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Methodology for JBI Mixed Methods Systematic Reviews

JBI Library of Systematic Reviews

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Joanna Briggs Institute Reviewers' Manual: 2014 edition/supplement

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Foreword

Every year the Joanna Briggs Institute publishes a Reviewers' Manual, which is designed to support individuals who are undertaking systematic reviews following JBI methodologies and methods. This chapter represents the latest work and methodological development of the Institute that was not ready for inclusion in the 2014 edition of the Reviewers' Manual that was published in January.

As with the Reviewers' Manual we recommend that this chapter be utilised in conjunction with the JBI SUMARI User Guide. Please note that this chapter makes reference to forthcoming analytical modules that do not currently exist in the JBI SUMARI software suite, but should be available in 2015. For advice on how to best apply the current software to accommodate this new methodology please contact the Synthesis Science Unit of the Institute at jbisynthesis@adelaide.edu.au.

We hope that the information contained herewith provides further insight into how to analyse and synthesise different types of evidence to inform clinical and policy decisions to improve global health outcomes.

A handwritten signature in black ink, appearing to read 'E. Aromataris', with a long, sweeping horizontal line extending to the right.

Associate Professor Edoardo Aromataris

Director, Synthesis Science

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Methodology for JBI Mixed Methods Systematic Reviews

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1. Mixed Methods Systematic Reviews and Evidence-Based Practice

Joanna Briggs Institute (JBI) systematic reviews are designed to close the gap between research and practice; however single method reviews are frequently too narrow to develop actionable findings in terms of policy and practice. Mixed methods reviews address this issue and have the potential to produce systematic reviews of direct relevance to policy makers and practitioners. By including diverse forms of evidence from different types of research, mixed methods reviews attempt to maximize the findings—and the ability of those findings to inform policy and practice. Methods for mixed methods reviews are still emergent: there are a number of approaches described in literature, and most emerging methodologies focus on pooling the findings of quantitative and qualitative inquiry. The JBI methodology for mixed methods reviews is designed to bring together the results of single method reviews (including quantitative, qualitative, economic, diagnostic, etc.) on a given topic.

Qualitative versus quantitative: my synthesis is better than yours

There is an ongoing debate regarding the comparative usefulness of quantitative and qualitative evidence. On the one hand, studies that present qualitative data are integral to understanding the human experience by giving a voice to the patient/client or provider in the health care decision-making process; however they cannot provide any empirical evidence to support the effectiveness of the topic of interest.

Conversely, studies that present quantitative data provide statistical and theoretically reproducible evidence regarding the effectiveness of a particular intervention or treatment; however such evidence often ignores the patient's opinion, clinical wisdom and the diverse contexts in which such statistical evidence may be of less utility.

Although both qualitative and quantitative evidence syntheses have their strengths, any review which focuses exclusively on one form of evidence presents only half the picture and will thus have limited applicability in many contexts. For example, although quantitative evidence suggests that the use of maggots is clinically and financially effective in the debridement of wounds, one study demonstrates that 23% of leg ulcer patients would not consider larval therapy, irrespective of whether it was recommended (Spilsbury et al 2007), and another study identifies one patient who *"lost her appetite for three days during the treatment owing to the image of maggots on her wound"* (Menon 2012).

Were the authors of a quantitative review to suggest that every clinician adopt the use of maggot therapy for wound debridement based on the evidence of effectiveness (in those cases with no medical contraindications), this would present a very short sighted conclusion which is out of tune with reality.

Two or more syntheses are better than one: mixed methods analyzes

Within primary research qualitative and quantitative methodologies are not always separated. Primary mixed methods research has the capacity to overcome problems inherent in the independent generation of quantitative or qualitative evidence alone; however mixed methods studies are usually less likely to describe how the study was conducted, to describe procedures of qualitative data analysis, and to be judged credible (Atkins et al. 2012). Furthermore, as with other individual studies, the strength of evidence rests on the design and context of a particular study. That being said, careful inclusion of such studies into systematic reviews can prove beneficial and strengthen the conclusions.

The mixed methods approach to conducting systematic reviews is a process whereby (1) comprehensive syntheses of two or more types of data (e.g. quantitative and qualitative) are conducted and then aggregated into a final, combined synthesis, or (2) qualitative and quantitative data are combined and synthesized in a single primary synthesis. Mixed methods reviews represent an important development for all individuals involved in evidence-based health care. That being said, Sandelowski et al. (2012) suggest that such mixed methods reviews are particularly relevant to international organizations (such as the JBI) because they:

"...broaden the conceptualization of evidence, [are] more methodologically inclusive and produce syntheses of evidence that will be accessible to and usable by a wider range of consumers."

Through the development of well structured mixed method systematic reviews, the numerical strength inherent in the positivist paradigm can fuse with the less tangible yet equally important opinions and perspectives presented in interpretive and critical paradigms, producing far more informative conclusions than those derived from evidence presented in autonomous modes of synthesis. By following a systematic methodology for combining quantitative and qualitative data, the requirement for interpretation is reduced, thereby increasing the objectivity of subsequent conclusions.

A multiplicity of methods

As the field of mixed methods systematic reviews is still in its infancy, there is at present no consensus with regards to how such reviews should be conducted. A search of literature reveals numerous articles claiming to encompass both quantitative and qualitative data analyses; however few of these can be considered mixed methods in that included data are rarely combined in a single synthesis nor united in a secondary "final" synthesis.

Rather, the majority either develop a framework based on themes derived from qualitative studies and incorporate quantitative data within the framework (e.g. Thomas et al. 2004), or analyze qualitative and quantitative data separately and then provide a brief narrative discussion of the “total” results (e.g. Bruinsma et al. 2012).

To date, several books and papers have been published presenting methodological approaches for combining diverse forms of data; however rather than providing a foundation through which to consolidate ideas in an effort to derive a consensus:

“...the current impetus in the literatures of mixed methods research and mixed research synthesis is a multiplicity rather than parsimony.” (Sandelowski et al. 2012)

The continual development of new methodological approaches to mixed methods systematic reviews diminishes the usability and utility of such reviews, as, instead of focussing on the conclusions generated for the topic of interest, much energy is spent on critiquing the method employed to derive these conclusions.

In a recent technical brief, Harden identifies three methods in which mixed methods systematic reviews are conducted at the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre) in the United Kingdom (Harden 2010):

1. The systematic review of mixed research studies is by default a mixed methods systematic review: as the original studies are of mixed methods, the resulting synthesis will be mixed.
2. The synthesis methods used in the review are mixed (e.g. two or more syntheses are performed involving, for instance, quantitative and qualitative data).
3. A model which involves both the building and testing of theories based on the results of original syntheses. This involves the same process as method 2 (separate syntheses of qualitative and quantitative data; building); however it also incorporates a third synthesis (testing), whereby the thematic synthesis of qualitative data is used to “interrogate” the meta-analytical results of quantitative data.

The first two of these methods do not present viable models through which to conduct mixed methods systematic reviews, as although they include both quantitative and qualitative data, the inability of authors to clearly delineate evidence types in a single synthesis (1), or failure to combine evidence in a secondary synthesis (2), may significantly limit their utility. The third model is akin to the segregated methodology described in Sandelowski et al. (2006 [see below]), in that syntheses are conducted separately and then recommendations from the qualitative synthesis are used to contextualize quantitative data and generate reasons behind the success and/or failure of a program.

In the third method, two or more syntheses are conducted and then combined in a secondary synthesis. In this example, the authors conduct both a qualitative synthesis (synthesis 1) and a quantitative synthesis (synthesis 2) regarding the barriers to healthy eating in adolescents in the UK (Thomas et al. 2004). By applying specific recommendations derived from qualitative-based themes (synthesis 1) to numerical data (synthesis 2), the authors can more accurately predict the cause behind an observed effect. For instance, if synthesis 2 demonstrates that children are not interested in “health” per se and do not consider future health consequences as being relevant, by applying this statement to synthesis 1, the authors can recommend rebranding fruit and vegetables as being “tasty” rather than “healthy” in an attempt to convince children to eat more of these foods (Harden 2010).

2. Methodological approaches to mixed-method syntheses

New approaches to mixed methods synthesis are continually being reported in literature. The two dominant approaches are Realist Synthesis (Pawson 2002) and a set of alternative frameworks posited by Sandelowski et al. (2006).

Realist synthesis

Realist synthesis (Pawson 2002) is not an evaluation technique in itself; rather it presents a framework which encompasses the “whole enterprise”. Realist syntheses follow an unstructured contingent design (see above) presenting a theory-driven approach that follows a context-mechanism-outcome paradigm in which:

“...interventions offer resources which trigger choice mechanisms (M) which are taken up selectively according to the characteristics and circumstances of subjects (C), resulting in a varied pattern of impact (O).” (Pawson 2005)

The process attempts to “differentiate and accumulate evidence on positive and negative CMO configurations” (Pawson 2002) and assumes that all program mechanisms are met with both success and failure, depending on the context. A realist synthesis thereby explains not only for whom the mechanism generates success or failure but also encompasses differing degrees of success and the associated reasons for this variability. The focus is not on whether a particular program works, but on resources available to facilitate program success. The interpretation of such a stratagem by a subject generates a “program mechanism” and forms the foundation of realist syntheses. Pawson (2002) summarizes the realist approach as presenting evidence for “what works for whom in what circumstances”. The process begins with the development of an initial “theory” which, although abstract in nature, is presumed to underlie a particular program or intervention. This theory is then utilized as a basis for identifying and extracting applicable data from diverse sources of information, including primary studies, media reports and abstracts. Once extracted, these data are integrated into the framework, presenting evidence either for or against the theory based on the particular context from which the data were sourced. These results attempt to explain how the intervention works in a way that facilitates decision-making within a range of contexts (Pawson 2004). For example, Greenhalgh et al. (2007) conducted a Cochrane review on the efficacy of school feeding program in disadvantaged children. Although results demonstrated that such program had significant positive effects on the growth and cognitive performance of disadvantaged children, trial design and social context varied considerably between studies. The authors then used the Cochrane review as the basis for a realist review to ascertain which aspects determined success and failure within these varying contexts (Greenhalgh et al. 2007). The results of this review demonstrate that program should be aimed at children with known nutritional deficiencies and that partnering with the local community and piloting of program are more likely to produce beneficial results. Such results show that not all school feeding programs are created equal and help to facilitate the implementation of effective program in the future.

Although realist syntheses have been utilized effectively in many circumstances, several key problems have been identified with the realist approach: for example, the process can lack transparency regarding the choice of evidence selected and there is a lack of explicit guidance regarding how to process contradictory evidence (Dixon-Woods et al, 2005; Curnock et al. 2012). In addition, as the process is highly iterative and can constantly changes the direction and focus of the review, this may result in significant bias (Pawson 2004).

General frameworks for mixed methods reviews

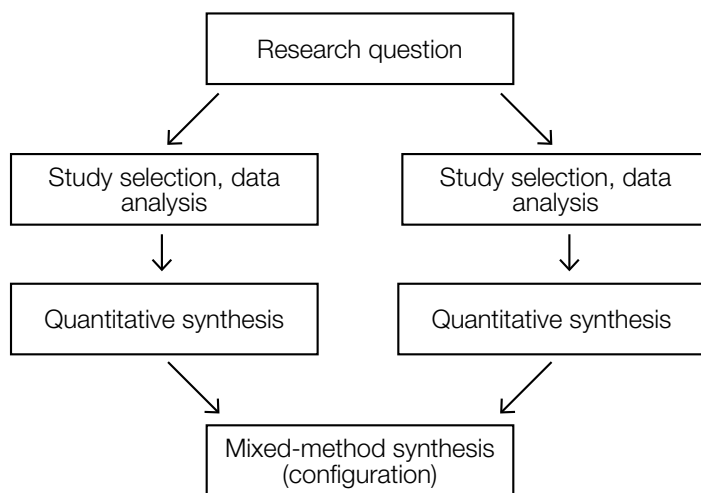
Sandelowski et al. (2006) identify three general frameworks through which to conduct mixed methods systematic reviews: segregated, integrated and contingent (Figure 1).

Segregated methodologies maintain a clear distinction between quantitative and qualitative evidence and require individual syntheses to be conducted prior to the final “mixed method” synthesis. The findings or evidence can fall into two categories: the quantitative and qualitative findings may either support each other (confirmation) or contradict each other (refutation); or they may simply add to each other (complementary).

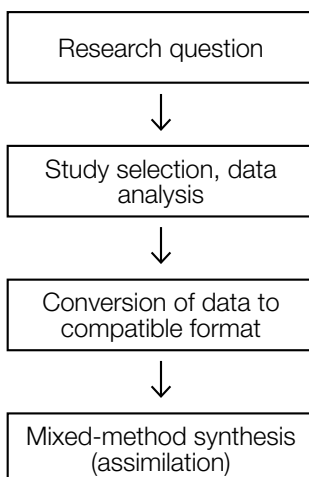
The category is not chosen by the reviewer, rather the category used depends on the data being analyzed. For example, a qualitative study which looks at a patient’s experience following a specific treatment could either confirm or refute quantitative findings based on lifestyle surveys/questionnaires of the same treatment. Conversely, the same qualitative study could not be used to confirm or refute the findings of a quantitative study of clinical effectiveness of the same treatment, and would instead present complimentary evidence. If the quantitative and qualitative syntheses focus on the same general phenomenon both confirmation/refutation and complementarity can inform the topic in a complementary manner. The resulting synthesis is often presented in the form of a theoretical framework, a set of recommendations or conclusions or a path analysis (Figure 1a: Sandelowski et al, 2006).

Integrated methodologies directly bypass separate quantitative and qualitative syntheses and instead combine both forms of data into a single mixed method synthesis. A primary condition for the development of an integrated mixed method systematic review is that both quantitative and qualitative data are similar enough to be combined into a single synthesis. As opposed to segregated methodologies, where the final synthesis involves a configuration of data, integrated methodologies are almost always confirmatory or refuting in nature and involve an assimilation of data. This presents the only method whereby both forms of data can be assimilated into a single synthesis, and requires that either (a) quantitative data is converted into themes, codified and then presented along with qualitative data in a meta-aggregation, or (b) qualitative data is converted into numerical format and included with quantitative data in a statistical analysis (Figure 1b).

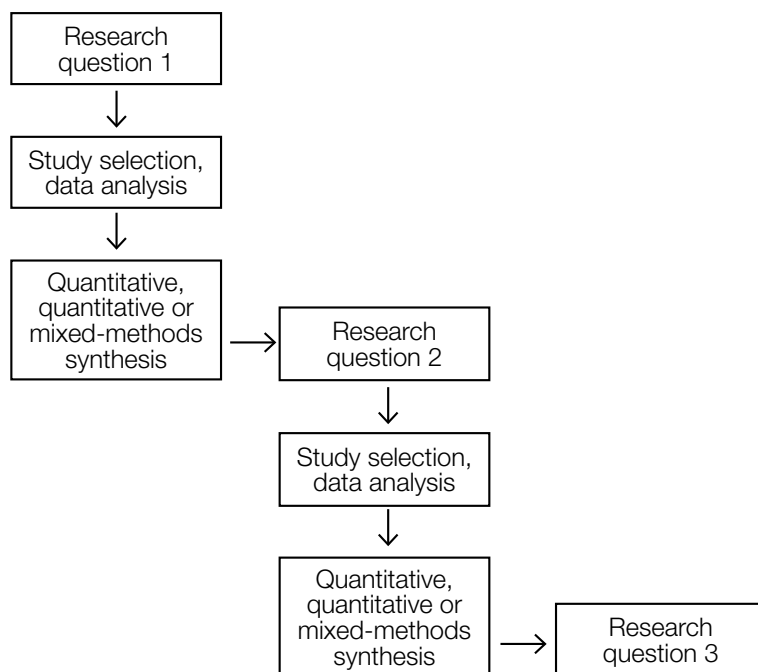
Contingent methodologies involve two or more syntheses conducted sequentially based on results from the previous synthesis. The process begins by asking a question and conducting a qualitative, quantitative or mixed method synthesis. The results of this primary synthesis generate a second question, which is the target of a second synthesis, the results of which generate a third question and so on. Contingent designs can include either integrated and/or segregated syntheses, and multiple syntheses can be conducted until the final result addresses the reviewer’s objective (Figure 1c: Sandelowski et al. 2006).



(a) Segregated



(b) Integrated



(c) Contingent

Figure 1: conceptualisation of the mixed-method review process. Adapted from Sandelowski et al. (2006)

Although all of the above methods utilize both quantitative and qualitative data in their analyses, only segregated methodologies present individual syntheses and then combine data in the same synthesis using a meta-analytical or meta-aggregative approach.

Bayesian approaches to mixed methods synthesis

Bayesian methods generate summative statements of the evidence through the meta-aggregation of data. This can involve attributing a numerical value to all qualitative data, facilitating a final statistical analysis of individual syntheses (i.e. translating qualitative data into quantitative), or attributing a qualitative thematic description to all quantitative data, thereby permitting a final meta-aggregation of individual syntheses (i.e. translating quantitative data into qualitative) (Table 1).

The use of Bayesian methods in mixed methods systematic reviews has been discussed widely but applied infrequently (Crandell et al. 2011). Essentially, in order for qualitative and quantitative data to be incorporated into the same stage of synthesis and thus equally inform the topic, the data must be transformed into a mutually compatible format (Voils et al. 2009). For example, if there are qualitative and quantitative findings, all must be translated into either a quantitative or qualitative form.

Bayesian conversion 1: qualitative to quantitative

Converting qualitative data to quantitative data involves assigning a numerical value to qualitative data in a form that is compatible to that of the quantitative data, enabling the author to calculate the proportion of participants associated with a particular finding. Both quantitative and qualitative data sets are analyzed independently using the same framework, and then may or may not be combined in a final analysis, depending on whether the estimates of probability have overlapping 95% credible sets (Voils et al. 2009). In other words, if the probability of a participant reporting a relationship (e.g. adherence to a complex medical regimen) is significantly different between the quantitative and qualitative analyzes, no further analysis is performed.

One problem with this method of analysis is the ambiguity often associated with participants in qualitative studies. Qualitative studies frequently express results through thematic and interpretive approaches that are not amenable to counting. Through the frequent application of the verbal count translation approach, seriously skewed or inflated ranges may be inadvertently developed. For example, an author may consider the statement *“many patients adhered to the treatment regime”* as appropriate when 20-305 of total patients made such a statement; however, this definition varies significantly from the verbal count translation system developed by Chang et al. (2009), in which “many” was defined as more than 50%.

Bayesian conversion 2: quantitative to qualitative

A novel method of combining quantitative and qualitative data was presented by Crandell et al. (2011) when comparing factors facilitating or hindering antiretroviral adherence. The authors initially grouped similar variables together into themes and then coded data for each variable based on the whether the variable signified adherence, non-adherence, or both adherence and non-adherence (Table 2). These values were entered into a data matrix with a single report occupying each row and single theme (variable) occupying each column. If a report did not address a variable, that cell was left blank (Crandell et al. 2011).

As the majority of cells occupying the resulting data matrix are blank (most of studies only report on a subset of themes), a naive analysis of the results (assuming that each value independently contributes to the probability that these results are correct, regardless of the presence or absence of other values) produces broad 95% confidence intervals which significantly reduce the strength of conclusions. The application of Bayesian data augmentation methods helps to mitigate these effects by imputing missing values based on the available data. The results take the form of posterior mean values ranging from 0 to 1, with “high” values signifying factors associated with adherence and “low” values signifying factors associated with low adherence (with middle-range factors signifying a mix of adherence and non-adherence). Table 2 shows how Crandell et al. have coded this so that a mean value of 0 equates to a qualitative descriptor of “non-adherence” and a mean value of 1 equates to a qualitative descriptor of “adherence.”

Table 2: coding of quantitative and qualitative data (Crandell et al 2011)

Value	Quantitative*	Qualitative
0	$d \leq -0.20$	Non-adherence
0.5	$-0.20 \leq d \leq 0.20$	adherence + non-adherence
1	$d \geq 0.20$	adherence

*based on Cohen's d (standardized difference between means)

Crandell et al.'s somewhat simple example has its limitations. Other examples of more direct relevance to JBI reviews include findings in worked examples by Pearson et al. (In Press) and Salmond et al. (In Press).

The Joanna Briggs Institute aggregative mixed method synthesis draws on the Bayesian approach to converting quantitative to qualitative data, as proposed by Crandell et al. (2011); however, where these authors convert raw quantitative data into qualitative themes to generate a single combined synthesis, the JBI method applies the conversion process to the results of individual syntheses, thereby producing a single overarching synthesis which “marries” the results of separate syntheses. Irrespective of the quantitative data presented, such data lends itself well to the derivation of defined themes, and codifying quantitative data is less error-prone than attributing numerical values to qualitative data. By utilizing both quantitative and qualitative data to develop themes and then codifying all data into a compatible system for meta-aggregative analysis, equality between both data types is achieved. This approach presents a more simplistic, elegant and yet powerful method of combining data with the additional benefit of maintaining high fidelity through the production of separate syntheses (a fidelity which is lost through pre-synthesis pooling of extracted primary data).

Pearson et al. (in Press) pooled the results of a quantitative and qualitative synthesis on the impact of Self Monitoring of Blood Glucose (SMBG) on patient outcomes. Two meta-analyses from the initial quantitative component of the review (as presented in meta-view charts) show the significant reduction in glycated haemoglobin (HbA1C) levels in the SMBG groups. These quantitative values are translated into a qualitative statement of “the use of SMBG results in significant improvement in HbA1c levels at six months but not at 12 months” (see Figure 2).

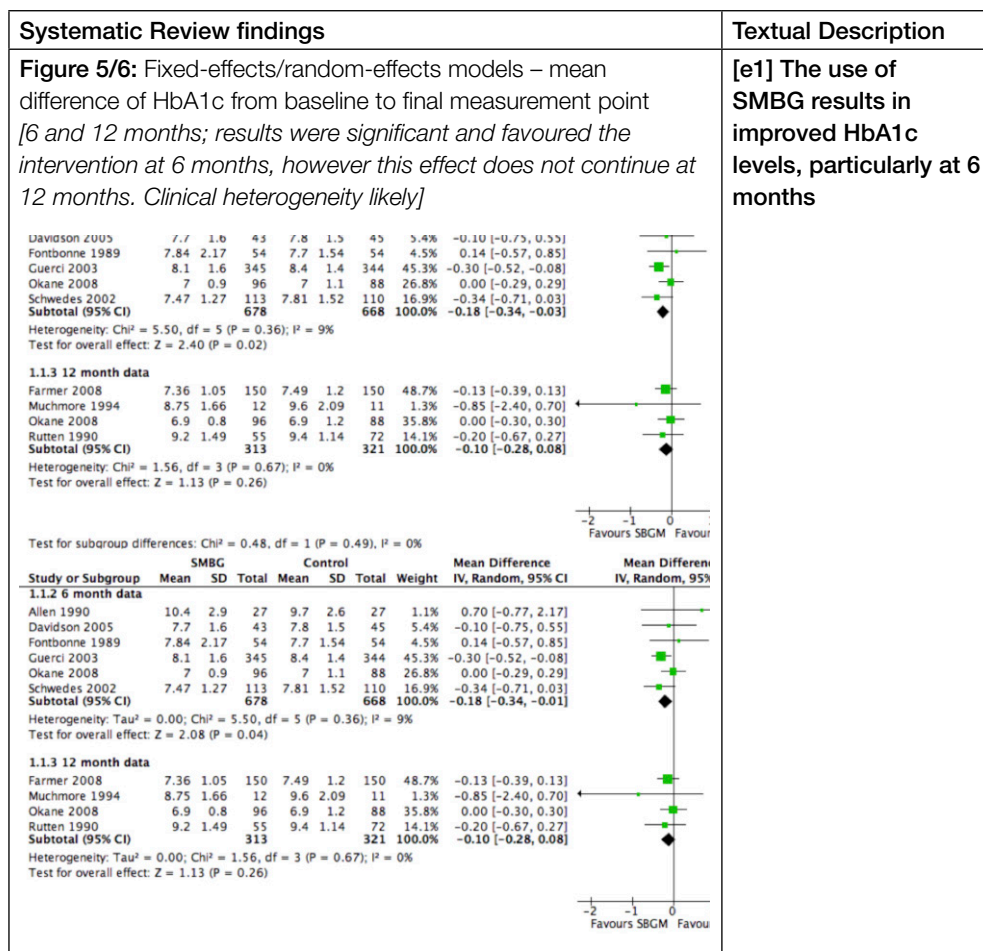


Figure 2 – Example conversion of quantitative data into textual description (Pearson et al 2013)

Maintaining rigor when translating quantitative findings into qualitative statements

It is important that attention is paid to minimizing the possible impact of pre-understandings that might arise from the conduct of the initial qualitative meta-aggregation when converting the quantitative values to qualitative statements in mixed method synthesis.

As in synthesizing qualitative evidence in single method qualitative reviews, reviewers are encouraged to consider ways to “bracket” when conducting the mixed method synthesis. Bracketing relates to how qualitative investigators attempt to minimize the impact of their own vested interests, personal experience and cultural beliefs on how they view and interpret data. To view data in a “fresh” way, researchers try to put these potential influences into “brackets” – that is they try to “shelve” them for time being.

Another consideration in maintaining rigor in mixed methods reviews relates to ensuring that the full context of included syntheses is not lost. Mixed methods synthesis takes the data from the included reviews to a higher level of extraction and the fidelity of the original review findings may be lost if they are not contextualized appropriately.

For example, in qualitative reviews, the final synthesized findings are based on categories, which are formed from the findings of included studies. As a result, all such synthesized findings have deep roots embedded in the studies from which the data is derived. In other words, these original syntheses have built-in contexts that not only form the foundations on which discussions of the synthesized findings are based but can also be used to justify the conclusions produced from such syntheses. Similarly, in quantitative reviews, meta-analyses and other summaries such as evidence tables are derived from data generated within a given context, and it is important to not lose this information in a mixed methods synthesis.

This process of contextualizing “textual descriptions” is referred to as “text-in-context” by Sandelowski et al. (2012). They suggest that when results derived through a synthesis of included reviews are anchored to the most important contexts in which such results are produced, these results are never “stand-alone” but instead they maintain a relationship with the methods used to generate them.

For example, in a review involving the effectiveness and appropriateness of educational components and strategies associated with insulin pump therapy, both quantitative and qualitative syntheses were developed based on data presented within identified studies. To combine these syntheses, the results of the quantitative review were translated into “textual descriptions” and assembled alongside the synthesized findings generated from the qualitative review. Finally, these textual descriptions and synthesized findings were pooled or “married” to each other to generate a mixed methods synthesis.

For this example, one textual description and one synthesized finding were combined to form a single mixed method synthesis as follows:

Textual description of quantitative synthesis finding:

“Participants who undergo training are generally receptive to helpful information and believe such programs to be of value, particularly when undertaken within a group setting”

and

Synthesized finding from qualitative review:

“Education that incorporates group and individual dynamics facilitates experiential learning”

Mixed method synthesis which “marries” the two:

“Educational programs are viewed positively by participants and may be particularly effective when conducted in group settings that are inclusive of all participants”

This synthesizing process does not appear to have given due weight to the full context of the reviews included. Stating that such educational programs may be “particularly effective when conducted in group settings that are inclusive of all participants” is rather general and does not inform the reader exactly why and for whom group sessions prove successful, or the components involved in group training which lead to its success.

Recommendations which are developed based on such a statement would be inherently vague, and require the reader to re-analyze the primary syntheses in order for the data to be useful in assisting them in developing an effective group training program. This limits the usefulness of mixed methods synthesis in informing policy or practice.

To avoid this, reviewers should consider close examination of included single method syntheses, then ascertain which contextual aspects are of the greatest importance to the mixed methods synthesis and subsequently use these to anchor the finding. In the above example, the original synthesized finding incorporates both group learning and autonomy as an objective of education. This synthesis demonstrates that achieving autonomy [with regards to self-management] is important, and that to achieve autonomy, patients must first be engaged and drawn into a group dynamic which encourages “learning from sharing” rather than being tied to a timeframe or curricula. These nuances are lost when the synthesized finding is stripped of context and included within the mixed methods synthesis, potentially leading the reader to erroneously assume that simply grouping participants together is the key to experiencing the benefits of such education. Thus, the mixed methods synthesis, if contextually grounded, should be as follows:

“Educational programs that focus on patients becoming autonomous through the use of group processes that encourage ‘learning from sharing’ are viewed positively by participants and may be particularly effective when conducted in group settings that are inclusive of all participants”

Systematic reviews of effects rely on a variety of output methods which are dependent on both the nature of included primary data and, in some instances, author preference. The most rigorous means of combining data within a systematic review is represented by the meta-analysis. If data is incompatible with such means of combination, the tabular presentation of primary data is a more simplified way of visually presenting like data. Unfortunately, many reviews rely on the narrative method of data presentation, whereby the author describes the results of included studies in prose.

When considering including systematic reviews of effects that deal exclusively (or almost exclusively) with a narrative presentation of results, it is more appropriate for the author of a mixed methods systematic review to skip the tabular conversion of quantitative to qualitative data, and use a more qualitative approach, i.e. use instead a thematic analysis program such as JBI TAP (<http://www.jbiconnect.org/sumari/sumarimodules/Tap/common/login.cfm>) to analyze quantitative data. This results in the development of a three-tiered meta-aggregation suitable for direct combination with the synthesized findings as presented within the qualitative component of the mixed methods review.

Critical analysis of included systematic reviews

Systematic reviews that universally sit atop the hierarchy with regards to the strength of evidence attributed to them, i.e. systematic reviews, either alone or next to high level randomized controlled trials (RCTs), are attributed the status of Level 1 Evidence. Mixed methods syntheses, through the combination of multiple sources of evidence in the form of independent systematic reviews, have the capacity to present a very high level of evidence. That being said, the simple combination of a qualitative systematic review with a quantitative systematic review is insufficient for achieving Level 1 Evidence status alone. Rather, the quality of included systematic reviews must be considered prior to assimilation if the author is to justify the strength given to recommendations derived from this assimilation of evidence.

It is important that, prior to inclusion in a mixed methods review, individual systematic reviews are critically appraised using tools such as those developed by JBI (see JBI Umbrella Reviews chapter) or the AMSTAR tool, or some other appropriate quality assessment tool. In this way, the author can identify strengths and limitations within included systematic reviews and ascribe a more accurate and reproducible strength to evidence presented within the mixed method review. Some statement concerning the quality of any included review should be presented in the mixed method review.

Summative, proscriptive or indicative?

Clinicians rely on the ability of systematic review authors to condense their results into recommendations which are immediately useful to informing the way they practise. In other words, rather than focus on providing an executive summary of the results of a systematic review, a good systematic reviewer should convert this summary into one or more statements explicitly describing what a clinician needs to do in order to adhere to evidence-based best practice.

Based on consultation with experts in a recent mixed methods workshop (JBI International Convention, October 2013, Adelaide Australia), consensus suggests that rather than take either the proscriptive approach as outlined above, or the basic summation of results of a systematic review, authors of mixed methods systematic reviews should take the mid-line approach of providing indicative statements based on the available evidence.

Summative: “Studies included in this review generally suggest that treating patients with X is more effective and results in shorter length of hospital stay compared with Y”

Proscriptive: “Clinicians should administer X to patients instead of Y”

Indicative: “The clinician should consider administering X rather than Y as this has been shown to be both more effective and results in shorter length of hospital stay”

Table 1: Comparison of Bayesian methods for mixed method synthesis

Method of synthesis	Description
Bayesian conversion: Qualitative → Quantitative	<p>A numerical value is attributed to all qualitative data in a format that is complementary to that of the quantitative data;</p> <p>Separate prior distributions (presumed probabilities) are applied individually to quantitative and qualitative data;</p> <p>Posterior distributions (evidence informed probabilities) are compared and, if 95% confidence intervals overlap, combined.</p>
Strengths	<p>Facilitates the statistical analysis of both quantitative and qualitative data;</p> <p>Attributes equal strength to quantitative and qualitative data instead of simply using qualitative data for the generation of themes in which to impute quantitative data.</p>
Weaknesses	<p>Significant problems associated with conversion of verbal counts (e.g. “many”, “few” etc) to numerical format;</p> <p>Non-overlapping 95% confidence intervals prohibit combined analysis of data.</p>
Bayesian conversion: Quantitative → Qualitative	<p>All quantitative data is thematically synthesised and codified according to strength of effect.</p>
Strengths	<p>Codification of quantitative data is less error prone than quantification of qualitative data;</p> <p>Existing data provides a more accurate basis for the development of prior distributions through which to base subsequent analyses.</p>
Weaknesses	<p>Whole study focus produces a reliance on reasonable number of studies for strength of conclusions;</p> <p>The weighting of individual studies needs to be adjusted based on the varying levels of evidence and methodological quality of these included studies.</p>

3. The JBI approach to mixed method syntheses

JBI has adopted the segregated approach to mixed method synthesis as described by Sandelowski et al. (2012), which consists of separate syntheses of each component method of the review. The JBI mixed methods synthesis of the findings of the separate syntheses uses a Bayesian approach to translate the findings of the initial quantitative synthesis into qualitative themes and pooling these with the findings of the initial qualitative synthesis.

JBI mixed method syntheses can be managed in two ways:

1. Two or more individual, single method reviews may be conducted (via CReMS and appropriate analytical modules such as the Meta Analysis of Statistics Assessment and Review Instrument [MAStARI]), Qualitative Assessment and Review Instrument [QARI], etc.) and published as separate, single methods reviews. These single method reviews may then be combined in a mixed method review using a new mixed methods protocol and the Joanna Briggs Institute's Mixed Methods Assessment and Review Instrument (MMARI) module. CReMS permits reviewers to identify previously completed syntheses in any of the analytical modules and to link them to a new mixed methods review. This will automatically re-publish the previously published individual review reports as sections of the new mixed method review; or
2. The mixed method review will be conducted as a whole (via CReMS and relevant analytical modules) and the component syntheses will be published only as part of the mixed method review report.

The mixed method review question will determine the components of the review. For example, in a mixed methods review of the use of blood glucose monitoring (BGM) in people newly diagnosed with type 2 diabetes, the question may focus on the effects of BGM on blood sugar levels, the cost benefits of BGM, and the experience of people newly diagnosed with type 2 diabetes in using BGM. In this mixed methods review, the broad question focuses on the effects of BGM on blood sugar levels, but a broader perspective that encompasses both the effects on the outcome itself, the related costs, and the experiences of people newly diagnosed with type 2 diabetes may generate more meaningful and useful findings for patients, policy makers and practitioners. To conduct the mixed method review for this example, the reviewer conducts three segregated syntheses using (1) MAStARI, (2) QARI, and (3) Analysis of Cost, Technology and Utilisation Assessment and Review Instrument (ACTUARI), and then configuratively aggregates the results of these syntheses using MMARI, as shown in Figure 2. Within this system, the results of primary mixed methods research will be separated into their respective components and included within individual syntheses (the quantitative component will be incorporated into the quantitative synthesis within MAStARI, the qualitative component will be incorporated into the qualitative synthesis within QARI, etc.). It is important to ensure that only those components of a mixed method study which are eligible for inclusion within their respective syntheses (based on pre-defined inclusion criteria) contribute to the review, and that eligible studies that include quantitative, qualitative or other data are presented as separate studies within their individual syntheses.

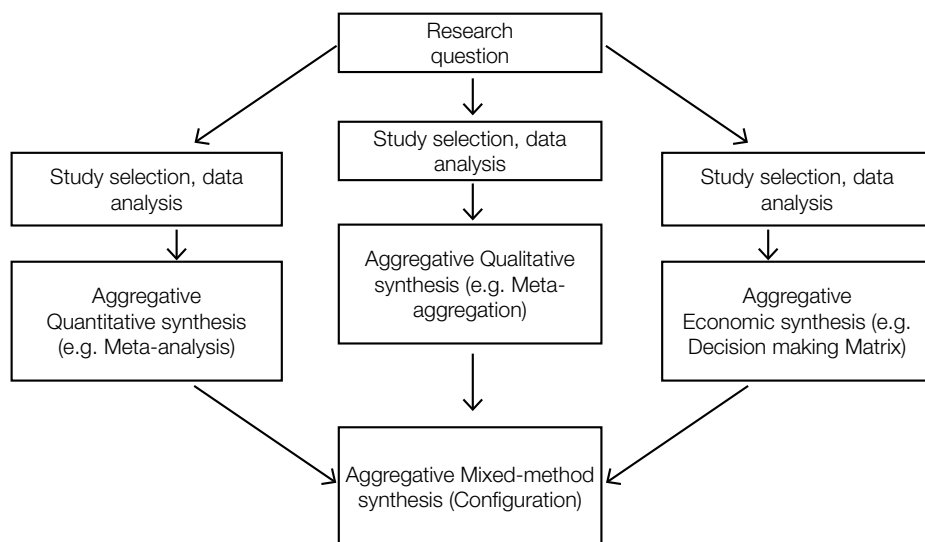


Figure 3: JBI model of mixed method synthesis

The System for the Unified Management, Assessment and Review of Information (SUMARI) Version 6 is structured to produce meta-aggregative results of separate quantitative, diagnostic, economic, qualitative and textual syntheses and has the ability to combine syntheses developed using existing modules (i.e. QARI, Narrative, Opinion and Text Assessment and Review Instrument [NOTARI], MASTARI and ACTUARI) to generate a single overarching synthesis.

Mixed methods protocol and title development

By definition, a mixed method review embodies the conduct of at least two single method syntheses (e.g. a synthesis focusing on RCTs to measure the effects of an intervention and a synthesis focusing on qualitative studies exploring the experiences of patients). Protocol development therefore firstly addresses two or more specific PICO/PICo criteria that are aligned with their respective analytical modules in SUMARI. The segregated approach adopted by JBI maintains a clear distinction between quantitative and qualitative evidence and requires individual syntheses to be conducted prior to the final “mixed-method” synthesis. Thus, the development of the protocol must follow the approaches set out below:

Title of systematic review protocol:

The title should be informative and give clear indication of the topic of the mixed methods review. The title should always include the phrase “...: a mixed methods systematic review protocol” to allow easy identification of the type of document it represents. A JBI review requires at least two reviewers. The names of all reviewers with their post-nominal qualifications, affiliations for each author including their JBI centre affiliations and email address for the corresponding author should be included.

Review objectives/questions:

Mixed methods reviews should pose a question that specifically requires the inclusion of two or more syntheses that are grounded in different approaches. An example objective for a mixed methods review might be: *“The mixed methods review seeks to develop an aggregated synthesis of qualitative, quantitative and economic systematic reviews on XYZ in an attempt to derive conclusions and recommendations useful for clinical practice and policy decision making”*.

Examples of and clearly articulated PICO/PICo questions that may be posed by one mixed methods systematic review are:

1. What is the effectiveness of educational strategies associated with insulin pump therapy?
2. What is the appropriateness of educational strategies associated with insulin pump therapy?”

Background:

As with all JBI systematic review protocols, the background to a mixed methods review should describe and situate the topic of interest under review including the population and context. Definitions can assist to provide clarity. Where complex or multifaceted phenomena are being described, it may be important to detail the whole of the phenomenon for an international readership. In mixed method review protocols, the protocol should present background information for each of the separate syntheses that make up the review and follow with sufficient background information demonstrating the importance and justification for a combined synthesis.

Inclusion criteria

Types of participants

This should address each of the syntheses included in the review, for example:

- The quantitative component of this review will consider studies that include #describe population#
- The qualitative component of this review will consider studies that include #describe participants#
- The textual component of this review will consider publications that included #describe participants#
- The economic component of this review will consider studies that included #describe population#

Types of intervention(s)/phenomena of interest

This should address each of the syntheses included in the review, for example:

- The quantitative component of the review will consider studies that evaluate #insert text#
- The qualitative component of this review will consider studies that investigate #insert text#
- The textual component of this review will consider publications that describe #insert text#
- The economic component of this review will consider studies that evaluate #insert text#

Types of outcomes

This should address each of the syntheses included in the review, for example:

- The quantitative component of this review will consider studies that include the following outcome measures: #insert text#
- The economic component of the review will consider studies that include #insert text#

Context

- The qualitative component of this review will consider studies that investigate #insert text#

Types of studies

This should address each of the syntheses included in the review, for example:

- The quantitative component of the review will consider any experimental study design including randomized controlled trials, non-randomised controlled trials, quasi-experimental, before and after studies for inclusion.
- The qualitative component of the review will consider studies that focus on qualitative data including, but not limited to, designs such as phenomenology, grounded theory, ethnography, action research and feminist research. In the absence of research studies, other text such as opinion papers and reports will be considered. The textual component of the review will consider expert opinion, discussion papers, position papers and other text.
- The economic component of the review will consider cost effectiveness, cost benefit, cost minimisation, cost utility #modify text as appropriate# studies.

Search strategy

This should address each of the syntheses included in the review, for example:

- The search strategy aims to find both published and unpublished studies. A three-step search strategy will be utilized for each component of this review. An initial limited search of MEDLINE and CINAHL will be undertaken followed by an analysis of the text words contained in the title and abstract, and of the index terms used to describe article. A second search using all identified keywords and index terms will then be undertaken across all included databases. Thirdly, the reference list of all identified reports and articles will be searched for additional studies. Studies published in #insert language(s)# will be considered for inclusion in this review. Studies published #insert dates# will be considered for inclusion in this review.

Depending on the review questions that are posed, authors may find that it is appropriate to search for all forms of evidence simultaneously with the one search strategy. This approach may lead to a lower specificity of the search, and require more time and effort during the study selection phase of the review but will however require less individual searches to be developed, tested and conducted.

For the quantitative component of the review:

The databases searched included:

#insert text#

The search for unpublished studies included:

#insert text#

Initial keywords used were:

#insert text#

For the qualitative component of the review:

The databases searched included:

#insert text#

The search for unpublished studies included:

#insert text#

Initial keywords used were:

#insert text#

For the economic component of the review:

The databases searched included:

#insert text#

The search for unpublished studies included:

#insert text#

Initial keywords to be used will be:

#insert text#

Assessment of methodological quality

This should address each of the syntheses included in the review, for example:

- Quantitative papers selected for retrieval were assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument (JBI-MASARI) (Appendix V). Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer.
- Qualitative papers selected for retrieval were assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Qualitative Assessment and Review Instrument (JBI-QARI) (Appendix V). Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer.
- Textual papers selected for retrieval were assessed by two independent reviewers for authenticity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Narrative, Opinion and Text Assessment and Review Instrument (JBI-NOTARI) (Appendix V). Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer.

- Economic papers selected for retrieval were assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Analysis of Cost, Technology and Utilisation Assessment and Review Instrument (JBI-ACTUARI) (Appendix V). Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer.

Data extraction

Similarly, the data extraction procedures aligned with the specific SUMARI analytical modules (e.g. MASTARI, QARI, ACTUARI, etc.) and set out in the relevant chapters of this manual must be presented in the mixed methods protocol as part of the review that relates directly to the analytical module selected. However, an additional section of data extraction is required to address how the results of each of the single method synthesis will be extracted. The JBI Mixed Methods Aggregation Instrument (MMARI) automatically extracts findings of each single method synthesis entered into the mixed method review. Optional set text is provided in CReMS to assist the reviewer. The set text is editable and states:

"The results of each single method synthesis included in the mixed method review will be extracted in numerical, tabular or textual format. For example, for syntheses of quantitative data, this will consist of appropriate elements of the meta-analysis Forest plot or, where applicable, an evidence table; for qualitative reviews, it will consist of appropriate elements of the QARI-view table."

Data analysis/synthesis

Data analysis/synthesis procedures aligned with the specific SUMARI analytical modules (e.g. MASTARI or QARI) and set out in the relevant chapters of this manual must also be presented in the mixed methods protocol as part of the review that relates directly to the analytical module selected. However, an additional section of data analysis/synthesis is required to address how the results of each of the single methods reviews will be pooled. The JBI Mixed Methods Aggregation Instrument (MMARI) automatically extracts findings of each single method synthesis entered into the mixed method review. The optional set text in CReMS provides a framework that reviewers can extend and edit, and clarifies the synthesis involved in meta-aggregation through the analytical module MMARI:

"The findings of each single-method synthesis included in this review will be aggregated using MMARI. This will involve the configuration of the findings to generate a set of statements that represent that aggregation through coding any quantitative to attribute a thematic description to all quantitative data; assembling all of the resulting themes from quantitative and qualitative syntheses; and the configuration of these themes to produce a set of synthesised findings in the form of a theoretical framework, set of recommendations or conclusions."

Once a protocol has been approved, it is published in the JBI Database of Systematic Reviews and Implementation Reports. Protocols can be found at:

<http://joannabriggslibrary.org/index.php/jbisir/user>

4. Configurative synthesis in mixed methods reviews

(Please refer to the author guidelines in the JBI Database of Systematic Reviews and Implementation Reports for specific submission requirements for systematic review reports.

<http://joannabriggslibrary.org/index.php/jbisrir/about/submissions#authorGuidelines>)

All JBI systematic reviews are based on approved, peer-reviewed systematic review protocols. Deviations from approved protocols are rare and should be clearly justified in the report. JBI considers peer review of systematic review protocols as an essential part of a process to enhance the quality and transparency of systematic reviews. JBI systematic reviews use English (US) spelling.

Layout of the report

The systematic review protocol details how the review will be conducted, what outcomes are of interest and how the data will be presented. The systematic review report should be the follow-up to an approved protocol – any deviations from the protocol need to be clearly detailed in the report to maintain transparency. CReMS software provides a detailed framework for the necessary sections of a report and automatically compiles the report which can be edited in the <Report Builder> section of CReMS. There is no word limit for a review report. Briefly, a JBI mixed methods review should contain the following sections:

Title of systematic review

Review authors

The title should be informative and give clear indication of the topic of the mixed methods review. The title should always include the phrase "...: a mixed methods systematic review" to allow easy identification of the type of document it represents. A JBI review requires at least two reviewers. The names of all reviewers with their post-nominal qualifications, affiliations for each author including their JBI centre affiliations and email address for the corresponding author should be included.

Executive Summary

(This section is a summary of the review in 500 words or less stating the purpose, basic procedures, main findings and principal conclusions of the review. The executive summary should not contain abbreviations or references.)

The following headings should be included in the executive summary and also throughout the review report. Abbreviated details of each of the below sections should appear in the executive summary of the review. Further detail, as detailed below should be included in the review proper.

Background

This section briefly describes the issue under review.

Objectives

The review objectives and clearly articulated PICO/PICo questions should be stated in full, as described in the Protocol section.

Inclusion criteria

Types of participants

This should address each of the syntheses included in the review. For example:

- The quantitative component of this review considered studies that included #describe population#
- The qualitative component of this review considered studies that included #describe participants#
- The textual component of this review considered publications that included #describe participants#
- The economic component of this review considered studies that included #describe population#

Any differences in study populations between the different modes of synthesis should be addressed and discussed with regards to how such differences may affect the conclusions of the mixed methods synthesis. For example, “the initial economic analysis presented information which primarily involved QALY in individuals aged 50 years or over, whereas participants included in the qualitative synthesis had a mean age of 44 years. Both populations are suitable for comparison, however, because #explanation# OR this difference may affect the final synthesis because #explanation#”. This would only be required when the populations do in fact differ – in those instances where the same populations were considered, one cover statement could be applied to all separate syntheses.

Types of intervention(s)/phenomena of interest

This should address each of the syntheses included in the review. For example:

- The quantitative component of the review considered studies that evaluated #insert text#
- The qualitative component of this review considered studies that investigated #insert text#
- The textual component of this review considered publications that described #insert text#
- The economic component of this review will considered studies that evaluated #insert text#

Types of outcomes

This should address each of the syntheses included in the review. For example:

- The quantitative component of this review will consider studies that include the following outcome measures: #insert text#
- The economic component of the review will consider studies that include #insert text#

Context

- The qualitative component of this review will consider studies that investigate #insert text#

Types of studies

This should address each of the syntheses included in the review. For example:

- The quantitative component of the review considered any experimental study design including randomized controlled trials, non-randomized controlled trials, quasi-experimental, before and after studies for inclusion.

- The qualitative component of the review considered studies that focus on qualitative data including, but not limited to, designs such as phenomenology, grounded theory, ethnography, action research and feminist research. In the absence of research studies, other text such as opinion papers and reports were considered. The textual component of the review considered expert opinion, discussion papers, position papers and other text.
- The economic component of the review considered cost effectiveness, cost benefit, cost minimisation, cost utility #modify text as appropriate# studies.

Search strategy

This should address each of the syntheses included in the review. For example:

The search strategy aimed to find both published and unpublished studies. A three-step search strategy was utilized for each component of this review. An initial limited search of MEDLINE and CINAHL was undertaken followed by an analysis of the text words contained in the title and abstract, and of the index terms used to describe article. A second search using all identified keywords and index terms was then undertaken across all included databases. Thirdly, the reference list of all identified reports and articles were searched for additional studies. Studies published in #insert language(s)# were considered for inclusion in this review. Studies published #insert dates# were considered for inclusion in this review.

For the quantitative component of the review:

The databases searched included:

#insert text#

The search for unpublished studies included:

#insert text#

Initial keywords used were:

#insert text#

For the qualitative component of the review:

The databases searched included:

#insert text#

The search for unpublished studies included:

#insert text#

Initial keywords used were:

#insert text#

For the economic component of the review:

The databases searched included:

#insert text#

The search for unpublished studies included:

#insert text#

Initial keywords to be used will be:

#insert text#

Assessment of methodological quality

This should address each of the syntheses included in the review, for example:

- Quantitative papers selected for retrieval were assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument (JBI-MASARI) (Appendix V). Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer.
- Qualitative papers selected for retrieval were assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Qualitative Assessment and Review Instrument (JBI-QARI) (Appendix V). Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer.
- Textual papers selected for retrieval were assessed by two independent reviewers for authenticity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Narrative, Opinion and Text Assessment and Review Instrument (JBI-NOTARI) (Appendix V). Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer.
- Economic papers selected for retrieval were assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Analysis of Cost, Technology and Utilisation Assessment and Review Instrument (JBI-ACTUARI) (Appendix V). Any disagreements that arose between the reviewers were resolved through discussion, or with a third reviewer.

Refer to the relevant chapters of the JBI Reviewers' Manual for detailed information on the conduct and documentation of critical appraisal and the use of MASARI, QARI, ACTUARI or NOTARI.

Data collection

This should address each of the syntheses to be included in the review (included the mixed methods aggregation), for example:

- Quantitative data were extracted from papers included in the review using the standardized data extraction tool from JBI-MASARI (Appendix VI). The data extracted included specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.
- Qualitative data were extracted from papers included in the review using the standardized data extraction tool from JBI-QARI (Appendix VI). The data extracted included specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.
- Textual data were extracted from papers included in the review using the standardized data extraction tool from JBI-NOTARI (Appendix VI). The data extracted included specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

- Economic data were extracted from papers included in the review using the standardized data extraction tool from JBI-ACTUARI (Appendix VI). The data extracted included specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.
- Findings from each of the component syntheses were extracted using the standardized data extraction procedure from MMARI (Appendix 00). The data extracted included forest plots, evidence tables and synthesized findings.

Refer to the relevant chapters of the JBI Reviewers' Manual for detailed information on documenting collection for the components of the review that use MASTARI, QARI, ACTUARI or NOTARI.

MMARI

Data extraction in the analytical module MMARI involves the extraction of the findings of each single method synthesis to be included in the mixed method aggregation. For each finding selected for inclusion in the mixed method aggregation, the following data will upload to the MMARI aggregation screen:

For synthesis conducted using the MASTARI module (where one or more meta-analysis/sub-group analyses are performed) the MMARI module will extract each result:

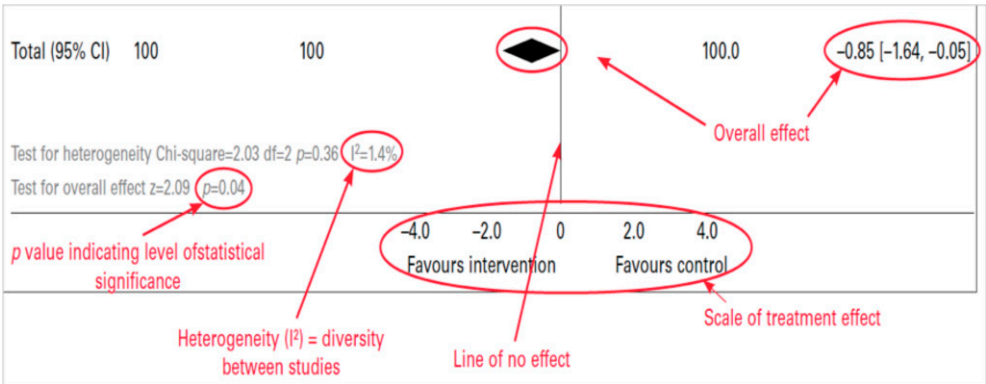
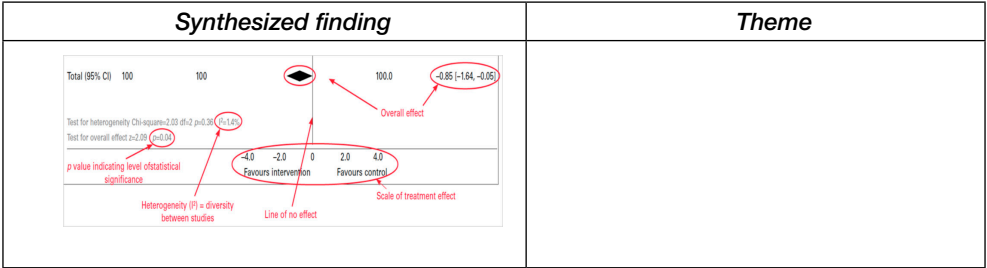


Figure 4: Results to be extracted from quantitative meta-analyses (circled in red)

The extracted result will be inserted into the MMARI aggregator screen:

Table 3: Meta-analysis snap-shots as generated within MASTARI included in the thematic table



In quantitative syntheses where meta-analysis is not performed, excerpts from an evidence table can be inserted into the aggregator screen – example (a) or a textual description can be entered (example b):

Table 4: Tabulated data or textual descriptions as generated within MASTARI included in the thematic table

Synthesized F=finding (quantitative)	Textual description												
<div>Example (a) – From an evidence Table</div> <table><tr><th>Complication</th><th>Relative risk (95% CI)</th></tr><tr><td>Any complication</td><td>1.7 (1.3–2.4)</td></tr><tr><td>Any medical complication</td><td>2.1 (1.5–2.9)</td></tr><tr><td>Pulmonary insufficiency</td><td>4.5 (2.9–6.9)</td></tr><tr><td>Reintubation</td><td>1.6 (1.1–2.5)</td></tr><tr><td colspan="2">CI, confidence interval.</td></tr></table>	Complication	Relative risk (95% CI)	Any complication	1.7 (1.3–2.4)	Any medical complication	2.1 (1.5–2.9)	Pulmonary insufficiency	4.5 (2.9–6.9)	Reintubation	1.6 (1.1–2.5)	CI, confidence interval.		
Complication	Relative risk (95% CI)												
Any complication	1.7 (1.3–2.4)												
Any medical complication	2.1 (1.5–2.9)												
Pulmonary insufficiency	4.5 (2.9–6.9)												
Reintubation	1.6 (1.1–2.5)												
CI, confidence interval.													
Additional information for aggregation:													
<div>Example (b) – Textual description</div> <p>A significant number of nurses in the aged care sector compared with the public sector were unaware of the existence of any structured processes to deal with workload and workplace issues ($P < 0.001$). Of the nurses who were aware of such processes there were significant differences in perceived effectiveness related to these processes between the sectors ($P < 0.001$).</p>													
Additional information for aggregation:													

For synthesis conducted using the QARI module (where a meta-aggregation is performed) and the NOTARI module, the MMARI module will extract each synthesised finding, for example:

“Challenging behavior during bathing of people with dementia is minimized when strategies are in place to facilitate a sense of control for residents/clients.”

The extracted result will be inserted into the MMARI aggregator screen:

Table 5: Synthesised findings as generated within QARI and/or NOTARI included in thematic table

Synthesized finding	Textual description
<i>Challenging behaviur during bathing of people with dementia is minimized when strategies are in place to facilitate a sense of control for residents/clients.</i>	
<i>Challenging behavior during bathing of people with dementia is minimized when caregivers understand and apply appropriate assessment and communicate clearly and empathetically.</i>	

For synthesis conducted using the ACTUARI module (where a decision matrix is generated) the MMARI module will extract each matrix:

Table 6: Economic matrices as generated within ACTUARI included in thematic table

Synthesized finding	Textual description																																											
<p>Results For : A systematic review of cost-effectiveness of paclitaxel and cisplatin versus cyclophosphamide and cisplatin paclitaxel plus cisplatin vs cyclophosphamide plus cisplatin</p> <table><tr><th>Cost</th><th>Studies</th><th>No. of Studies</th><th>Clinical effectiveness</th><th>Decision</th></tr><tr><td>+</td><td rowspan="3"></td><td>0</td><td>+</td><td rowspan="3">} Don't use</td></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>+</td><td>0</td><td>0</td></tr><tr><td>-</td><td></td><td>0</td><td>-</td><td>Further analysis required</td></tr><tr><td>0</td><td></td><td>0</td><td>0</td><td>Neutral</td></tr><tr><td>+</td><td></td><td>0</td><td>+</td><td>Further analysis required</td></tr><tr><td>-</td><td rowspan="3"></td><td>0</td><td>0</td><td rowspan="3">} Use</td></tr><tr><td>0</td><td>0</td><td>+</td></tr><tr><td>-</td><td>Berger et al [1998] Covens [1996]</td><td>2</td><td>+</td></tr></table>	Cost	Studies	No. of Studies	Clinical effectiveness	Decision	+		0	+	} Don't use	0	0	0	+	0	0	-		0	-	Further analysis required	0		0	0	Neutral	+		0	+	Further analysis required	-		0	0	} Use	0	0	+	-	Berger et al [1998] Covens [1996]	2	+	
Cost	Studies	No. of Studies	Clinical effectiveness	Decision																																								
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-		0	-	Further analysis required																																								
0		0	0	Neutral																																								
+		0	+	Further analysis required																																								
-		0	0	} Use																																								
0		0	+																																									
-		Berger et al [1998] Covens [1996]	2		+																																							

Data synthesis

This should address each of the syntheses to be included in the review (including the mixed methods aggregation), for example:

- Quantitative data were, where possible, pooled in statistical meta-analysis using JBI-MAStARI. All results were subject to double data entry. Effect sizes expressed as odds ratio (for categorical data) and weighted mean differences (for continuous data) and their 95% confidence intervals were calculated for analysis #modify text as appropriate#. Heterogeneity was assessed statistically using the standard Chi-square. Where statistical pooling was not possible the findings are presented in narrative form including tables and figures to aid in data presentation where appropriate.

- Qualitative research findings were, where possible, pooled using JBI-QARI. This involved the aggregation or synthesis of findings to generate a set of statements that represent that aggregation, through assembling the findings (Level 1 findings) rated according to their quality, and categorizing these findings on the basis of similarity in meaning (Level 2 findings). These categories were then subjected to a meta-synthesis in order to produce a single comprehensive set of synthesized findings (Level 3 findings) that can be used as a basis for evidence-based practice. Where textual pooling was not possible the findings are presented in narrative form.
- Textual papers were, where possible, pooled using JBI-NOTARI. This involved the aggregation or synthesis of conclusions to generate a set of statements that represent that aggregation, through assembling and categorizing these conclusions on the basis of similarity in meaning. These categories were then subjected to a meta-synthesis in order to produce a single comprehensive set of synthesized findings that can be used as a basis for evidence-based practice. Where textual pooling was not possible the conclusions are presented in narrative form.
- Economic findings were, where possible, pooled using JBI-ACTUARI and presented in a tabular summary. Where this was not possible, findings are presented in narrative form.
- Evidence from each of the component syntheses were aggregated using MMARI and presented in the form of a theoretical framework, a set of recommendations or conclusions.

Refer to the relevant chapters of the JBI Reviewers' Manual for detailed information on documenting data synthesis for the components of the review that use MASTARI, QARI, ACTUARI or NOTARI.

To aggregate the findings of individual single methods syntheses included in the mixed method review, all findings should be tabulated in the form of qualitative themes using MMARI. In the case of qualitative syntheses using QARI and textual themes using NOTARI, the synthesized findings serve as themes. For other synthesis presented in numerical form, the finding must be summarized in a thematic statement by the reviewers, and this thematic statement is entered into the aggregator screen:

The optional set text in CReMS describes the process by which these options are implemented in the protocol development section as follows:

The results of the syntheses included in the mixed methods review will, where possible, be pooled using MMARI.

This will involve the configurative conversion of all numerical results into qualitative thematic statements; assembling these "converted" findings and the qualitative thematic statements from the component syntheses; and the aggregation/configuration of all themes to generate a set of statements that represent that aggregation or the development of a theoretical framework, a set of recommendations or conclusions or path analysis:

Discussion

This section should provide a detailed discussion of issues arising from the conduct of the review, as well as a discussion of the findings of the review and of the significance of the review findings in relation to practice and research. The discussion does not bring in new literature or findings that have not been reported in the results section but does seek to establish a line of argument based on the findings regarding the phenomenon of interest, or its impact on the objectives identified in the protocol.

Conclusions

Implications for practice

Where evidence is of a sufficient level, appropriate recommendations should be made. The implications must be based on the documented results, not the reviewer's opinion. Recommendations must be clear, concise and unambiguous.

Implications for research

All implications for research must be derived from the results of the review, based on identified gaps, or on areas of weakness in the literature such as small sample sizes or methodological weaknesses. Implications for research should avoid generalized statements calling for further research, but should be linked to specific issues (such as longer follow-up periods).

Developing recommendations

The Joanna Briggs Institute develops and publishes recommendations for practice with each systematic review, wherever possible. Across the different types of evidence and approaches to systematic reviews, a common approach is the construct of recommendations for practice, which can be summed up as the requirement for recommendations to be phrased as declaratory statements. Recommendations are drawn from the results of reviews and given a level of evidence (see below) based on the nature of the research used to inform the development of the recommendation. Recommendations are a reflection of the literature and do not include any nuances of preference or interpretation that reviewers or review panels may otherwise infer.

Assigning levels of evidence

The Joanna Briggs Institute and its entities assign a level of evidence to all recommendations drawn in JBI systematic reviews. The reviewers (in conjunction with their review panel) should draft and revise recommendations for practice and research, and include a level of evidence congruent with the research design that led to the recommendation. The JBI Levels of Evidence are available at <http://joannabriggs.org/jbi-approach.html#tabbed-nav=Levels-of-Evidence>.

The level of evidence relates to individual papers included in the systematic review. The levels of evidence for clinical and economic effectiveness reflect current international standards and expectations. However, as JBI takes a broader conceptual view of evidence, as reflected in the capacity to conduct reviews on the feasibility, appropriateness or meaningfulness of health care or health care experiences, the JBI Levels of Evidence incorporate particular criteria related to the appraisal of included studies, with the overall objective of assessing the trustworthiness of the evidence.

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