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Managing and Coding References for Systematic Reviews and Scoping Reviews in EndNote

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ABSTRACT

This article describes a novel approach for using EndNote to manage and code references in the conduct and reporting of systematic reviews and scoping reviews. The process is simple and easy for reviewers new to both EndNote and systematic reviews. This process allows reviewers to easily conduct and report systematic reviews in line with the internationally recognized PRISMA reporting guidelines and also facilitates the overall task of systematic or scoping review conduct and reporting from the initial search through to structuring the results, discussion, and conclusions in a rigorous, reproducible, and user-friendly manner.

Introduction

Systematic reviews are an increasingly popular and common approach to the synthesis of evidence. One of the defining features of systematic reviews is that they tend to follow more formalized and rigorous processes than literature reviews and are, ideally, largely reproducible based upon their more exhaustive reporting style.[1] There is no single "gold standard" methodology for conducting systematic reviews.[2]

While many organizations such as the Cochrane Collaboration, The Joanna Briggs Institute, and the EPPI-Centre have developed their own approaches and software, overall different types of evidence and review questions call for different methodological approaches. Searches for systematic reviews and especially those for scoping reviews (which may be directed by considerably broader inclusion criteria and thus search terms) commonly result in the identification of a very large number of studies.[3] Having a clear, reproducible, and robust approach to managing the studies located by the search conducted as part of a systematic review or scoping review not only may enhance the rigor and quality of the process and reporting but also may assist reviewers to conceptually manage the evidence and knowledge gathered as part of the entire endeavor. By understanding and recording how each paper fits in with the review's "bigger picture" from those to be included in the background to

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those contributing statistical data to a meta-analysis, reviewers may be better placed to successfully complete a report on high quality reviews efficiently, effectively, and with a minimum of stress.

Many reviewers use EndNote or similar software packages (e.g., Mendeley, Refworks, EPPI-Reviewer, Review Manager, Covidence) to collate and remove duplicate records, and to screen titles, abstracts, and the full text of retrieved studies.[4] The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement[5] and its various associated extensions specify the widely recognized guidelines for reporting the conduct of systematic reviews. These reporting guidelines are frequently recommended when conducting systematic reviews using any of the potentially relevant methodologies indicated above and may assist reviewers to ensure that rigorous and reproducible stages have been carried out throughout the review process. A four-phase flow diagram (depicted in Figure 1 and adapted from the preferred reporting items for systematic reviews and meta-analyses by David Moher and colleagues) also forms the basis for representing the flow of information (the studies) through each of the phases of the systematic review process, from identification of records from databases and other sources, through screening, examining eligibility, and on to the selection of relevant studies for inclusion.[5] In many systematic reviews, this flow diagram is represented with slight differences in terms of content; for example, reviewers may also include diagrammatic representations of the critical appraisal of studies or how studies have been included into different "arms" (for example, statistical meta-analysis versus qualitative synthesis) of the overall systematic review.

While many published methodologies and guides exist to assist reviewers in the conduct and reporting of systematic reviews, few go into much detail regarding how reviewers may practically undertake the processes and steps of a review in a rigorous and reproducible manner. Managing a sometimes vast number of retrieved studies can be particularly challenging, especially for less experienced reviewers. A great deal of time can be lost simply ensuring each field in the PRISMA flow diagram adds up correctly and that all studies can be properly accounted for. Building upon the process for setting up key features of EndNote's bibliographic software for systematic reviews explained by King, Hooper, and Wood, this paper presents a similar and compatible process that may assist systematic reviewers to rigorously conduct and report their work.[6]

The approach to managing and coding references for systematic reviews and scoping reviews described in this paper was developed after participating in the conduct of a number of reviews and was piloted in the writing of a scoping review. The approach has been explained and shared with a number of reviewers trained in the Joanna Briggs Institute (JBI) approach to systematic reviews, and while simple, it is hoped that other reviewers may find it of use or helpful in refining their own tailored approach.
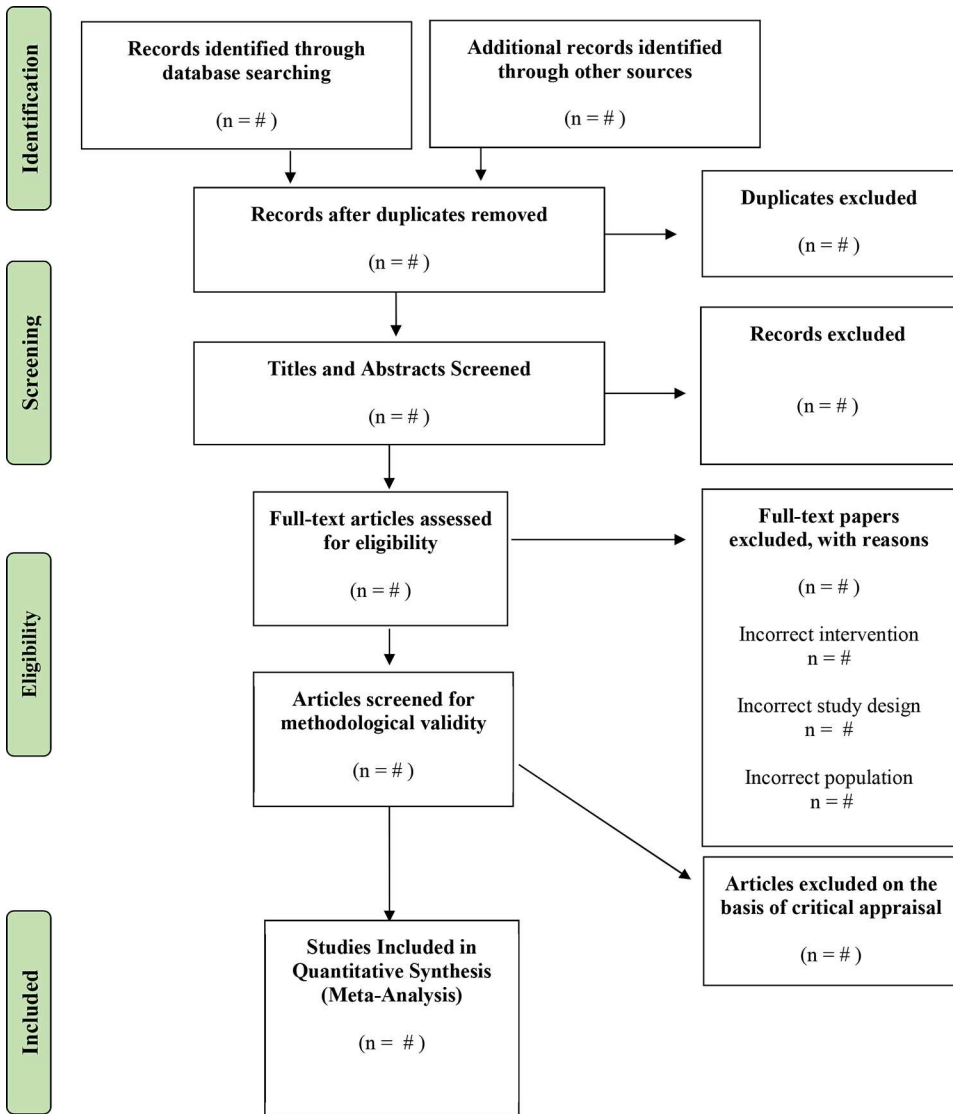
Figure 1. Example of a PRISMA flow diagram.

The Process

Groups and Group Sets

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The approach described here is largely based around the use of "Groups" and "Group Sets" in the EndNote software. Groups can be created in EndNote to collect together multiple references as indicated in the left-hand sidebar, so all references assigned to a Group will appear in the right-hand field. For example, all references published in 2000–2010 could be placed together for 105 ease of management in a Group called "2000–2010." Group Sets are simply groups of Groups, so a Group Set called "Publication Dates" could contain

the Group "2000–2010," "2011–2015," "1990–1999," and so on. Reviewers may set up a complete template in an EndNote Library by creating all the desired Group Sets and Groups and proceed to use it throughout the conduct of the systematic review.

"Smart Groups" and "Labels" can also be very useful throughout this process, since by assigning different label terms to references in their information screen, EndNote can be used to form Smart Groups that collate all references given that label (using the Groups drop-down menu). Smart Groups are simply Groups that can be automatically created by the EndNote software according to desired parameters. So reviewers may use the "Create Smart Group" function from the "Groups" drop-down menu to collect all references published in 2016. The "Label" is the "Year" field in each particular reference that the software uses to identify all references published in 2016.

These Smart Groups can be renamed and then combined into groups of Groups by using the "Create from Groups" function from the Groups drop-down menu. It is important to note that users cannot add references from manually created Groups to Smart Groups or Groups created using the "Create from Groups" function. Also, Groups and Group Sets are not mutually exclusive; a study may appear in all, any, or no groups, depending on where it is placed. This can potentially have dire consequences if a reviewer is not attentive in carefully placing each study into its correct group. One way to cross-check if this has occurred (and to remedy it if it has) is to use the "Mark as Read/Unread" right-click function. By marking particular references or groups of studies as "Unread," they become bold and can then be easily identifiable in a list of non-bold references. Reviewers can then examine Groups they wish to use in a mutually exclusive manner to quickly determine if a study or studies appears in both.
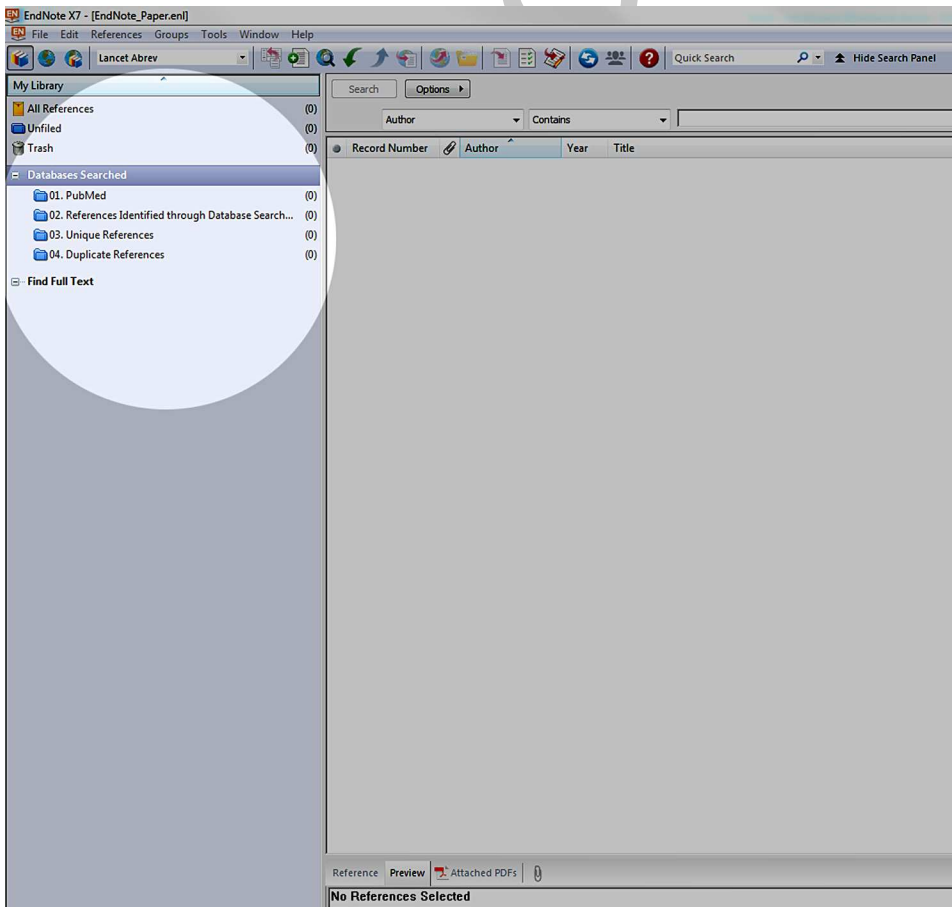
Identification of References

A reviewer will generally begin by importing into the EndNote software all studies that have been identified by searching databases and other sources (e.g., websites, hand search). Ideally, the results from each source should be kept separate and distinct for ease of reporting the numbers of studies identified from each database. This can be done by creating Group Sets by first importing, for example, all identified studies from the PubMed database into EndNote and then right clicking in the left-hand column of the EndNote Screen under "My Groups" and selecting "Create Group Set." The reviewer is then prompted to name the Group Set; the first set may be named "Databases Searched." A Group can then be created by again right clicking in the left-hand column of the EndNote Screen under this newly created Group Set and selecting "Create Group." This new Group can be named "PubMed,"

and all studies identified in PubMed can be highlighted from the Library and dragged into this Group. The process for creating new Groups can be repeated for each database searched, allowing the reviewer to quickly and easily see how many studies were identified in each.

Once all studies have been imported and added to their Groups, a final Group for this stage can be created called "References Identified through Database Searching (Including Duplicates)," and all studies from all Groups dragged and dropped into this Group. Each reference, or multiple references, can also be selected by right clicking and using the "Add Reference/s to" function to add them to the desired Group. To create Groups within Group Sets automatically, reviewers can select references or Groups, right click, and use the "Add References to/ Create Custom Group … " function. The number beside the Group "References Identified through Database Searching" is the number required in the first box of the PRISMA flow diagram. Figure 2 illustrates this in EndNote.

Figure 2. Reporting databases searched using groups in EndNote.

Once all databases have been searched and their respective Groups populated with the references located in each, duplicate identification must occur. Reviewers may decide to do this manually, using EndNote's built-in functionality, or by using the process recommended by Bramer and colleagues.[7] This is where some further recordkeeping outside of EndNote may be necessary, because if duplicates are removed, they are actually deleted and this will interfere with the numbering of the Groups. By moving duplicates to their own Group from the existing "Duplicate References" Group in the left-hand column, reviewers are able to manually assign references into either "Duplicate References" or "Unique References" Groups as Groups within the Group Set and to report these numbers in the PRISMA flow diagram.
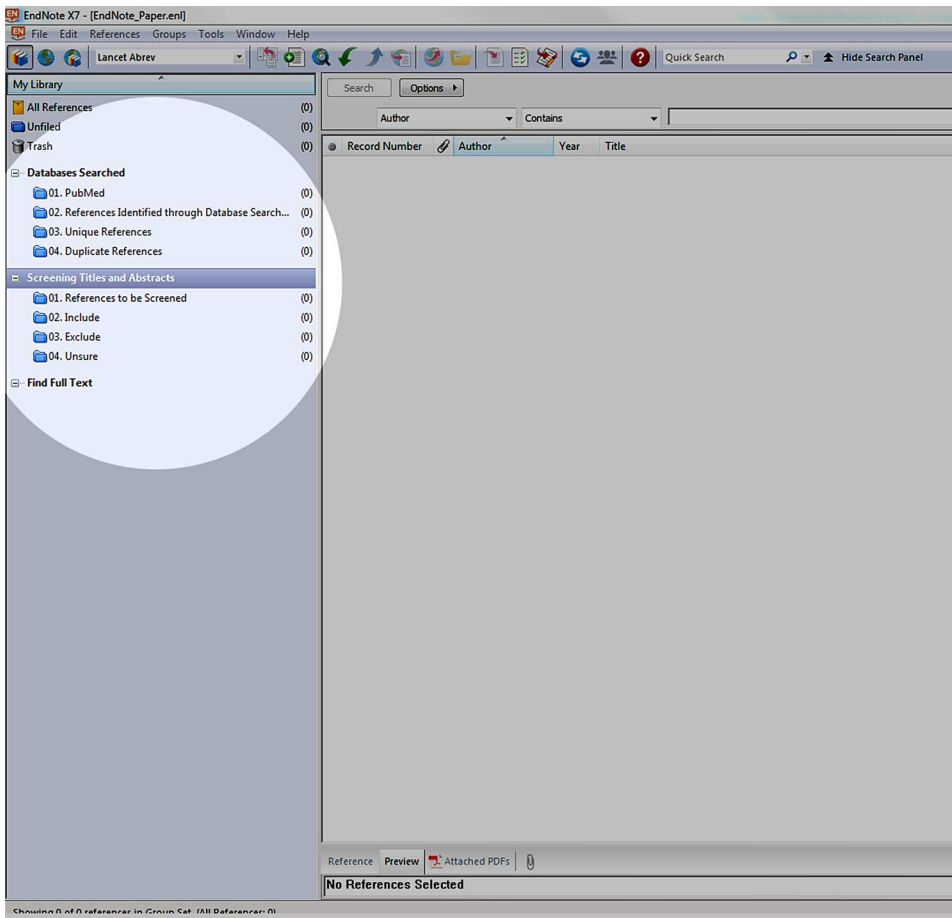
Screening References

Once the reviewer is ready to begin the screening of the titles and abstracts of the retrieved references, a new Group Set can be created, this time called "Screening Titles and Abstracts." At this stage, only four Groups are required for this Set: "References to be Screened," "Include," "Exclude," and "Unsure." The reviewer then simply reviews each title and abstract from every reference that has been moved from the previous stage (from "References Identified through Database Searching") into the "References to be Screened" Group and drags them into the relevant Group.

The "References to be Screened" Group can be used to identify references that the reviewers have not yet screened; this is especially useful if screening is to be conducted over a number of sessions. The number of references in this Group also corresponds with the number in the first box in the Screening stage of the PRISMA flow diagram. References in the "Unsure" Group can be retained for discussion with other reviewers and then divvied up for inclusion or exclusion (see Figure 3).

At the end of this process, all the references in the "Include" Group can be moved into a new Group Set ("Eligibility of Full-Text Articles") and, within that set, to a Group called "Full-Text Articles Assessed for Eligibility." This is the first box in the PRISMA flow diagram section for the Eligibility phase. The number of references in the "Exclude" Group should correspond with what would be reported in the "Records Excluded" (at title/abstract) box in the PRISMA flow diagram.

Eligibility of References for Inclusion

If the reviewers have not already done so for all references retrieved, the full texts of only the references identified for full-text assessment need to be located. This can be done via EndNote by highlighting only those references

Figure 3. Reporting references screened using groups in EndNote.

that have been added to the Group "Full-Text Articles Assessed for Eligibility." At this stage, the reviewers should evaluate the inclusion criteria of their systematic review or scoping review and create Groups to move refer- 205 ences into those Groups that correspond to reasons for exclusion for each element. For example, an "Exclude – Population" Group can be used to contain references that do not report on the population of interest for the particular systematic review.

Only one Group for "References Included After Full-Text Review" is 210 required at this stage and can be used in the PRISMA flow diagram, but reviewers may also consider beginning to code references for inclusion by creating additional Groups to identify studies with particular features, for example; "Include – Population (Aged 0–4 years)." Coding references by their characteristics at this stage is especially appropriate for scoping reviews, as 215 scoping reviews will seldom include an eligibility stage for methodological critical appraisal/assessment of bias.
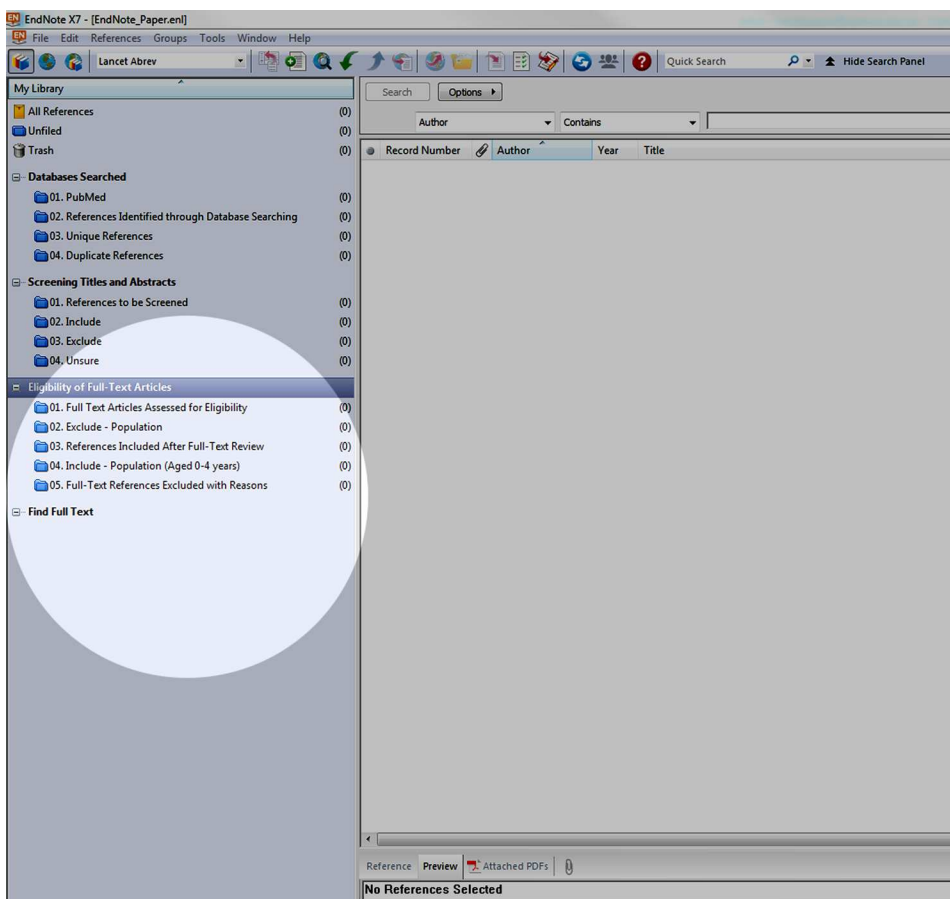
Figure 4. Reporting full-text screening using groups in EndNote.

When the full texts of all references have been examined, each of the excluded groups can be added up into a Group called "Full-Text References Excluded with Reasons" corresponding with a box in the PRISMA flow diagram, and the number of references in each Group with a reason for exclusion can be reported, also. This way, the reviewer is easily able to cite which references have been excluded from the review and why in the appropriate appendix of the final review report. This stage of the process is depicted in Figure 4.

Eligibility Based on Methodological Quality

If the systematic review includes a stage for methodological critical appraisal/ assessment of bias, all references included following full-text assessment can then be moved to a new Group Set "References for Critical Appraisal." Reviewers undertaking systematic reviews that may include references reporting studies of different methodological designs may also consider creating Groups to correspond with the types of studies and therefore the particular

critical appraisal tools to be used, for example, "Experimental Studies to be Assessed."

In systematic reviews that have been planned to exclude studies on the basis of methodological quality/risk of bias, it is best practice to report clearly why refer- 235 ences have been excluded following assessment. Groups can be created to correspond with why particular references have been identified as excludable, for example, "Exclude – appropriate method of randomization not reported." References to be excluded should be moved into the Group or Groups that are named based on the reason why they have not met a particular benchmark of quality. 240 Thus, when writing up the report, reviewers will be able to efficiently locate each reason for exclusion and will be able to provide clearly grounded reasons for exclusion and make robust statements regarding the methodological quality of excluded references. An "Unsure Whether to Include/Exclude" Group can also be created to identify references that should be discussed between members of 245 the review team to determine final inclusion (also helpful for full-text selection).
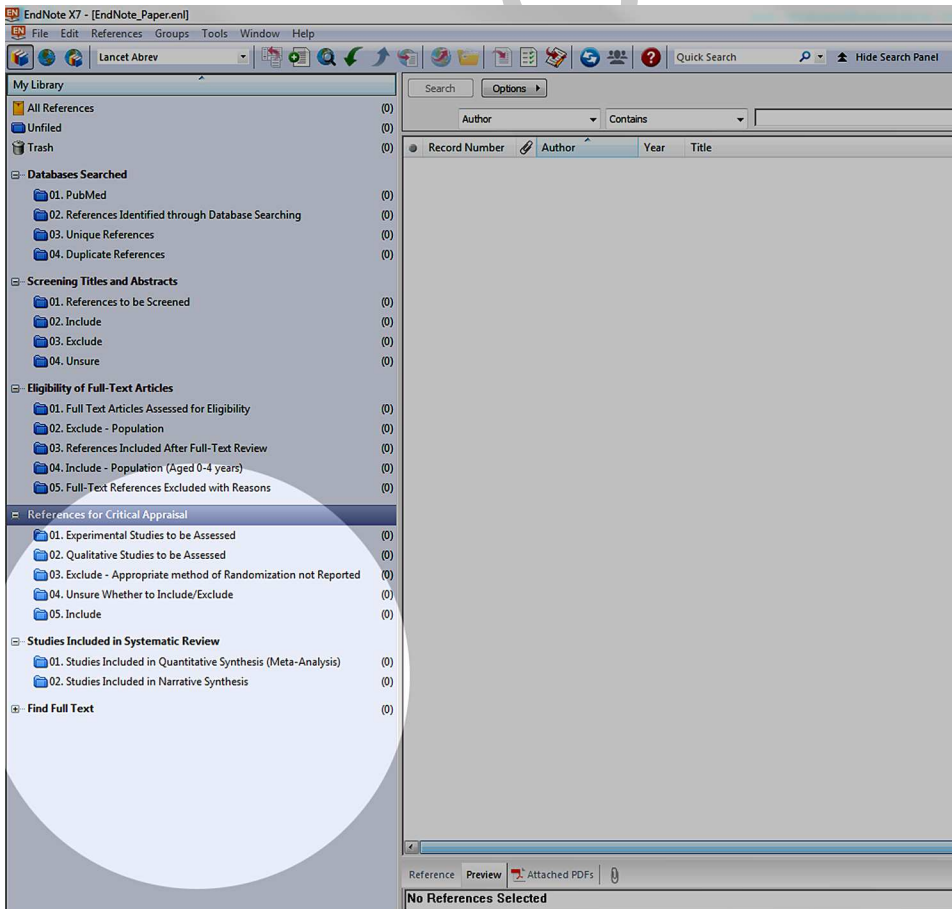

Figure 5. Reporting critical appraisal and reference inclusion using groups in EndNote.

At the end of this process, reviewers will be able to report in the PRIMSA flow diagram the total number of references that met the inclusion criteria of the review that have been assessed for methodological quality/risk of bias, the number of references included as a result of this, and the number and reasons for exclusion of any references that have not been chosen for inclusion. Traditionally, this is where the PRISMA flow diagram concludes; the final box is "Studies Included in Quantitative Synthesis (Meta-Analysis)." Naturally for systematic reviews that do not or will not undertake quantitative meta-analysis, this box should be retitled or even accompanied by a separate box, for example; "Studies Included in Narrative Synthesis." This stage is shown in Figure 5.

Coding the Included References

When the reviewer has identified all references to be included in the review, EndNote can also be used to assist in the coding of references in a number of
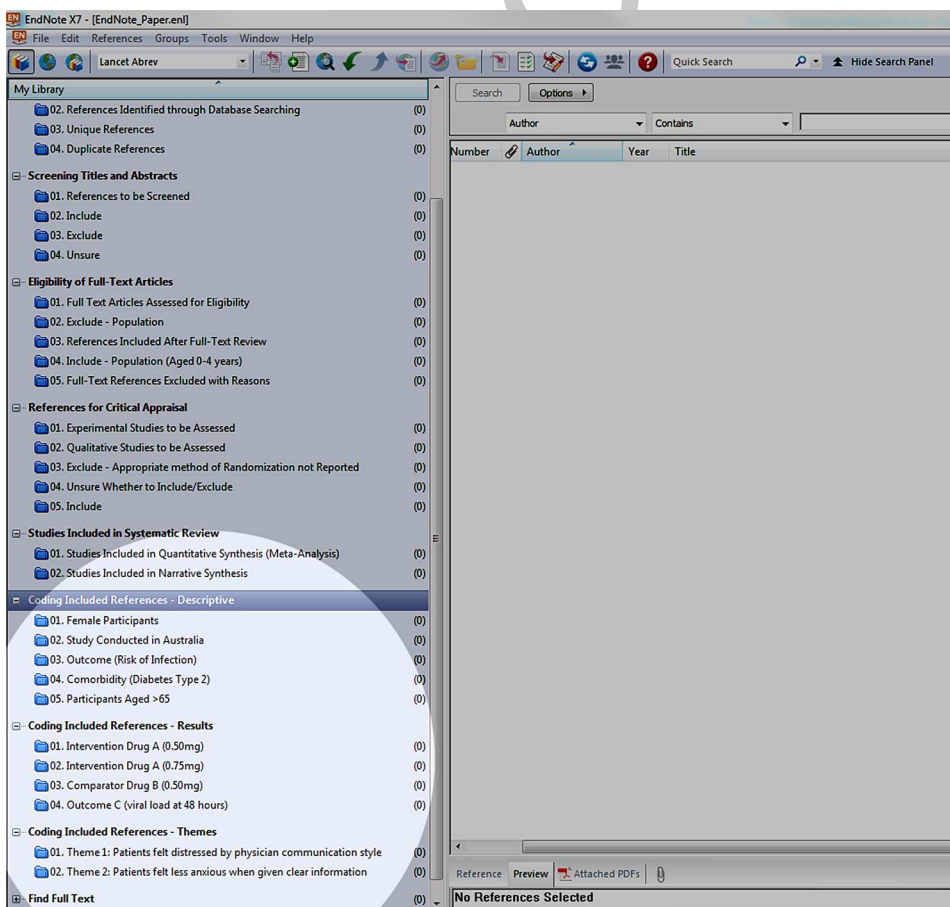

Figure 6. Coding information and results from references using groups in EndNote.

ways. As mentioned above, reviewers may choose to begin basic coding at the 260
time of full-text selection when they are closely reading each article to deter-
mine whether it meets with the review's inclusion criteria. A new Group Set
for coding can be created and within that Set, relevant Groups created based
upon the salient characteristics of the references. Systematic reviews and scop-
ing reviews should report on any relevant characteristics of the references they 265
include; coding Groups can be created to help reviewers to collate references
on the basis of similarity. For example, it might be useful to create Groups for
subpopulations, country, outcomes measured, co-morbidities, sex of
participants, and so on.

Beyond assisting in the reporting of descriptive characteristics of included 270
references, EndNote Groups can also be used to organize and then report
upon any syntheses/analyses that are to be undertaken in the systematic
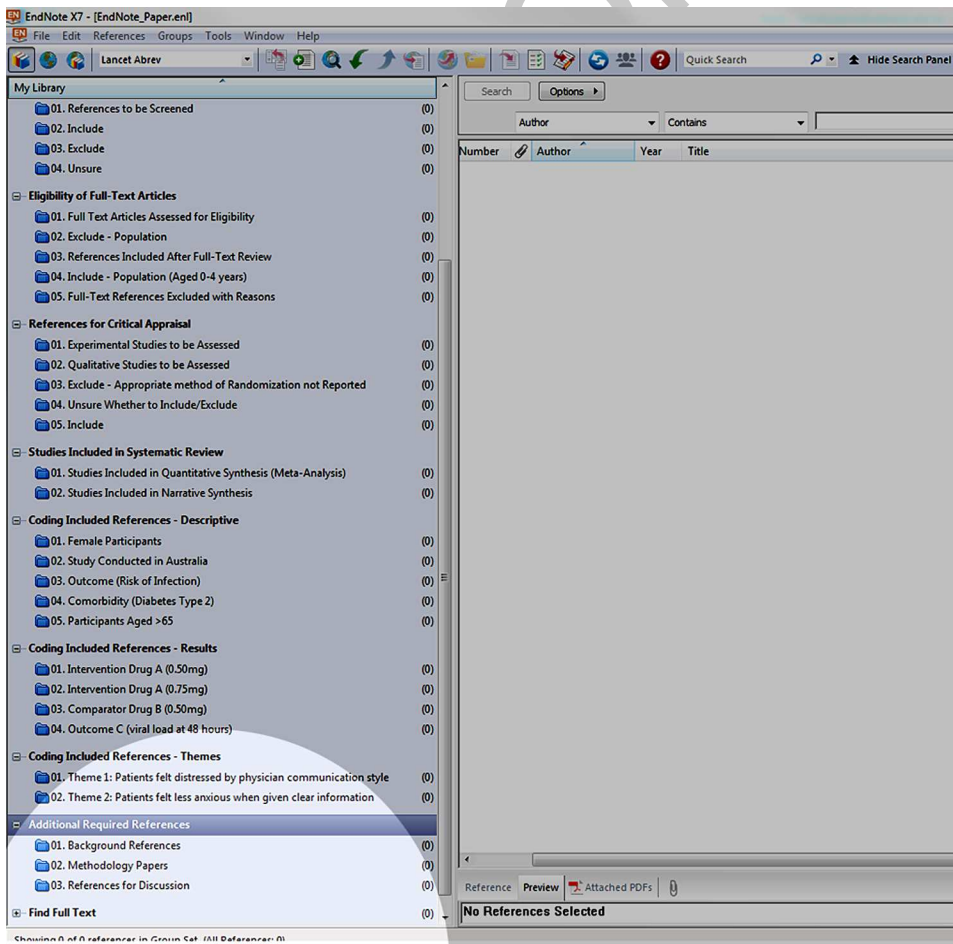review including quantitative, qualitative, and narrative synthesis. For

Figure 7. Reporting additional groups of references using groups in EndNote.

example, a systematic review may be conducted to determine the effectiveness of a particular drug (Drug A) in comparison with a comparator drug (Drug B) in terms of their impact on disease progression measured by viral load over time (Outcome C). Reviewers may find it useful to create groups for "Intervention Drug A – 0.50 mg," "Intervention Drug A – 0.75 mg," "Comparator Drug B – 0.50 mg," "Outcome C – viral load at 48 hours," and so on.

Any relevant system of coding can be used, depending on the particular focus or type of systematic review. As another example for a different type of systematic review on the experiences of patients regarding care provided by physicians for a particular condition, coding may be undertaken by theme, for example, "Theme 1: Patients felt distressed by physician communication style," "Theme 2: Patients felt less anxious when given clear information," and so on (see Figure 6).

Additional Groups can also be created to assist reviewers writing up the systematic review report beyond simply the studies that follow the phases of the systematic review process. Groups can be created for the "Background References," "Methodology Papers," "References for Discussion," and so on (see Figure 7).

Conclusion

While the process described in this article likely appears exceedingly simple and only uses very basic functions, this means that users who are new to EndNote and/or to systematic reviews can easily learn to apply it to their own work. Further, the approach is systematic, reproducible, and rigorous, which will likely increase the quality, clarity, and robustness of the overall systematic review process and reporting.

While described only for EndNote (X7 and above), a similar process can also be used in previous versions of the software, as well as with Mendeley and RefWorks software using slight variations that would be recognized easily by users who are familiar with the functionality of those programs.

Readers will have also ascertained that the specifics of the approach in terms of creating certain groups with certain names is infinitely modifiable. This is a strength of the approach, and means that users are able to adapt the process to serve their particular requirements (for example to involve additional reviewers in any of the processes of screening, selection, critical appraisal, and coding by sharing the library or giving access to other reviewers). Unfortunately, however, a limitation exists in that EndNote does not allow the creation of mutually-exclusive Groups within Group Sets, a feature that would considerably enhance the utility and ease of using the process described here.

Acknowledgments

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Notes on Contributor

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