

Effectiveness of evidence-based interventions in promoting resilience among nursing students in all years of study: an umbrella systematic review protocol

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Review title

Effectiveness of evidence-based interventions in promoting resilience among nursing students in all years of study: An Umbrella Systematic Review Protocol

Abstract

Objective: This review aims to summarize the evidence on the effectiveness of evidence-based interventions in promoting resilience among nursing students in all years of study.

Introduction: Nursing inherently involves high-stress environments, substantial workloads, and emotional strain. Amid these challenges, nursing resilience is vital for ensuring the quality of patient care and protecting nurses' well-being. Nursing students learn about these problematic work environments that they will be a part of upon graduation through courses and clinical experiences. Understanding interventions that promote the resilience of nursing students in the context of their nursing education will help support their preparedness for today's challenging healthcare systems.

Inclusion criteria This review will include research syntheses about evidenced-based interventions to promote resilience among prelicensure professional nursing students in all years of study. This can include those in diploma, associate degree, baccalaureate degree or pre-licensure Master of Science in nursing programs. Comparisons will be made across evidenced-based interventions. This review will consider systematic reviews with and without meta-analysis that include the primary outcome of resilience and possible secondary outcomes of emotional well-being, academic satisfaction, and retention.

Methods: A comprehensive search will be carried out across CINAHL (EBSCOhost), MEDLINE (EBSCOhost), Cochrane Library (Ovid), JBI ES, EMBASE and Epistemonikos. The search will focus on English-language articles without limitations on geographical location or publication dates. Two independent reviewers will screen the titles and abstracts based on the inclusion criteria. The selected reviews will be appraised using the JBI critical appraisal instrument for systematic reviews and research syntheses. Data from each review will be extracted using the JBI data extraction tool. The review characteristics and findings will be presented through a narrative summary and detailed tables.

Review registration: PROSPERO ID: CRD420251111264

Keywords: nursing students, resilience, emotional well-being, academic satisfaction, retention, umbrella review

Introduction

Overview

Nursing practice is known for its high-stress environments, demanding workloads, and emotional challenges. Even before entering clinical practice, nursing students encounter similar challenges in the context of pre-licensure nursing education. These challenges include learning complex content, taking high-stakes theory exams, passing skills and competency testing, completing clinical rotations in various settings, and navigating a landscape with many emotional highs and lows. Resilience can help nursing students navigate these highs and lows. Resilience is coping with stress effectively, returning from adversity, and sustaining professional performance.¹ Resilience can reduce the likelihood of errors, improve patient safety, and enhance overall patient satisfaction.² Resilience is important as it impacts nursing students' and nurses' mental and physical health and the overall effectiveness of care delivery.¹

Nursing is synonymous with high-stress environments, demanding workloads, and emotional challenges. Developing effective strategies to promote resilience during nursing education is crucial for navigating stressful clinical learning environments. When instructors facilitate these skills, nursing students can protect their well-being and foster positive learning outcomes in the face of stressors.

Resilience has been linked to improved well-being and reduced burnout among nursing students.³ Burnout has become a global health crisis, further intensified by the pandemic. According to the International Council of Nursing,⁴ 90% of National Nursing Associations (NNAs) express concern that stress and burnout, exacerbated by increased workloads without adequate resources, are leading causes for nurses leaving or considering leaving the profession. Moreover, the COVID-19 pandemic has heightened burnout and attrition rates among new graduate nurses, underscoring the urgent need for mental health support.⁵ This discussion emphasizes the importance of utilizing nursing education to build resilience in nursing students, who represent the future workforce of the profession.

Impact of Resilience on Nursing Student Success

To develop a robust and capable nursing workforce, it is essential to ensure that qualified nursing students receive the support they need to complete their programs successfully.

Unfortunately, up to 30% of prelicensure students are lost to attrition before graduation.⁶ Resilience is associated with better success during nursing education. In a study of 554 nursing students across six nursing schools in Belgium, it was found that resilience was the only factor (including age, gender, previous education, nationality, previous education, and caring for family members) that was significantly associated with the academic outcomes studied; it was found to promote academic success and be protective against both intent to leave and dropout.⁷ Resilience was also positively associated with learning engagement and developing a professional identity in nursing, mediating between those factors.⁸ Students with higher resilience scores also recognized their stressors, accepted their limitations, and applied coping strategies.⁹

According to Crary,¹⁰ nursing students face unique challenges due to the simultaneous didactic and clinical experiences they undergo, unlike other health profession students at the undergraduate level. These challenges include stress from interactions with teachers and nursing staff, rejection by peers and patients, feelings of inadequacy, self-doubt, unpreparedness, lack of knowledge and skills, fear of making mistakes, heavy workloads, and fears related to graduation, coursework, clinical, the NCLEX-RN, and time management. Incorporating resilience-building strategies into the curriculum, such as stress management workshops and reflective practices, can enhance students' resilience.¹¹ While some adjustments to the curriculum may be beneficial, nurse educators are unlikely to fully alleviate the everyday stressors nursing students face. Instead, the focus should be on identifying strategies to build resilience among nursing students. Resilience helps students manage stress during their education and equips them with coping mechanisms for their future careers as licensed nurses. Students can better handle challenges that often lead to academic burnout by fostering resilience, ultimately creating a healthier and more balanced academic experience. Academic burnout, characterized by chronic stress and exhaustion from prolonged academic demands, results in emotional, physical, and mental fatigue, impairing a student's performance. Studies suggest academic burnout often begins early in nursing programs and intensifies as semesters progress, especially during clinical experiences.^{12,13} Although global data is unavailable, estimates indicate that 20% of nursing students experience academic burnout.¹⁴ Factors contributing to burnout include academic workload, tests, assignments, direct patient care responsibilities, clinical environments, and interactions with educators.

Studying Nursing Student Resilience

United States (US) based nursing education programs are transitioning to a competency-based framework and The American Association of Colleges of Nursing (AACN) has identified the following competency: "the development of the nurse as an individual who is resilient, agile and

capable of adapting to ambiguity and change”.¹⁵ This falls under Domain 10 of the Essentials—Personal, Professional, and Leadership Development.¹⁵ Considering it will now also be required for accreditation in the US, the importance of a better understanding of fostering resilience in nursing students is underscored.

In an integrative review of resilience in nursing students, it was concluded that key factors that promoted resilience included strong feelings of empowerment, the passage of time with an awareness of cumulative successes, and social support from significant others, peers, and faculty.¹⁶ From an intrapersonal standpoint, Hughes and colleagues¹⁶ concluded that resilience is associated with self-stewardship/self-care, emotional intelligence, optimism, and self-efficacy. Resilience also appears complex, changing over time and negatively associated with higher perceived stress levels, suggesting that effective stress management techniques may also build resilience.¹⁷

When considering specific resilience-building strategies, the authors report that building resilience may require multi-modal interventions over time.^{18,19,20,21} A qualitative systematic review and thematic analysis s concluded that a learning culture that included trustworthiness and integrated various strategies to support students might effectively promote resilience.¹⁹ Another systematic review recommended that multi-dimensional strategies be utilized to promote resilience in nursing students, including adequate information sharing, progressive skill acquisition, and reflective learning.²⁰ Ejaz et al.¹⁸ also concluded that there may be a delayed effect of strategies to build resilience, especially in undergraduate nursing students, suggesting multi-dimensional approaches implemented over time. Strout and colleagues²² have implemented a longitudinal group of WellNurse interventions to promote resilience and reduce burnout, including promoting physical fitness and nutrition, mindfulness building, stress management, and peer support. These will be implemented over time and measured longitudinally, following the student's level of resilience, perceived stress, burnout, life satisfaction, BMI, and other sleep and nutritional metrics.²²

Overall, ongoing support, developing adequate coping strategies for expected stressors, and deploying multiple strategies are needed to promote resilience. This makes it crucial to organize the systematic review data under this umbrella to identify further which strategies or interventions are the most effective for nursing students, our future nursing workforce.

Review question(s)

What interventions have been used, and how effective are they in promoting resilience among prelicensure professional nursing students in all years of study?

Inclusion criteria

Participants

The review will consider studies promoting resilience among students in a prelicensure professional nursing program within any year of study. This can include those in diploma, associate degree, baccalaureate degree or pre-licensure Master of Science in nursing programs. Participants will be of any gender, age, race, and ethnicity. Studies of licensed practical nurses and graduate student nurses will be excluded. Studies involving other health professions students (unless nursing student data can be separated) will also be excluded.

Interventions

This umbrella review will examine studies assessing interventions to foster resilience within this population. It will identify systematic reviews, with or without meta-analyses, that have evaluated the effectiveness of interventions based on a resilience promotion model, which encompasses physical, psychosocial, environmental, and academic organizational factors (e.g. flexible scheduling, resilience training programs). The review will consider a variety of resilience-building interventions, including mindfulness and meditation practices, prioritizing self-care, developing practical coping skills, seeking professional support when needed, and educational opportunities. We will analyse whether these interventions are implemented individually or in combination. Only interventions conducted within nursing programs will be included, and the studies must evaluate the intervention. The providers of these interventions will be identified, and they may include professionals with diverse levels of expertise.

Comparators

This umbrella review will examine systematic reviews, including those with or without meta-analyses, that evaluate interventions promoting the primary outcome of resilience, with or without a comparator. The comparator may include the usual nursing curriculum or usual educational supports built into a program without a specific focus on strengthening the students' resilience. The focus will also be on possible secondary outcomes related to emotional well-being, academic satisfaction, and retention within the target population. Studies that compare these interventions to a control group, such as standard practice, will also be included. At least one intervention to enhance resilience must

be part of the studies. The review will also facilitate comparisons among evidence-based interventions.

Outcomes

The primary outcome in this review is resilience as measured by well-known and validated resilience scales, including but not limited to the Resilience Scale (RS), A 25-item, scale that assesses personal resilience; or the Connor-Davidson Resilience Scale (CD-RISC), a widely used tool with 25 items, designed to measure resilience across various populations; or the Predictive 6-Factor Resilience Scale (PR6) which evaluates six domains of resilience-Vision, Composure, Tenacity, Reasoning, Collaboration, and Health; or the Brief Resilience Scale (BRS), a shorter scale that focuses on an individual's ability to bounce back from stress; or the Ego-Resiliency Scale (ER89), which measures psychological resilience and adaptability.

Resilience is the capacity to cope with stress effectively, bounce back from adversity, and sustain professional performance.¹ Resilience is thought to mitigate the negative effects of stress, thereby improving overall well-being.²³ As nursing students aim for competence when caring for patients, curriculums must help shape professional mindsets, values, and critical thinking skills.²⁴ Cultivated and sustained resilience is also key for nursing students to ensure academic and future career success.²⁵

Possible secondary outcomes are emotional well-being, academic satisfaction, and retention in the nursing program. *Emotional well-being* is all about how you feel and manage your emotions daily. It is the ability to cope with life's challenges, to feel good about yourself and your relationships, and to enjoy life despite its ups and downs. Key components include self-awareness (understanding your own emotions, strengths, and weaknesses), emotional regulation (the ability to manage and respond to emotions positively), positive relationships (having fulfilled and supportive interactions with others), purpose and meaning (engaging in activities that give you a sense of purpose and accomplishment), and resilience.²⁶ *Academic satisfaction* is a subjective evaluation of a student's entire educational experience, which is a factor in determining the quality of learning²⁷. This can be affected by institutional characteristics, preparation for practice, and clinical experiences. Satisfaction within these areas can affect students' desires to remain in nursing programs and/or the nursing profession after graduation²⁷. *Retention* implies that higher education institutions that are successful at retaining current students are promoting program completion, maintaining competitive

recruitment numbers, and focusing on improving their ability to meet the needs of students to prepare them for their careers in a meaningful way.²⁸

Types of studies

To be included in this umbrella review, systematic reviews with or without meta-analyses must define resilience, measure resilience in some manner, describe the factors that enhance or impede resilience, and strategies to promote resilience. Consultation will occur between the reviewers to determine the definition's suitability. We will exclude qualitative and economic systematic reviews. We will exclude systematic reviews that used other than primary studies to conduct the review.

Methods

The proposed systematic review will use the JBI methodology for umbrella reviews.²⁹ This protocol has been registered in [include PROSPERO number or equivalent].

Search strategy

The search strategy will aim to locate published and unpublished studies. An initial limited search of MEDLINE (PubMed), CINAHL, and EMBASE was undertaken to identify articles on the topic. The text words in the titles and abstracts of relevant articles and the index terms used to describe the articles were used to develop a full search strategy for MEDLINE (PubMed). The Epistemonikos database was also searched. See Appendix A for an example. The search strategy, including all identified keywords and index terms, will be adapted for each included information source. The reference list of all studies selected for critical appraisal will be screened for additional studies.

Study selection

Titles and abstracts will be screened by two independent reviewers for assessment against the inclusion criteria for the review. Potentially relevant studies will be retrieved in full, and their citation details will be imported into the JBI System for the Unified Management, Assessment, and Review of Information. Two independent reviewers will assess the full text of selected citations in detail against the inclusion criteria. The review will record and report Reasons for excluding full-text studies that do not meet the inclusion criteria. Any disagreements between the reviewers at each stage of the study selection process will be resolved through discussion or with a third reviewer. The search results will be reported in full in the final review and presented in a Preferred Reporting Items for Systematic

233 Reviews and Meta-Analyses (PRISMA) flow diagram.³⁰

234 *Critical Appraisal*

235 Two independent reviewers will assess quantitative systematic reviews selected for retrieval for
 236 methodological validity before inclusion in the review using standardized critical appraisal
 237 instruments from JBI SUMARI for Umbrella Reviews. (Appendix III; JBI manual)

238 Authors of papers will be contacted once to request missing or additional data for clarification,
 239 where required. Any reviewer disagreements will be resolved through discussion or with a third
 240 reviewer. Critical appraisal results will be reported in narrative format and a table. All studies,
 241 regardless of the results of their methodological quality, will undergo data extraction and synthesis
 242 (where possible), and any apparent flaws will be noted. Critical appraisal results will be reported in
 243 narrative form and a table. Regardless of the results of their methodological quality, all syntheses
 244 will be included in the review. Any potential flaws will be described.

245 *Data extraction*

246

247 Quantitative data will be extracted from studies included in the review by two independent
 248 reviewers using the standardized JBI data extraction tool in JBI SUMARI for Umbrella Reviews
 249 (Appendix II). Specifically, quantitative data will be composed of data-based outcomes of descriptive
 250 and/or inferential statistical tests. Data extraction will comprise review characteristics (title, first
 251 author, country, year of publication, objectives, the number of included studies), included
 252 populations (sample sizes, age, gender, clinical practice area), and search strategy (e.g., electronic
 253 databases and inclusion/exclusion criteria), the intervention studied (name/type of interventions,
 254 intervention components, type of controls, sample sizes, effect sizes).analysis and synthesis of data,
 255 overall findings and authors' conclusions. For reviews with meta-analyses, data will be extracted on
 256 effect sizes (e.g., rate ratio, risk ratio, odds ratio, mean difference, or standardized mean difference
 257 for continuous data) and corresponding 95% CIs and P values.

258 Any reviewer disagreements will be resolved through discussion or with a third reviewer. Extracted
 259 data will be presented in a Table of Included Review Characteristics. This table lists the systematic
 260 reviews and meta-analyses included in the umbrella review and relevant details such as the authors,
 261 year of publication, study design, and key findings. It will help provide transparency and allow

readers to see which studies were considered and why. We will pilot the data extraction process on five studies.

Data synthesis and integration

The presentation of the findings and results will align with the umbrella review question. Overall effect estimates extracted from systematic reviews will be presented in tabular form (Table 1 example), including the quantitative data, the number of reviews that inform the outcome, the number of participants (from included reviews), and statistical heterogeneity for each variable/outcome of interest. The tabular presentation will accompany a description of the intervention/outcome addressed that converts these findings into qualitized data (Table 2 example). This will involve transformation into textual descriptions or narrative interpretation of the quantitative results in a way that answers the review question. Assembled data will be categorized and pooled together based on similarity in meaning to produce a set of integrated findings in the form of line-of-action statements. The methodological and clinical heterogeneity of included reviews and their quality (low, moderate, or high) will be reported and considered about the overall evidence. The results of the umbrella review will be presented in a table using visual indicators (traffic light system) to represent the beneficial, neutral, and negative effects of each risk intervention. The degree of overlap of original research studies in the included research syntheses will be illustrated with a citation matrix and the corrected covered area (CCA) index will be calculated.³¹ Reviews demonstrating significant overlap will undergo closer examination and may be excluded if necessary.

Table 1 (example)

Intervention/ Outcome	Author/Yr	#studies/participants	Results/finding	Heterogeneity

Table 2 (example)

Phenomenon of Interest	Synthesized Findings	Strategy Details

Certainty of Findings

The Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) approach³² will be employed to evaluate the quality of evidence and the strength of recommendations across reviews. This method ensures transparency and consistency in the assessment of evidence. A Summary of Findings will present the outcomes of the included reviews. For similarities between risk factors and interventions, the GRADE approach will assess the quality of evidence by considering the risk of bias, inconsistency, indirectness, imprecision, and publication bias. Based on these factors, the quality of evidence will be either downgraded or upgraded, with all adjustments thoroughly documented. The quality of evidence will be classified as high, moderate, low, or very low.

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Appendix I: Search strategy

Updated with new terms

Ovid MEDLINE(R) ALL <1946 to June 17, 2025>

- 1 Students, Nursing/ 32100
- 2 (nurs* adj2 student*).mp. 43273
- 3 education, nursing/ or education, nursing, associate/ or education, nursing, baccalaureate/
- 4 or education, nursing, diploma programs/ 59956
- 5 stress, psychological/ or burnout, psychological/ or burnout, professional/ or caregiver
- 6 burden/ or emotional exhaustion/ or financial stress/ or occupational stress/ or compassion fatigue/
- 7 or subjective stress/ or time pressure/ 158252
- 8 (resilience or resilient or resiliency or wellbeing or well-being or "educational satisfaction" or
- 9 hardiness or "bounce back" or adaptation or adjustment or endurance or tenacity or perseverance
- 10 or adaptability or "psychological capital" or fortitude or flexibility or toughness or (ability adj2
- 11 (endure or adapt or cope or thrive)) or self-efficacy or "self efficacy").mp. [highlighted terms were
- 12 added based on review from the team] 1032052
- 13 exp Mental Disorders/pc [Prevention & Control] 56399
- 14 exp anxiety/pc or depression/pc or emotional exhaustion/pc or exp psychological distress/pc
- 15 or sadness/pc 10756
- 16 or/1-3 82788
- 17 or/4-7 1206801
- 18 8 and 9 6259
- 19 (systematic review or scoping review).ti. or scoping review.ab. or meta-analysis.pt. or meta-
- 20 analysis.ti. or systematic literature review.ti. or this systematic review.tw. or pooling project.tw. or
- 21 (systematic review.ti,ab. and review.pt.) or meta synthesis.ti. or meta-analy*.ti. or integrative
- 22 review.tw. or integrative research review.tw. or rapid review.tw. or umbrella review.tw. or
- 23 consensus development conference.pt. or practice guideline.pt. or drug class reviews.ti. or cochrane
- 24 database syst rev.jn. or acp journal club.jn. or health technol assess.jn. or evid rep technol assess
- 25 summ.jn. or jbi database system rev implement rep.jn. 517622
- 26 (clinical guideline and management).tw. 833
- 27 (evidence based.ti. or evidence-based medicine.sh. or best practice*.ti. or evidence
- 28 synthesis.ti,ab.) and (((review.pt. or diseases category.sh. or behavior.mp.) and behavior
- 29 mechanisms.sh.) or therapeutics.sh. or evaluation studies.pt. or validation studies.pt. or guideline.pt.
- 30 or pmcbook.mp.) 755
- 31 (systematic or systematically).tw. or critical.ti,ab. or study selection.tw. or ((predetermined
- 32 or inclusion) and criteri*).tw. or exclusion criteri*.tw. or main outcome measures.tw. or standard of
- 33 care.tw. or standards of care.tw. 2006614
- 34 (survey or surveys).ti,ab. or overview*.tw. or review.ti,ab. or reviews.ti,ab. or search*.tw. or
- 35 handsearch.tw. or analysis.ti. or critique.ti,ab. or appraisal.tw. or (reduction.tw. and (risk.sh. or
- 36 risk.tw.) and (death or recurrence).mp.) 4738707
- 37 14 and 15 783678
- 38 (literature or articles or publications or publication or bibliography or bibliographies or
- 39 published).ti,ab. or pooled data.tw. or unpublished.tw. or citation.tw. or citations.tw. or
- 40 database.ti,ab. or internet.ti,ab. or textbooks.ti,ab. or references.tw. or scales.tw. or papers.tw. or
- 41 datasets.tw. or trials.ti,ab. or meta-analy*.tw. or (clinical and studies).ti,ab. 3838916
- 42 treatment outcome.sh. or treatment outcome.tw. or pmcbook.mp. 1217969

451 19 17 or 18 4785929
 452 20 16 and 19 520774
 453 21 11 or 12 or 13 or 20 691574
 454 22 (letter or newspaper article).pt. 1283095
 455 23 21 not 22 [Lines 11-23: CADTH search hedge for systematic reviews with alterations to add
 456 scoping reviews] 681562
 457 24 Meta-Analysis as Topic/ 24430
 458 25 meta analy\$.tw. 311402
 459 26 metaanaly\$.tw. 2728
 460 27 Meta-Analysis/ 205323
 461 28 ((systematic or scoping) adj (review\$1 or overview\$1)).tw. 363877
 462 29 exp Review Literature as Topic/ 25752
 463 30 or/24-29 538741
 464 31 cochrane.ab. 154038
 465 32 embase.ab. 178443
 466 33 (psychlit or psyclit).ab. 919
 467 34 (psychinfo or psycinfo).ab. 66615
 468 35 (cinahl or cinhal).ab. 53072
 469 36 science citation index.ab. 3987
 470 37 bids.ab. 739
 471 38 cancerlit.ab. 640
 472 39 or/31-38 282514
 473 40 reference list\$.ab. 23414
 474 41 bibliograph\$.ab. 24077
 475 42 hand-search\$.ab. 9059
 476 43 relevant journals.ab. 1409
 477 44 manual search\$.ab. 6665
 478 45 or/40-44 58110
 479 46 selection criteria.ab. 38246
 480 47 data extraction.ab. 37344
 481 48 46 or 47 72787
 482 49 Review/ 3360929
 483 50 48 and 49 38001
 484 51 Comment/ 1039347
 485 52 Letter/ 1264815
 486 53 Editorial/ 700277
 487 54 animal/ 7479620
 488 55 human/ 22126177
 489 56 54 not (54 and 55) 5210278
 490 57 or/51-53,56 7401362
 491 58 30 or 39 or 45 or 50 628301
 492 59 58 not 57 [Lines 24-59: SIGN search hedge for systematic reviews with alterations to add
 493 scoping reviews] 599584
 494 60 23 or 59 791732
 495 61 10 and 60 276
 496

<https://proxy.queensu.ca/login?url=http://ovidsp.ovid.com?T=JS&NEWS=N&PAGE=main&SHAREDSEARCHID=4JixhtU1nvtGUrwwCH3WNYRUNf0U3YuJokfJHURBAuKAHunA6Pez47hoNSlcugjp>

499

500 **Embase Classic+Embase <1947 to 2025 June 17th>**

501

502 1 exp nursing student/ 35693

503 2 (nurs* adj2 student*).mp. 44612

504 3 exp nursing education/ 98290

505 4 exp psychological resilience/ or exp mental stress/ or exp burnout/ 233533

506 5 (resilience or resilient or resiliency or "emotional wellbeing" or "emotional well-being" or

507 "educational satisfaction" or hardiness or "bounce back").mp. 98270

508 6 exp mental disease/pc or exp anxiety/pc or exp mood disorder/pc or sadness/ or exp anxiety

509 disorder/pc 67875

510 7 or/1-3 118632

511 8 or/4-6 376215

512 9 exp Meta Analysis/ 329292

513 10 ((meta adj analy\$) or metaanalys\$).tw. 399090

514 11 ((systematic or scoping) adj (review\$1 or overview\$1)).tw. 436417

515 12 or/9-11 672853

516 13 cancerlit.ab. 759

517 14 cochrane.ab. 195423

518 15 embase.ab. 222848

519 16 (psychlit or psyclit).ab. 1013

520 17 (psychinfo or psycinfo).ab. 63978

521 18 (cinahl or cinhal).ab. 61841

522 19 science citation index.ab. 4595

523 20 bids.ab.941

524 21 or/13-20 338117

525 22 reference lists.ab. 25150

526 23 bibliograph\$.ab. 35026

527 24 hand-search\$.ab. 11092

528 25 manual search\$.ab. 7819

529 26 relevant journals.ab. 1670

530 27 or/22-26 73408

531 28 data extraction.ab. 45554

532 29 selection criteria.ab. 47945

533 30 or/28-29 90636

534 31 review.pt. 3317463

535 32 30 and 31 41046

536 33 letter.pt. 1338586

537 34 editorial.pt. 820244

538 35 animal/ 2174513

539 36 human/28182700

540 37 35 not (35 and 36) 1645649

541 38 or/33-34,37 3785628

542 39 12 or 21 or 27 or 32 780672

543 40¹ 39 not 38 761981

¹ SIGN Systematic Reviews filter, with scoping reviews added: <https://www.sign.ac.uk/using-our-guidelines/methodology/search-filters/>

544 41 (systematic review or meta-analysis).pt. 0
545 42 meta-analysis/ or systematic review/ or systematic reviews as topic/ or meta-analysis as
546 topic/ or "meta analysis (topic)"/ or "systematic review (topic)"/ or exp technology assessment,
547 biomedical/ or network meta-analysis/ 702112
548 43 ((systematic* adj3 (review* or overview*)) or (methodologic* adj3 (review* or
549 overview*))).ti,ab,kf. 456408
550 44 ((quantitative adj3 (review* or overview* or syntheses*)) or (research adj3 (integrati* or
551 overview*))).ti,ab,kf. 20781
552 45 ((integrative adj3 (review* or overview*)) or (collaborative adj3 (review* or overview*)) or
553 (pool* adj3 analy*)).ti,ab,kf. 61296
554 46 (data syntheses* or data extraction* or data abstraction*).ti,ab,kf. 56815
555 47 (handsearch* or hand search*).ti,ab,kf. 14304
556 48 (mantel haenszel or peto or der simonian or dersimonian or fixed effect* or latin
557 square*).ti,ab,kf. 52015
558 49 (met analy* or metanaly* or technology assessment* or HTA or HTAs or technology
559 overview* or technology appraisal*).ti,ab,kf. 22653
560 50 (meta regression* or metaregression*).ti,ab,kf. 20674
561 51 (meta-analy* or metaanaly* or systematic review* or biomedical technology assessment* or
562 bio-medical technology assessment*).mp,hw. 830823
563 52 (medline or cochrane or pubmed or medlars or embase or cinahl).ti,ab,hw. 510760
564 53 (cochrane or (health adj2 technology assessment) or evidence report).jw. 32330
565 54 (comparative adj3 (efficacy or effectiveness)).ti,ab,kf. 29021
566 55 (outcomes research or relative effectiveness).ti,ab,kf. 17532
567 56 ((indirect or indirect treatment or mixed-treatment or bayesian) adj3 comparison*).ti,ab,kf.
568 8321
569 57 (meta-analysis or systematic review).md. 0
570 58 (multi* adj3 treatment adj3 comparison*).ti,ab,kf. 454
571 59 (mixed adj3 treatment adj3 (meta-analy* or metaanaly*)).ti,ab,kf. 263
572 60 umbrella review*.ti,ab,kf. 2295
573 61 (multi* adj2 paramet* adj2 evidence adj2 synthesis).ti,ab,kf. 35
574 62 (multiparamet* adj2 evidence adj2 synthesis).ti,ab,kf. 22
575 63 (multi-paramet* adj2 evidence adj2 synthesis).ti,ab,kf. 30
576 64 or/41-63 1110557
577 65 40 or 64 1156777
578 66 7 and 8 and 65 141
579

580 **Appendix II: Draft data extraction instrument**

581 **Information extracted from each included review should include the following:**

- 582 1. citation details
- 583 2. objectives of the included review
- 584 3. type of review
- 585 4. participant details
- 586 5. setting and context
- 587 6. number of databases sourced and searched
- 588 7. date range of database searching

8. publication date range of studies included in the review that inform each outcome of interest
9. number of studies, types of studies, and country of origin of studies included in each review
10. instrument used to appraise the primary studies and the rating of their quality
11. outcomes reported that are relevant to the umbrella review question
12. method of synthesis/analysis employed to synthesize the evidence and
13. comments or notes the umbrella review authors may have regarding any included study

Most of this information will appear in the umbrella review report's Table of Included Review Characteristics

Appendix III: Critical Appraisal

1. Is the review question clearly and explicitly stated?
2. Were the inclusion criteria appropriate to the review question
3. Was the search strategy appropriate?
4. Were the sources and resources used adequate?
5. Were the criteria for appraising studies appropriate?
6. Was the critical appraisal conducted by two reviewers independently?
7. Were the methods used to combine studies appropriate?
8. Was the likelihood of publication bias assessed?
9. Were the recommendations for policy/practice supported by the reported data?
10. Were the specific directives for new research appropriate?