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Julie H. Schiavo

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PROSPERO: An International Register of Systematic Review Protocols

Julie H. Schiavo

Louisiana State University Health Sciences Center, New Orleans, Louisiana, USA

ABSTRACT
PROSPERO is an international database of systematic review protocols produced by the University of York’s Center for Research and Dissemination and funded by the National Institute for Health Research. It contains protocols of systematic reviews on health and social care, welfare, public health, education, crime, justice, and health-related international development. PROSPERO compiles a comprehensive listing of systematic review protocols in an attempt to avoid duplication of effort, reduce reporting bias, and promote transparency.

Background
Writing a systematic review is a long and complex task requiring the cooperation of many researchers of varied backgrounds. Librarians play an integral role in this process. One of the first steps in the process is for a librarian to determine if there are other systematic reviews on the same or similar topics, when they were conducted or if they are still in process, and what methods were used to conduct the reviews. It can be difficult to determine this information since publication of prospective systematic reviews or systematic review protocols is encouraged but not required by any of the popular reporting guidelines. Librarians are forced to search several different websites and through both general and discipline specific journals to find protocols. In 2011, the National Institute of Health Research developed PROSPERO, an international prospective register of systematic reviews, in an effort to bring this information together and provide a centralized source for systematic review protocols.1

PROSPERO provides a place for authors to post their protocol and officially register it so that other authors know they have embarked on the project and how they intend to accomplish their goal. Registration is...
voluntary but encouraged by many reporting guidelines. PROSPERO has grown exponentially since its inception. After one year of operations, there were 359 registered systematic review protocols contained in the database, with an average of 63 submissions per month. That number increased to 26,535 in October 2017, with an average of 800 submissions per month.\textsuperscript{1,2} Authors from more than 100 countries have registered protocols in PROSPERO. Authors from England completed 18% of registrations followed by Australia with 11% and the United States with 10%.\textsuperscript{2} A recent study has shown that completed systematic reviews with protocols in PROSPERO were of higher quality and have more favorable methodological characteristics than those not registered.\textsuperscript{3}

The founding principles of PROSPERO are to provide free access to both register a prospective systematic review and to search the database. This free access is intended to avoid duplication, minimize bias, and increase transparency in systematic reviews. It assists peer reviewers and journal editors by providing an avenue to compare the elements of a completed manuscript, especially the eligibility criteria and outcome measures, with the public protocol. PROSPERO also assists guideline developers by alerting them to forthcoming reviews. PROSPERO accepts protocols regardless of which guideline the authors choose to follow to aid in conducting the project. The most popular guideline, Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocol (PRISMA-P), recommends registration of the protocol and making it public.\textsuperscript{4,5} PROSPERO helps authors fulfill this recommendation by generating a registration number and providing a public record of the protocol.

**Methodology**

The PROSPERO database comprises prospective systematic reviews voluntarily registered by the authors. Acceptance into PROSPERO will be granted if a protocol meets the eligibility criteria and the complete review methodology is included in the registration application. Authors should register in PROSPERO when the protocol is completed and before screening of articles against eligibility criteria has begun. However, it can be done later in the process if data extraction is not complete. Registrations can be revised after submission if timelines or other alterations are necessary.

Submissions are not peer reviewed by the administrators of PROSPERO, unlike other collaborations who initiate and publish protocols and completed systematic reviews. Submissions are only checked for clarity, completeness, and applicability before they are assigned a unique registration number and entered into the open access database. All submissions must be in the English language, but protocols and search strategies in different
languages may be attached. Scoping reviews and general literature reviews are not included in PROSPERO. Protocols developed by Cochrane and the Joanna Briggs Institute (JBI) are automatically uploaded into the database.

**Searching the Database**

The PROSPERO database is available to the public through the University of York at [https://www.crd.york.ac.uk/PROSPERO/](https://www.crd.york.ac.uk/PROSPERO/). The home page offers a variety of options, including links to register a review, search the database, join PROSPERO, log in to your account, find more information about PROSPERO, directions to register a protocol, a brief description of the database, and a quick view of the newest registrations (see Figure 1).

Searchers have the option of doing a quick search from the home page or choosing “Search” on the green bar on the top of the screen for an advanced search. The advanced searching page has options to use Medical Subject Headings (MeSH) and/or filters for a more precise search. Clicking on MeSH will open a new window that allows the searcher to find MeSH terms by entering text and then choosing to permute or stem the term or to show the term in the MeSH tree structure. If the searcher chooses to find the term in the Tree structure, there are choices to select subheadings and to explode the term. Clicking on the orange box marked “Go” will carry the MeSH term to the search screen and initiate a search of the database. Clicking on the link to show the search history and hide results will
allow a searcher to select previous searches and combine them using the Boolean operators AND, OR, and NOT.

The Show Filters link displays pull down menus of six descriptive filters that can be applied to a search. These include Health Area of Review, Type and Method of the Review, Source of the Review, Status of the Review, Restrict Search to Specific Fields, and Date Added to PROSPERO. Review authors assign tags for Health Area of Review; Cochrane review authors do not use these tags so those reviews are not retrieved with this filter. Source of the Review will allow the searcher to limit to or exclude from the search Cochrane protocols and/or animal studies for human health protocols. The menu to Restrict Search to Specific Fields allows searchers to limit results to those with a specific term in the title or reviews funded by a particular source.

Results can be sorted by date registered, alphabetical by title, type of review, or review status. Clicking on the title of a review will open the full text of the protocol in a new window, where it can be printed from the screen or downloaded in PDF format.

Figure 2. PROSPERO search results.
Sample Search

In a sample search, the terms postoperative pain and dent* were entered in the search box on the home page (see Figure 1). Dent* was used in an effort to retrieve entries with the words dental, dentistry, and so on. The result was a simple keyword search without any qualifiers or a controlled vocabulary. The search produced 39 results, although several of the results, such as the first one, do not seem to be specific to the subject (see Figure 2).

Clicking on any part of a result opens an additional window with the entire PROSPERO entry. After scanning the full text of the protocol, it is evident the authors have included postoperative pain in the conditions to be studied and the word dental is in the search strategy, but the study does not specifically address the relationship between them (see Figure 3).

Search Options

The MeSH tool can be used to perform a more specific search. Entering the MeSH term Pain, Postoperative and clicking on the Go button
performs a search with the term exploded generating 183 results. The process was repeated with the term dentistry, which yielded 1,428 results. The two searches were combined by clicking on the green words “show your search history and hide search results,” selecting the two MeSH searches, and clicking on the word AND. This search resulted in 22 hits.

Another way to approach a search is by using keywords with a filter. In this case, the keywords postoperative pain were entered in the search box and Dental and Oral Health were chosen from the Health area of review filter. This approach yielded 29 results (see Figure 4). To get the most comprehensive search on a specific topic, the keyword search with the filters activated (postoperative pain AND (dental OR Oral health):HA) and the combination of the two MeSH searches (#2 AND #3) were combined using the operator OR, resulting in 36 relevant hits (see Figure 5).

**Registration**

Registered prospective systematic reviews may include studies of any design that fall within the scope of the PROSPERO database, including human or animal studies with at least one human health-related outcome.
Studies may be of interventions, service delivery, prognostic factors, risk factors, genetic associations, and epidemiological reviews. All reviews must be relevant to health and social care, welfare, public health, education, crime, justice, or international development provided there is at least one human health outcome. Animal model studies may concern human disease, interventions, exposures, diagnosis, prognostic factors, risk factors, and genetic associations. Methodology reviews must contain an outcome that affects direct patient care or have clinical relevance.

Registration of a systematic review protocol is free, and the process is designed to be as simple as possible (see Figure 6). Authors are required to set up an account and complete a minimum of 22 fields concerning the administration of the review and the study design. These questions include identification such as the title, author and review team names, author affiliations, contact information, and a conflict of interest question. Authors must supply a review question with complete participant/population, intervention/exposure, comparison/control, and outcomes (PICO/PECO question); details of the literature searches; and inclusion/exclusion criteria. Strategies for data extraction, risk of bias assessment, and data synthesis are also required for every application. Eighteen optional fields can make a
submission more robust, such as a description of the context of the review and a dissemination plan. If accepted, the protocol receives a unique registration number, indexed with MeSH, and published immediately on the PROSPERO site. Updates and revisions to the initial version of the protocol appear in the public record with the date of modification. It is expected that authors will report the results of the completed systematic review and provide a bibliographic citation for any published article that may arise out of the registered protocol. The authors should also provide a link to the full text of the article. If the project is not completed and no results are generated, the record should be updated stating that the project was abandoned and why.

**Comparison with Other Databases**

Many publications and organizations publish review protocols, but these are limited to the scope of the publication and peer review. Others publish protocols for only reviews produced by the organization itself. PROSPERO creates an opportunity to find prospective systematic reviews on a broad
spectrum of topics and allows submissions from authors with a variety of backgrounds and affiliations. This diversity allows for a greater depth and breadth of potential sources, opportunities for collaboration, with less opportunities for bias. As discussed earlier, the keyword search postoperative pain and dent* retrieved 39 results from many disciplines and international researchers. However, when the same search was performed in the Cochrane Database of Systematic Reviews and the Campbell Library, no protocols on the topic were discovered. A search in the JBI database generated seventeen results, all from within the discipline of nursing. Not all of the JBI results were included in the PROSPERO results; two Cochrane Reviews were included in the PROSPERO results. The intent of PROSPERO is to provide access to all protocols by one database, but that goal has not yet been achieved. A comprehensive search for systematic review protocols or prospective systematic reviews still requires more than one database before embarking on the project.

Additional Information

Many authors choose not to register their protocols in PROSPERO. Often they are worried that others will copy their protocol and pass it off as their own. The producers of the PROSPERO database are aware of the issue and trust the integrity of researchers. The purpose of the database it to share information freely, and it would be impossible to stop such behavior if it were to occur. Duplication of a review could be beneficial in some circumstances, however, and could lead to collaboration among authors. In fact, many authors see registration of a protocol as “staking their claim” on the topic.

Another concern raised is that of protocols the authors never update. Although they agree to keep entries updated when the protocol is registered, many entries are never touched after being published in the database. These “zombie reviews” can become a hindrance to searchers who may not know if the project is taking a long time, has been abandoned, is about to be published, or has already been published. While duplication of reviews can be an important part of advancing the study of a topic, it is possible no one will embark on another systematic review on the subject when an entry on the subject is already in the database. Authors are encouraged to use their own judgment about the likelihood of a systematic review being completed.

Finally, many authors are concerned registration of their protocol will be difficult and a hassle to maintain. The creators of PROSPERO have attempted to make registration as easy and beneficial as possible. Record
updates are not frequent, but they are very important to the sustainability of the database. The benefits of registration outweigh the hassle and risks.

**For More Information**

For more information on systematic review of humans, contact crd-register@york.ac.uk, +44(0)1904 321049. For more information on systematic reviews of animals, contact crd-register-2@york.ac.uk.

**Notes on Contributor**

Julie H. Schiavo, MLIS, AHIP (jschia@lsuhsc.edu) is Assistant Librarian and Assistant Director for Dental Library Services, Louisiana State University Health Sciences Center, New Orleans, School of Dentistry Library, 1100 Florida Avenue, New Orleans, LA 70119.

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