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REFLECTIONS

Research faculty development: an historical perspective and ideas for a successful future

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Abstract What does it take to be successful as a tenure-track research faculty member in a School of Medicine? What are the elements necessary to run a successful laboratory? How does one find the resources and help to know what is important for promotion and tenure? Most training in graduate school or in clinical fellowships does not answer these questions. Too often, new junior tenure-track research faculty members are left to learn from the "school of hard knocks" and essentially are reinventing the wheel, which is a huge waste of time. This article describes the history of research faculty, what makes them successful, and offers suggestions on how we can help them reach their greatest potential.

Keywords Faculty development · Medical school faculty · New office development · Research faculty

Introduction

There has been a particularly strong emphasis of late on the revenue-generating component of an academic medical center. A handful of reports published over the past several years (e.g., Goldman et al. 2000; Joiner et al. 2007; Joiner 2009; Dorsey et al. 2009) has suggested that the contributions of research faculty in a School of Medicine (especially those in basic science) are revenue-depleting. One quote in a recent report indicated that research faculty members "do not generate sufficient positive cash flow to the medical school to recover the initial investment even during 10 years" (Dorsey et al. 2009), which was echoed in an earlier report (Joiner et al. 2007). The Dorsey et al. study did not substantively comment on whether these faculty members truly offer a specific or overall value to the institution. Granted, it was stated in the same study that the authors' "metrics also do not account for the nonfinancial returns in terms of contributions to the school's

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mission and reputation," but there was nothing more about that. Other reports were a bit clearer that there should not be "a higher premium on the financial value of the individual than on their broader contribution to the institution and its mission" (Joiner 2005). Nonetheless, if the overall arguments on the institutional value of a research faculty member are based mainly on revenue and without substantial consideration of the other missions, he or she will feel overlooked, undervalued and unappreciated. So, what can be done to help the research faculty at one's institution feel valued? This article is written from the perspective of a highly productive basic science researcher and faculty development Dean to argue why institutions need to support the development of their research faculty, across all missions, using what we at the Indiana University School of Medicine and others have done as models. This has a direct impact on the overall culture of the institution.

"*The faculty is an institution's greatest resource*". Think about that statement. The accomplishment of the core missions of any medical school is more dependent upon the faculty than any other factor. For this reason, considerable resources and effort are placed into developing faculty. However, a majority of those resources are directed to the core missions of teaching and service, whereas fewer resources are aimed at the critical mission of research. Yet, the research mission is an essential component of a productive School of Medicine. In fact, the national ranking of medical schools has been largely based on the number of NIH grant dollars received. What do we know about how to enhance the vitality of research faculty and strengthen their contributions to the success (and status) of the institution?

For one to have a better understanding of the importance of research faculty to a School of Medicine, and their specific faculty development needs, it is necessary to discuss the history of research faculty as subjects of scholarship. How did the current "system" of research by faculty develop in the first place? What factors contributed to (and were responsible for) measures of success by research faculty? Models were originally developed as a means to compare research output as a function of socialization and the reason(s) behind differences between literary and research scholars (Snow 1959). Mostly, the differences were on the type of manuscripts published by these groups—books in the case of literary scholars; short articles by researchers (Snow 1959). Drilling this down further, Kuhn argued that scientific questions in the physical sciences and the manner in which these problems are addressed require clearly-defined paradigms specific for these areas, unlike those in other disciplines (Kuhn 1970). The Biglan model, developed in the 1970s, was used to focus specifically (and solely) on research faculty as a group, in order to identify reasons behind their success (Biglan 1973a). It was found that the social structure of a department relates to its output in research articles, books and other publications (Biglan 1973b). Therefore, there was a link between social interactions (e.g., collegiality) and research productivity. In other words, you are happy if you are publishing. In line with this idea, other studies, particularly those of Hagstrom published before Biglan's important work (Hagstrom 1964), analyzed the concept of scientific teamwork. Hagstrom found that the team concept consisting of teacher and student(s), along with scientific freedom (Kornhauser 1962), was the most effective model for research productivity (Hagstrom 1964). Part of this involves mutual respect and trust that each performs his or her task at the highest level possible. Even almost 50 years later, it is this model that is most prevalent in academic research.

A 1986 study by Baird asked the simple question, "What characterizes the productive department?" (Baird 1986). He conducted a nationwide survey to compare the levels of research productivity from the perspective of faculty and students in three different

disciplines: Chemistry (24 departments), Psychology (25 departments) and History (25 departments). The study identified some commonalities that would create conditions leading to a highly productive research department: "Hire faculty from highly respected programs, enroll students who are talented and committed to scholarship, be sure everyone understands that the goal of the department is to train researchers, and provide the resources, or at least the time for the faculty to conduct research" (Baird 1986). Baird found an important role for graduate students in a research department's success, rather than a pure focus on the faculty member. He also pointed out that many studies have found a relationship between the ratings of peers (e.g., "impact factor") and the level of publication productivity (Jones et al. 1982; Clark and Centra 1985; Baird 1986)—a relationship that is not surprising in the modern scientific research world. Later work by Carole Bland and her colleagues (Bland et al. 2002; Bland et al. 2004; Bland et al. 2005) revealed that the most successful research departments rely on three pillars whose dynamic interactions dictate the level of productivity (Bland et al. 2005). These pillars are comprised of variables at the: 1. Individual; 2. Institutional (college and department); and 3. Leadership levels. Each has a number of elements that contribute to overall research productivity and success. Thus, what individual characteristics permit a researcher to be highly productive (e.g., motivation, networking, mentors)? What does the department or institution do to support their faculty (e.g., faculty development, resources and culture)? Who are the leaders and what do they do to develop and foster a culture that contributes to a high level of productivity by the research faculty? All of these elements are critical in determining how successful an institution ultimately is. Interestingly (and surprisingly), gender or family-related factors seem to have little or no effect on research productivity (Sax 2002).

Overall, these studies were used to understand, in a broader context, faculty vitality and how to improve it. Thus, the analyses described above were aimed at answering what is, on first glance, a very simple question: "What makes scientific researchers successful?" However, for those actually involved in biomedical research in Schools of Medicine, the answer is generally, "It depends." A priori, publishing several papers per year and obtaining multiple, competitive extramurally-funded grants comprise a relatively straight-forward assessment of success by a researcher. Simple–correct? However, these are outputs—the outcomes of successful researchers—and do not address the actual pathway to achieving success. How do researchers really get there? Furthermore, which tools do you develop to help those researchers who are not as productive or successful as they would like (or need) to be? This is more difficult. Who tackles this problem? In many ways, it is often preferable to have the perspective of an active researcher in addressing this question. "If you haven't lived it, you don't innately know it." This is the same argument people have used for the inability of others to understand cultural differences. In the context of a research department or researchers in general, the wealth of knowledge that a successful Principal Investigator possesses is often key to mentoring a junior faculty member toward becoming an independent researcher. If a productive, successful senior research faculty member could develop activities to accomplish this goal to a broader audience than his or her protégés only, then the institution should be more successful overall.

Thus, what are ways in which different institutions have enhanced (or can enhance) the success of their research faculty? Here, I present what I believe are important elements on how to achieve this goal. Further, I will discuss what a number of institutions have done in order to help provide opportunities for research faculty to be successful and some means to

measure those successes. Hopefully, this will start a dialog on other ways we can help our research faculty reach the next level and, by doing so, enhance our institutional culture.

Developing a portfolio for an office responsible for research faculty development

To really take the development of research faculty to a high level, one can (and should) consider creating a Dean-level office focused specifically on research faculty development. This could be under the umbrella of a Faculty Affairs office or simply a separate entity within the Dean's office. In order to develop a portfolio for an Office responsible for research faculty development, one must first define its responsibilities, and who would be served. Overall, such an Office needs to: develop, coordinate, implement and oversee programs aimed at enhancing the development and success of tenure-track and non-tenure track research faculty in the School, College or overall institution. Thus, the objective would be to focus on research faculty in all aspects of their professional growth and development as they pertain to the three major missions of a medical school: education, research and service. These goals could be achieved via a "quadpartite" approach: 1. Research Faculty Development Seminars (e.g., "Brown Bag Lunches"); 2. Topic-focused Workshops; 3. Enhancement of an existing website to include research faculty development; 4. Faculty Mentoring. The purpose and function of these ideas are explained in more detail below:

Research faculty development seminars

What are the topics that most junior research faculty members consider to be very important, and for which we essentially do not receive training in graduate/medical school or as postdocs or fellows? For example, "How do you recruit personnel to your laboratory?" "How do you balance taking care of a family and writing grants at the same time?" "What are the offices and contacts in the School of Medicine one needs to know about, in order to be able to put together a grant application?" A "Top 10" list of topics that can be covered in a Research Faculty Development Seminar Series as suggested by the author, are listed in Table 1. Other topics could most certainly be included, depending upon the needs and interests of the faculty at one's institution.

Table 1 Research faculty development seminar topics

1. Features and use of the "guide for applying for research grants" for new Research Faculty (specific for each institution)
2. Balancing grants and kids
3. How to recruit personnel to your laboratory
4. Mentoring graduate students and postdoctoral fellows
5. Helping trainees get to the next level
6. Dealing with personnel problems in your laboratory
7. Choosing a faculty mentor
8. Getting recognized as an independent scientist—without being a "photon magnet"!
9. Patenting inventions and other intellectual property elements
10. Diversity in science

This table lists the "Top 10" topics for research faculty covered by "Research Faculty Development Seminars" as suggested by the author

Research faculty-oriented workshops

These activities would be meant to complement the seminars and expand their breadth and focus on other areas for which a 1 h seminar would be insufficient. For example, workshops that deal with how a study section review panel discusses grant applications are critically important for those individuals submitting their first grants. Although actually serving as a review panel member for a granting agency is the ideal experience, not all have that opportunity (or will before submitting their first grant). Thus, some of that knowledge can be imparted via a workshop- or seminar-type format. Additionally, the National Institutes of Health (NIH) does have a role play video example of how a study section review panel conducts business (http://www.youtube.com/watch?v=kfgzdLe92c0). One of the most important types of activities that can be argued to be very helpful to research faculty are those that are focused on grant writing. Because of its importance, I discuss that topic in more detail below.

Workshops or courses focused on grant writing

With the last near decade of flat line "growth" of the budgets for the National Institutes of Health (NIH) and National Science Foundation (NSF), for example, the percentage of researchers successfully competing for funding from these (and other) federal agencies has fallen precipitously. In fact, the concern is that people have lost–and will continue to lose–their research programs, laboratory space and their professional identity. This is a major concern for the ultimate survival of the mentor "pool", as the faculty members seemingly most affected are those in the middle ranks. Thus, we are at great risk of losing a generation of scientists who serve as mentors for junior faculty protégés. Think of it like the children in parts of Africa losing their parents to AIDS. Senior investigators will not be around forever, and yet it is extremely important to assist the new generation of scientists in getting their successful research programs off the ground. This, of course, requires that they obtain extramural, peer-reviewed grant funding—mostly from the NIH for those in a medical school. A number of institutions have taken the initiative to help all research faculty members be successful.

Grant writing workshops

As a means to help research (especially junior) faculty successfully compete for extramural research funding, a number of institutions hold grant writing workshops. These can consist of one, two or three days of intensive presentation and discussions on how to write effective grant proposals. There are a number of private organizations that have developed such workshops. The presentations are given by individuals who have been successful grant recipients themselves for a number of years, who have also served as members and/or Chairs on NIH (or other funding agency) review panels. One can generally find testimonials provided by these organizations that address how successful a grant applicant was after participating in the workshop. The cost of these programs can be high: they can range from several hundred dollars per person or even more. Some are very good; but alas, some are not. It is important to try to find one that will work for you and your faculty by investigating the various options, cost component, etc. Speak to your colleagues at other institutions—which ones have they used and how successful have they been for their faculty?

Representatives from funding agencies

Oftentimes, an institution's faculty mainly obtains grants from one particular agency or another. For medical schools, it is almost always the NIH. Thus, one can also partner with a grant funding agency to help the faculty be more successful. A nice example of this is a grant writing workshop for individuals from minority-serving institutions supported by the National Institute of General Medical Sciences (NIGMS). The NIGMS is an NIH institute that has been at the forefront of supporting researchers of color take their efforts to the next level and be successful in competing for funding from the NIH and other extramural funding agencies. The workshop held at the University of Kentucky (http://www.uky.edu/Projects/GrantWriting/) is worth investigating.

An alternative to a workshop of this nature is to bring in Program officials from the agency one is interested in. For example, for those not that familiar with grants from the NSF, a number of institutions have invited Program Directors to discuss the various areas that the different NSF Programs cover and the type of investigations they are most interested in funding. Of further help is how that agency is different from the NIH in terms of the studies they generally support, the review process, how many years the grants are usually supported, etc.

Grant writing courses

A number of institutions have been running almost year-long grant writing courses (or academies) for faculty and postdoctoral fellows that require their participants to submit a grant proposal to the NIH for the June deadline. The programs generally start in the Fall and meet on a monthly basis. Each meeting involves hitting a benchmark (e.g., Summary/Abstract, Specific Aims, etc.) with the idea that by the end of the course in the Spring, the applicants will have provided a well-written (i.e., almost ready) draft for faculty to read. The faculty members who read the grant applications are funded investigators who have agreed to participate in this part of the course. They then provide constructive feedback in time for the applicant to revise the grant application accordingly, before the agency submission deadline. Too often, human nature is to procrastinate. Having a structured program like this is much more likely to compel the applicants to have an application "ready to go" by the submission deadline. This is particularly important for junior faculty members who have not yet been funded, and to teach them how to meet deadlines so that it becomes second nature to them. However, the major problem with these types of courses is not the Course Director or the participants—it is finding a sufficient number of senior, funded faculty members willing and able to read the grants; not a simple, quick turnaround task. One example includes the Penn State University Grants Academy directed by Drs. Kenneth and Sheila Vrana (http://pennstatehershey.org/web/facultyorientation/research/grantsacademy). Ken is the Elliot S. Vessell Professor and Chair of the Department of Pharmacology at the Penn State College of Medicine. He is also Chair of the NIH Molecular NeuroPharmacology and Signaling Study Section (i.e., grant review panel). Sheila is the Associate Dean for Basic Research in the College of Medicine. Both are highly accomplished and successful scientists and offer their expertise to the participants in the academy throughout the 10 month program. A similar program is run by the University of Minnesota (http://www.dom.umn.edu/research/researchresources/grantworkshopfor_R01_type/home.html). This is Co-Directed by Drs. Richard King and Anne Marie Weber-Main (Anne-Marie is the Research Medical Editor in the Department of Medicine there). Participants have weekly assignments to finish, such as individual paragraphs for the Specific Aims page, etc. Such programs are viewed by these institutions as an important investment in their faculty.

Using a website as a resource for research faculty

Enhancing an existing faculty affairs website to one that also specifically assists research faculty can most certainly increase the utility of that website for the faculty overall. In particular, there is already a familiarity there (i.e., the faculty already will be used to perusing the website for other Faculty Affairs resources). Adding additional resources for research faculty can only help them be more successful as researchers. Examples of such websites include the Indiana University School of Medicine's Office of Faculty Affairs and Professional Development (http://faculty.medicine.iu.edu/offices/fd/resFac.html), with a dedicated section specific for research faculty, and the University of Pittsburgh's Office of Academic Career Development (http://www.oacd.health.pitt.edu/faculty.html). The latter website provides resources for faculty, graduate and medical students, as well as clinical and postdoctoral fellows. Like many other Schools, the faculty development offices at the University of California at Davis (http://www.ucdmc.ucdavis.edu/facultydev/) and Duke University (http://medschool.duke.edu/modules/som_fac_dev/index.php?id=1) have faculty development programs aimed at helping faculty to become successful at the next level. One can certainly take what is in existence at his or her institution and focus additional offerings specific for research faculty. Further, the Research Faculty Development Seminars at the Indiana University School of Medicine are live-streamed and recorded (both video and audio) for use by faculty to review at their leisure.

Mentoring

The mentoring of junior faculty is usually the responsibility of the individual department Chair (or Division Chief). There are two main approaches people generally take for faculty mentoring nationwide: 1. One-on-one mentoring (e.g., selection from a mentor "pool"); 2. A formal "Mentoring Committee". In the first model, there are many ways in which a faculty mentor(s) could be identified and chosen. This could be initiated by the junior faculty member themselves by meeting others in the department and/or in a "get together" where there is a faculty mentor pool from which the protégé chooses. If a junior faculty member does not choose a mentor by the end of the first year at the institution, the Department Chair could/should then select one. The second approach usually involves the Chair forming a committee, or appointing a Chair for such a committee who then recruits the other committee members. If the position exists at one's institution, an Assistant/Associate Dean responsible for research faculty development should also be a mentor *ex officio*. However, nothing that this person does in his/her office should compete with efforts already put in place by the Department Chairs or Division Chiefs for their specific faculty. Instead, such a Dean-level role should only be complementary.

One-on-one/face-to-face meetings with junior research faculty as an additional means to assist research faculty development

The Research Faculty Development Dean should ideally be an accomplished researcher, with a currently active research program. This will immediately impart credibility in the eyes of the junior (and senior) research faculty. Thus, part of their role might include meeting with all junior tenure-track faculty members for whom research is their declared area of excellence. These faculty members should include both basic scientists and those

whose work involves patient-based studies. The goal for such meetings would be to understand the obstacles the junior faculty member has faced, which allows the Faculty Development Dean to see the entire landscape through the eyes of that faculty member—and as a fellow researcher. Further, it would be helpful to ask them what advice they would give to a new research faculty member on his or her first day on the job. It is always useful to hear fresh perspective on what it is like to be junior faculty. Sometimes, we forget…

Infrastructure

Depending upon what different institutions want (or are able to invest) in the development of their research faculty, the monetary input can be substantial or modest. Further, it is not restricted to medical schools. For example, the Department of Faculty Development at the M.D. Anderson Cancer Center (http://www.mdanderson.org/education-and-research/education-and-training/faculty-development/index.html) has been in place for a number of years and they have a substantial office for serving their research faculty. In the context of the infrastructure in an academic setting, we could use the Indiana University School of Medicine as a model. As the Assistant Dean for research faculty development, I apply 25% of my effort to these endeavors. For support, there is an Administrative Assistant who schedules meetings with junior faculty, helps with ensuring that there is food, etc., present at the events, and collects the evaluation/assessment and demographic data for each session. The data collection is important for an institution to look at the trends and assess the effectiveness of their offerings. In other words, "Does what you do for the faculty actually work?" A Program Manager works with the Assistant Dean in the planning, scheduling of rooms and arranging for recording of the sessions (both audio and video), and helps with the attendee data analysis. Budgeting (also assisted by the Program Manager) is dependent upon a number of factors. Food can be provided at the sessions. For example, if it is a breakfast, coffee, juice and pastries could be made available at a nominal cost. If at lunchtime, a tray with a variety of items (with drinks) could be provided. Alternatively, one could have the equivalent of "Brown Bag Lunches", which of course reduces the cost. The overall annual budget for research faculty development activities using this model is approximately $35,000 and includes: Research Faculty Development Seminars, two different writing workshops, and one-on-one meetings with faculty. This can be modified depending upon the timing and the format of these sessions. I will say that Research Faculty Development Seminars are relatively inexpensive, as faculty members (mainly the Research Faculty Development Dean) are the speakers. Although the writing workshops would involve the greatest expenditures, they are considered to be extremely critical to the success of the faculty, as indicated by participant comments and increased success in obtaining extramural grants. Each individual institution has to decide for itself how best to invest in the development of their research faculty.

Evaluation and assessment of events offered to support research faculty development

It is very important following any offering to obtain feedback from those who attended the events. Thus, participants are generally asked to fill out evaluation forms that address specific elements of the activities just attended. Additionally, one can collect data on the number of participants and demographic information for all events. This is important, as one should attempt to reach out to faculty regardless of department, race, faculty rank or

gender. Further, it will be worthwhile to follow up with these participants to find out if they have published more papers than if they had not attended the offerings or have been successful at competing for extramural grant funding. It is important to spread the word about these activities, as faculty members need to understand that these offerings are worthwhile to them. The issue is about the culture of one's institution.

Overall, whether you hold a several day grant writing workshop, invite funding agency Program Directors or hold a "Grants Academy", is not necessarily important. What is essential is if an institution considers research productivity to be critical, it needs to do something about it to support their faculty. How might this pay off dollar-wise? Let's say your institution paid for 100 participants to attend a three-day grant writing workshop that costs $595.00 per person. That is $59,500 in total! However, if just one of these attendees was successful at obtaining a five-year NIH R01 grant at $200,000 per year in direct costs because of that workshop, that equates to $1,000,000 in direct costs. Considering an institutional indirect cost rate of 50% for example, the institution receives an additional $500,000 over that timeframe. Is that worth the $59,500 investment paid upfront? What if two participants were successful? More? You get the idea… If it is your intent to increase the number of research grants awarded to your institution, consider such activities to be investments in your faculty and institution. In the end, their success is a benefit for all.

Final thoughts

Having an office focused on assisting the development of research faculty can make a tremendous impact on your faculty and should be highly supported by the School/College of Medicine administration. A recent comment from an Assistant Professor about the activities offered by my office said simply, "Don't stop". From my perspective, it is important to not restrict one's research faculty development offerings to only the Medical School, particularly for those who are members of a larger University family. Certainly, faculty from other schools (e.g., Dentistry), will likewise consider your programs to be meaningful and very useful to them as well. In our experience, the faculty has been very receptive to these activities overall and has offered several suggestions for future topics we had either not yet considered or, in most cases, had already been in the pipeline. An important characteristic for an office of this kind is that it must be both dynamic and accessible, and thereby change with the needs and desires of the faculty we all serve. In the beginning, an office of this type will most likely need to be focused on efforts targeting Assistant Professors. We all agree that their success in promotion to Associate Professor with tenure is a goal we have for them and, as a School, share responsibility. So how might one go beyond this? It is apparent that Associate Professors are the least satisfied faculty rank, which reflects the current nationwide trend (Dankoski et al. submitted). We have recently developed a model to evaluate faculty vitality (Palmer et al. 2010). One could use this model to find new and creative ways to assist in the development of research faculty at the Associate and Full Professor levels.

Our careers follow a current with an ebb and flow, with our needs, interests and desires as faculty members changing as we follow that current over time. By providing an environment whereby everyone can continue to feel vital as members of the School of Medicine, every faculty member can be a "success story".

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