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Conceptual recommendations for selecting the most appropriate knowledge synthesis method to answer research questions related to complex evidence

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Abstract

Objective: To compare and contrast different knowledge synthesis methods and map their specific steps through a scoping review to gain a better understanding of how to select the most appropriate knowledge synthesis method to answer research questions of complex evidence.

Study design and setting: Electronic databases were searched to identify studies reporting emerging knowledge synthesis methods (e.g., Realist review) across multidisciplinary fields. Two reviewers independently selected studies and abstracted data for each article.

Results: We synthesized diverse, often conflicting evidence to identify 12 unique knowledge synthesis methods and 13 analysis methods. We organized the 12 full knowledge synthesis methods according to their purpose, outputs and applicability for practice and policy, as well as general guidance on formulating the research question. To make sense of the overlap across these knowledge synthesis methods, we derived a conceptual algorithm to elucidate the process for selecting the optimal knowledge synthesis methods for particular research questions.

Conclusion: These findings represent a preliminary understanding on which we will base further advancement of knowledge in this field. As part of next steps, we will convene a meeting of international leaders in the field aimed at clarifying emerging knowledge synthesis approaches.

Keywords: Systematic review; Knowledge synthesis; Concept synthesis; critical interpretive synthesis; Integrative review; Meta-synthesis; Meta ethnography; Metastudy; Meta-interpretation narrative synthesis; Realist review

1. Introduction

We aimed to make sense of conflicting information about emerging knowledge synthesis methods (e.g., meta-narrative review, realist review) by conducting a scoping review [1] across multidisciplinary fields (including health, education, and psychology). Our goal was to compare and contrast different knowledge synthesis methods and map their specific steps to gain a better understanding of how to select the most appropriate knowledge synthesis method to answer research questions related to complex evidence. Our protocol has been published elsewhere [2], and we described the methods and main results in an earlier article in the current series [3]. In this, the fifth article in the series, we summarize our findings and offer conceptual recommendations.

2. Summary of scoping review

In a commentary for this series [4], we described the impetus for our work, namely, the recent evolution of knowledge synthesis methods. The growing complexity of

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What is new?

Key findings

- We synthesised diverse, often conflicting evidence from multidisciplinary fields to identify 12 unique knowledge synthesis methods and 13 analysis methods. These findings represent a preliminary understanding on which we will base further advancement of knowledge in this field.

What this adds to what was known?

- We have advanced the knowledge of different knowledge synthesis methods, and have identified the need to enhance the description of these methods. We organised the 12 complete knowledge synthesis methods according to their purpose, outputs, and applicability for practice and policy, and derived a conceptual algorithm to elucidate the process for selecting the optimal knowledge synthesis methods for particular research questions.

What is the implication and what should change now?

- Currently, we cannot provide guidance beyond our conceptual recommendations, which highlight gaps in the literature, particularly in terms of elucidating the purpose and conduct of emerging knowledge synthesis methods. As one of our next steps, we will convene a meeting of international leaders in the field with the aim of clarifying emerging knowledge synthesis approaches, to create an algorithm for matching a question to a method, and to write a textbook on how to conduct each of the methods.

health care issues has increased the need for investigation of complex questions, which in turn has highlighted the need to move beyond simply understanding ''what works'' (through traditional systematic reviews of effectiveness) to consider ''why, for whom, and under what contexts'' it works (through other knowledge synthesis methods, such as realist review).

We suggest that knowledge syntheses exist on a continuum, whereby a traditional systematic review of an intervention can be used to identify ''what'' innovation works, with other emerging knowledge synthesis methods being used to integrate qualitative and quantitative evidence to elucidate a more in-depth understanding of the contextual and theoretical underpinnings of the innovation. Decision makers are increasingly seeking to better understand how various interventions work in different settings. Such understanding can be achieved in different ways, so it is crucial to match the most appropriate knowledge synthesis method to each question posed. For example, investigators might conduct a realist review after, concurrently with, or independent of an effectiveness review, or they might decide that a meta-narrative approach is more appropriate. The choice of method depends largely on the purpose of the knowledge synthesis and the needs of its end users (e.g., generating knowledge to identify gaps in the literature or to directly inform decision making). Mays et al. [5] suggested that other factors, such as the ''nature and balance of available evidence and the stage that policy development has reached,'' may also influence the choice. For example, a policy question in the early stages of development may best be answered by a knowledge synthesis designed to develop theory, whereas a more well-developed policy question may require a combination of cost-effectiveness modeling and meta ethnography [5]. However, with little guidance available, selection of the knowledge synthesis method most appropriate to answer a particular question remains challenging.

In the second article of the series [3], we presented the main findings of our scoping review. Of the 25 unique knowledge synthesis methods identified, 12 provided guidance on the full or complete conduct of the review (i.e., operationalized the steps to conduct the review), whereas 13 provided guidance on analysis techniques only. The knowledge synthesis methods with the highest frequency of reported use were metasynthesis (25% of identified articles), meta ethnography (19%), metastudy (11%), integrative review (10%), and realist review (8%); the knowledge synthesis method most dispersed across the disciplines included in our literature search was meta ethnography. We found that ''exploration of a phenomenon'' was the most common objective among the complete knowledge synthesis methods, except for meta-narrative review, metasummary, and narrative synthesis. These three methods, along with mixed studies review, focused on the study or analysis of methodological aspects. The exploration of perceptions (i.e., how people perceive and experience a phenomenon, disease, or health state) was most commonly investigated using meta ethnography, metasummary, metasynthesis, and mixed studies review. Two distinct purpose of full knowledge synthesis methods emerged from our scoping review: they are used either to integrate qualitative and quantitative data (meta-narrative review, metasummary, and mixed studies review) or to establish or refine a theory, perspective, or phenomenon (concept synthesis, meta ethnography, meta-interpretation, metastudy, and metasynthesis); critical interpretive synthesis, integrative review, narrative synthesis, and realist review were used for both. These distinctions were further explored in subsequent articles.

In our third article [6], we compared and contrasted the seven knowledge synthesis methods that can be used to integrate qualitative and quantitative evidence, and in the fourth article [7], we compared the nine knowledge

synthesis methods that can be used to generate or refine theory. We identified the strengths and weaknesses of the methods, similarities, and differences among them, and the knowledge and skills required for their conduct, to help in identifying selection criteria for choosing a method. We noted that most of the differences among methods were related to how data are synthesized rather than how steps are operationalized. However, we found many gaps in the literature that make it difficult to definitively match specific knowledge synthesis methods with particular research questions. We also observed that emerging knowledge synthesis methods are not as well developed as traditional systematic reviews. For example, we found no studies that completely explained how to reproducibly integrate qualitative and quantitative evidence.

After the presentation here of recommendations arising from these analyses, we will describe, in the final article of the series, the volume and attributes of the original research that emerged from our scoping review. This bibliometric analysis was based on 608 records, among which we observed a steady increase since 2003 in the number of studies using knowledge synthesis methods, with the largest number published in 2011 (n = 105). This literature is widely dispersed (across 330 journals) and represents many disciplines and authors. This diversity may explain, in part, the inconsistencies in terminology and in guidance on how to conduct such studies. Inconsistency of indexing by Medical Subject Headings makes it difficult for researchers and knowledge users to locate relevant articles. Overall, these inconsistencies and the increasing number of publications using various knowledge synthesis methods suggest not only growing interest but also the realization that traditional systematic reviews may be insufficient to answer complex or context-dependent questions.

3. Implications and recommendations

Our work has several implications. We have advanced the knowledge of different knowledge synthesis methods, which has, to date, been scattered in the literature. Moreover, we have identified the need to enhance the description of these methods. In her 1959 account, Isabella Leitch recognized the value of knowledge synthesis: ‘‘the technique of the research review, by virtue of the assembly and use of scattered records, appears to be unequaled as an instrument for retrieval of buried work. It gives a new value to the small experiment … and in the analysis may reveal truths which might not be reached in a lifetime of direct investigation’’ [8,9]. She also identified different types of knowledge synthesis methods: the ‘‘statistical review,’’ the ‘‘review of concepts,’’ the ‘‘service or interpretive review,’’ and the ‘‘creative review,’’ which ‘‘has the highest manifestation of such endeavor because it deliberately sets out to effect a synthesis between phenomena previously unrelated’’ [8,9].

Over the past decade, several investigators have endeavored to organize different knowledge synthesis methods, including Barnett-Page and Thomas [10], who explored which method might be used to synthesize qualitative research; Ring et al. [11], who presented methods for synthesizing qualitative research in health technology assessment; Dixon-Woods et al. [12], who critiqued strategies for synthesizing qualitative and quantitative evidence; and Mays et al. [5], who described approaches to synthesizing qualitative and quantitative evidence to inform management and policy-making decisions in health care. Gough et al. [13,14] indicated the need for clarity in understanding the differences between review designs and their methods, and suggested looking across three dimensions: aims, structure and components, and the extent of engagement with the research issue. More recently, investigators from the Joanna Briggs Institute have proposed a mixed methods approach to systematic reviews (i.e., ‘‘the class of research in which the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts, or language into a single study’’) [15] and have offered methodological guidance for conducting meta-aggregation of qualitative evidence [16]. However, none of these investigators searched the literature across multidisciplinary fields to identify any knowledge synthesis method for any type of evidence, with the aim of identifying similarities and differences among methods, nor did they map the specific steps in conducting these methods, and most did not attempt to analyze their objectives to develop guidance on selecting the best knowledge synthesis method to answer research questions related to complex evidence. Mays et al. [5] provided some general guidance on selecting a ‘‘suitable’’ knowledge synthesis method based on the aim and the strengths and weaknesses of various review approaches, but these authors focused on identifying methods to synthesize diverse evidence rather than searching for ‘‘complete’’ knowledge synthesis methods. As such, their recommendations were based on a subset of the complete knowledge synthesis methods that we captured in our scoping review (i.e., meta ethnography, narrative synthesis).

To clarify the implications of our findings, in terms of guiding selection of the optimal methods for particular questions, we organized the 12 complete knowledge synthesis methods according to their purpose, outputs, and applicability for practice and policy, as well as general guidance on formulating the research question (Appendix A). Three of the methods appeared to have a unique purpose that did not overlap with that of other methods, and these may offer the most clarity for reviewers in the selection process. The first of these, concept synthesis, can be used to identify concepts, viewpoints, or ideas

informed by qualitative evidence aimed at developing a synthesis model or to identify attributes of a phenomenon. As such, this method can be applied in areas where there has been little or no concept development to date or where observations of the phenomenon are available but not yet classified or named (e.g., What are the attributes of family-centered care and partnership in care?) [17]. The second method with a unique purpose is realist review, which considers qualitative and quantitative evidence and can be used to investigate complex questions to inform what works for whom, under what circumstances, and why. It can provide explanations or hypotheses across interventions or programs that share similar underlying "theories of change" as to why they work (or do not work) for particular end users in particular contexts [18]. These explanations, in the form of context–mechanism–outcome configurations, can directly inform policy or clinical decisions (e.g., in the enabling of evidence-informed health care, what change agency interventions and strategies are effective, for whom, in what circumstances, and why?) [8,19]. Meta-narrative review, the third method with a unique purpose, is used primarily for investigating a disciplinary paradigm or the "story" of a discipline as it evolves. It focuses on explaining contradictions in the literature and treats such data as "higher-order constructs" [10,20]. The purpose of critical interpretive synthesis (to synthesize findings of multiple disciplines and diverse evidence) may be considered similar to that of meta-narrative review, but this method does not have explicit methods for explaining contradictions in findings.

The remainder of the knowledge synthesis methods overlaps in purpose. For example, six of the 12 methods can be used to investigate patients' experience (in addition to other purposes): meta ethnography, meta-interpretation, metastudy, metasummary, metasynthesis, and mixed studies review. However, metastudy is unique in considering the experiences of patients with chronic illness, and it uses a highly systematic process that is not apparent in the other methods. The output of a metastudy is similar (i.e., a new interpretation or theoretical claim), but this new interpretation is derived from bringing together ideas from the deconstruction of its three major analysis components (metadata, metamethod, and metatheory). More specifically, "metamethod" involves interrogating the influences of study quality on the interpretation of findings, and "metatheory" involves investigating how theoretical frameworks underpinning individual studies influence their interpretation, so that these components may contribute to a more credible and trustworthy interpretation of findings overall. There is also some similarity in purpose between meta ethnography and critical interpretive synthesis; the latter uses synthetic constructs to create a "synthesizing argument" to derive a line of argument (i.e., a new interpretation that both links and explains a set of parts), similar to the third-order interpretation of meta ethnography (i.e., a new interpretation of the researcher based on the original authors' interpretations). We also observed a similarity between narrative synthesis and realist review in terms of identifying central theories or causal mechanisms, and a similarity between meta-narrative review and narrative synthesis and, both of which attempt to build a narrative explanation from the body of identified research.

There are other ways of conceptualizing the differences among various knowledge synthesis methods. Barnett-Page and Thomas [10] suggested that contrasting methods according to specific epistemological positions might help to explain their differences. Critical interpretive synthesis, meta-narrative review, and metastudy have a "subjective idealist" approach to knowledge (i.e., there is no shared reality independent of multiple alternative human constructions) [10]. For example, in metastudy, there is an assumption that no single objective reality will be found, so the creation of "grand theories" is not a goal, whereas meta ethnography has an "objective idealism" approach (i.e., there is a world of collectively shared understandings), which emphasizes commonalities rather than discrepancies between accounts [10]. Investigation of context is another important consideration for knowledge syntheses, particularly in knowledge translation and health services research. Critical interpretive synthesis, meta-narrative review, metastudy review, and realist review can be used to examine all aspects of the context in which knowledge is produced [10]. For example, realist review can identify the specific circumstances under which an intervention operates through context–mechanism–outcome configurations [18], and metastudy uses one of its elements, "metatheory," to determine the theories that shape a body of research, which can then be "used to examine the historical evolution of each theory and to put it in its socio-political context" [10]. Knowledge synthesis methods can also be distinguished as using either aggregative or configurative logic (or both) [13]. Aggregative reviews collect empirical data to describe and test predefined concepts, whereas configurative reviews attempt to interpret and understand the world [13]. For example, aggregative reviews (including systematic reviews) can investigate the effect of a health or social intervention, the accuracy of a diagnostic tool, or the cost–benefit ratio of an intervention, whereas configurative reviews can generate theory (e.g., critical interpretive synthesis and meta ethnography) or can be used to understand the development of a research tradition (e.g., meta-narrative review). Realist review is described as an approach that uses both aggregative and configurative logic [13].

As a first step toward making sense of the overlap across the 12 knowledge synthesis methods, we used the purpose, output, and applicability data from Appendix A to derive a conceptual algorithm to elucidate the process for selecting the optimal knowledge synthesis methods for particular research questions (Fig. 1). Appendix A data revealed five major categories of purpose: to generate or refine a theory or hypothesis; to explore experiences, perceptions, preferences, beliefs, and values; to identify gaps in the literature

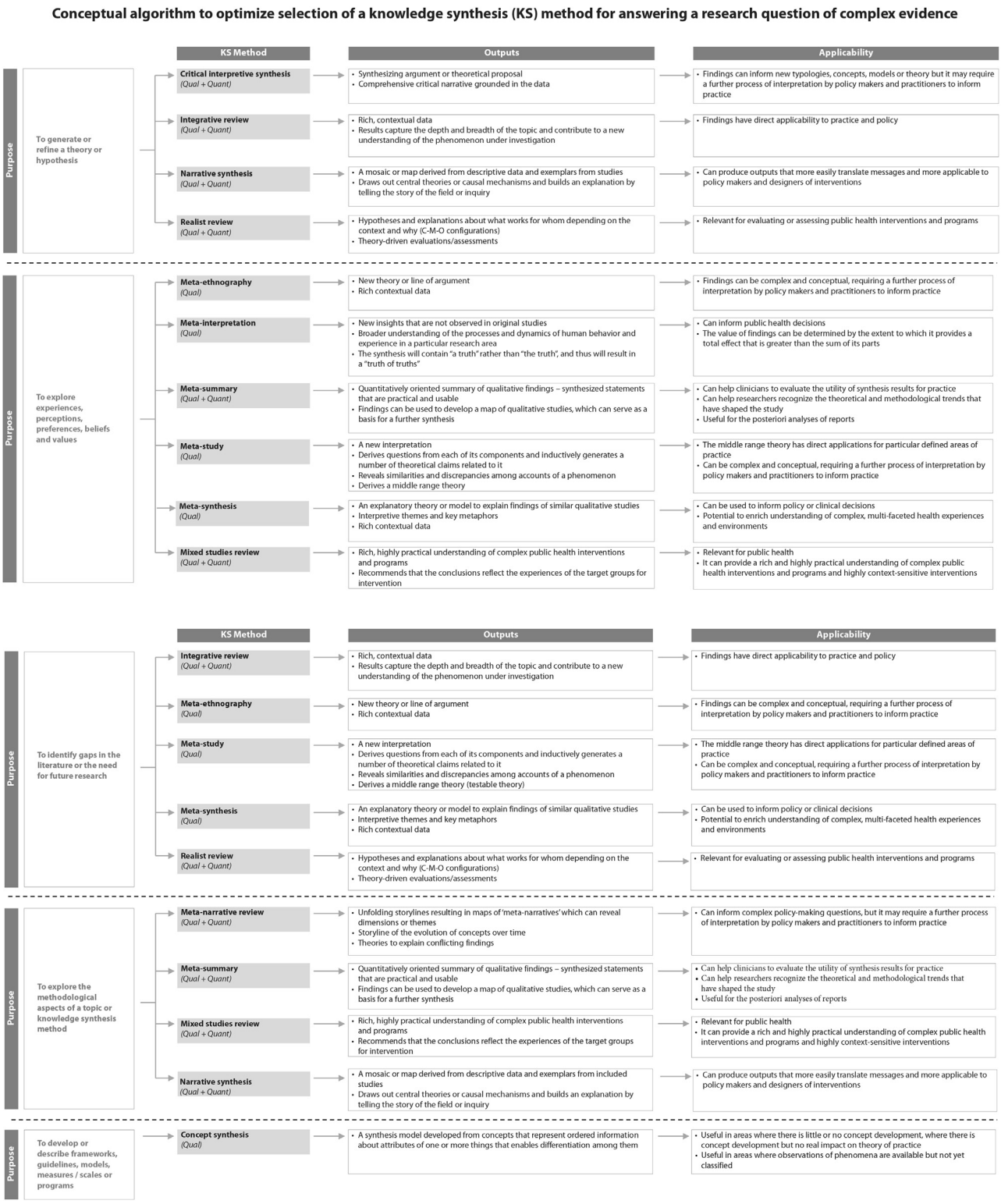

Fig. 1. Conceptual algorithm to optimize selection of a knowledge synthesis method for answering a research question.

or the need for future research; to explore methodological aspects of a method or topic; and to develop or describe frameworks, guidelines, models, measures, scales, or programs. For each of these, we suggest that different knowledge synthesis methods could be considered, including their outputs and applicability of findings to practice and policy. We did not consider the integration of quantitative and qualitative evidence as a purpose category as these types of evidence need not necessarily be integrated to define a particular purpose; they can inform a particular purpose regardless of whether

the evidence is quantitative, qualitative, or both. In addition, we acknowledge "effectiveness" as an important purpose category. However, we deliberately omitted this from our conceptual algorithm, as there is clear understanding that systematic review is the most appropriate knowledge synthesis method to address questions of effectiveness. Our intention was to identify purpose categories for knowledge synthesis methods that are less well understood. In an attempt to further distill the nuances of overlapping methods, we provide a table of the 12 knowledge synthesis methods with multiple examples to illustrate the concepts of purpose, output, and applicability (Appendix B).

4. Knowledge translation and next steps

We synthesized diverse, often conflicting, evidence from multidisciplinary fields to identify 12 unique knowledge synthesis methods and 13 analysis methods. These findings represent a preliminary understanding on which we will base further advancement of knowledge in this field. Currently, we cannot provide guidance beyond our conceptual recommendations, which highlight gaps in the literature, particularly in terms of elucidating the purpose and conduct of emerging knowledge synthesis methods. Indeed, less than 5% of studies included in our scoping review represented influential articles outlining steps of a particular knowledge synthesis method, and for only two methods (integrative review and realist review) were all steps fully operationalized; furthermore, none of the included studies completely explained how to reproducibly integrate qualitative and quantitative evidence. There was significant overlap in terminology to describe both knowledge synthesis and analysis methods, which could further hinder their application. Notably, 81% of the included studies were published after 2005, which highlights that emerging knowledge synthesis methods are not as well developed or as well represented in the literature as traditional systematic reviews.

We recognize the conceptual nature of our recommendations and the need for further scrutiny, refinement, and validation if these recommendations are to be useful to reviewers in selecting the most appropriate knowledge synthesis method for a particular question. As one of our next steps, we will convene a meeting of international leaders in the field with the aim of clarifying emerging knowledge synthesis approaches. During the meeting, we will present our findings and a preliminary conceptual algorithm (Fig. 1) and will work with participants to identify and clarify the nuances of each method that might help in further distinguishing, consolidating, or reclassifying their respective purposes, outputs, and applicability. For example, to help elicit these nuances, subgroups of participants could apply different knowledge synthesis methods in attempting to answer the same research question. We would then compare the results from the various synthesis approaches and determine whether the answers differ according to the method used. The goal of this exercise would be to identify methods that are truly unique, to help inform a final algorithm with the potential to optimize reviewers' selection of knowledge synthesis methods suitable for their research questions. We encourage readers to contact the corresponding author (Dr. Sharon Straus) if they are interested in participating in this stakeholder meeting and to provide feedback on our conceptual algorithm, which is considered a preliminary step forward in the knowledge synthesis field.

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Supplementary data

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