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Abstract

The National Institutes of Health has implemented new grant application guidelines that include a substantial reduction in the number of pages allowed for project descriptions. Shorter proposals will potentially decrease reviewer burden, but investigators may find the new page limits challenging. Writing more concisely while still presenting a persuasive argument requires honing certain skills with regard to preparation, construction, and editing of proposals. This article provides strategies from the *Western Journal of Nursing Research* editorial board for preparing competitive shorter research proposals. Two key strategies for success are fully conceptualizing the study prior to writing and obtaining assistance from experienced colleagues during the editing process.

Keywords

In 2010, the National Institutes of Health (NIH) implemented significant changes in its grant application guidelines. One of the more striking aspects of the restructuring was a substantial reduction in the number of pages allowed for the research project description. The space allowed has been reduced by half, which means research plans for R01 applications must now fit into 12 pages rather than 25. The NIH changes were implemented with the goal of increasing the efficiency of the peer review process while decreasing the administrative burden (NIH, 2010). With this change, the NIH joins a large number of other public and private funding agencies that impose strict limits on proposal length.

Writing a shorter proposal may seem easier, but in reality, it is often much more difficult. Shorter proposals are challenging because they force investigators to write concisely, distilling ideas down into their simplest form while still being persuasive. In this latest of *Western Journal of Nursing Research*'s continuing series of Editorial Board Special Articles (Cohen et al., 2010; Conn, 2010), members of our editorial board have each contributed essays that reflect on the new NIH guidelines and provide practical advice on how to prepare shorter yet compelling grant proposals.

Susan Rawl (Indiana University)

Although 12 pages, or less in some cases, may seem like much too little space to make a convincing argument for the best grant idea in the world, it can be done! And from a reviewer's perspective, the shorter applications make me think I died and went to heaven. It also helps that grant applications are now organized according to evaluation criteria, making it easier for reviewers to find important information on significance and innovation. In the past, these criteria have been challenging to

evaluate because they were often buried in different sections of the application. This is no longer the case.

The specific aims page is critical and must provide a preview of what will come later in the application. This page should grab the reader's attention with clear and compelling arguments about the problem to be addressed, why it is significant, and how your proposed study is a necessary component of a solution to this important problem. The aims page should end with a strong, single paragraph describing the potential impact of the proposed research. It is also helpful to provide a strong, single paragraph that summarizes the impact, significance, and outcomes of your study at the end of the entire grant.

With shorter applications, the background section/literature review must be brief and well synthesized. It helps to write comprehensive statements about the evidence to support your research that can be followed by multiple references. Clearly describe your methods narratively but use figures, such as study schemas, and tables to detail the study design, recruitment, data collection, and timeline. Provide a general description of the measures to be used but put details about measures in the appendix. Preliminary studies must be described succinctly in one or two paragraphs. Rather than describing each study your team has conducted that is relevant to the proposed work, integrate your preliminary studies and present them in a single paragraph (or two) as evidence supporting your team's prior successes with the proposed recruitment, data collection, measurement, intervention design, delivery, and/or quality assurance methods. Finally, a clear timeline that gives an at-a-glance overview of the study components, activities, and when they will be accomplished is extremely helpful.

The rules have changed and it is absolutely essential to understand what is acceptable and not acceptable for inclusion in the Appendix. Although it may be tempting, never use the appendix to circumvent the page limits of the research strategy. Reviewers are being regularly reminded to ignore information that, although not allowed, has been included with grant applications. If you have any questions about preparing an NIH grant application, including what is allowed, do not hesitate to contact NIH staff. They are there to help applicants be successful and are more than willing to answer your questions. However, our NIH colleagues, like you, are busy people and the best way to get good advice is to give people time to prepare to address your questions. First, send an e-mail explaining who you are and what you are working on, and request an appointment for a phone consultation. Then, send a few (no more than 4-5) specific questions via e-mail a few days in advance of the scheduled call to give the staff member an opportunity to prepare and, if needed, obtain additional information before the call.

Finally, obtaining critical review of your application from funded investigators and experienced reviewers prior to submission is absolutely essential for success. At Indiana University, we have several mechanisms in place to provide internal and external reviews of grant applications and we all celebrate when a colleague gets funded. Although it can be difficult for young investigators to hear that their grants are not yet ready for submission, most prefer to hear that from trusted colleagues than from NIH reviewers. So, put on your bullet-proof vest and ask for feedback!

Mary Wurzbach (University of Wisconsin–Oshkosh)

Short grant applications to the NIH pose a challenge for all researchers, both seasoned and novice, because the researcher is excited about his or her project and wants to share this enthusiasm with the reviewer. Often, it is difficult to stay within the requested page count.

Several suggestions, however, might help the grant writer with his or her application. First of all, develop the proposal, guided by the exact criteria for the grant. Emphasize the high scientific caliber and the application to public health needs of the project. Second, make a case for why this proposal is unique and different from other grants. Be concise, clear, and cogent when describing the project. Emphasize the NIH mission of enhancing health, extending healthy life, and reducing the burdens of illness and disability.

Finally, honor requested page counts and formatting guidelines for NIH grants. It is not always possible to include all of what one wants to include, but writing in a condensed format often makes it more precise.

Nancy Fahrenwald (South Dakota State University)

This reflection on the revised NIH grant guidelines is focused on just two of the changes, the revised length and the added emphasis on innovation. A statement made by a former mentor bears much wisdom when advising students and faculty in the grant writing process. That statement is, "It is more difficult to write a short paper than a long paper." Given that the page limit for an NIH application was reduced from 25 pages to 12 pages, one can surmise that writing a proposal is more challenging. Precise and compelling writing is essential for any grant application, and this recommendation cannot be overstated for the new NIH requirement. After a thorough review of a draft application, a colleague of mine reads the application backward, sentence by sentence, to evaluate whether every word and statement is clear and essential. There are other strategies that achieve a similar purpose, such as seeking out an uninformed reviewer who will agree to thoroughly read the narrative and point out any areas that seem redundant, overstated, or unnecessary. This review should occur outside of a formal mock review process, yet mock reviewers should consider the same issues. Attention to detail is critical because a risk of the revised length is failure to provide enough information about the proposed research, such as a lack of detail in the presentation of the investigator's prior work. The former Preliminary Studies section provided a clear place for this information, which can now be integrated within the Significance, Innovation, and Approach subsections.

Communicating the innovation of proposed research is a new section within the revised NIH format. Innovation was important in the former guidelines but was not a separate subsection in the application format and review. Prior to writing the grant, the investigator should consider whether the idea is innovative enough to warrant funding. What is enough innovation? It depends on the state of the science in a particular area. Questions to ponder are as follows: How does this research shift the paradigm in current thinking about the phenomenon of interest? How does this proposal improve on or refine current methods, conceptualizations, or interventions? What is new about the approach? Has it worked elsewhere but never been applied in this area of science? Statements about innovation should be unquestionable and realistic.

Marlene Cohen (University of Nebraska Medical Center)

The NIH directives have changed many aspects of grants, and writers of grant proposals are still sorting out the best way to describe their projects. As Associate Dean for Research, I am privileged to be able to read the grants submitted by faculty at the University of Nebraska Medical Center, College of Nursing (UNMC CON). Writing shorter grants, while not easy to do, does help make the proposal more clear and often helps the writer clarify what will be done in the research.

Many resources are coming out to help with the new NIH format. For example, in 2010, the Principal Investigators Association published a manual (Principal Investigators Association, 2011). In addition, the National Institutes of Allergy and Infectious Diseases (NIAID) have a wealth of information about grants and writing on their website. They provide grant tutorials, examples, and samples of grants posted on their site (NIAID, 2011). Recently, NIAID has posted new samples of R01 applications in response to changes grant writers must now make—writing shorter sections with less detail. Some guidance about how to accomplish this is also on the website, where they give advice about using simple clear writing, the active voice, and the use of graphics. As they note, a picture is likely worth more than a thousand words. Graphics, timelines, charts, and other visual elements help reviewers quickly grasp a great deal of information and also help break up the text. Formatting to make it easier for reviewers to follow the grant is helpful. Use a hierarchy of headings and appropriately number them.

Organizing the sections of your grant is also important. The specific aims page needs to begin with an introductory paragraph and follow with a "what," "why," and "who" paragraph. The last paragraph should inform reviewers what can be expected for a return.

The research strategy has three sections. First, it begins with "Significance." This section needs to include a critical analysis of the literature, statement of significance, and discussion of expected benefits. The second section, "Innovation," needs to document what the norm has been; what is the prevailing paradigm; the statement of innovation, which is how this proposal will shift the paradigm; and the positive impact of the innovation. The third and final section, the "Approach," should include the content and quality of the science, and the impact the research will have. Begin with preliminary studies, to establish the feasibility of the proposed project, and how to interpret these preliminary data. It is useful to include only preliminary studies that support the project's feasibility in your hands. Include primarily unpublished data and interpret the data. In the approach, answer the following questions: (a) what will be done, (b) what are the means to accomplish the aim, (c) what alternative strategies would you turn to, and (d) what are the expected outcomes and why are they important. Include discussion of the sample, setting, measures, procedures, and the analysis, linked to the aims. In organizing the approach, begin each aim with an introductory paragraph; provide justification and feasibility with review of the relevant literature and preliminary studies, the research design, expected outcomes, potential problems, and alternative solutions. It is important to conclude with a timeline and summary paragraph.

Finally, another aspect that has changed and been shortened is the biosketch. You are now limited to 15 publications. It is useful to include your 5 most recent, 5 most important, and 5 most relevant papers. Of course, these three categories may overlap so that you can include more publications in one

of the categories. For example, your most recent papers may also be your most relevant papers, so you can include 10 such papers.

Strategies we have found very useful at UNMC CON are to have internal reviews by the research team as well as local and expert colleagues across the country. Another very helpful guide we developed is a detailed timeline of all aspects of the grant application, with aspects leading to the submission of the grant on the deadline. Allowing adequate time to develop ideas, to write, to get critical review, and to rewrite is vitally important.

Donna McCarthy (Ohio State University)

In the past months, The Center for Scientific Review at the NIH has made many changes to the format requirements for an investigator-initiated grant proposal. The shorter page limits, the well-defined sections, and the revised format for the biosketch force the investigator to rethink how to get the research idea from one's desk to the study section. I greatly appreciate the revised format for the biosketch, which now allows the applicant to "sell" themselves as a scientist. For the body of the proposal, I believe the specific aims page is the most important part of the application. You must immediately convince the reviewer that the problem to be addressed by the study is compelling in terms of health care dollars, human capital, and human health. Grab them with the facts in the first three sentences. Then tell them what we already know (two sentences) and what we do not know about this problem, and what we need to know to advance the science or improve health care outcomes for people with this problem (three sentences). These ideas will carry forward as you write the Significance section of the Research Strategy. Next, describe the purpose or organizing hypothesis of the proposed study. The next four or five sentences should lay out the variables to be manipulated or measured, and the relationships between them. A simple diagram at this point is often very useful. You could also insert a sentence about the expertise of your research team in the content area or methods. You will build on these ideas in the Innovation section, how your conceptualization, approach, and scientific team will approach the research problem from a new scientific perspective.

You are now ready to describe the specific aims of the proposed study. The aims should be related to the purpose or organizing hypothesis but should not depend on each other. Try to limit yourself to three aims. Leave room at the bottom of the page to describe potential impact of the study, how achievement of the aims will advance the science or improve health care. The aims should be clearly stated. This clarity helps you to set up the Approach section of the Research Strategy, which should be organized according to each aim to be addressed. I try to do this by setting up the approach section as a sequence of subsections, each titled for an aim. I then put the methods and relevant pilot data using the method, the power analysis for sample size, and the data analysis plan specific to the aim in each subsection. Be sure to include potential problems and alternative methods to successfully achieve that aim. This shows the reviewer that you have carefully thought out the strategy for each aim and that you and your team are the best scientists to do this work. Describing the approach aim by aim also lets me see where I have redundant material. Knowing where to prune or cross reference information is very important when you are trying to stay within the shorter page requirements. Finally, I find that using the aims to organize the approach section helps me to use consistent language throughout the proposal and to demonstrate the overall research strategy. This, in turn, helps the reviewer follow the

logic of a study, which leaves them free to fully appreciate your innovative approach to solving a significant health problem.

Julie Zerwic (University of Illinois, Chicago)

Many investigators naturally start their grant applications at the beginning and work through to the end. Although this would seem a natural progression, it also causes the unintended consequence of an investigator spending more time on pages at the beginning of the application and less at the middle or end. Instead, it might be helpful to develop a map, much like you plan a trip. Decide in advance how much time and space you should devote to each particular section. This will provide you with a more balanced application, and important sections such as the approach will not be shortchanged. An important goal is to always write with the reviewer in mind. The reviewer might not be versed in the language of your particular area of science. Avoid abbreviations. Every time a reviewer reads an abbreviation, they must stop and translate that abbreviation to understand your writing. For example, "HTN pts experiencing an AMI or ACS are eligible for tx with PTCA, TPA or CABG." (HTN = hypertensive, pts = patients, AMI = acute myocardial infarction, ACS = acute coronary syndrome, tx = treatment, PTCA = Percutaneous transluminal coronary angioplasty, TPA = tissue plasminogen activator, CABG = coronary artery bypass graft). If you must use abbreviations, pick two or three and only use those in your application. Follow the directions on the format of the application. Reviewers will expect information in certain sections, and if it is hard to find, they will assume it is missing. The use of headings and subheadings enhances the reviewer's ability to follow your roadmap. At the beginning of each section/paragraph, let the reviewer know the focus of that particular section and remind them of the focus at the end of the section through a conclusion or summary. Avoid sending the reviewer to other articles or the appendices for information that is critical to your application. Reviewers have multiple applications to review and will appreciate the efforts of an investigator who makes the process easier.

Barbara Given (Michigan State University)

Moving to shorter applications for grants was met with mixed review at our college. The established researchers were shocked and spent time wondering how they could possibly tell their grant story in half the pages for an R01 or for an R21. Junior faculty, however, were happy because it appeared they would be able to do the work faster and get the grants written faster.

We soon discovered that for the senior faculty it did, in fact, take work to reduce and refine our statements so that they would be coherent and cover all of the areas needed for a complete grant application. After much work and cutting, faculty were able to do that and felt they were able to write a good grant. We believe it takes us as much work and intellectual activity as the 25 (and 12) page applications. We have adjusted however.

Senior researchers have seen several summary sheets coming back on the submitted and reviewed shorten grants about use of Resources section or Appendix use to "get around the page requirements." In one case it was related to a timeline. For 15 years, we have put the timeline in Resources section but now it was called out as not appropriate. The other example was putting a schematic in the appendices along with the measures. This pointed out in the review and administrative note as not acceptable.

This was written up as an administrative note saying we were trying to get around page limits. So the correct balance of content and sections remains a concern.

The junior faculty, however, remain challenged and find the six pages for the R21 (which most of them write) to be tough and time-consuming. The Specific Aims page takes a longtime just as it did before. Because they are new at submitting grants, the adjustment has not been as bad as for the senior faculty.

Researchers in our college thought it might be easier to get out more grants because they are shorter—well, that did not happen. We are still submitting at the same rate, there has been no increase. As Associate Dean, I find we are still using the same amount of resources from the Research Center to get a grant out as before. Perhaps that will change with time and experience.

As a reviewer, this change to shortened proposals was good news. NIH indicated the purpose for shortening the page limits to help reduce the administrative burden on the applicant, the reviewers, and NIH staff. We do not see that the burden is any less on applicants, perhaps due to the competition. As a reviewer, however, I welcome the reduction in pages and find it is a more realistic load—the reduction in appendices also helps.

As an individual, I do not yet see that the change has brought about focus on the "essentials of the science" as promised and the stated reason for the change. The criteria areas used for grant review have emphasis on other areas than what we think of as science (investigator, innovation, and environment). I assume that in 2 to 3 years, the length of the grant and our approach will be the new normal. We will write 6 and 12 pages with ease and understand the study section reviews. Until then we live with uncertainty and uneasiness.

Donna Algase (University of Toledo)

The shorter NIH application is challenging for both grant writers and reviewers because it requires us to move out of our comfort zone. Although we have tended to view favorably applications describing a carefully designed study with very thorough and detailed methods, emphasis now is placed on impact, reflected in the combination of significance, innovation, and approach. This is not to say that applications no longer need to provide adequate information to assure that methods are rigorous enough to yield definitive results or to demonstrate that the research team and environment encompass the expertise and resources to carry out the work as planned. Rather, strength in these components of an application simply is not enough to warrant an overall strong review. Today's winning applications are those that clearly show why it is important to move the field in a particular direction, how investigators plan to do so, and why they are the ones to do it. If impact is the winning combination of significance, innovation, and approach, how does each of these factors lend to the likelihood of strong impact?

As to significance, most strong nursing research proposals argue well for the importance of the clinical issue that they address in terms such as scope (number of people affected), severity (e.g., seriousness of effects on health, functioning, quality of life), and/or cost or burden on individuals or society. Significance is also often argued in relation to approach, as in the use of stronger designs or sharper or improved measures over those found in prior studies. In fewer proposals does the researcher argue as

well for the significance of the scientific question, that is, the significance of the undergirding theoretical issue, as for clinical or methodological significance. For example, a strong argument on theoretical grounds may evaluate rival hypotheses, each of which may lead to alternative treatment or intervention strategies. Although such thinking may be embedded in a study, such as a test of comparative effectiveness of two treatments, it is an exceptional proposal that explicates the significance of the matter at a theoretical level. Including such in one's argument for significance will ramp up an evaluation of impact.

There are many ways to demonstrate innovativeness in a research proposal. Broadly, innovation may be shown through methodological or theoretical means. Both entirely new construction and adaptations of existing approaches constitute an innovation. Methodological innovations are more common and might include measurement advances, devices, or applications to new populations. Similarly, development, testing, or adaptations of interventions to new problems, contexts, or populations also would be methodologically innovative, as would be the protocols and the packaging of same as tutorials, manuals, videos, or the like for subsequent dissemination by any appropriate means. A less common—but not less significant—innovation would be a new research design or modification of an existing one. Theoretical innovations include new models, extended or modified models, or theories or partial theories synthesized from other theories, translated from other fields, or built from empirical findings. Such theoretical constructions may be tested in the proposed study or result from the proposed study. Of course, the significance of these theoretical advancements must also be shown for the innovation to have greater merit. Although it may seem that the more innovation, the merrier, there is a caveat: Too many innovations in one study could serve to weaken a reviewer's confidence in the rigor or trustworthiness of the methods or approach. However, according to one philosophy of science, programs of research often advance methods and theory simultaneously (Lakatos, 1978).

The above paragraphs also point to some ways in which significance, innovation, and approach are linked. Although not exhaustive, they offer a beginning for readers to understand how these three criteria come together to affect impact. The collective set of significant and innovative proposal elements and their interactions can be myriad and are usually unique. They are what inform a reviewer's judgment of the proposal's likely impact.

Gregory Alexander (University of Missouri)

The new NIH guidelines for writing a research proposal require a researcher to write a proposal in less than half the space previously required. For example, 12 pages are now allowed for the research strategy section of an R01 proposal; previously, 25 pages were allowed. The 12 pages of the proposal do not include introductory specific aims page, which is allowed one page. Less space means that writers must write succinctly, tightly constructing a proposal around the purpose and aims, and provide convincing arguments that a proposal is worthy of excellent review scores and funding. In these brief statements, I would like to offer some pointers for writers preparing proposals. These are tips that have been offered to me by colleagues and mentors and that I have learned through peer review as I have progressively written more research proposals.

It is not easy to create a competitive proposal while making it succinct. One method that I have used with some success is creating a timeline table, which outlines a proposal on one page. The timeline table includes column headings for specific aims, research questions, methods, analysis, and outcomes to be measured. This table becomes an active working document that I use to evaluate if my methods are meeting the aims, if analyses are appropriately answering research questions, and if outcomes are contributing to a meaningful research proposal. Creating a timeline table allows the researcher to outline the study within a specified time frame, including all the steps necessary to conduct the research. This allows the researcher to determine whether the research is feasible to conduct within a specified time frame or whether aims and methods need to be more narrowly defined. Writers using a timeline table will be able to organize activities and write fewer words to describe what is being done. Finally, the final table can be included in the proposal to illustrate in one succinct place all the elements of the project. This will provide reviewers a helpful table that can be viewed "at a glance."

Writers need to tightly construct sections of the proposal to reflect purpose and aims. I learned long ago that a picture is worth a thousand words. So, with restricted limits enforced by NIH, a picture can save a lot of space while making an excellent illustration demonstrating relationships between variables and outcomes. For example, Figure 1 contains a diagram from a proposal illustrating the population that I proposed to include, relationships with the population of interest, and a title identifying the problem (which was transitions). Of course, illustrations also have to be succinct, so they need to be edited critically for content. Creating these types of diagrams take some expertise working with software, which can be a challenge if writers are not familiar with these features. Taking a class to become more familiar with software features can be helpful for writers to condense the proposal into succinct parts using illustrations.

Figure 1. An example proposal diagram illustrating the population of interest and relationships.
Note: The problem is identified in the title.

Writers also need to make their arguments convincing throughout the proposal. One way I have learned to make arguments stronger is to avoid extra jargon and use of too many acronyms. In some research, the terminologies may be difficult to understand for reviewers who are not intimately familiar with concepts and variables of interest. Using terminologies that are difficult to understand make the proposal difficult to read, labor intensive, and not a very satisfying experience. Furthermore, using a lot of acronyms requires more memory and can be tiring for reviewers. Acronyms can also be distasteful, such as the use of PU for pressure ulcer. I had a reviewer tell me that after reading PU for several minutes that it began to affect the way the proposal was viewed. It was suggested that I use a different form of acronym, such as PrU or none at all. Researchers have to weigh these sorts of problems or pitfalls with the ability of a reader to understand what is being stated while keeping with the intent or specific aim of the research proposal.

There are many more tips besides those offered in these paragraphs for writing succinctly, constructing a tightly written proposal, and for making your arguments stronger. NIH has several resources available on their website to assist researchers to put together proposals that will be more competitive during review processes. In addition, there are many resources for learning to write succinctly available via Google if appropriate keywords are used for searching. Finally, there is nothing better than to have experienced writers and peer reviewers read a proposal and inform the writer about weaknesses and strengths. If a writer uses these tips, there is a greater chance of writing a winning research proposal which meets new NIH guidelines.

Vicki Conn (University of Missouri)

Constructing a shorter grant application is much more than a matter of paring down a lengthier document to fit in the space allotted. Such an approach will rarely produce a convincing application. A different approach is needed, one that places greater emphasis on the preparation and planning stages of the writing process. The goal is to write concisely from the outset rather than shortening the document after the fact. Put another way, one should write to fit, not edit to fit.

The first step in the process is to compose a "theme statement," a one-sentence description of the research problem the investigator proposes to solve by conducting the project. The theme statement should do more than just identify the significance of the problem; it should state the purpose of the project and then justify that purpose by putting it in the context of the significance of the problem.

This theme statement serves as the foundation of the entire grant and provides the organizing principle for the next step, which is the construction of an outline. Writing an outline may seem like a throwback to grade school, but it is a powerful method for creating well-organized prose that stays on topic. The outline consists of key points organized in a logical manner that collectively support the theme statement. When completed, the outline functions as the blueprint for the grant application. Every paragraph of the grant should arise from and connect back to the key points in the outline.

When preparing an outline, it is helpful to have other members of the research team, one's research mentors, or other experienced principal investigators review the content for relevance, organization, and connection to the theme statement. "Focus" is (or should be) the mantra of every grant writer, and the outline helps maintain that focus. After writing each paragraph, the investigator should stop and check to make sure it derives from the outline and that it supports the theme statement.

To end up with a shorter proposal, key points rather than details must be emphasized. There is just no room to provide in-depth descriptions of pilot work or previously published studies that support and justify the research strategy. This means that reviewers perforce will be closely scrutinizing the research records of the principal investigator and other members of the research team to determine whether they have the right skills and experience to successfully complete the proposed work. Therefore, an important strategy for winning grants is to keep one's publication record relevant and up to date. Research findings should be published in a timely manner, preferably in well-regarded journals. Recently published, pertinent papers can be cited in the proposal in lieu of detailed descriptions, which will both save space and provide reviewers evidence of the principal investigator's abilities and knowledge. A related strategy is to publish methodology and review articles, which can also be cited in the proposal. Likewise, relevant publications by research team members can be cited to

save space and provide evidence of their capabilities. Careful selection of the research team is therefore of utmost importance. If every team member has pertinent research experience plus a record of strong publication and research funding, this will bolster reviewers' confidence that the project will be successful.

Page limits also necessitate the development of tighter, less academic style of writing to keep the word count down. The temptation may be to write everything out with the intention of cutting extra material later. This approach is an inefficient use of time and is less likely to produce a quality document. Another approach to avoid is copying and pasting sentences or paragraphs from other documents into the proposal, as they may not have the focused, tight structure necessary for a persuasive application.

Strategies to minimize the word count include using active rather than passive voice, minimizing use of adjectives, and avoiding strings of prepositional phrases. Another space-saving strategy is to write simple, single-clause sentences. Complex and compound sentences actually will increase the word count because they require conjunctions to tie multiple clauses together. Every sentence should be examined for nonessential words. The number of words that can be removed without significantly affecting the meaning of a sentence can be surprising. Any well-crafted but excessively verbose sentences should be deleted entirely and the sentence written anew. These elegant turns of phrase can be pasted into a file to save for later use in a manuscript, but they just take up too much precious space in a grant application.

Do not try to save space by cutting corners and breaking the rules. Using excessive acronyms is unwise because reviewers find these annoying and difficult to follow. Finally, do not try to slip research content into other sections of the grant that do not have page limits. NIH guidelines expressly forbid this practice. Trying to buy space, for example, by putting sampling information in the human subjects section of an NIH proposal will probably result in a reprimand and might negatively impact the application's score. Do use sections outside the research plan page limits, such as the abstract, budget justification, and biosketch narrative statement, to make compelling arguments for the proposed project.

If parts of the proposal that just are not seeming to gel, seek input from colleagues with experience in preparation of successful grant applications. Another option is to hire a professional editor who can improve the organization, eliminate redundancies, and cut out unnecessary verbiage. Once the proposal is written, a mock or external review can further help identify extraneous content that can be deleted as well as key content that must be added. Mock and external reviews are a dress rehearsal for the real thing; therefore, all documents should meet funding agency guidelines, including page limits.

In summary, a tightly written, concise grant application requires substantial forethought before actual writing begins. The end result will be a more compelling document that will impress reviewers and ultimately result in a higher score.

Conclusions

With the new requirements by the NIH with regard to the length and content of grant applications, investigators must become more adept at producing highly organized, succinctly written proposals.

This article describes specific strategies that investigators can use that will not only improve the quality of their proposals but also streamline the entire application process. These strategies are summarized in Table 1.

Table 1. Strategies for Constructing Concise, Compelling Proposals

Writing Stage	Strategies

Preparation	Study application guidelines carefully
	    Determine what content belongs in each section
	    Follow directions regarding page limits and format
	Assemble and access resources
	    Review additional guidance documents provided by the funding agency
	    Obtain external guidance on writing and grant applications as needed
	    Contact the funding agency with additional questions
	Consider the purpose of the proposed study
	    Determine whether study meets the requirements for funding: Is it innovative? Does it address the mission of the funding agency?
	    Write a theme statement to provide an overall foundation for the proposal
	    Construct a detailed outline that identifies key points to be addressed in each section
	Carefully assemble the research team
	    Choose members with publications and funding history to document the presence of expertise necessary to complete project goals
	    Integrate preliminary and previous work by team members into the proposal
	    Clarify expertise in the biosketch narrative statements
	Construct a timeline of the grant application process
	    Include all time frames, from proposal development through submission
	    Include the time frame for actual proposal writing, with the amount of time and space allotted to each section

Construction	Create a compelling specific aims page
	    Grab reviewers' attention with arguments regarding the problem, its significance, relevance to the funding agency, and the uniqueness of the approach
	    Clearly state the aims of the study; organize the approach (design and methods) section around these aims
	Maintain focus
	    Examine every paragraph to determine consistency with the specific aims
	    Ensure each sentence makes the key points stated in the outline
	Write with the reviewers in mind
	    Avoid excessive use of abbreviations, technical jargon, and acronyms
	    Use headings and subheadings as a roadmap; format these as directed in the guidelines; avoid excessive headings which occupy space
	    Make use of topic and conclusion sentences within paragraphs and sections
	Write concisely to avoid extensive cuts later
	    Use simple rather than complex sentences
	    Write in active voice
	    Limit use of adjectives
	    Avoid strings of prepositional phrases
	Use multiple allowable grant sections to present the study
	    Describe coinvestigators' expertise in the biosketch narrative statements
	    List coinvestigators' and consultants' project responsibilities in the budget justification

	Do NOT attempt to circumvent page limits by placing research approach information outside the designated page limits
	Use figures and tables
	Summarize data, timelines, and procedures and illustrate relationships
	Include details that will save space in text
	Summarize the study
	Provide a timeline that summarizes study tasks and events
	Conclude the proposal with a summary of the impact, significance, and expected outcomes
Editing and reviewing	Eliminate unnecessary verbiage that is interested but not essential to study aims
	Reduce nonessential words in each sentence
	Consider if sentences can be deleted without affecting meaning
	Evaluate the proposal for clarity and appropriate content
	Read the proposal backward to find typographical errors and to check for logical progression of ideas
	Have a professional editor or trusted colleagues edit for clarity of writing and organization of content
	Conduct a mock review to identify necessary and unnecessary content

Two common themes run through the authors' suggestions. The first is that thorough planning and preparation are critical to a successful application. Developing a timeline of the application process will help ensure that administrative and writing deadlines are met. Constructing a concise theme statement and an outline of key points will facilitate the actual writing process so that the content stays focused. Carefully reading the guidelines beforehand and consulting with agency staff when questions arise will keep investigators from subjecting themselves to extra revisions. Second, a fresh pair of eyes is invaluable. Colleagues can assist by identifying unnecessary verbiage, unclear statements, and illogical progression of ideas. A mock review conducted by peers will help identify both necessary and unnecessary content in addition to judging the persuasiveness of the proposal.

Writing clear and concise proposals is a skill that can be learned and improved with practice. But no matter the writing skills of the investigator, the proposal will not be successful if the research plan has been hastily conceived and poorly thought out. Regardless of how agency guidelines may change over time, the strength of any application will continue to depend on the capacity and willingness of an investigator to thoroughly reflect on a study's design and its potential outcomes, limitations, and implications.

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