50 Pearls of NIH Grant Application Wisdom

Federal funding likely is a key source of sustenance for the important work you do. In fact, money from the National Institutes of Health (NIH) in particular may be the very life's blood of your operations. Knowing how to maximize the NIH grants process, then, is key to your lab's success, and navigating the short-form application is even more so.

1. Don't try to circumvent page limits by moving experimental details into sections that fall outside them – like Human Subjects, Vertebrate Animals, and Data & Resource Sharing.

2. Don't boast in your Personal Statement.

3. Don't try to cram in more information than a 12-page application can comfortably hold by using densely written text with small fonts and small margins.

4. Do use the "elevator speech" test for your proposal, where you imagine you're in an elevator with Bill Gates and he has a billion dollars he wants to invest in research. Could you convince him in a couple of minutes that what you want to do needs to be done — and that you can do it? Is your proposal that succinct?

5. Do write your proposal as if you're telling a story, with a resolution that explicitly explains the impact of your work: "When this research is done, my field will be changed because we will know [fill in the blank] and we will then be able to go on and do [fill in the blank]."

6. Do use the Introduction section, if you're resubmitting, to outline a big-picture view of the original reviewers' major concerns and how you've addressed them. Then refer new reviewers to your revised document.

7. Do show clearly your independence from other researchers at your institution.

8. Do get a letter of support from your department head stating your institution's commitment — in terms of human and financial resources — to your success.

9. Do limit your publications list to a total of 15, including the five most recent, the five most important to your general field of study, and the five most relevant to the proposed research.

10. Do spend most of your effort on the Approach section, discussing specific problems, alternative strategies, and benchmarks for success. Reviewers are interested in your thought process.

11. Do convince reviewers there is a future to your proposal even if you get an unexpected result in your first Specific Aim.

12. Do discuss reliability and standard operating procedures in the Approach section — and in the Environment section if your institution has a history of good laboratory practices (GLP) or good manufacturing practices (GMP).

13. Do be sure to explain why you changed your Specific Aims if you're applying for a competitive renewal.

14. Do address how the scientific environment at your institution will contribute to your success, highlighting the features there that make it the best place to do your proposed research.

15. Do play up in the Impact statement any additional uses of the data set you'll be putting together. If you can use your data to do more than one study, you are much more likely to get your work funded.

16. Do add a Personal Statement detailing — with specifics — your experience and qualifications, including your pedigree, your research experience, and your track record of being able to solve problems in new areas. Be sure to reference specific objectives and criteria in your background, grants you have already been awarded, and publications that came out of those grants.

17. Do use the Personal Statement, if you've been out there for years but have never had an NIH grant, to make it clear that while you are a new investigator, you are not an early-stage investigator. That's an important distinction reviewers need to know about.

18. Don't start with an old 25-page application that wasn't funded and try to cut it down to 12 pages. Start over.

19. Don't go into great experimental detail in your application or include a lot of background on the history of your field.

20. Do take the long view of impact. Tell reviewers the ultimate utility of your research — even if it's five years down the road.

21. Do complete a draft at least 10 days before the application is due and find someone who's not involved in the project (not one of your post-docs) to check it out.

22. Don't forget to tell reviewers why you're doing a specific experiment. You know the logical connections in your head. Make them crystal-clear to others.

23. Do use the word "impact" as needed. Using it as often as necessary shows reviewers that you paid attention to the new criteria for grants.

24. Don't confuse Significance and Impact. The former is whether what you're doing is worth doing; the latter is what the NIH gets after it's funded you.

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25. Do use the Personal Statement section to clarify who does what — and who pays for what — in a series of experiments that involve multiple personnel and multiple funding sources.

26. Do create a specific Preliminary Studies section within the Research Strategy section, using about three of the allotted 12 pages. And be sure to say something like, "Work completed under the K award demonstrated that …" or "Based on work funded by the K award, we hypothesize that …"

27. Do use the Publications List to show previous collaborations with your co-investigators. You're better off sacrificing some of your more impactful publications to include a few that show that you've worked with them before.

28. Don't use a limited definition of Innovation. It can mean your idea is innovative, you're changing the paradigm and the way you look at a problem, or you've got new instruments or methodologies or techniques for your invention.

29. Don't short-change Environment. It's one of the review criteria that used to be virtually meaningless, but the NIH now requires you to address exactly how the scientific environment at your organization will contribute to your probability of success.

30. Don't use the application as leverage to get a promotion from your institution. Reviewers may be skeptical if you're a long-term post-doc with an offer of a research assistant professorship if you get a grant; rather, they want to see that your institution has already made you one.

31. Don't organize your application by the bullet points and subheads in the generic form. Instead, provide a narrative.

32. Do understand that some reviewers will focus on the techniques you use when evaluating innovation, to the virtual exclusion of other aspects of your application. If your work is based on applying established techniques in an innovative way to solve an important problem, describe the endpoint of your experiments, if they work as planned, and then explain what is new and novel about the information you will have at the end of the day.

33. Don't try to change your proposal too much in response to previous reviewers' directions. You may find that the next set of reviewers doesn't like the changes.

34. Do, if your project is in the early stages of development, describe your strategy to establish feasibility and address the management of high-risk aspects of the proposed work in the Approach section.

35. Do, if your work involves human subjects, discuss your ability to recruit X number of participants in both the Environment/Resources section and the Approach section. Use a sentence in the Approach section to document annual patient accruals and/or past successes in recruiting patients, then go into slightly more detail in the Environment section about why your institution is such a good place to do the clinical studies.

36. Do address the section on Protection of Human Subjects very seriously, as your proposal will automatically hit the "not discussed" bin if reviewers feel your discussion of it is inadequate.

37. Don't compromise the novel aspects of your work just because they may be unfamiliar to reviewers. Rather, reference a publication that explains the new technique and stick to a brief description of its advantages in your Approach section. If there really needs to be a large chunk of explicative text, try getting the Scientific Review Officer's permission to submit it as supplemental material.

38. Do treat the Specific Aims section as the most important one page in your application, because most reviewers will read it and make up their minds right then and there about whether your work is something they're interested in trying to fund.

39. Do use these definitions: Goals are strategic and high-level. Objectives go down one more level of granularity; they're, in a sense, a re-statement of your hypothesis, in a way that can be falsifiable. And Aims are the outline of your tactics, something that you can point to at the end of the year and say, "I have accomplished this aim."

40. Don't force a hypothesis on experiments that are not truly hypothesis-driven.

41. Do detail your hypothesis, though, if one is appropriate. Unless your project is discovery research, it's key to have a specific, falsifiable hypothesis and to state it explicitly. It can be a general, overarching hypothesis that covers the entire proposal or a specific hypothesis for each aim.

42. Do emphasize institution-level collaborations in the Environment section of Area Grant applications, and highlight unique aspects, like Historically Black University status, as well. Individual-level collaborations should be highlighted in the Personal Statement of Area Grant applications.

43. Don't try to sneak details of your experimental approach into the Budget Justification section — unless it justifies something that is unusually expensive, such as high animal costs for a transgenic study.

44. Do be aware of budget envy among reviewers, especially if your salary structure looks high. Explain it in the Budget Justification section if you think that might be an issue.

45. Do make sure you know what the funding official is really looking for, and be sure to demonstrate how your research is responsive to the call. For an R01, make a link between your idea and improving human health. Review criteria have become much more concerned with how much your project affects human health down the road.

46. Do focus on the mechanistic qualities of your proposal. Characteristics that increase the likelihood that your research will be seen as mechanistic include observations that are completely objective and quantifiable; an experiment that will perturb the system; a postulate-able upstream chain of events that leads to your observation; and the ability to test your postulated mechanism by disrupting the chain of events and losing the observed outcome.

47. Do be stingy with supplemental information. Unpublished papers are no longer allowed in an appendix, for example, and only published papers that are not freely available on the Internet still are. And note that reviewers are not required to read supplemental data. Indeed, supplemental data are really effective only if they demonstrate the solution of a key problem that threatened the feasibility of the proposal.

48. Don't hesitate to pitch long-term research.

49. Do use key words in your summary to get the best reviewer assignment.

50. Do communicate with reviewers in their language. They're chosen largely because of their scientific and technical expertise and knowledge of the research field involved, so present your project in a manner that makes your work understandable to them.

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