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ABSTRACT

Objective: To describe and compare, through a scoping review, emerging knowledge synthesis methods for generating and refining theory, in terms of expertise required, similarities, differences, strengths, limitations, and steps involved in using the methods.

Study design and setting: Electronic databases (e.g., MEDLINE) were searched, and two reviewers independently selected studies and abstracted data for qualitative analysis.

Results: In total, 287 articles reporting nine knowledge synthesis methods (concept synthesis, critical interpretive synthesis, integrative review, meta-ethnography, meta-interpretation, meta-study, meta-synthesis, narrative synthesis, and realist review) were included after screening of 17,962 citations and 1,010 full-text papers. Strengths of the methods included comprehensive synthesis providing rich contextual data and suitability for identifying gaps in the literature, informing policy, aiding in clinical decisions, addressing complex research questions, and synthesising patient preferences, beliefs, and values. However, many of the methods were highly subjective and not reproducible. For integrative review, meta-ethnography, and realist review, guidance was provided on all steps of the review process, whereas meta-synthesis had guidance on the fewest number of steps.

Conclusion: Guidance for conducting the steps was often vague and sometimes absent. Further work is needed to provide direction on operationalising these methods.

Word count: 190 (abstract), 2124 (main text), 1 table, 1 figure, 1 box, 6 appendices.

Key Words: knowledge synthesis, critical interpretive synthesis, integrative review, meta-synthesis, meta-ethnography, realist review

Running Title: Synthesis methods for generating/refining theory
What is new

Key findings
We found nine knowledge synthesis methods that can be used to generate or refine theory: concept synthesis, critical interpretive synthesis, integrative review, meta-ethnography, meta-interpretation, meta-study, meta-synthesis, narrative synthesis, and realist review. For integrative review, meta-ethnography, and realist review, guidance was provided on all steps of the review process, whereas meta-synthesis had guidance on the fewest number of steps.

What this adds to what is known
This is the first study to compare and contrast numerous features of emerging knowledge synthesis methods that can be used for generating and refining theory.

What is the implication
We found a lack of guidance on how to conduct emerging knowledge synthesis methods for generating or refining theory. Differences among the methods are predominantly related to analysis techniques rather than the full synthesis methods.

What should change now
We propose convening an international group of leaders in the field to clarify the methods for 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.
1. Introduction

In health care, information synthesis has focused predominantly on systematic reviews of interventions using methods proposed by the Cochrane Collaboration [1] and others [2-4]. However, systematic reviews often lack the rich contextual detail that can be gathered using emerging knowledge synthesis methods [5], such as meta-ethnography, meta-study, and realist review. Such forms of synthesis can generate greater understanding and provide useful insight through the development of theories and frameworks. It has been argued that such emerging methods show promise for informing practice and policy, and could thereby improve health care systems [6, 7].

Patients’ expectations, adherence, preferences, knowledge, and values are factors that can influence the effectiveness of an intervention [8-12]. As well, the perspectives of various stakeholders, such as patients, researchers, clinicians, and policy-makers, can shape the creation of different types of interventions. These factors provide rich contextual details that can be used to establish theories as to why certain interventions work (or fail) in particular settings and contexts [13]. As such, the perceptions, values, and experiences of stakeholders are important factors to consider in planning, implementing, and evaluating health care interventions.

Interest in emerging knowledge synthesis methods within health care has been increasing [14, 15], but confusion exists about similarities and differences among the methods and how to operationalise them. Previous work focused on explaining the different types of synthesis methods for qualitative evidence [16, 17], but was not informed by a comprehensive scoping review of the literature. The overall objective of our scoping review was to identify and chart the different types of emerging knowledge synthesis methods in terms of definitions, comprehensiveness, disciplines, and objectives. For the current article, we aimed to compare emerging knowledge synthesis methods that can be used to generate or refine theory (e.g.,
Roger’s Diffusion of Innovation theory) [18]. Our specific objectives were to describe the expertise required to carry out these synthesis methods, the similarities and differences among the methods, their strengths and limitations, and the steps needed to operationalise them.
2. Methods

This is the fourth in a series of articles reporting the results of our scoping review of emerging knowledge synthesis methods [19-22]. We formulated our protocol [23] using the Arksey and O’Malley framework [24]. Our methods are briefly described below.

2.1 Information sources

To identify potentially relevant studies, the main search was of several electronic databases from inception until December 2011: MEDLINE, CINAHL, Embase, PsycINFO, the Cochrane Methodology Register, the Cochrane Database of Systematic Reviews, Social Sciences Abstracts, Library and Information Science Abstracts (LISA), Philosopher’s Index, and Education Resources Information Center (ERIC). The literature search was supplemented by scanning the reference lists of included studies, as well as searching textbooks for details about the methods identified.

2.2 Inclusion criteria

We included articles, manuscripts, dissertations, books, and reports that described, evaluated, or used emerging knowledge synthesis methods for generating or refining a theory (Box), as reported by the study authors. We defined theory generation or refinement as use of a collection of ideas to develop patterns of meaning [25]. We recognise that differences in meaning and concepts of “theory” exist across the various knowledge synthesis methods. For example, some generate new theory (e.g., critical interpretive synthesis, meta-ethnography), while others refine a middle-range theory (e.g., realist review). We used a broad definition of the term “theory” to allow clear distinction between methods that generate or refine theory and those that do not. A theory-generating or theory-refining knowledge synthesis method could include any paradigm (such as constructivist, ethnographic, hermeneutic, interpretivist, naturalistic, and
phenomenological) seeking to generate theory through qualitative or mixed qualitative and quantitative methods [25, 26]. We also considered correlational, determinative, experimental, normative, positivist, and reductionist paradigms for generating theory through quantitative methods [26]. Multi-disciplinary knowledge synthesis methods from the fields of health, psychology, education, sociology, and philosophy were included.

2.3 Screening and data abstraction

Eligibility criteria were established a priori and were calibrated amongst the team through a series of pilot tests. Once agreement reached 90%, pairs of reviewers independently screened the literature search results, resolving discrepancies through discussion. The data abstraction form was developed a priori, calibrated using a random sample of 10 included studies, and independently abstracted by pairs of reviewers, with discrepancies resolved through discussion.

2.4 Synthesis

We synthesised the results through qualitative analysis with NVivo 10 [27]. We categorised the methods used to generate theory according to the objectives of included studies [21]. Thematic analysis was used to synthesise common themes and to assess similarities, differences, strengths, and limitations across the various knowledge synthesis methods [28]. In addition, we compared and contrasted the included knowledge synthesis methods with traditional systematic review and meta-analytic methodology. We identified the seminal papers that introduced each knowledge synthesis method. The steps for performing each type of synthesis were categorised into the themes, established a priori.
3. Results

3.1 Literature search

We screened a total of 17,962 titles and abstracts and 1,010 potentially relevant full-text papers and found 287 articles (Appendix A, Appendix B) that fulfilled our eligibility criteria for this part of the scoping review (Figure 1).

3.2 Definitions of knowledge synthesis methods

Using thematic analysis, we identified nine knowledge synthesis methods that can be used to generate or refine theory: concept synthesis, critical interpretive synthesis, integrative review, meta-ethnography, meta-interpretation, meta-study, meta-synthesis, narrative synthesis, and realist review, which were defined previously [22]. The full definitions can be found in Appendix C.

3.3 Expertise required for conducting the knowledge synthesis methods

In terms of the expertise required to conduct the various knowledge synthesis methods, the common themes were related to characteristics of the team as a whole and skills, knowledge, and expertise of individual team members (Table).

For example, to understand the literature captured by integrative reviews, meta-syntheses, narrative syntheses, and realist reviews, it was recommended that the knowledge synthesis team include members with training in nursing research methods and sociology.

3.4 Similarities and differences relative to systematic reviews and other emerging knowledge synthesis methods

When we compared the nine knowledge synthesis methods with traditional systematic reviews and with other emerging knowledge synthesis methods, numerous similarities and differences were identified (Appendix D). For example, in terms of underlying paradigms, meta-synthesis comes from the integrative, interpretivist, and phenomenological tradition (Box),
similar to the paradigms for meta-ethnography, meta-interpretation, and meta-study, but different from systematic reviews, which arise from the reductionist paradigm (Box).

3.5 Strengths and weaknesses of the methods

We also identified a number of strengths and weaknesses reported by the authors of the included studies (Appendix E). For example, a strength was that the method was a comprehensive synthesis that provides rich contextual data (e.g., can accommodate various study designs, contexts, and types of evidence): critical interpretive synthesis, integrative review, meta-ethnography, meta-study, meta-synthesis, narrative synthesis, and realist review. To contrast, an example of a weakness was that the method is highly subjective and not reproducible: concept synthesis, critical interpretive synthesis, integrative review, meta-ethnography, meta-interpretation, and meta-synthesis.

3.6 Operationalising the knowledge synthesis methods

For integrative review, meta-ethnography, and realist review, guidance was provided on all steps of the process, whereas meta-synthesis had guidance on the fewest number of steps (Appendix F). Examples of the guidance related to the specific steps as reported by authors of seminal articles are highlighted below.

Clearly identifying the research question was recommended for the conduct of integrative review, meta-ethnography, and realist review, whereas iterative and open-ended questions were recommended for critical interpretive synthesis and meta-study. Well-defined, comprehensive literature searches were recommended for integrative review and narrative synthesis. For other methods, recommended approaches were purposive sampling (meta-interpretation, realist review), multiple search strategies (critical interpretive synthesis, meta-study), or use of as many terms as possible to describe the concept of interest (concept synthesis). Specific guidance on the
literature search was not provided for meta-ethnography or meta-synthesis, other than to locate studies for inclusion.

Clear formulation of eligibility criteria was recommended for integrative review, while concept synthesis, meta-ethnography, and realist review considered “fit for purpose” for selecting studies for inclusion, and purposive sampling was mentioned for critical interpretive synthesis. Use of a pre-defined data collection form was recommended for critical interpretive synthesis and integrative review, while a set of forms (with different sections completed for different sources of evidence) was recommended for realist review. The exclusion of methodologically flawed studies was suggested for critical interpretive synthesis, but without specific guidance on the threshold for defining a study as “fatally flawed.”

Specific to data analysis, thematic analysis was recommended for critical interpretive synthesis, integrative review, meta-synthesis, and meta-ethnographic and meta-interpretation analytical techniques for critical interpretive synthesis. In addition, refinement of the program theory occurred during the synthesis phase of a realist review.

Mentioning implications for practice and policy, as well as limitations of the synthesis, was recommended for the discussion section of integrative reviews. Drafting and applying recommendations and conclusions with key stakeholders across different contexts was recommended for realist reviews.
4. Discussion

Through our scoping review, we identified nine knowledge synthesis methods that can be used to generate or refine theory. Upon close examination, we found that the true difference among these methods was related to the manner of data synthesis. This finding suggests that these methods differ largely in terms of analysis rather than full knowledge synthesis methods.

Guidance was provided on all steps of the process for integrative reviews, meta-ethnography, and realist reviews, whereas meta-synthesis had guidance on the fewest number of steps. However, even with full guidance available, it can be difficult to operationalise these methods. Indeed, a recent study found that meta-ethnography methods are not well reported or operationalised [29]. This shortcoming makes it challenging for others to use these knowledge synthesis methods. We propose convening an international group of leaders in the field to clarify these methods further. Outputs from this meeting may include an algorithm to select the most appropriate synthesis methods for particular research questions, a textbook describing how to conduct the various methods, presentations at knowledge synthesis conferences, and workshops with knowledge synthesis producers.

Some of the strengths identified in our scoping review provide clues as to which synthesis methods can be used to answer different types of review questions. For example, all of the methods considered here can be used if reviewers are interested in generating or refining a theory. Although involvement of individuals with experience conducting qualitative studies was not recommended by all of the included papers, we believe that such expertise should be available in the conduct of these knowledge syntheses.

Our results confirm that the methods examined here are indeed “emerging”, and that they are far less developed than established methods for systematic reviews of interventions [1].
Nonetheless, these methods can provide rich contextual details useful in establishing theories as to why certain interventions work (or fail) in particular settings and contexts [13]. They can also be used to elucidate the perceptions, values, and experiences of stakeholders, which are important factors to consider in planning, implementing, and evaluating health care interventions. As such, we argue that more work is necessary to develop and improve these novel methods and to give knowledge synthesis producers opportunities to use them. We also recommend that knowledge synthesis producers identify strategies to ensure their syntheses are conducted to the highest level of methodological rigour. Because many of these methods use the same qualitative approaches as the original studies on which the syntheses are based, similar threats to internal validity should be anticipated and mitigated, whenever possible [30]. Finally, publications should report study methods in as much detail as possible.

Our scoping review had some limitations. We included only published articles written in English, we relied on key articles to identify the steps involved with each method, and we relied on the information presented by the authors of the included studies. As such, we may have missed important knowledge synthesis methods or studies that fulfilled our eligibility criteria, and we may have misinterpreted the intentions of authors of the included studies. Furthermore, our results are based on thematic analysis, which is subjective and might not be reproducible. Scoping reviews provide a map of the literature, stressing the breadth rather than depth of a topic. As such, most scoping reviews do not appraise the methodological quality of included studies. Finally, because of time and resource constraints, we were unable to include guidance for some of the methods that has recently become available. For example, recently published methods for meta-narrative reviews [31] and realist reviews [32] could not be included here.
In this article, we have focused on the similarities and differences, strengths and limitations, and key skills required for conducting complete knowledge synthesis methods that can be used to generate or refine a new theory. In the next paper, we will put all of our results into context, propose future research endeavours, and discuss knowledge translation strategies.
FIGURE LEGENDS

Figure 1: Study flow diagram
Competing interests

The authors have no competing interests to declare.

Acknowledgements

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Authors’ contributions

ACT conceived the study, obtained funding for the study, screened citations and full-text articles, abstracted data, analysed and interpreted the data, and wrote the manuscript. JA and CS coordinated the study, screened citations and full-text articles, abstracted data, developed the qualitative analysis, coded and analysed data, and edited the manuscript. MK conceived the study, obtained funding for the study, screened citations and full-text articles, abstracted data, analysed and interpreted the data, and edited the manuscript. EC screened citations and full-text articles, abstracted data, and edited the manuscript. HM screened citations and full-text articles, abstracted and cleaned the data, and edited the manuscript. JD and WH coded data in NVivo, and generated tables and figures, and edited the manuscript. SES conceived the study, obtained funding for the study, analysed and interpreted the data, and edited the manuscript.
Box: Pertinent concepts

Generate theory: To generate (or refine) a theory is congruent with inductively developing a pattern of meanings.

Interpretivist, constructivist, hermeneutic, ethnographic, phenomenological, naturalistic paradigm: This paradigm grew out of hermeneutics, and these research approaches attempt to understand human experience. The purpose is to generate theory through qualitative research methods or mixed qualitative and quantitative methods.

Positivist/experimental/correlational/reductionist/determinative/normative paradigm: This paradigm grew out of empiricist philosophy, where causes determine effects or outcomes. The purpose is to test theory through quantitative research methods.


Research dilemmas: Paradigms, methods and methodology,

<table>
<thead>
<tr>
<th>KS Method*</th>
<th>Characteristics of the team</th>
<th>Skills, knowledge, and expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept synthesis</td>
<td>None reported</td>
<td>Novice level and up</td>
</tr>
<tr>
<td>Critical interpretive synthesis</td>
<td>Academic background</td>
<td>Extensive experience and training in academia (for critical appraisal) and academic service (for program implementation)</td>
</tr>
<tr>
<td>Integrative review</td>
<td>Nursing background, Health background, Sociology background, Key stakeholders</td>
<td>Knowledge of research utilisation, Consultation with or use of a librarian</td>
</tr>
<tr>
<td>Meta-synthesis</td>
<td>Nursing background, Sociology background, Health care professionals</td>
<td>Experience or expertise in qualitative research, Broad range of skills, Broad range of experiences, Knowledge of research utilisation, Semantic (literal) and idiomatic (meaningful) skills, Advanced skills in understanding, Consultation with/use of a librarian</td>
</tr>
<tr>
<td>Meta-ethnography</td>
<td>Sociology background, Health care professionals</td>
<td>Experience or expertise in qualitative research, Broad range of experiences, Critical judgement</td>
</tr>
<tr>
<td>Meta-study</td>
<td>Meta-disciplines (history, philosophy)</td>
<td>Broad range of experiences</td>
</tr>
<tr>
<td>Meta-interpretation</td>
<td>None reported</td>
<td>None reported</td>
</tr>
<tr>
<td>Narrative synthesis</td>
<td>Nursing background, Sociology background, Health care professionals, Researchers with varied backgrounds or variety in team membership (professionally and/or demographically)</td>
<td>Extensive background in research, Broad range of experiences, Critical judgement</td>
</tr>
<tr>
<td>Realist review</td>
<td>Nursing background, Sociology background</td>
<td>Broad range of skills, Broad range of experiences</td>
</tr>
</tbody>
</table>

*Note: As reported by the authors of papers included in the scoping review. References for each method are shown in Appendix A and B.

**Abbreviation:** KS, knowledge synthesis
References


[20] Perrier L, Lightfoot D, Straus SE, Kealey MR, Tricco AC. Knowledge synthesis methods research: a bibliometric analysis found relevant MeSH were not applied or not available for emerging knowledge synthesis methods. In press at the Journal of Clinical Epidemiology.


N=17,962 titles and abstracts from MEDLINE, CINAHL, ERIC, LISA and other sources

N=16,952 excluded
1) Not a knowledge synthesis method (n=16,915)
2) Not related to health or philosophy (n=37)

N=1,010 potentially relevant full-text articles

N=601 excluded
1) Not a knowledge synthesis method (n=457)
2) Non-English study (n=72)
3) Unable to locate full text (n=69)
4) Not related to health or philosophy (n=3)

N=409 included articles reporting on 25 methods