### **RESEARCH METHODS PRIMER**

# The Use of Evidence Synthesis in the Context of Healthcare: A Literature Review Primer

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#### Abstract



"Research in Earnest"

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**Introduction:** Evidence synthesis (ES) uses different systematic methodologies to compile a body of evidence on a given topic based on existing literature to help inform practice, policy, and future research decisions. There are multiple ways to categorize different types of ES. However, they differ in how they search, appraise, synthesize, and analyze data. Some of the most common ES forms include systematic, narrative, scoping, critical, environmental scans, and rapid reviews.

**Utility:** ES offers a myriad of benefits. These methodologies provide an immediate response to a question using research that has already been approved, funded, and completed, highlighting potential applications in numerous non-research-focused disciplines. Additionally, when information is not readily available in the current literature, ES methodologies elucidate gaps in knowledge that otherwise would be masked. Finally, they enhance the development of novel strategies, studies, and theories by summarizing, appraising, and critiquing current literature despite not being a direct source of unknown information.

**Challenges:** Several practical challenges inhibit the use of ES. To compile any form of ES, access to a wide range of databases and peer-reviewed journals is necessary, thus hindering feasibility for non-academic researchers and those in poorly funded research organizations. These challenges are often exacerbated in developing countries. Due to these barriers, ethical implications exist regarding the lack of inclusive evidence-building between scientists. Additionally, conducting a rigorous and rigid systematic review that analyzes every significant paper on a particular topic is highly time-consuming, thus hampering the effective utilization of ES in most labs.

**Limitations:** ES techniques contain several inherent limitations. Firstly, research questions that are too specific such that existing literature is inadequate or questions that are too broad, such that existing literature is in excess, make ES methodologies weak in providing accurate answers. Additionally, to achieve objectivity, authors of ES studies need to create comprehensive inclusion/exclusion criteria. Unfortunately, this often fosters bias amongst different interpretations of the criteria, thus influencing what research gets included in the analysis. Subsequently, the validity of the entire ES method is jeopardized.

**Keywords:** evidence synthesis; systematic review; healthcare; utility; subtypes; challenges; feasibility; limitations; objectivity; bias

#### Introduction

Over 20,000 journals publish over 2 million articles annually from which healthcare professionals, students, and policymakers are tasked with extracting data for their respective purposes [1]. The evidence synthesis methodology is necessary for making such vast research bodies accessible to individuals and organizations. Evidence synthesis is the systematic process of aggregating information from multiple sources to inform and extend the understanding of a phenomenon, decision, or debate [2]. Data sources include journal articles, conference abstracts, errata and letters, trial registers, clinical study reports, and regulatory reviews. This research methodology can clarify what is known and unknown about a subject matter. This research methodology is multidisciplinary in both its methods and application [2-4].

Hariharan | URNCST Journal (2023): Volume 7, Issue 1 DOI Link: <u>https://doi.org/10.26685/urncst.431</u> For instance, evidence synthesis is crucial in pharmacology because it helps to summarize and establish the efficacy of drugs or in public health to support population-wide health applications such as screening guidelines. Despite the multidisciplinary nature of this research method, its significance and continued use in healthcare is arguably the most important and, thus will be the subject of this primer.

Evidence synthesis methodologies have some intrinsic qualities in research papers that are universal across subtypes. They aim to comprehensively synthesize research questions by reviewing published research or other documents from large databases. While synthesis may help organize what is known, they also contribute to elucidating what is unknown and identifying gaps in the current literature [5].

Evidence synthesis can be carried out in different ways. A wide range of these methodological subtypes is commonly seen and used in literature. These include systematic, scoping, rapid, critical, and qualitative evidence synthesis, environmental scans, and narrative reviews [5]. This list is not comprehensive but describes the subtypes of evidence synthesis most commonly published by researchers.

This article will discuss the strengths, challenges, and limitations of evidence synthesis by exploring some evidence synthesis practices while delineating several subtypes to provide a holistic understanding of this research method.

#### Utility

Evidence synthesis methodologies are versatile. Their major strengths lie in their ability to compare and contrast different studies and designs, use in healthcare for establishing treatment efficacy and reducing discrepancy, and multidisciplinary applicability.

Evidence synthesis may involve pooling, assessing, analyzing, and synthesizing data from various studies. This process allows reviewers to compare data across contexts, participants, and other study characteristics [1]. Differences between study data may inform policy and practice and point towards areas that require further investigation, whereas similarities may increase the usefulness and relevance to different populations [1,3-6].

The best available evidence should inform clinical and policy decisions. Given the outburst of medical literature, evidence syntheses play a vital role in evidence-based clinical practice. Evidence syntheses are essential for physicians to provide high-quality and effective healthcare. They summarize large quantities of primary research, and some methodologies may give an overall assessment of the confidence of the findings depending on the study design and methods [7]. This methodology provides physicians solid evidence to make informed clinical decisions and evaluate medical treatments and technologies [3,7]. By effectively organizing and appraising the breadth of literature for a particular treatment or therapy, evidence synthesis can permit physicians across disciplines and geographic regions to make well-informed decisions based on the information presented in the evidence synthesis paper [7]. Additionally, having a well-done review on a topic, in theory, can be applied to multiple different settings, clinic types, and populations depending on the research question and the breadth of information available [8]. For example, a review paper on tamoxifen efficacy can be vital not just in the oncology clinic but also for the pathologist, radiologists, and support workers since this type of treatment has a relatively large scope in medical oncology. Thus, evidence synthesis-based research may prove vital in how healthcare professionals deliver care effectively while minimizing discrepancies.

Lastly, evidence synthesis methods can be applied to a diverse and growing number of areas, including education, criminology, veterinary medicine, drug development and toxicology, and the broader healthcare delivery and assessment fields [7,8]. Although this paper focuses on evidence synthesis in healthcare, its use in other areas must not be understated. All the aforementioned advantages of this research methodology exist across disciplines. Table 1 explores the major ES subtypes used in this typical evidence synthesis publication, their overarching goal, their main strengths compared with other subtypes, and an example of a publication that utilizes that subtype.

#### Challenges

Despite the values and strengths of evidence synthesis, some challenges can hinder the use of this research methodology. For some researchers not already wellestablished in their fields or disciplines, the most obvious deterrent to evidence synthesis is accessibility to large databases [17]. Systematic reviews require access to a wide range of information in databases and peer-reviewed journals. Regulating, maintaining, and expanding these databases are expensive. This challenge is often prevalent for non-academic researchers and those in developing countries [17]. This issue is exemplified in a recent article by Bennett et al., where the authors describe the challenges of using systematic reviews in Jamaica [18]. They found the main difficulties were accessibility to literature, human resources in research, local funding, and knowledge translation [18]. These challenges are detrimental by themselves but are exacerbated by how they interact. For instance, allocating funding for database access would leave less funding for research personnel and potentially reduce the quality of knowledge translation presented in the review paper. These conflating issues often permeate different forms of research methodologies in academia, and evidence synthesis is no exception [17]. It is also important to note that these issues are not unique to developing countries. Subscriptions to large search databases such as OVID can sometimes cost more than the entire university library budget.

Another major challenge of systematic reviews is the time required to perform a useful literature review. This can vary depending on the research question and the breadth of information available in peer-reviewed journals or grey literature [19]. To investigate this, one registry was examined to detect and summarize aspects of published review papers in a recent study [20]. Borah et al. found that within that registry, the average time it takes to publish a review is approximately 67 weeks (~17 months), and the time was higher for funded compared to unfunded research [20]. The cost of human resources represents another critical consideration for these methodology types. In that same article, researchers found that the average number of authors per peer review was five and increased to seven when the research was funded [20].

Unfortunately, the time commitment and investment of human resources make it challenging for labs with fewer resources to conduct evidence syntheses [18]. According to

the Cochrane Library, one of the most profound databases used in medicine and healthcare, it is common for shortages to occur in information searching, retrieval, and statistical analysis [19]. These issues are exacerbated in developing countries where poorly funded research can negatively affect knowledge synthesis and translation [18,19]. Despite these issues, many reviewers underestimate the time commitment in completing a systematic review, skip creating a protocol, and find ways to shorten the number of studies to screen by modifying search strategies and reducing the number of databases. These challenges can result in delays, duplication of work, and failure to complete the review [19].

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Evidence Synthesis	Main Goals [5,9]	Strengths [5,9]	Example
Systematic Reviews	Systematically identifies, appraises, and synthesizes evidence, sometimes using clinical practice guidelines.	Aims for exhaustive and comprehensive aggregation or synthesis of what is known in the literature.	Sanagoo et al., 2020 [10]
Narrative Reviews	Identifies what is written about a subject allowing for consolidation, improving previous work, and identifying gaps.	Can cover a wide range of subjects at various levels of completeness and comprehensiveness.	Ayadurai et al., 2016 [11]
Scoping Reviews	Identifies the extent, size, and scope of available research literature.	Can quickly identify the value of undertaking a more comprehensive review and identify gaps.	Majid et al, 2020 [12]
Critical Reviews	Employs critical assessment of literature, often leading to a hypothesis/model.	It goes beyond describing the primary papers by focusing on analysis and conceptual innovation.	Rossi et al., 2017 [13]
Qualitative Evidence Synthesis	Synthesizes qualitative data across primary qualitative studies to generate themes and concepts.	One of the only methods that allow for understanding a phenomenon is through thematic analysis.	Majid & Ahmad, 2020 [14]
Environmental Scans	Identifies external factors on the effectiveness of an intervention or program in social, economic, and technological contexts.	Allows for quick analysis of current interventions or programs for a rapid decision on program continuity or augmentation.	Jang et al., 2022 [15]
Rapid Reviews	Follows the systematic review process but modifies time-consuming steps such as screening, data extraction/analysis, and quality assessment.	Produces good quality evidence on an uninvestigated topic with a short turnaround to inform a time- sensitive decision.	De Kock et al., 2021 [16]

#### Limitations

Researchers should consider several limitations in evidence synthesis methodology before conducting them. One such limitation is that the summaries presented in evidence synthesis are only as reliable as the rigor of each study [21]. Any problems inherent in original studies cannot be overcome through the study design of any evidence synthesis subtype. These issues can vary, including biases, poor study protocols, or weak and insufficient statistical power [21]. In all evidence synthesis methods, the primary studies included act as the unit of analysis. The validity of the review paper hinges on the validity of the studies that make it up [22]. This limitation is essential when evidence synthesis is used in healthcare. For instance, if the methodological quality of clinical trials is inadequate, the findings of review papers may also be compromised. One of the most significant examples of this

National Breast Screening Study (CNBSS) [23]. Despite being a seminal article in all of oncology, researchers found many significant flaws in the study design after it was published. The hundreds of review articles that used this primary paper lost some validity since the data they summarized was inherently flawed. Thus, any drawn conclusion made had to be evaluated [23]. These issues were apparent in those CNBSS review papers and many others when researchers combined studies of poor quality with those of more rigor. In these instances, the reviewer will likely come to a false sense of precision or a worse estimate of the underlying truth. The data summarized and analyzed from primary

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papers are not the only inherent limitation of evidence synthesis methodologies. How papers are collected and included in the review can be influenced by several types of

bias and can result in a review that is not accurately representative of the literature available [20]. When conducting evidence synthesis, some subtypes require inclusion and exclusion criteria to screen potentially relevant studies. Unfortunately, as with most instances of research, true objectivity is hard to achieve [17]. This remains a limitation in this methodology, especially when many researchers are involved, as each member can interpret the inclusion criteria differently [17]. As such, different primary sources can be included in the population of papers that undergo a review. This can change the paper's overall conclusions since the data set can vary drastically depending on what paper is included [17,21]. Additionally, discordant primary articles are often pooled together in many forms of evidence synthesis to find the "true" meaning or answer behind a phenomenon or hypothesis [21]. This process inevitably leads to the inclusion of diverse studies in their design, methodological quality, intervention used, and patients studied [21]. As such, bias arises when there is subjectivity around which studies are similar enough to include and which are different enough to exclude. To mitigate this bias, a detailed research protocol must be stated and followed from the start of the review process to the end by all members of the research team [21]. Objectivity should be maximized within the protocol, and quality checks are necessary to reduce the effect of this limitation [17,19,21].

One of the significant threats to any evidence synthesis is the occurrence of selective outcome reporting in the papers included in the review process [21]. Selective outcome reporting is when authors of primary papers decide only to report and publish specific statistically significant outcomes or outcomes that best suit their interests [21]. Papers that report dramatic events or results are more likely to be identified, organized, and included in evidence synthesis publications than studies with smaller effect sizes [21,24]. Since the quality of the evidence synthesis is dependent on a practical and accurate survey of the current literature, any discrepancy that can cause the unfair inclusion of one paper over others serves as an essential limitation of this methodology's study design [24]. This limitation is also found in several different evidence synthesis tools. For example, over three-quarters of metaanalyses did not report any empirical assessment of publication bias which undermines the true frequency of this form of bias [21]. Unfortunately, this form of bias cannot be mitigated until journals and publishers require an empirical assessment of bias for every submitted evidence synthesis manuscript [24].

Evidence synthesis papers are often limited by the literature available for a specific topic or question [25]. Government agencies, educational institutions, healthcare facilities, and other organizations frequently request researchers to investigate issues that are naturally very focused in terms of intervention or population. This can lead to knowledge synthesis of very limited amounts of

of intervention or population. This can using less grey ge synthesis of very limited amounts of particularly impo

data, which limits the number of conclusions the reviewer can make [25]. Certain questions cannot be answered since there is not enough primary literature investigating the topic in the first place. In healthcare, this is commonly seen when questions about specific populations and their response to an intervention arise [25]. For instance, finding studies for women aged 40–49 and their response to an annual intervention is significantly more complicated than finding a study for women, in general, taking the same intervention at any point. Researchers using evidence synthesis might face significant limitations if they review the former while also being significantly overwhelmed if they choose to review the latter [25].

#### Conclusions

The importance of evidence synthesis in different disciplines, including healthcare, cannot be overstated. The practice of medicine is becoming increasingly specialized and expanding the biomedical literature at rates never seen before. As such, review papers that can organize, synthesize, and summarize large quantities of pooled papers serve as principal tools for physicians, policymakers, and students to learn and integrate into their field of practice. There are several subtypes of evidence synthesis, each with its strengths and weaknesses, but some common concepts are universal to all subtypes. Evidence synthesis allows the reviewer to compare and contrast different studies about the same phenomenon, thus generating a "true" understanding or revealing a knowledge gap that should be addressed. Additionally, the information they gather can serve as essential tools in knowledge translation, especially for policymakers and practitioners, to ensure effective healthcare delivery without variance. However, this research method has certain challenges, including the need to access large, expensive databases, the required time commitment to produce a quality review, and the constant shortages research groups find themselves in due to these challenges. Additionally, several limitations prevent this methodology from being used by different organizations, including the bias that may arise from selecting papers, interpreting the results, or cherry-picking data sets. Since evidence synthesis methods utilize primary papers as the unit of analysis, errors inherent to those papers cannot be corrected through this method and are often aggregated with errors from other documents. Furthermore, access to limited or overwhelming levels of information in the literature can limit which research questions can effectively undergo a review. Concerning the long-standing nature and use of evidence synthesis and its limitations, there is still development to ensure the research methodology is keeping up with the rapidly growing information age. One such future direction is expanding the use of rapid reviews. Rapid reviews can provide timely information to decisionmakers by simplifying the evidence synthesis process (e.g., using less grey literature) [26]. These reviews are particularly important for urgent decisions when the health

Hariharan | URNCST Journal (2023): Volume 7, Issue 1 DOI Link: <u>https://doi.org/10.26685/urncst.431</u>

and well-being of many are at stake [26]. Most recently, there was an explosion in the use of this evidence synthesis as their utility proved significant in understanding different facets of the COVID-19 pandemic [27]. As such, rapid reviews are being implemented as a potentially valuable member of the evidence synthesis ecosystem.

#### List of Abbreviations Used

ES: evidence synthesis CNBSS: Canadian national breast screening study

#### **Conflicts of Interest**

The author declares that they have no conflict of interest.

#### **Ethics Approval and/or Participant Consent**

The study did not require ethics approval and/or participant consent seeing that it was only a review of primary and secondary literature about a research methodology.

#### **Authors' Contributions**

JH: made substantial contributions to the conception of the work, acquired, and interpreted papers for review, drafted the manuscript, and submitted the final version for publication.

#### Acknowledgements

The author would like to thank their mentor, Umair Majid, for his continued assistance, guidance, and feedback from the project's conception to the submission.

#### Funding

This study was not funded.

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#### **Article Information**

Managing Editor: Jeremy Y. Ng Peer Reviewers: Umair Majid, Kavin Selvan Article Dates: Received Aug 29 22; Accepted Nov 12 22; Published Jan 03 23

#### Citation

Please cite this article as follows: Hariharan J. The use of evidence synthesis in the context of healthcare: A literature review primer. URNCST Journal. 2023 Jan 03: 7(1). <u>https://urncst.com/index.php/urncst/article/view/431</u> DOI Link: <u>https://doi.org/10.26685/urncst.431</u>

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