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AHRQ series on complex intervention systematic reviews—paper 4: selecting analytic approaches

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Abstract

Background: Systematic reviews of complex interventions can vary widely in purpose, data availability and heterogeneity, and stakeholder expectations.

Rationale: This article addresses the uncertainty that systematic reviewers face in selecting methods for reviews of complex interventions. Specifically, it lays out parameters for systematic reviewers to consider when selecting analytic approaches that best answer the questions at hand and suggests analytic techniques that may be appropriate in different circumstances.

Discussion: Systematic reviews of complex interventions comprising multiple questions may use multiple analytic approaches. Parameters to consider when choosing analytic methods for complex interventions include nature and timing of the decision (clinical practice guideline, policy, or other); purpose of the review; extent of existing evidence; logistic factors such as the timeline, process, and resources for deciding the scope of the review; and value of information to be obtained from choosing specific systematic review methods. Reviewers may elect to revise their analytic approach based on new or changing considerations during the course of the review but should guard against bias through transparency of reporting.

Keywords: Complex interventions; Evidence-based medicine; Review literature as topic; Systematic review; Qualitative research; Research design

1. Introduction

This is the fourth of a seven-part series of papers providing tools and approaches for conducting reviews of complex interventions. This paper is intended to assist systematic review authors in selecting analytic approaches regarding reviews of complex interventions.

In response to the standards established by the National Academy of Medicine (formerly the Institute of Medicine) for trustworthy clinical practice guidelines [1], the National Guidelines Clearinghouse now requires that clinical practice guidelines be based on systematic reviews [2]. This move has accelerated the demand from clinicians and policymakers for systematic reviews on an array of topics. As a result, systematic reviews increasingly scrutinize complex interventions. Researchers are now paying greater attention to the methods, constraints, and requirements of systematic reviews of complex interventions [3–13].

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Because complex interventions often allow for adaptation, systematic reviews of a ''class'' or type of complex intervention may include a set of studies in which the overall intervention either includes slightly different components in each instance or is implemented differently in every study. Without using appropriate methods that explicitly take into account the multiple components and their variation, systematic reviewers could easily find themselves defaulting to a stance that the studies cannot be combined or even analyzed together. This default can lead to inappropriate and unnecessary conclusions that the strength of the body of evidence is insufficient for making decisions.

New methods are available currently that allow an investigator to glean potentially important information about the role of the components in addition to the overall relative effectiveness of the complete intervention as well as the variability in implementation [9]. The underlying requirements, assumptions, and outputs of these new methods vary greatly. Inadequately justified or inappropriate analysis methods for systematic reviews of complex interventions [13] can lead to questions about the utility of the systematic review [14].

This article lays out parameters for systematic reviewers to consider when selecting analytic approaches that best answer the questions at hand and suggests analytic techniques that may be appropriate in different circumstances. We believe this document will be of interest to systematic reviewers in identifying methodological approaches, commissioners or funders of reviewers in understanding what types of methods might best suit their purposes, and other stakeholders. It will also provide greater transparency to the systematic review process.

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We first define complex interventions and then briefly summarize potential methods. The remainder of the paper describes the parameters that influence the choice of analytic approaches, provides specific examples, and offers suggestions for improved transparency in reporting.

2. Characterizing complex interventions

According to the definition of complex interventions as defined by Guise et al. and presented in the following, all complex interventions have multiple components and causal pathways characterized by feedback loops, synergies, mediators, or moderators [15]. In addition, they may target multiple participants, groups, or organizational levels; require multifaceted adoption, uptake, or integration strategies; or be implemented in a dynamic multidimensional environment.

Definition of complex interventions [15]

All complex interventions have two common characteristics; they have multiple components (intervention complexity) and complicated/multiple causal pathways, feedback loops, synergies, and/or mediators and moderators of effect (pathway complexity). In addition, they may also do one or more of the following: three additional characteristics target multiple participants, groups, or organizational levels (population complexity); require multifaceted adoption, uptake, or integration strategies (implementation complexity); or work in a dynamic multidimensional environment (contextual complexity).

3. Approaches for addressing complex interventions in systematic reviews

Two independent sets of authors have arrayed approaches for systematic reviews of complex interventions along a continuum [5,16]. The Anderson et al.'s paper arrays approaches along a spectrum of theory, from theory generation (using configuring methods such as meta-ethnography or thematic synthesis), to theory exploration, and finally to theory testing (using inferential statistical methods such as meta-analysis) [16]. Anderson and colleagues also note that methods such as Bayesian synthesis, framework synthesis, cross-study synthesis, and realist synthesis can potentially integrate qualitative or quantitative data.

The AHRQ report [5] arrays approaches along a continuum reflecting the complexity of systematic review questions. The least intricate questions ask whether the overall bundle of interventions works. This approach is the classic ''efficacy'' use of the systematic review, for which a traditional qualitative or quantitative synthesis may be used. This approach asks whether an intervention works when compared against usual care or other appropriate control. Note that this approach differs from what is commonly the comparative effectiveness question in which multiple multicomponent interventions must be compared with one another. Comparative effectiveness questions can be answered using quantitative synthesis methods, including network meta-analysis; qualitative syntheses may also be appropriate. A middle set of approaches extends the comparative effectiveness question by asking how it varies by intervention features and disaggregates them according to a hypothesized set of features. Analytic approaches such as meta-regression, finite-mixture modeling, realist synthesis, and qualitative comparative analysis can be used to answer these questions [9,17]. Advanced meta-analytic approaches are described in detail by Pigott et al. in this issue [9]. The most intricate set of questions asks about reasons for the success or failure of interventions. These questions also may use an extended array of methods encompassing qualitative, quantitative, or mixed methods. Specific approaches include qualitative comparative analysis, Bayesian approaches, critical interpretive synthesis,