Recommendations for Writing Successful Grant Proposals: An Information Synthesis

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Abstract

Purpose
To provide a detailed account of the nature and scope of recommendations for promoting faculty grant proposal success in academic medical settings.

Method
The authors searched relevant scientific databases for articles related to techniques that promote faculty research proposal success, published from 2000 through June 1, 2012. They applied standard information synthesis procedures for sifting abstracts, scrutinizing full texts, and abstracting data.

Results
The search identified 1,130 abstracts, which the authors narrowed to 83 for in-depth review. Of these, 53 unique articles fit the inclusion criteria. From these articles, the authors extracted 10 recommendations for writing successful grant proposals: (1) research and identify appropriate funding opportunities; (2) use key proposal components to persuade reviewers of project significance and feasibility; (3) describe proposed activities and their significance persuasively, clearly, and concisely; (4) seek review and feedback from colleagues; (5) establish a study design that is simple, logical, feasible, and appropriate for the research questions; (6) develop a timeline for the proposal process; (7) select a novel, high-impact project; (8) conduct an exhaustive literature review; (9) ensure that budgets are reasonable; and (10) consider interdisciplinary collaborations.

Conclusions
These findings highlight that further institution-level development and interventions to support faculty grant writing success are warranted. Future research should employ more rigorous evaluation methods to move the field toward a stronger evidence base for determining which specific faculty development activities help increase funding.

The United States supports an enormous research enterprise and spends more money than any other country on research and development; this investment is of incredible importance to global science.[1,2] In recent years, economic constraints have prompted major funding agencies (such as the National Institutes of Health [NIH], the world's largest source of funding for medical research) to slash budgets.[3] Researchers working in medical education settings know that clinical revenue and academic performance are aligned,[4] but only 2% of all U.S. physicians report research as their main professional activity.[5] The many physicians with competing clinical or teaching responsibilities seeking to pursue research may benefit from assistance in obtaining research funding. Institutions must support these faculty in their work to write successful grant proposals in this challenging funding climate.

One-quarter of academic health science faculty have reported considering leaving academia.[6] Difficulties obtaining research funding, identifying mentors, securing protected time, and garnering institutional support are all barriers to faculty retention.[7] Physicians, assistant professors, and those in clinical departments are leaving academic health centers at higher rates than PhDs, associate professors, and those in basic science departments.[7] Research grant proposal success is an important aspect of faculty development,[8–10] and an inability to secure extramural funding is a major discouragement for faculty.[11]

Institutional faculty development efforts that focus on research may facilitate the advancement of evidence-based clinical science and the receipt of research funds in academic health center settings. Although excellent materials exist to promote faculty grant proposal writing success, the literature is scant, and the prioritization of tasks for writing successful proposals is not well documented. A practical approach to increasing extramural funding success for academic health science faculty is needed and should be grounded in evidence. Thus, we performed a review of the literature and information synthesis to address the research question, "What promotes faculty grant proposal success in academic medical settings?" The answers may help institutions develop effective interventions that promote research faculty success.

Method

Search strategies

We conducted this literature search in summer 2012 with the support of a research librarian. We searched the Cochrane database and CSA Illumina (a database repository that includes the following databases: ERIC, IBSS, PAIS Archive, PAIS International, PILOTS Database, Social Services Abstracts, and Sociological Abstracts). We also searched Ovid MEDLINE, PubMed, EBSCOhost, and CINAHL. We chose Cochrane and CSA Illumina because they include literature from across the health sciences

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professions. We sequentially searched each of the databases to account for the substantial overlap between them. The exact search terms for each database were a combination of standardized medical subject heading search terms and free-text keywords. We combined our search terms for grant proposals (*grant submission*, *grant writing*, *grant proposal*, *grant submitting*) with those for postbaccalaureate medical education settings (*higher education*, *colleges*, *universities*, *graduate programs*, *graduate schools*, *schools of public health*, *medical schools*, *nursing schools*) and those related to health sciences faculty (*professional development*, *university faculty*, *professors*, *academics*, *academia*, *research*, *research development*, *training support*).

Inclusion criteria, article selection, and data abstraction

We included articles that provide recommendations for writing successful research proposals for faculty in graduate-level medical education settings across the health professions. We included only articles published in journals between January 1, 2000, and June 1, 2012. Included articles offered recommendations for faculty on how to increase research productivity or success, or they described programs within universities to improve either university research infrastructure or faculty research productivity and success. Given the focus on securing funding resources for academic health science faculty in the United States, we excluded articles from foreign institutions and articles that were not written in English.

We then applied standard information synthesis procedures (e.g., identifying relevant information and assessing validity), first, to sift through the 1,130 abstracts the search initially uncovered and, then, to scrutinize the full papers selected and abstract the relevant data. After applying the inclusion/exclusion criteria, eliminating duplicates, and reviewing abstracts, we selected 123 abstracts for article review, and then 83 articles for in-depth review. Team members (H.R., N.M.) independently reviewed the full text of these 83 to determine whether to include them in the final review. Fifty-two articles were selected for inclusion. Two authors reviewed 10% (n = 5) of the 53 articles to establish a consistent standard for data extraction. Interrater reliability was 94%. The first author (J.P.W.) resolved any disagreements and made the final decisions for inclusion. An additional team member (N.M.) then independently abstracted the pertinent data from the remaining studies. All pertinent recommendations, defined as any statement by the authors that suggested how faculty might improve their chances of earning research funding, were extracted from each article.

Results

We initially identified 1,130 abstracts. On the basis of our review of abstracts, we selected 83 articles for closer scrutiny. After reviewing these, we selected 53[12–64] for inclusion in our review. The spreadsheet initially contained 445 discrete recommendations, which we condensed, on the basis of their similarities, into the 10 major recommendations described below. The number of recommendations per article ranged from 1 to 17. Table 1 presents the 10 recommendations for faculty who are writing research proposals (listed in order of frequency) distilled from the 53 articles we reviewed.

Generally, articles did not describe their recommendations as based on evidence; rather, recommendations were described as "lessons learned," "tips," and even "trade secrets."[21] The authors of one exceptional article based their recommendations on their review of 66 NIH applications submitted to one clinical research study section.[12]

1. Research and identify appropriate funding opportunities

There are thousands of private and public funders; applicants should research them to understand the goals, missions, projects, and current staff of each.[12,13,17,20,21,26,28–30,34,37,38,40,41] In many cases, faculty can contact a representative at the funding organization (e.g., a program officer) to ask if a project is a good fit given the organization's interests.[12,17,18,22,23,36,39,42,44] Once faculty decide to apply for funding from a particular organization, they should attend carefully to the funding organization's proposal instructions and review process.[12–22,24,25,27–29,31–33,35,36,39,43] Successful proposals use the funding organization's suggested structure (e.g., subheadings),[22,27,29] language (e.g., special terms),[21] and format (e.g., font).[14,15,17,35,36] Linking the funding agency's priorities, mission, and language, as well as the emphasis of the specific grant announcement to the proposal sections, is key.[13,16,21,24,28,31–33] The proposal must appeal to non-subject-matter-expert reviewers who will read the proposal quickly.[15,19,20,25] Faculty should

Table 1

Recommendations for Writing Successful Grant Proposals From a Synthesis of the Literature, 2000 to 2012

Recommendation	Articles, no. (% of 53) that mention the recommendation
Research and identify appropriate funding opportunities.	33 (62)
Use key components of the proposal to persuade reviewers of the project's significance and feasibility.	32 (60)
Describe proposed activities and their significance persuasively, clearly, and concisely.	30 (57)
Seek advice from colleagues to help develop, clarify, and review the proposal.	30 (57)
Keep the study design simple, logical, feasible, and appropriate for the research questions.	29 (55)
Develop a timeline that includes time for possible resubmission to guide the grant proposal process.	25 (47)
Choose a novel, high-impact project with long-term potential.	21 (40)
Conduct an exhaustive literature review to clarify the present state of knowledge about the topic.	13 (25)
Ensure budgets request only essential items and reflect an honest portrayal of the funding that the team needs to successfully carry out the work.	10 (19)
Consider interdisciplinary collaborations.	8 (15)

study examples of funded grants from a funding organization when planning and preparing their proposals.[14,15,18,25,31]

2. Use key components of the proposal to persuade reviewers of the project's significance and feasibility

If the applying faculty member has any preliminary data (e.g., from a pilot study) indicating, for example, prior research productivity and success, proof of concept, the appropriateness of the research site or population, or preliminary results, he or she should include the data in the proposal to demonstrate the viability of a grant application.[14,15,20,22,24,29,31,38,40,45–52]

Faculty should communicate the complementary strengths of all faculty, mentors, collaborators, and consultants who will be involved in the funded project in a way that demonstrates not only the qualifications, content and methodological expertise, and contributions of each team member but also his/her ability to collaborate.[15,20,22,25,34,38,39,43,45,49,50,53,55] A description of the host and collaborating institutions or organizations should document facilities, space, equipment, and laboratory resources[15,32,34,43] and clarify that the setting can accommodate the proposed activities and is supportive of the faculty.[15,19,22,32,34,43,49,55]

The description of the research design should include a timeline for study startup, data collection, data analysis, and manuscript or other product preparation to demonstrate how the work can be completed within the proposed project period.[20,21,26,27,37,47,48] The proposal should include a short section on potential limitations, methodological strengths and weaknesses, alternative strategies, and contingency plans if the study activities do not proceed as intended.[20,22,24,46,47,54] The proposal should include comprehensive yet concise (one-page only) letters of support from the proposed host institutions, collaborators, and data collection sites that state the letter writer's strong professional position, planned contribution, expected level of compensation, and knowledge of and enthusiasm for the project; ideally, these letters should be signed and on institutional letterhead.[14,17,22,39,46,51,53,56] Applicants should be prepared to provide documentation of ethical and regulatory compliance (e.g., for human subjects research) by the institution, faculty, and study staff—even if such information is not explicitly required in the proposal instructions.[14,29,32,37,51,52]

3. Describe proposed activities and their significance persuasively, clearly, and concisely

Faculty applying for grants should carefully consider the language used in their proposals.[13–26,45–51,59] Faculty must use persuasive language to convince the reviewers that the proposed study is significant and innovative and that it contributes substantially to knowledge in the field.[18,20,22–26,29,33,36,38,39,45,46,48,50,60] Faculty can describe the significance of the project by either highlighting deficits in existing knowledge[29,38,39,48] or providing quantitative data on the incidence, prevalence, and sequelae of a problem.[18,26,36] Innovation can be communicated by highlighting, for example, how the project provides a novel approach to a long-standing problem or why it represents an enlightening perspective or conceptualization.

In addition to being persuasive, proposals should be well written, concise, and clear.[16,19,22,24,46,49,50] The narrative should be coherent, fluid, and easy for the reviewer to read.[12,17,20,21,60] Proposals should be free of spelling, grammatical, and syntax errors.[13,14,18,23,25,45,47,48] Faculty should limit their use of jargon and acronyms in their proposals, and they should ensure that the proposal's formatting makes the text easy to read (e.g., adequate paragraph breaks and white space).[15,26,51] The summary or abstract is usually the first section of the grant and must be particularly appealing and succinct[20,22,38,49,59]; the authors of several articles recommended revising this section last to ensure the largest impact.[19,24,26,38,53]

4. Seek advice from colleagues to help develop, clarify, and review the proposal

Faculty seeking to submit grant proposals should seek advice—both at the planning and writing stage—from their colleagues and other people in their professional network to ensure that the proposal is as strong as possible.[12–15,17–19,21–23,25–32,34,38,42,45,48–53,57–59] Mentors and colleagues who have previously received or reviewed grants or who have topical expertise may be especially valuable advisors.[15,38,55] Faculty should actively network or work with others from whom they can learn,[30,31,34,42,48,58] including senior faculty[13,32,52] and peers.[21,28,29,31] Faculty should allow enough time during the proposal process to be able to solicit feedback from colleagues, including a statistician or methodological expert[15,22,32,51,57] and a reader outside the field.[18,19,27] Faculty can ask these colleagues to read the proposal for feedback both to improve the study design, methodological approach, proposal clarity, and writing style and to help identify and eliminate errors and confusing text.[12,14,23,25,26,30,45,49,50,52]

5. Keep the study design simple, logical, feasible, and appropriate for the research questions

Faculty working on grant proposals should focus on their research questions and the best study design for answering those questions.[15,16,18–23,29,32,37,46,49–53,60–62] They should include two to four study aims or objectives,[12,14–17,19–22,24,26,32,33,37,48,51,54,61] and these should be clear, concise, and realistic given the time and resources proposed.[12,14,15,19,22,24–26,37,48,51,54] The research questions and study aims should drive the methods proposed.[15,19,21–23,29,32,37,49,50,52,61,62] Each section of the proposal should reinforce the interrelationship of the study objectives, specific research questions, methods, and anticipated outcomes.[15,19–23,25,39,46,54] All objectives and aims should suggest a course of action (and complementary specific activities) that will be feasible with and acceptable to the proposed population.[16,17,20,21,32,33,54,61] Approaches to data analysis that are especially well planned or innovative may be particularly praised by reviewers.[16,18]

6. Develop a timeline that includes time for possible resubmission to guide the grant proposal process

Grant writing takes time, and faculty should plan accordingly.[12,16,18,21–23,26,27,29,30,38,39,43,47,48,50–53,57] Proposal writing requires protected time and entails multiple steps, multiple drafts, and multiple reviewers.[16,21,26,30,48,57] A timeline developed in advance that includes institutional deadlines and time for review is essential.[18,22,27,32,38,39,47,51,53] Applicants should start writing early.[12,23,29,50,52] Faculty should be prepared to revise and

resubmit,[23,25,28,29,31,43,46,50,51] and they should recognize that reviewers' comments are not a personal attack.[25,31,43] Being persistent is a key to grant success.[23,28,29,31,43,46,50,51]

7. Choose a novel, high-impact project with long-term potential

Research that produces findings that have substantial implications or that will affect multiple people over a long time are more likely to be funded than local, short-term projects.[12,15–17,19–21,23,24,29,30,33–37,46,48,52,62] The proposal must consistently articulate what the project will accomplish.[15,20,21,30,46] The chosen project should be innovative and focus on an area of high, current scientific interest.[24,26,36,47,52,63] A good research problem addresses ongoing clinical challenges, translates knowledge into practice, or conducts outcomes research.[17,19,29,33,34,37,52] The proposal should indicate how the project fits into a longer-term research direction for faculty.[23,30,35,48]

8. Conduct an exhaustive literature review to clarify the present state of knowledge about the topic

A well-written proposal includes a well-written, thorough review of the literature.[12,16,17,19,21,22,27,29,32,37–39,56,60,63] Faculty should critically highlight how the proposed research fits into, and begins to bridge gaps in, the current literature.[19,21,22,29,38,39] Literature reviews also expose potential conceptual frameworks that the faculty can use to structure their own study activities.[16,17,59,62]

9. Ensure budgets request only essential items and reflect an honest portrayal of the funding that the team needs to successfully carry out the work

Research proposals should include a transparent, realistic, and fiscally responsible budget.[14,16,26,29,30,36,46,50,51,55] Costs and the importance of all funding requested should be clearly presented, accurate, and specific.[16,29,50,51,55] A realistic budget linked with a proposal that does not propose more work than that budget can handle is best.[14,26,30,36,46]

10. Consider interdisciplinary collaborations

Faculty should consider working with colleagues from multiple fields.[31,41,42,44,54,58,60,64] Brainstorming project ideas with colleagues from multiple disciplines may be a good way to build a research team.[44,58,64] Funders, such as the NIH, value interdisciplinary work, and participation in such work may help to jumpstart a junior faculty member's career.[31,42,54]

Discussion and Conclusions

Through our review of the literature, we have synthesized data[65] to provide a detailed account of the accumulated wisdom surrounding successful research funding proposals. Although scholarship is an important focus of recent faculty development initiatives,[9] we believe this is the first attempt to review and synthesize recommendations for applying for research funding. Our review also highlights that, seemingly, there is no single comprehensive source of evidence-based strategies for writing successful funding proposals. The one article[12] that reported evidence from the comments of grant reviewers did not present substantially different recommendations from those articles that provided recommendations based on the authors' experience; a larger evidence base could determine the soundness of expert opinion recommendations.

This information synthesis suggests that faculty research funding proposal success may be within the reach of faculty who have the time, organizational skills, support of colleagues/collaborators, resources, and resilience needed to submit (and resubmit) a well-written, focused proposal. Success may be more likely if the proposal is easy to read, is reviewed by a variety of colleagues until all agree that the project is clear, and describes research that has the potential to make a lasting, substantial scientific contribution. This finding suggests that much of faculty members' resources for success can be cultivated among their colleagues and in their communities using existing resources, as long as faculty exercise good time management and networking skills.

This information synthesis also suggests that universities may be able to facilitate the success of faculty research proposals through specific research infrastructure, as some have already done.[66–68] Institutions may help by offering research development support (e.g., helping faculty to develop a timeline to guide activities required for grant submission), templates of the common grant requirements that funders seek (e.g., a list of institutional resources), and/or a repository of successful grant proposals from faculty members willing to share. In addition, preformed, presubmission peer review networks within the university may strengthen proposals and reduce faculty effort required to identify appropriate collaborators and reviewers. Offering proposal writers a professional editor who can ensure that the proposal is easy to read and lacks errors may be a good investment, particularly for faculty for whom English is not a native language. Institutions that offer seed funding to junior faculty may also help them get the preliminary data they will likely need to write a strong proposal.

Further research on interventions that enhance the success of faculty research funding proposals is needed. Does seed funding reduce the overall time to award? Do training courses for early faculty or peer review networks reduce the time from initial submission to reward by eliminating the need for multiple resubmissions? If so, what aspects of the training courses and networks are most effective? What is the role of mentorship in the process of researching, writing, and (re)submitting grant proposals? Some research has been conducted in these areas,[12,66,69] but more is needed to help universities better support faculty who are preparing grant proposals. A program of research on the factors facilitating successful grant proposals should address several critical issues:

1. Clarifying how to accurately and quickly measure whether a particular activity (e.g., researching funders, developing a timeline, conducting a literature review) has occurred;
2. Identifying the most effective strategies for promoting these activities (e.g., written instruction, classroom instruction, mentoring, online resources); and
3. Developing comprehensive training and support programs that include these (and possibly other) activities and conducting trials with faculty to identify their effectiveness and eventually tease apart which activities and training techniques are most effective.

Documenting the occurrence and studying the effectiveness of some activities (e.g., linking the aims to proposed activities and

outcomes) will be easier than for others (e.g., considering interdisciplinary collaborations). A comprehensive program of research is a challenging endeavor given the variation among different funders and changing priorities in the research environment.

There are some limitations to this study. Many of the articles we included provide advice for applicants that remains hearsay; many recommendations have not yet been proven through rigorous evaluation to be effective. By excluding book chapters or training materials, we may have overlooked some potential sources of data. In addition, a different array of search terms may have produced different results. However, our initial identification of 1,130 abstracts from 2000 to 2012 is likely to have captured the bulk of the most current recommendations, which we have distilled into 10 useful recommendations for faculty grant proposal writing success.

In conclusion, these findings suggest that promoting faculty development in research proposal writing success at the institutional level may be very feasible. We have synthesized the accumulated wisdom of a more than a decade of articles on how health sciences faculty might write successful proposals for research funding. Institutions can use our 10 recommendations to innovate faculty development interventions that ease faculty members' burden of successfully finding research funding in the currently challenging economic climate, which will, in turn, promote further sponsored research in the academic medical setting.

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References

1 The Royal Society. Knowledge, Networks and Nations: Global Scientific Collaboration in the 21st Century. 2011. http://www.interacademies.net/File.aspx?id=25069. Accessed April 27, 2015.
2 Battelle. 2014 global R&D funding forecast. December 2013. http://www.battelle.org/docs/tpp/2014_global_rd_funding_forecast.pdf?sfvrsn=4. Accessed April 27, 2015.
3 National Institutes of Health. About NIH. http://www.nih.gov/about/. Reviewed February 2, 2015. Accessed April 27, 2015.
4 Wartman SA. Toward a virtuous cycle: The changing face of academic health centers. Acad Med. 2008;83:797–799.
5 American Medical Association. Physician Characteristics & Distribution, 2012. Chicago, IL: American Medical Association; 2012.
6 Ries A, Wingard D, Gamst A, Larsen C, Farrell E, Reznik V. Measuring faculty retention and success in academic medicine. Acad Med. 2012;87:1046–1051.
7 Liu CQ, Morrison E. U.S. medical school full-time faculty attrition. AAMC Analysis in Brief. 2014;14:1–2. https://www.aamc.org/download/369006/data/faculty-attrition.pdf. Accessed April 27, 2015.
8 Gomez-Cambronero J, Allen LA, Cathcart MK, et al. Writing a first grant proposal. Nat Immunol. 2012;13:105–108.
9 Leslie K, Baker L, Egan-Lee E, Esdaile M, Reeves S. Advancing faculty development in medical education: A systematic review. Acad Med. 2013;88:1038–1045.
10 DeCastro R, Sambuco D, Ubel PA, Stewart A, Jagsi R. Batting 300 is good: Perspectives of faculty researchers and their mentors on rejection, resilience, and persistence in academic medical careers. Acad Med. 2013;88:497–504.
11 Pololi LH, Krupat E, Civian JT, Ash AS, Brennan RT. Why are a quarter of faculty considering leaving academic medicine? A study of their perceptions of institutional culture and intentions to leave at 26 representative U.S. medical schools. Acad Med. 2012;87:859–869.
12 Inouye SK, Fiellin DA. An evidence-based guide to writing grant proposals for clinical research. Ann Intern Med. 2005;142:274–282.
13 Wescott L, Laskofski M. Grant writing tips for translational research. Methods Mol Biol. 2012;823:379–389.
14 Falk GW. Turning an idea into a grant. Gastrointest Endosc. 2006;64(6 suppl):S11–S13.
15 Bordage G, Dawson B. Experimental study design and grant writing in eight steps and 28 questions. Med Educ. 2003;37:376–385.
16 Blanco MA, Lee MY. Twelve tips for writing educational research grant proposals. Med Teach. 2012;34:450–453.
17 Barnard J. Keys to writing a competitive grant. J Pediatr Gastroenterol Nutr. 2002;35:107–110.
18 Penrod J. Getting funded: Writing a successful qualitative small-project proposal. Qual Health Res. 2003;13:821–832.
19 Urrutia R. Academic skills: A concise guide to grant writing. Pancreatology. 2007;7:307–310.
20 Vivar CG, McQueen A, Whyte DA, Armayor NC. Getting started with qualitative research: Developing a research proposal. Nurse Res. 2007;14:60–73.
21 Brock MV, Bouvet M. Writing a successful NIH mentored career development grant (K award): Hints for the junior faculty surgeon. Ann Surg. 2010;251:1013–1017.
22 Koppelman GH, Holloway JW. Successful grant writing. Paediatr Respir Rev. 2012;13:63–66.
23 Pierce LL, Larsen PD. The Rehabilitation Nursing Foundation celebrates 20+ years of funded research. Rehabil Nurs. 2010;35:135–140, 160.
24 Setiati S. Tips for making a good research proposal. Acta Med Indones. 2004;36:43–47.
25 Pullen RL Jr, Mueller SS. Preparing successful grant proposals. Am J Nurs. 2012;112(1 suppl):21–22.
26 Koren G. How to increase your funding chances: Common pitfalls in medical grant applications. Can J Clin Pharmacol. 2005;12:e182–e185.
27 Wurmser T. Advance your nursing agenda with philanthropy and grant writing. Nurs Manage. 2006;37:35–36, 38.
28 Wurmser T, Hedges C. Primer for successful grant writing. AACN Adv Crit Care. 2009;20:102–107.
29 Schilling LS. Ten things I learned while writing my last research grant. Pediatr Nurs. 2003;29:150–151.
30 Schleipman AR. Navigating the biomedical research system as a full participant: Strategies and opportunities for the nuclear medicine technologist. J Nucl Med Technol. 2007;35:170–175.
31 Lisanti P, Talotta D. Tips for writing a NAON research grant proposal. Orthop Nurs. 2000;19:61–65.
32 Beitz JM, Bliss DZ, Whitney JD. Preparing a successful grant proposal—part 1: Developing research aims and the significance of the project. J Wound Ostomy Continence Nurs. 2005;32:16–18.
33 Devine EB. The art of obtaining grants. Am J Health Syst Pharm. 2009;66:580–587.
34 Kaplan K. Funding: Got to get a grant. Nature. 2012;482:429–431.
35 Kugler C, Fischer S, Russell CL. Preparing a replication study. Prog Transplant. 2006;16:15–16.
36 Pierce LL. Twelve steps for success in the nursing research journey. J Contin Educ Nurs. 2009;40:154–162.
37 Bierig SM, Coon P, Korcarz CE, Waggoner AD. The research grant process: A reference guide for cardiovascular sonographers. J Am Soc Echocardiogr. 2005;18:264–267.
38 Lusk SL. Developing an outstanding grant application. West J Nurs Res. 2004;26:367–373.
39 Pullen RL Jr, Mueller SS. How to prepare a successful grant proposal. Nurse Pract. 2010;35:14–15.
40 Rosenzweig JS, Van Deusen SK, Okpara O, Datillo PA, Briggs WM, Birkhahn RH. Authorship, collaboration, and predictors of extramural funding in the emergency medicine literature. Am J Emerg Med. 2008;26:5–9.
41 Harper FD. Writing research reports and scholarly manuscripts for journal publication: Pitfalls and promises. J Negro Educ. 2006;75:322–340.
42 Rekow ED. Leveraging your research—mapping our future. J Dent Res. 2006;85:583.
43 Bliss DZ. Letters of support for a research grant proposal. J Wound Ostomy Continence Nurs. 2010;37:358–359.

44 McGovern V, Kramarik J, Wilkins G. Career benchmarks from the Burroughs Wellcome Fund's early faculty career development awards. Acad Med. 2013;88:1732–1739.

45 Thompson JC. Lessons from a life in research: Getting things straight. Pharos Alpha Omega Alpha Honor Med Soc. 2002;65:20–25.

46 Berger AM, Moore TA. Effective grant writing. J Infus Nurs. 2011;34:167–171.

47 Chung KC, Shauver MJ. Fundamental principles of writing a successful grant proposal. J Hand Surg Am. 2008;33:566–572.

48 Daniel BV, West JK, Daniel GE, Flowers P. Grant writing as a funding source and collaborative endeavor. Coll Stud Aff J. 2006;25:199–208.

49 Walsh MM. Lessons learned from grant writing: Establishing a track record for funding and involving community providers in implementation. J Dent Hyg. 2009;83:212–213.

50 Sandler RS. Writing clinical research grant applications. Inflamm Bowel Dis. 2002;8:196–200.

51 Colwell JC, Bliss DZ, Engberg S, Moore KN. Preparing a grant proposal—part 5: Organization and revision. J Wound Ostomy Continence Nurs. 2005;32:291–293.

52 Granger NA, Calleson D. Finding support for educational projects in anatomy: Tips, tools, and lessons learned. Anat Rec B New Anat. 2005;282:13–17.

53 Nolan MT, Wenzel J, Han HR, Allen JK, Paez KA, Mock V. Advancing a program of research within a nursing faculty role. J Prof Nurs. 2008;24:364–370.

54 Powell K. Tag teams. Nature. 2005;437:590–591.

55 Berger DH. An introduction to obtaining extramural funding. J Surg Res. 2005;128:226–231.

56 McBride AB. Toward a roadmap for interdisciplinary academic career success. Res Theory Nurs Pract. 2010;24:74–86.

57 Whittemore R. Top 10 tips for beginning a program of research. Res Nurs Health. 2007;30:235–237.

58 Weinert C. Are all abstracts created equal?? Appl Nurs Res. 2010;23:106–109.

59 Bliss DZ. Writing a grant proposal: Part 6: The budget, budget justification, and resource environment. J Wound Ostomy Continence Nurs. 2005;32:365–367.

60 Todd RF 3rd, Miller DM, Silverstein RL. Hematology grants workshop—2001. Hematology Am Soc Hematol Educ Program. 2001:507–521.

61 Antonakos CL, Kazanis AS. Research process in the health sciences: A focus on methods. Res Theory Nurs Pract. 2003;17:257–264.

62 Sherrill JT, Sommers DI, Nierenberg AA, et al. Integrating statistical and clinical research elements in intervention-related grant applications: Summary from an NIMH workshop. Acad Psychiatry. 2009;33:221–228.

63 Grey M. Top 10 tips for successful grantsmanship. Res Nurs Health. 2000;23:91–92.

64 McCormick CB, Barnes BJ. Getting started in academia: A guide for educational psychologists. Educ Psychol Rev. 2008;20:5–18.

65 Goldschmidt PG. Information synthesis: A practical guide. Health Serv Res. 1986;21(2 pt 1):215–237.

66 Sajdyk TJ, Sors TG, Hunt JD, et al. Project development teams: A novel mechanism for accelerating translational research. Acad Med. 2015;90:40–46.

67 Havermahl T, LaPensee E, Williams D, et al. Model for a university-based clinical research development infrastructure. Acad Med. 2015;90:47–52.

68 Byrne DW, Biaggioni I, Bernard GR, et al. Clinical and translational research studios: A multidisciplinary internal support program. Acad Med. 2012;87:1052–1059.

69 DeCastro R, Sambuco D, Ubel PA, Stewart A, Jagsi R. Mentor networks in academic medicine: Moving beyond a dyadic conception of mentoring for junior faculty researchers. Acad Med. 2013;88:488–496.