com/com/	ohique de	
		For peer review	oniy - http://bmjopen.bmj.com/site/	about/guideimes.xntmi —	
Lavoie- Tremblay et al.	1,705		Poor preparation and overwhelming workload during pandemic increased turnover intent	ht, includin	Higher intent to leave among the infected with COVID-19 or who team members were infected
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Lee et al.	202			Occupational stress positive correlated with turnover intent; Recovery experience negative correlated and moderated relationship	
Liu et al.	200	0		Resilience, post-traumatic go the and professional benefits post we linked to intent to stay; Resifter of had strongest effect	
Lofti et al.	190		Safety climate reduced turnover intent during COVID-19	data min	
Lou et al.	64		6	Burnout associated with interactions quit	
Matsuo et al.	975		6	Intent to leave negatively line of coherence and work life balance; Positively linked to a schustion, cynicism, imbalance and burnout	
Medvec et al.	13,687	Intent to leave highest among youngest nurses and those ≥65 years old; Abuse increased intent to leave	Favorable practice environment, higher staffing, and adequate resources reduced intent to leave	Burnout, stress, inadequate ar Lunstaffing, and mandatory over fime 10, 20, 20, 20, 20, 20, 20, 20, 20, 20, 2	
Mehra et al.	229	Marital status significantly influenced job turnover intention		ies.	Fear of COVID-19 significantly influenced turnover intent
Miller et al.	28			Sustained demands, challenging <b>B</b> work environment, and fear of future pandemics correlated with intent to leave	

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Mirzaei et al.	479	Gender, marital status, and position predicted turnover intent		PTSD, job strain, insecurity positively linked to turnoverenteet; Social support negatively linked	
Nakai et al.	81	Nurses with <2 years' experience more likely to leave due to anxiety, not finding work meaningful, frustration, and fear		n 4 March 202 g for uses rela	
Nakic et al.	120			Transition shock linked to the two of the transition shock linked to the two of	Personal and professional COVID- 19 stressors linked to turnover intent
Nam et al.	308		Workplace violence indirectly increased turnover via distress	Distress positively linked to and data from turnover intent data n	Caring for COVID-19 patients strengthened distress's effect on turnover intent
Nashwan et al.	512	Higher turnover intent in single nurses, those with 5–10 years' experience, critical care/emergency nurses pre-COVID	rev:	http://bmjope ES) . Al trai	Turnover intent higher during COVID, especially among those deployed 3–6 months; Decreased after 6 months
Noer et al.	1,318	Higher seniority linked to turnover intent; Part-time nurses more likely to leave than full-time	0	Turnover intent linked to generalized work pressure	
Ohue et al.	56			Burnout, subthreshold deprezion and anxiety disorder positively correlated with intent to leave	Anxiety and intent to leave increased with more COVID-19 patients
Pahlevan Sharif et al.	305		Organization support, pay satisfaction, and job satisfaction negatively correlated with turnover intent.	Job satisfaction mediated relationship between organications support and turnover intent.	
Poku et al.	348	Significant predictors of turnover intent: years in healthcare, general well-being, job control,	Quality of work-life negatively, work stress weakly positively linked to turnover intent	nce Biblio	
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		satisfaction, and working conditions		t, inclu
Putekova et al.	1,170	Higher turnover intent among hospital nurses	Extreme workload, inadequate pay, and lack of appreciation associated with intent to leave	ding for us
Rheaume & Breau	236		Lack of administrative support and poor work environment noted as reasons for leaving	Psychological safety and physical safety reported as main reas
Rotenstein et al.	11,040	0r	Work overload increased turnover risk; Inpatient nurses more likely to leave than outpatient nurses	to text and
Said & El- Shafei	420		Night duties (>3/week) linked to greater turnover intent	dur (ABE
Salaten et al.	257		61.	Job satisfaction and professional identity positively correlated with intent to stay
Sanner-Stiehr et al.	399		Workplace support positively linked to intent to stay	lining, a
Sat et al.	263		Nurses exposed to violence, mobbing, longer working hours, and higher patient loads had higher turnover intent; Severe working conditions identified as the primary reason for leaving	nd similar technolo
Schug et al.	757		Lower reward levels, part-time work, and department changes during the pandemic predicted turnover intent.	Higher depression levels prodict to the second seco

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COVID-19-stress and anger significantly influenced turnover intent	Emotional exhaustion mediated relationship with turnover internet			301	Shah et al.
	Age and burnout were significant predictors of turnover intent		Higher turnover intent in nurses in their 20s	9,520	Shapiro et al.
	ch 2025. Dow es related to t	Work experience positively correlated with job retention; Job retention and organizational commitment positively correlated	A.	172	Shayestehazar et al.
Vaccination status, COVID-19 patient care, and working unit significantly affected intent to leave	nloaded from Superieur (AE ext and data r	00	Younger nurses had greater intent to leave; older nurses (51–69 years) more likely to remain	437	Sihvola et al.
Organizational COVID-related stress predicted turnover intent	Burnout, exposure fear, and anxiety/depression linked tog .	High workload predicted turnover intent	>20 years of experience associated with intent to leave	2,301	Sinsky et al.
	raining, an	Workplace management and organizational support impacted turnover intent		318	Squires et al.
	Fatigue and burnout positively, jeb satisfaction negatively linket to 9 turnover intent			374	Sun et al.
	Burnout scores positively correlated with turnover integet gies State Burnout scores positively correlated with turnover integet state Sta	Turnover intent negatively correlated with organization resources and motivation in pandemic areas	Turnover intent negatively correlated with age, self- awareness, and self-regulation in non-pandemic crisis areas	322	Sungbun et al.
	gence Bib	Turnover intent negatively correlated with sense of security and work engagement; Work engagement mediated relationship		2,480	Tang et al.

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			between security and turnover intent	4-09633 t, inclu	
Urban	192	Highest turnover intent in new nurses (9–12 months) due to incivility, stress, dissatisfaction		Stress and co-worker incivility of the stress and co-work	
Varasteh et al.	16	Younger and novice nurses with unstable contracts more likely to leave	Positive environment and financial incentives supported retention	Sense of commitment and work in 202 conscience motivated retent	Fear of infection and fear of infecting families impacted willingness to work
Wang et al.	321		Safety climate positively impacted willingness to stay	Psychological capital positive s linked to willingness to stay	
Wang et al.	673		Certo	Emotional intelligence and jab performance negatively correction with turnover intent; Job performance mediated relationship	
Wei et al.	900		High intent to leave linked to lower work engagement scores	Al traini	
Yang et al.	13,966		Working with nursing home- employed NPs reduced registered nurse and certified nursing assistant turnover	ng, and simila	
Yu et al.	1,600	Nurses with no children and unmarried nurses more likely to stay	Perceived hospital support increased retention; Poor communication with nurse managers and greater organizational constraints negatively impacted intent to stay	Lower stress and better RN-&Dune relations supported retention 10, 2025 at Age	
Zangiabadi & Ali-Hassan	3,430	Higher turnover intent in nurses with <10 years' experience and those working multiple locations	Outpatient and ambulatory care had lower turnover intent than acute care; Lack of training in IPC increased intent to quit	Stress, burnout, mental health concerns, and lack of job satisfaction significant reasons for quitting	

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Zeiher et al.	56		Unfavorable work environment accounted for 20.3% of nurses' intent to leave	-2024-096333 ( yright, includir	
Zeng et al.	2,299		Inclusive leadership negatively impacted turnover intent	Psychological ownership had direct effect on turnover intent	
Zhang	2,513	For		PTSD, social support, and presenteeism significantly predicted turnover intention and attendance participation support and attendance participation mediated PTSD and intent to leave	
Zhou et al.	576		Distributive, procedural, and interpersonal justice positively influenced turnover intent; informational justice negatively liked to turnover intent	Job engagement negatively added affected turnover intent and gate mediated relationships between the organizational justice composition and turnover intent	
Zhu et al.	759		Job satisfaction positively associated with intent to stay	Transition shock and negative 3 coping negatively associated with intent to stay	
Supp	lementary <b>T</b>	able 2. Factors associated w	ith nurse retention	tg, and	
Author(s)		Strategies for Nurse Rete	ention	t similar	Strategy Category*
Anderson et al.		<ul> <li>Career progression and d</li> <li>Promotion of mental heal</li> <li>Workplace discrimination</li> <li>Adequate pay, employment</li> </ul>	evelopment opportunities Ith and psychological support n reduction ent conditions, and benefits (e.g., tax	technologies. x relief on pensions)	4 2+3 1 5
Baumann et al.		- Funding incentive progra - Bridging programs for sp	ms for retention in specific areas becialty care areas (e.g., critical care)	) E	5 4
Boulton et al.		<ul> <li>Individualized, informal</li> <li>Embedding senior profes</li> </ul>	support to foster a supportive environ sionals to facilitate discussions on n	noral distress	1 2+3
		For peer review	w only - http://bmjopen.bmj.com/site/	/about/guidelines.xhtml	

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2 3 4 5 6 7	Boyle et al.	<ul> <li>Financial support for continuing education and professional certifications</li> <li>Positive work environments and safe nurse-patient ratios</li> <li>Work-life integration and minimizing physical demands</li> <li>Enabling nurses to work to their full capabilities (e.g., reducing administrative tasks)</li> </ul>	4 1 1 4
8 9 10	Brooks	- Incentive pay tied to unit vacancy rates	5 5
10 11 12 13 14 15 16	Buerhaus et al.	<ul> <li>Matching work environment with nurses' priorities and needs</li> <li>Transition-to-practice programs for new graduates</li> <li>Preventing workplace violence and increasing access to mental health resources</li> <li>New care models (e.g., task shifting, expanded scope of practice, telehealth)</li> <li>Career reinvention resources and data collection on attrition</li> <li>Increased incentives for preceptors/mentors</li> </ul>	1 4 1+2 1 4 5
17 18 19 20	Chervoni-Knapp	- Retention bonuses and overtime rates for high-risk areas (e.g., COVID-19 units) - Flexible staffing schedules and cross-training programs	5 1+4
21 22 23 24 25	Costa & Friese	<ul> <li>Federal rules for safe staffing ratios with financial penalties for overloads</li> <li>Mandatory patient-to-nurse ratios and prohibition of mandatory overtime</li> <li>Loan repayment programs and incentives for childcare or onsite education</li> </ul>	1 1 5
25 26 27 28	Gaffney	<ul> <li>Flexible staffing options (e.g., reciprocal employment agreements, part-time roles)</li> <li>Competitive compensation, paid time off, pension plans, stay interviews</li> <li>Transition programs for new graduates and late-career nurses</li> </ul>	1 5+2 4
29 30 31 32 33 34 35 36 37 38 39 40	Government of Canada	<ul> <li>Job fulfilment and leadership opportunities across all levels, roles, and settings</li> <li>Enhance scheduling systems, workplace resources, and amenities to improve flexibility</li> <li>Zero tolerance for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism; moral distress care; best practices for violence, bullying, and racism;</li></ul>	2+4 1 2 4 2 3 3 1+2 5
40 41 42 43 44 45 46 47		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	

	Autnor(s)	Sample	Intervention	
	Supplementa	ry Table 3. Strategie	es for nurse retention	Agence Bibl
	Improved leader	ship and communication	<b>4)</b> Increasing professional development and mentorship c	opportunities 5) Beter corport ation and incentives
vang et	aı. *Strateav Catead	- Conducting pries: 1) Ensuring safe fle	stay interviews to strengthen staff engagement xible staffing and quality work environments <b>2)</b> Enhancing	g organizational mental head the end wellness supports 3)
Virkstis (		- Accelerating - Offering fle	xible, non-traditional roles	similar te
Virlectio	ot al	- Encouragin - Good work-	g leadership, mentorship, and teaching opportunities -life balance and psychological support	<b>i</b> g, <b>a</b> <b>and i</b> g <b>2</b> +1
lusser e	t al.	- Flexible sch - Mentor-pred - Recognitior	equilibrium terms of the second secon	<u>▶ 1</u> traini, 1 4 3
eters		- Transition a - Flexible sch - Policy refor	and mentorship programs tailored to demographics nedules aligned with individual preferences rms to address workplace bullying and safety	ta mining.
Ioons		- Structured c - Stress reduc - Social supp - Extra staffir	onboarding and transition programs etion programs (e.g., mindfulness, self-care) ort initiatives (e.g., listening events, facility dogs) ng, work environment optimization, and innovative teo	chnologies data data data data data data data dat
Aitchell	& Maykut	- Mentorship - Aligning be - Strengthenii	and structured programs with clear expectations for n st practices with quality and safety education principle ng partnerships between academia and professional pr	1ew graduatesset set set set set set set set set set
Iodgson	et al.	- Temporary - Twice-daily - Improving r	or permanent pay improvements (e.g., shift bonuses, i physician-led "medical minute" huddles nurse-patient ratios and promoting a team environmen	internal travel programs $3$ $3$ 5 3 $3$ $4nt 5 41$ $2$ $1$
irubaug	h et al.	- Structured t	ransition-to-practice programs for new graduate nurse	es inc 4
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Amicucci et al.	New graduate nurses (White Plains Hospital, White Plains, New York)	<ul> <li>Nurse Residency Program to support transition to practice</li> <li>Ongoing support and assessment to address knowledge gaps</li> <li>Initiated role of Nursing Orientation Resource Coordinator (NORC)</li> <li>Monthly team check-ins with Nursing Orientation Resource Coordinator and the clinical education team</li> <li>Emotional intelligence education</li> <li>Routine Care Code Meetings to debrief stressful work situations</li> <li>Pairing with preceptors and peer mentors</li> </ul>	-Dvegall retention rate s poges inception: 74% uding for uses related to box
Cadmus	New graduate nurses (New Jersey, USA)	<ul> <li>Statewide 12-month residency program across 19 hospitals</li> <li>Didactic education</li> <li>1:1 preceptor-mentor on-the-job hours</li> <li>Residency reflections</li> </ul>	- Solution in process; of for the solution in process; of for
Gularte- Rinaldo et al	<ul> <li>4,335 Versant NGN</li> <li>program participants (2018-2021)</li> <li>(Multiple care settings in 6 states)</li> </ul>	- Mentorship program with culturally congruent, customized pairing for 96 mentees	
Krofft & Stuart	18 newly hired staff nurses (300-bed Midwestern US hospital)	- Evidence-based mentoring program for new RNs in medical- surgical units during the COVID-19 pandemic	-antent to stay slightly lo provide to slightly
Lee	New graduate emergency nurses (Sentara Health (SH) system)	<ul> <li>Emergency Department RN Transition to Practice Pathway</li> <li>Standardized orientation</li> <li>Ongoing mentoring</li> <li>Gradual professional growth opportunities</li> </ul>	- Retention rates: - 96% at 6 months - 86% at 1 year - pre-COVID 2-year ret 82% post-COVID: 65%

		BMJ Open	136/bmjopen-20 cted by copyrig
Satoko et al.	Nurses (3 hospitals)	<ul> <li>Clinical process support system (Team Compass with Patient Condition Adaptive Path System, TC-PCAPS)</li> <li>COVID-19 Clinical Management System (COVID-19-CMS)</li> </ul>	
Sattler et al.	Nurses (Large academic medical health system in the Southeastern US)	<ul> <li>Nurse Retentionist Role using evidence-based strategies including: <ol> <li>Planned individual meetings</li> <li>Intentional relationship building</li> <li>Revised clinical ladder with peer mentor program expansion</li> <li>System-wide retention committee</li> <li>Focused recognition efforts</li> </ol> </li> </ul>	- The turnover dropped to State (from 13%), retaining 254 reference to text and to text and
Sawyer et al.	108 direct care nurses (Intervention group matched with non- participants)	<ul> <li>RISE (Resilience, Insight, Self-compassion, Empowerment): psychoeducational group sessions</li> <li>8 weekly 90-minute in-person group sessions</li> <li>Developed/delivered by licensed mental health counselor</li> </ul>	-55 paration rate: -55 pa
Vogt et al.	84 critical care nurses	<ul> <li>Reboot: Resilience-boosting psychological coaching program</li> <li>Two 2-hour online group workshops (Zoom)</li> <li>Two 1-hour individual coaching calls with a Cognitive- behavioral therapist</li> </ul>	-Significant reduction in intent to avescritical care nursing: Pro-Reboot: Mean = 11.50 (SD 2.2) Post-Reboot: Mean = 13.56 (SD = 1.63)
upplementa	<b>ry Table 4.</b> Interventions	trialled for nurse retention	ne 10, 2025 at Agence Bibliographique d
	For pe	eer review only - http://bmiopen.bmi.com/site/about/guidelines.xhtml	le