

The Research Grant Process: A Reference Guide for Cardiovascular Sonographers

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Opportunities for sonographer-initiated research have increased during the past decade. Although research has traditionally been viewed as a nonclinical activity, funding is available for clinical problems. This article aims to increase sonographer awareness of this unique opportunity, encourage the submission of grant proposals, and enhance the understanding of the grant writing process. This

review discusses the procedures involved in planning a research project while describing the structure of the research grant proposal including specific aims, background, preliminary studies, methods, potential limitations, significance, budget, and references. (J Am Soc Echocardiogr 2005;18:264-7.)

Introduction

The applications of echocardiography used today were established by research investigations that focused on specific clinical problems. Clinical research not only attempts to define solutions to a specific clinical question while advancing the field of echocardiography; it also expands the investigators' personal knowledge and provides personal satisfaction as an alternative to routine clinical work. Funding for sonographer-initiated clinical research is provided by the American Society of Echocardiography (ASE) and includes support for the investigator's time and effort to conduct a well-designed research study. The objectives of this article are to increase sonographer awareness of this unique opportunity, encourage the submission of grant proposals, and enhance the understanding of the grant writing process.

Process

Before writing a research grant, considerable planning of at least 3 to 4 months is necessary. The initial step is to become familiar with the specific guidelines of the grant format. It is important to remember that a well-written grant proposal must be carefully structured, address a topic that has not

been well defined, and be relevant to the organization that will potentially fund the grant. It is also important to conduct an extensive literature search to determine what information has been published on the subject. The initial grant proposal may be strengthened or a new topic may surface after careful review of the literature.¹ Several peer-reviewed databases are available through the Internet including PUBMED, Ovid, CINAHL, and MEDLINE. In addition, a medical library can be an invaluable resource.

The next critical step for a new grant writer is to find a mentor who can provide guidance throughout the process. Ideally, the mentor has received grant funding and has experience reviewing grants.^{2,5} The mentor should be provided a short (1-2 pages) overview of the proposed research that includes: (1) a summary of the literature search results; (2) hypothesis and specific aims; and (3) research methodology and a summary of the anticipated results of the study.

Preliminary Data

It is necessary to review the previously published data on the research topic. Preliminary studies may also require prospective data collection or a retrospective analysis of previously collected data. By conducting this preliminary work, the feasibility of the hypothesis, the methods, and study design to be used in the research study proposal can be critically assessed. For example, preliminary data collection can reveal potential problems in the study design. The results of the preliminary data analysis can be incorporated into the grant proposal to emphasize familiarity with the clinical question and provide

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proof that the study design can be successfully conducted. Inclusion of previous publications on the research topic, particularly from members of the research team, provides evidence of familiarity with the subject matter and strengthens the application.

It is important to note that according to current Health Insurance Portability and Accountability Act regulations, any project that will use patient confidential information must be approved by the institutional review board, including feasibility pilot studies. The institutional review board will determine the regulations that apply to the specific project.

The statistical analysis for a research study is important and will be dictated by the study design. This often requires working with a biostatistician who can help to determine the correct sample size that would be necessary to detect significant findings. This will assist the investigator and provide an understanding of how the data should be collected and organized for analysis, and optimize the design of the study for testing the proposed hypothesis.

Structure of the Grant Proposal

All research grants submitted to an organization require a format that includes a summary of the proposed research (with a stated hypothesis and specific aims), background, preliminary studies, methods, potential limitations, significance of the proposed research, a budget, and references. A detailed outline of each section can be an important aid when beginning to write the grant.

Summary

The summary or abstract outlines the proposal and is the first section of the grant, but often may be the last section to be finalized. Because this is the first section of the grant a reviewer will read, it sets the initial tone of the proposal. It is especially important to devote critical time to clarifying the section. It must be succinct and present a strong argument.¹ It should include one or two sentences that describe the background of the research question, the hypothesis, specific aim or aims of the study, the methods, and research design. In addition, it is important to include the significance of the problem and how the proposed research will aid in answering an important question.

Hypothesis and the specific aims

The hypothesis and the specific aims must clearly state the goals and objectives of the research study. This section should begin with “It is hypothesized that. . .” or “The goal of this study is. . .” and clearly convey the message of the research question to be tested.

Background

The background should clarify the problem and emphasize the importance of the proposed study.⁴ This section should include a review and a critical analysis of what has been published regarding the proposed research. Highlight how the proposal fits into the current literature, or how it will provide data that are currently not available. In this section research questions should be potentially answered including “What is the rationale for your proposal?” “What studies have been done by others?” “Why is it important to do this study?” and “How will the research benefit the organization or society?”

Preliminary studies

The preliminary studies should outline the work that has been done on the topic that is related to the hypothesis and aims of the study. This will establish an investigator’s competence and prove that the concept addresses the hypothesis. Concerns or new insights regarding preliminary results that have been discussed should be addressed in this section.⁴ This section provides evidence that the research question in the proposed grant has been partially tested, but that additional support is required to address it completely. Providing evidence of the investigators’ qualifications and a supportive environment that will encourage and enable the research to be successfully conducted may be an important factor in funding a grant.³

Methods

The methods section is critical and needs to outline the research design of the study. A significant amount of effort and space should be committed to explaining exactly how the research team will conduct the study. In this section, specific questions should be answered including who will work on the project, what patient population will be studied, predicted recruitment, inclusion and exclusion criteria, the length the study will be conducted to achieve results, and where the work will be completed. The methods section can be divided into headings such as study design, setting, population, sample size, protocol, variables to be measured, measurement, data analysis, and timeline.⁴ It may be helpful to include figures or diagrams in this section that will explain certain processes at each stage of the research design.

Limitations

All clinical research has limitations with variables that often cannot be controlled. The potential weaknesses of the study should be discussed with comments on how these will be addressed relative to the research question. This section should be brief, but do not omit anything that may deny further consid-

eration of the application. The potential weaknesses of the study design should be discussed in a positive manner and demonstrate how a potential weakness would not nullify the hypothesis.

References

The references should include studies cited in the background section.⁵ It is also important to reference any techniques or measurements that are reported in the methods section. Primary sources should be used rather than textbooks and the use of direct quotes from the literature is usually not appropriate.

Budgets are often required as part of submission of a grant. It is helpful to outline the projected costs (ie, personnel salaries, equipment, supplies) to accomplish the design of the study. The financial office of the institution can be a potential resource to properly develop and allocate costs to particular areas. In addition, costs of contracts, division support letters, biographic sketches, and departmental signatures are required for many grant submissions. Furthermore, all clinical research requires written informed consent and approval by the institutional human studies committee.

Internal Grant Review

After the first draft of the proposal has been written, the research team involved with the project and colleagues need to review the grant. These individuals may be those with specific qualifications in research, others who understand the clinical problem but may not have particular expertise in echocardiography, or others who neither understand the research nor have expertise but may provide critical editing skills. This diversity of reviewers can provide numerous suggestions, identify the weak points of the proposal, and potentially provide insights that have not been considered. Ensure the reviewers will take the time to carefully read the grant proposal. Do not be deceived by a reviewer who has superficially read the proposal and responded with "great job."² Finally, complete the grant proposal at least a week before the deadline for submission.¹ Minor changes may need to be made at the last minute.

Caveats and Mistakes

There are a number of caveats and mistakes in the grant process commonly made by a novice grant writer. First, focus the proposal on one hypothesis and no more than two specific aims. Submission of a grant with an ill-defined hypothesis or several aims is too broad and may be a reason for initial rejection. Second, make sure the hypothesis and specific aims

fit the criteria of the reviewing body. For example, any grant proposal submitted to the ASE must have cardiovascular ultrasound as a primary focus and not as a supporting modality. Third, a grant should address all requirements and guidelines of the organization's grant review committee.

The proposal must be simple to follow and clearly describe the methods. Figures and tables can sometimes convey a concept better than text. It is important to recognize that grant proposals are limited to a certain number of pages. Key points for writing a grant include: (1) carefully follow the instructions and guidelines; (2) keep it focused (one hypothesis with one or two specific aims); (3) keep it simple but provide enough detail to support the hypothesis; (4) be attentive to methods; (5) use figures, tables, or both; and (6) be persuasive and write to the audience.

The Reviewer's Perspective

A primary question of the grant reviewer will be "Can the investigator accomplish what has been proposed within a reasonable time limit?" Thus, the investigator must insure the hypothesis can be tested and results can be achieved in a timely manner. Reviewers of the grant (often 3) then assign the submitted grant a priority score. These are based on their comments relative to the number of elements within the grant proposal that fulfill the criteria required in the guidelines. For example, all grants submitted to ASE will be reviewed and written comments provided to the individual submitting the grant.

It is important to present a persuasive tone in the grant proposal. A purely objective and technical grant is not only boring, but can be ineffective to convince a grant reviewer that the hypothesis is reasonable or that it makes a contribution to the practice of echocardiography. A grant that captures the attention of the reviewer, with a concisely written background, well-constructed hypothesis, and specific aims (with preliminary data) is more likely to be considered among other grants.

Conclusions

The process of writing a research grant presents a unique set of challenges. These guidelines potentially offer a sonographer the guidance to develop a specific application of cardiovascular ultrasound and encourage sonographers to submit interesting research project proposals.

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