

How to write a research proposal? A guide for medical professionals and students

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ABSTRACT

If you already have a research project in mind, the research planning phase must be completed with the formulation of a well-structured research proposal that must be submitted to an ethics committee for approval before your project can start. Generally, a research proposal contains the following elements: Title, abstract, introduction, objectives, methodology, timeline and milestones, ethical considerations, budget, appendices, and references. Whether you are a medical student or a researcher, knowing how to write a research proposal is an important skill to start any research project. This guide will give you the skills to write a successful research proposal.

Key words: Budget, Ethical considerations, Methodology, Objectives, Research proposal

Research is a scientific activity that goes through several steps. It begins with selecting a study topic, reviewing the literature, setting goals, choosing a study design and appropriate statistical tools, and formulating a research proposal to obtain approval from the relevant ethics committee. Therefore, writing a research proposal indicates that the researcher has chosen to begin investigating a topic he had in mind. Most medical professionals and students do not fully comprehend the significance of a research proposal or what it entails [1-4]. A research proposal is a brief document that contains all the key elements involved in the research process.

A key goal of research proposals is to obtain approvals from various bodies, including the ethics committee [5]. Therefore, writing an effective research proposal is essential to persuade reviewers that your research topic is significant and that you have the expertise and the degree of control over your work schedule required to complete it. Put simply, the quality of a proposal determines how good the research is. This guide describes step by step how medical professionals and students can write good research proposals.

ELEMENTS OF A RESEARCH PROPOSAL

A research proposal may take various forms depending on the needs of the local research committee. Generally, a research proposal must contain the following elements: Title, abstract, introduction, objectives, methodology, timetable and milestones,

ethical considerations, budget, appendices, and references (Box 1).

Title

The title should be meaningful and concise. It should convey the aim (research question) of the study. The title may need to be revised after the proposal is completed to better reflect the aim of the study [5-9]. Acronyms and technical jargon must be avoided as much as possible, as the reviewers may not have a similar technical background [8,9]. A compelling research title captures the reviewer's interest and positively prepares him for the proposal.

Abstract or synopsis

It is a summary of the study in about 200–300 words. It should state what you intend to do, why you think it is necessary, what results you expect, and what impact these results will have on the advancement of knowledge in the subject under study. It conveys your proposal's main points and conclusions to the reviewers [10].

Note that most funding organizations and academic institutions do not demand an abstract or synopsis before the introduction. However, it is best to review the regulations of your institution or local committee.

Introduction

This section must establish the problem that necessitates the study based on a review of the current literature on the topic in

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question [10-12]. The introduction to a good research proposal should include the Following Information.

1. A brief literature review: The researcher must thoroughly review the existing literature on the subject in question [12]. A literature review provides the reviewer with a concise overview of what is known in the field, highlights the shortcomings in the current knowledge base, and explains why the study is required to address this shortcoming [11].
2. The logical chain of reasoning: Your literature review must show that you're not simply repeating what others have done or said. The literature must be critically analyzed and evaluated rather than just described. A well-thought-out chain of reasoning leads to a logical discussion on the proposal that captures the reviewer's interest and positively prepares him for the proposal. As there are various ways to frame the chain of reasoning, many scholars [13] follow the use of the "five C's" while framing the chain of reasoning (Table 1). Note that research proposals have a word or page limit and so you cannot analyze all existing literature. However, don't feel like you have to cram all your information into one paragraph [14].
3. Hierarchical approach: The literature can be structured hierarchically, so that the literature on the more general aspects of your topic could come first. You could then narrow it down to a specific problem and the direction in which the solution is to be sought [11].

Sometimes the literature review is presented as a separate section. In this review, however, we prefer to incorporate it into the introduction section as we believe the literature review is key to writing an excellent introduction to a research proposal.

Objectives

The objectives of a proposed research study are established to answer questions by starting the particular actions that produce tangible outcomes which can be assessed either qualitatively or quantitatively. Well-described objectives provide the reviewer with clear criteria against which to evaluate the proposed research study [15]. Therefore, you can use the acronym SMART to validate your objectives, which means formulating your objectives as specific, measurable, achievable, realistic, and time-bound [16]. The objectives of a proposed research can be divided into:

1. General objectives: These describe the aim (research question) of the study in general terms, emphasizing what is to be accomplished.
2. Specific objectives: Unlike the general objectives, the specific objectives are more focused and relevant to solving the research problem. They divide your research aim into smaller parts and identify the variables to be studied and measured. The general objectives (aims) of a research study define what your study will answer, while the specific objectives specify how the study will answer it [16].

Methodology

The methods section is crucial because it outlines your approach to solving the research problem, leaving the research committee with no doubts about how the study objectives will be addressed. An effective way to frame your study design is by building upon and drawing examples from your literature review [14]. In this section, you need to include the following subheadings (Box 2):

Study design

Based on the literature review, choose an optimal design for your research question, data, and resources. A thorough explanation of the study design is required. Clinical trials, surveys (cross-sectional surveys), case-control studies, cohort studies, and qualitative studies are some popular designs.

Study population and setting

A detailed description of the study population is required, and an accurate description of the setting is essential, as this can

Box 1: Elements of a research proposal

- Title
- Abstract
- Introduction
- Objectives
- Methodology
- Timetable and milestones
- Ethical considerations,
- Budget
- Appendices
- References

Box 2: Suggested format for the methodology

- Study design
- Study population and setting
- Sampling strategy and Sample size calculation
- Data collection process and statistical analysis

Table 1: The five Cs that help in framing the chain of reasoning while writing a literature review

Cite	Keep the primary focus on the literature pertinent to your research problem.
Compare	Compare the various arguments, theories, methodologies, and findings expressed in the literature: What do the authors agree on? Who applies similar approaches to analyzing the research problem?
Contrast	Contrast the various arguments, themes, methodologies, approaches and controversies expressed in the literature: what are the major areas of disagreement, controversy, or debate?
Critique	Critique the literature: Which arguments are more persuasive, and why? Which approaches, findings, methodologies seem most reliable, valid, or appropriate, and why? Pay attention to the verbs you use to describe what an author says/does [e.g., asserts, demonstrates, etc.].
Connect	Connect the literature to your own area of research and investigation: how does your own work draw upon, depart from, or synthesize what has been said in the literature?

have a significant impact on the results and their interpretation. Study population planning should include the characteristics of the participants and how they will be selected and assigned to the study [12]. Setting the inclusion and exclusion criteria for study participants is a standard and required practice in designing research proposals [17]. In addition, establishing one or more clear diagnostic criteria saves time and resources.

Sampling strategy and sample size calculation

Sampling and sample size are crucial issues in pieces of quantitative research. When collecting a sample, you will ask questions such as: How many people should be included in the sample? How will they be chosen? The sample must be selected to represent the target population as closely as possible and in sufficient numbers to provide valid answers [5,7,12,15]. Therefore, a brief description of the sampling strategies and the sample size calculation is an important part of the proposal. Reference should be made to the calculation method.

Data collection process and statistical analysis

A thorough methods section should include a description of the instruments for the data collection, for example, interviews, questionnaires, checklists, observations, or computer-assisted interviewing systems [5-7,11,12,15]. Data analysis strategies such as the data management and post-data collection interpretation methods to be used should be described, including plans for processing and coding data, computer software to be used (e.g., Statistical Package for Social Sciences, Minitab Statistical Software, EPI-INFO, and Stata), choice of the statistical methods, confidence levels, significance levels, etc.[5-7,12,15].

Timetable and Milestones

A research proposal timeline is a plan that shows how you will conduct your research project from the application stage to the final report. It helps you organize tasks, set deadlines, and track

progress. Therefore, you should provide an overview of the different phases (milestones) and the corresponding timelines for their fulfillment up to the submission of the final report [7,15]. A well-structured timetable shows the reviewers how realistic and thorough your project plan is. You can design your timeline using a Gantt chart, displayed as bars reflecting the time to complete each task listed (Table 2).

Ethical Considerations

The Declaration of Helsinki serves as a guiding principle of medical ethics based on respect for autonomy, beneficence, non-maleficence, and justice [12]. The main ethical concerns are whether the research study will place the participants under undue risk and whether the subjects are fully informed about the nature of the study [6,12,15]. A crucial ethical issue is consent, and so you must provide sufficient explanations of each of these components. Describe how participants will be informed about the study and how informed consent will be obtained [5,12,15].

Budget

Every research study should have a budget to ensure all costs are covered. A detailed budget should include all costs for personnel, equipment, materials, and activities required for the project [5-7,13-15]. When preparing a research budget, you must include each item of expenditure necessary to complete the study. A well-prepared budget will be reasonable, coherent, allocable, and generally allowable.

Appendices

Appendices are documents that support the proposal and application. These can be very detailed and too voluminous to be included in the main body of the research proposal. The attachments will be specific to each proposal, but the documents that are usually required include an informed consent form, supporting documents, questionnaires, and letters of cooperation [5,14].

Table 2: Timetable and milestones of a research project

Task	January	February	March	April	May	June	July	August	September	October	November	December
Research committee application	█											
Prepare for data collection			█									
Data collection			█									
Prepare for data analysis							█					
Data analysis							█					
Writing the first draft of manuscript									█			
Writing the final draft of manuscript										█		
Submission of the final report												█

Some research committees do not require researchers to submit attachments, and so you should know in advance whether or not you need to submit supporting documents.

References

The references list or the bibliography lists the literature you referenced in the body of your proposal. Reference citations are required for any statements in your proposal that are not generally known and for which attribution is required. Your references should give reviewers a good sense of how you understand the literature and how you can contribute to it [5-7].

CONCLUSION

Research proposals are used to persuade potential reviewers from a relevant research committee and funders that your research topic is significant and that you have the expertise and the work schedule required to complete it. The structure of your research proposal is, therefore, important to achieve this goal. However, there is no definitive standard or secret formula for writing research proposals, as each research committee or funding institution has its own set of guidelines and protocols that each candidate must adhere to. In general, the elements of a research proposal include the following: Title, abstract, introduction, objectives, methodology, timetable and milestones, ethical considerations, budget, appendices, and references or bibliography. Although this article has attempted to cover the most important aspects of the research proposal as much as possible, the successful application of your research project cannot be guaranteed based on this. Therefore, you must retain sufficient flexibility to comfortably accommodate any changes you may need to make at the request of the reviewers.

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