

Outcomes from a Mentored Research Boot Camp: Focused Investigator Training (FIT) Program

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Study Objective. To evaluate the change in mentee self-efficacy with regard to research, number of grant submissions, and total amount of new monies awarded to graduates of a novel, mentored, investigator-training program—the Focused Investigator Training (FIT) Program.

Design. Retrospective observational analysis.

Setting. American College of Clinical Pharmacy Research Institute.

Participants. Fifty-five mentees from the 2008, 2009, 2010, and 2011 FIT Programs.

Intervention. The FIT Program is a novel, intensive, 5-day, mentored development “boot camp” for mid-career investigators holding research-intensive positions. The program consists of proposal groups of two mentors and two–four mentees, one-on-one office hours, lectures, panel discussions, directed readings, and small group sessions. Twelve highly successful researchers and biostatisticians were recruited as mentors. Mentees submitted a detailed proposal and received faculty feedback before the program.

Measurements and Main Results. The main outcomes of the FIT Program were mentee self-efficacy with regard to research, number of grant submissions, and total amount of new monies awarded to 2008 and 2009 FIT Program graduates. Univariate statistical analysis was conducted to determine characteristics of those FIT attendees with subsequent successful grantsmanship. A combined measure of self-confidence in successful grantsmanship was significantly increased after completion of the FIT program. More than \$2.7 million was funded to FIT graduates as principal investigators, and as coinvestigators or subcontractors, an additional \$382,000 was awarded in new funds. Seven mentees from the 2008 and 2009 classes received new federal funding, mostly through various K-type award mechanisms.

Conclusion. The FIT Program was associated with a significant increase in attendees’ self-efficacy for obtaining external research funding. Program attendance was associated with numerous successfully funded grants by pharmacist investigators. Future FIT Program success hinges on attracting adequate numbers of qualified applicants.

Key Words: faculty development, grantsmanship, training, scholarship, NIH funding, Focused Investigator Training Program, FIT Program, American College of Clinical Pharmacy, ACCP.

(*Pharmacotherapy* 2012;32(9):792–798)

The mission of the American College of Clinical Pharmacy (ACCP) Research Institute is to advance human health and quality of life by

facilitating the generation, dissemination, and application of new knowledge that promotes the safe, effective, and cost-effective use of drugs.

This mission is accomplished by supporting the training and development of pharmacy clinical scientists.¹ Competitive funding awarded by the National Institutes of Health (NIH) is widely regarded as one of the gold standards of scholarly achievement. It has long been noted that there is a national shortage of clinical pharmacist-scientists and a paucity of Pharm.D. principal investigators who have received NIH funding. In 2006, the NIH hosted a conference entitled “Pathways to Biomedical Research” to address this concern. Proceedings of the conference suggested that the pharmacy community be proactive by encouraging strong mentorship of research trainees (within or outside their respective departments and schools) and communicating ideas to the NIH.²

In an effort to positively affect the number of NIH-funded clinical pharmacists, the Board of Trustees of the ACCP Research Institute sponsor the Focused Investigator Training (FIT) Program. This program is an intensive, 5-day, mentored faculty development “boot camp” for mid-career investigators who hold academic or nonacademic research-intensive positions but who have not yet been awarded significant (> \$50,000) extramural funding as a principal investigator.

The FIT curriculum is grounded in the principles of active learning methods, using a multifaceted approach.³ This includes reading, writing, discussion, problem solving, analysis, synthesis, and evaluation (Table 1). The program is taught by a multidisciplinary team of experienced NIH-funded researchers and biostat-

Table 1. FIT Program Curriculum

Method	Components and Descriptions
Online mentee application	Applicant completes online form consisting of a 2–5-page research proposal, personal curriculum vitae, statement explaining reason for participation in this workshop, mentee’s dean or department head support letter, and local mentor letter of support with his or her curriculum vitae.
Proposal group sessions	The program director assigns four or five proposal groups before the meeting. Each group consists of two faculty mentor members and mentees. Assignment to groups is based on the type of proposal (e.g., basic science vs clinical) and specialty area. An abbreviated proposal synopsis of fellow mentees is sent to all mentees within their proposal group. In addition, a workbook with biographic information of all faculty and attendees is sent, which allows early networking.
Lectures and panel discussions	Experts in the field lead talks on specific topics related to the principles and conduct of high-quality research proposals. Some lectures may be followed by panel discussions so that students and faculty can explore topics in greater depth and answer questions relevant to the audience-at-large.
Small group discussions	The small groups allow mentees to interact on topics related to laboratory, animal, and human subjects’ protections. These discussions offer scholars an opportunity to engage in detailed conversations of special interest to the mentees. Attendance is limited to maximize the potential learning environment.
One-on-one sessions	Faculty are available for individual advice and expertise on proposal development, funding sources, data analysis, career development, and grant writing. Because of limited space, registrants are required to preregister with specific faculty.

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Funding was provided by the ACCP Research Institute through its Frontiers Fund. The FIT Program has received partial, unrestricted support from Amgen Inc. The University of Utah College of Pharmacy hosted the 2008 and 2009 FIT Programs, and the 2010 and 2011 programs were hosted at the University of Arizona College of Pharmacy. The colleges provided meeting space at no cost to the ACCP Research Institute.

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isticians who serve as faculty mentors. Intensive grant development activities are conducted in small group settings with two or three mentors working with two–four mentees. This mentored team approach represents a significant departure from other research training programs offered by the ACCP Research Institute.

The FIT curriculum also uses formative evaluation. The topics of two “wild-card” sessions are intentionally left open to meet the needs of mentees on site, based on feedback received during the program. Over the past 4 years, the most frequent topics discussed during these sessions were health outcomes research, working with a biostatistician, and additional statistical background information. Other curriculum changes over the years included greater focus

on specific aim development, increased focus on K-type awards, increased office hours, and the front loading of lecture-based curriculum to allow time for individual work at the end of the program.

Individuals interested in participating in the FIT Program are required to submit an extensive proposal packet to the ACCP Research Institute. Applicants are asked to identify a potential funding agency and type of grant. The faculty mentors score each proposal with a standardized rubric, used for many years by the ACCP Research Institute to evaluate grants for funding purposes. Faculty mentors and the program director make the final determination of who is invited to attend the FIT Program. On notification of acceptance, mentees are provided with the unscored, anonymous reviews of the faculty mentors.

In-kind support from the host institution or college or school of pharmacy (i.e., meeting space and audiovisual support) limits out-of-pocket costs. Sites are selected based on the availability of required meeting space within walking distance to a modestly priced hotel. In addition, an on-site faculty member is identified as the site champion to coordinate local efforts.

To our knowledge, this is the first program of its kind, exclusively for pharmacists and other pharmacy professionals. As the program is intended principally to support grantsmanship, our primary aim is to determine the number of new grants submitted and the grant monies received by FIT graduates. The nature of the research projects include clinical research, basic science, translational research, health services or outcomes, educational research, or behavioral science. The primary objectives of this study were to evaluate the change in mentee self-efficacy with regard to research, number of grant submissions, and total amount of new monies awarded to graduates of the FIT Program. The number of mentees who were affiliated with past mentees' colleges or schools who then participated in the program was also assessed. In addition, a post-hoc analysis was conducted to determine potential predictors of funding success.

Methods

Program Evaluation

Data from the 2008, 2009, 2010, and 2011 FIT Programs were sufficient to warrant a preliminary program evaluation and were thus

included in the analysis for immediate outcomes. Submission and funding data from 2008 and 2009 were used for analysis of long-term outcomes, allowing adequate time for grant submission and review.

Measures of long-range outcomes were the number of mentees sent from past mentees' colleges and schools to subsequent training programs, the submission of post-FIT grant applications, and the total grant monies awarded to program graduates. Mentees voluntarily provided updates to the ACCP Research Institute for 3 years after program completion.

Individual Assessment

All mentees were invited to participate in the program evaluation and in reporting subsequent submissions and awards. This study was reviewed by the American Academy of Family Physicians Institutional Review Board and deemed exempt. On the first day of the FIT Program, each mentee voluntarily completed a 50-item pretest developed by the program director. Pretest items focused on self-assessed overall preparedness for the FIT Program regarding knowledge, skills, attitudes, institutional capacity and resources, confidence, and level of skill. Descriptive analysis was performed for items, measured on a 5-point Likert scale, using the following choices: strongly agree, agree, neutral, disagree, and strongly disagree. On the last day, mentees completed a 28-item posttest.

Statistical Analysis

Using data provided by participants from all 4 years of the program, responses to pretest and posttest surveys were tabulated, and summary statistics were computed. The pretest self-efficacy items were as follows: "I believe I will be successful in obtaining funding to conduct my FIT research proposal from the granting agency of my choice" and "Even if I didn't come to the FIT Program, I would be comfortable with submitting my FIT research project to the granting agency of my choice." The posttest self-efficacy items were as follows: "I believe I will be successful at obtaining funding to conduct my FIT research proposal from the granting agency of my choice" and "Because of the changes made to my proposal, I now feel more comfortable with submitting my FIT research project to the granting agency of my choice." A self-efficacy score was computed for

the pretests and posttests by summing the two self-efficacy items for each time point. Item reliability was less than optimal at the pretest (Cronbach's $\alpha = 0.47$) and acceptable at posttest (Cronbach's $\alpha = 0.64$). Change from pretest to posttest was analyzed by paired *t* test analysis. This analysis was computed using nonparametric methods (Wilcoxon signed rank test). To enhance the interpretation of the findings, analyses were also conducted using parametric methods (paired-samples *t* test). The findings from these two analyses were equivalent; results of the paired-samples *t* test analyses are reported.

Evaluation of long-range outcomes of the FIT Program used data from 2008 and 2009 participants. These 2 years were used since insufficient time had passed for the 2010 and 2011 classes to complete a submission and review cycle. Using data from 2008 and 2009, differences between participants who had successfully received grant funding and those who had not yet received grant funding were tested by either χ^2 analysis for categorical outcome variables or independent groups *t* test analysis for continuous outcome variables.

Results

Fifty-five applicants graduated from the FIT Program between 2008 and 2011; 52 were from 32 colleges and schools of pharmacy, and three were from nonacademic institutions. The program is intended to develop pharmacist investigators; thus, all applicants had at least a bachelor's degree in pharmacy. One applicant resided outside the United States. All eligible applicants were accepted the first year of the program (2008). The subsequent acceptance rate ranged from 90–94%. Nine academic institutions sent attendees for more than 1 year; one university sent six attendees during the 4-year period. Of interest, three graduates from 2008 and 2009 have since left academia and are no longer pursuing research.

Demographic information for the 55 attendees is provided in Table 2. Most attendees had secured earlier funding as an investigator, and most hold the rank of assistant professor. None reported on their application that he or she secured funding over \$50,000 as principal investigator from a federal funding source.

Table 2. Demographic Characteristics of the FIT Program Attendees

Characteristic	2008 (n=18)	2009 (n=16)	2010 (n=12)	2011 (n=9)	Total (n=55)
Sex					
Female	7	9	3	6	25
Male	11	7	9	3	30
Rank					
Assistant professor	11	7	5	3	26
Associate professor	4	3	3	3	13
Clinical assistant professor	2	4	0	2	8
Clinical professor	0	0	1	0	1
Professor	0	1	1	0	2
Research assistant professor	0	1	1	0	2
Research associate	1	0	0	0	1
Nonacademic position	0	0	1	1	2
No. of years at current institution, mean (range)	6 (1–16)	4.5 (1–15)	4.25 (1–12)	6.3 (0.25–20)	5.3 (0.25–20)
No. of years since terminal degree, mean (range) ^a	11.6 (4–24)	9.8 (3–18)	12.3 (5–25)	9.1 (3–24)	10.7 (3–25)
Initial grant application type ^b					
R01	6	1	4	2	13
R03	1	2	2	2	7
R15	0	1	1	1	3
R18	0	1	1	0	2
R21	2	4	2	3	11
K	7	6	1	1	15
Other	2	1	0	0	3
Not listed	0	0	1	0	1
No. of earlier grants funded, mean (range)	4.1 (0–7)	3.6 (0–9)	2.8 (0–6)	3 (0–6)	3.4 (0–9)

FIT = Focused Investigator Training.

^aFor those with many advanced degrees, the time since their first advanced degree is reported.

^bFor those who listed more than one grant type, the first listed (their assumed first choice) is reported.

Analysis of the self-report survey data indicated a statistically significant increase in self-efficacy scores from the pretest to the posttest survey ($t(52) = 8.79, p < 0.001$); pretest and posttest self-efficacy scores were a mean \pm SD of 6.8 ± 1.4 and 8.6 ± 1.1 , respectively. This finding was confirmed by comparing changes in responses to the individual items. Feelings that one will be successful in obtaining funding significantly increased from pretest to posttest ($t(52) = 2.20, p = 0.03$); pretest and posttest scores were 3.9 ± 0.8 and 4.2 ± 0.6 , respectively. Feelings of comfort in submitting proposals also increased ($t(52) = 10.09, p < 0.001$); pretest and posttest scores were 2.9 ± 1.0 and 4.4 ± 0.7 , respectively.

Seventy-two proposals were submitted by the 34 attendees from 2008–2009, with 31 new projects submitted by 15 mentees receiving funding. Twelve mentees received at least one grant as principal investigator. The 20 new projects funded as principal investigator are shown in Table 3. More than \$2.7 million of funding was secured as a principal investigator. Three additional mentees received new funding as a coinvestigator or subcontractor. Of those who received new grant monies as a coinvestigator or subcontractor, approximately \$400,000 of those awards was attributed directly to the FIT mentee.

Submitting proposals to industry sponsors appears to have a high rate of success. Eight of 10 mentees who submitted proposals to industry sponsors received funding; six of the 10 received funding as the principal investigator, with the other two funded as a coinvestigator. In general, mentees who successfully received funding as

either the principal investigator or a coinvestigator submitted a higher average number of proposals to industry sponsors than mentees who had not yet received external funding ($t(32) = 2.77, p = 0.012$), with mean \pm SD of 0.60 ± 0.6 and 0.1 ± 0.3 proposals, respectively.

Analyses were conducted to test hypothesized predictors of success in receiving grant funding. These analyses were considered exploratory due to the small sample size of 34 mentees. No association with funding success was found with application score, number of proposals submitted, number of previous grants, years at current institution, years since terminal degree, percentage of time spent doing research, perceived support (financially or otherwise) from the department chair or supervisor, self-efficacy score from pretest to posttest or the amount of change in score from pretest to posttest, original type of grant sought (R or K), or targeted funding agency.

Of the funded graduates, eight were employed by institutions that have at least one 2009 or 2010 NIH-funded Pharm.D. on faculty. Furthermore, being associated with a Clinical and Translational Science Award (CTSA) institution appeared beneficial for obtaining funding as the principal investigator ($\chi^2(1) = 4.34, p < 0.04$), with 62.5% of the mentees who were at a CTSA institution having received funding as the principal investigator, and only 23% of the mentees who were at non-CTSA institutions having received funding as the principal investigator.

Discussion

The FIT Program has resulted in strong preliminary evidence of its long-range outcome of grantsmanship. Graduates' pursuit of new funding is followed for only 3 years after program completion due to a decreased ability to attribute further successful grantsmanship with program attendance. Although follow-up communication with graduates was attempted on a semi-annual basis, not all graduates elected to provide progress reports. Graduates were asked to provide priority scores and percentile funding lines of grants submitted; however, this information has not been routinely volunteered. Thus, it is possible that the data represent an underreporting of the outcomes. Fifty-five mentees graduated from the four FIT classes, with more than \$3 million in new grant monies secured.

A primary strength of the program is providing mentees with a better perspective of the

Table 3. 2008 and 2009 FIT Program 24-Month Status Report: New Grant Monies Received as Principal Investigator^a

Funding Agency	Type	No. of Grants	Total Amount (\$)
Federal source			
NIH NIA	R15	1	322,000
NIH NIAID	K23	1	600,000
NIH NCRR	K01	1	250,000
NIH	KM1	1	66,500
NIH	R21	1	213,000
AHRQ	K08	1	673,838
CTSA	Pilot	1	50,000
Internally funded	NA	5	39,000
Industry sponsored	NA	5	428,080
Nonprofit or foundation	NA	3	161,000

AHRQ = Agency for Healthcare Research and Quality; CTSA = Clinical and Translational Science Award; NA = not applicable; NCRR = National Center for Research Resources; NIA = National Institute of Aging; NIAID = National Institute of Allergy and Infectious Diseases; NIH = National Institutes of Health.

^aTwelve mentees were funded as principal investigators.

federal grant process and selection of a granting mechanism that best suits their needs, abilities, and institution. Specifically, the FIT Program has helped identify candidates for K-type awards and empowered the mentee to proceed with this type of grant pursuit at their home institution. The mean \pm SD percentage of time dedicated to research for all attendees was 34 \pm 21%, and K-type awards typically require a greater commitment of time to research, up to 75%.

Although a comprehensive review of 39 studies revealed an absence of experimental research about mentoring, the available evidence showed mentoring had an important effect on research productivity, including publication and grant success.⁴ The FIT Program has attracted and retained quality mentors, as evidenced by mentees who consistently comment on the spirit of collegiality, teamwork, and approach to sharing tips for success, together with detailing their individual challenges and failures in grantsmanship.

The FIT Program has been successful in large part because of the combination of capable, motivated attendees and a cohort of faculty mentors dedicated to the success of the applicants. Careful consideration was given to selecting and retaining mentors who were highly experienced, in mid-to-late career stages, and able to effectively work with mentees on a group and individual basis. Mentors are not required to provide postprogram support, although some mentees have reported continued involvement with FIT faculty members.

The FIT Program is designed to have a cadre of faculty that will support the content proficiency needed to provide feedback on any application received. This is a major challenge, as proposals may be from the entire research spectrum; thus, the FIT faculty may or may not be content experts within a particular area. The degree to which this affects attendance is unknown. None of the years had the same faculty group, although seven mentors have participated all 4 years.

This diverse faculty group, from a dozen or so institutions, may also be a distinctive strength of the course. As one mentor stated on completion of the inaugural FIT Program, "We have accomplished something here that would not have been possible within any of our own institutions," meaning that no single college or university has faculty with the breadth and depth of experience and funding success to offer

as this program. This sentiment was shared by the mentor group as a whole.

The main challenge the program faces is a decline in the number of suitable applicants. To attend the program, the applicant needs an individual commitment of 6 days away from personal and work obligations, a letter of support from a local mentor, and financial support from a supervisor. Financial support has been offered by several specialty groups within the ACCP organization and has been left unclaimed. Furthermore, nine institutions have sponsored attendees for more than 1 year, suggesting that program buy-in has been achieved by earlier attendees. It is plausible that the decline in suitable applicants is a function of increased clinical demands placed on clinical practice faculty; however, to be successful, tenure-track faculty should be afforded protected research time.

Another potential barrier is the perception that having a CTSA obviates the need for the program, as education and training are central features of a CTSA. The overall goal is to create competency-based educational curricula for training clinician-scientists in clinical and translational sciences. To the contrary, our limited data suggest that those with the additional resources of a local CTSA benefit most from a week to focus on a proposal. This assumption requires further exploration.

Study Limitations

The pretests and posttests were self-reported by the mentees. Therefore, any objective data provided were not verified by the authors. Furthermore, the possibility of social desirability bias, where mentees tended to answer questions in a manner perceived as favorable by others, may have existed. By contrast, the primary outcome measure of new grant submission and funding success was verified by the funding source when possible.

It is difficult to ascribe success on the basis of one educational intervention, and it is unknown how many of the applicants would have successfully obtained funding without the FIT Program. It is possible the program has attracted those individuals most likely to be successful. However, attendance at the program and subsequent success, combined with increased self-reported self-efficacy, may add credence to the positive impact the program has on successful grantsmanship. In addition, nine institutions have invested in sending attendees

in subsequent years, suggesting that external stakeholders support the value of the program.

Conclusion

On the basis of data obtained from 4 years, the FIT Program is a successful professional grantsmanship program. Twelve individuals with pharmacy degrees have received new funding as a principal investigator since attending the program, mostly through the various federally funded K-type award mechanisms. The long-term sustainability of the FIT Program relies on its ability to attract qualified applicants and retain a collection of highly motivated, extraordinary mentors.

Acknowledgments

The authors wish to acknowledge Erin Moore for her editorial contributions, the FIT Program mentors and mentees, and the Board of Trustees of the ACCP Research Institute for their support.

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