Mentor Networks in Academic Medicine: Moving Beyond a Dyadic Conception of Mentoring for Junior Faculty Researchers

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Abstract

Purpose
Career development award programs often require formal establishment of mentoring relationships. The authors sought to gain a nuanced understanding of mentoring from the perspective of a diverse national sample of faculty clinician–researchers who were all members of formal mentoring relationships.

Method
Between February 2010 and August 2011, the authors conducted semistructured, in-depth telephone interviews with 100 former recipients of National Institutes of Health mentored career development awards and 28 of their mentors. Purposive sampling ensured a diverse range of viewpoints. Multiple analysts thematically coded verbatim transcripts using qualitative data analysis software.

Results
Three relevant themes emerged: (1) the numerous roles and behaviors associated with mentoring in academic medicine, (2) the improbability of finding a single person who can fulfill the diverse mentoring needs of another individual, and (3) the importance and composition of mentor networks. Many respondents described the need to cultivate more than one mentor. Several participants discussed the use of peer mentors, citing benefits such as pooled resources and mutual learning. Female participants generally acknowledged the importance of having at least one female mentor. Some observed that their portfolio of mentors needed to evolve to remain effective.

Conclusions
Those who seek to promote the careers of faculty in academic medicine should focus on developing mentoring networks rather than on hierarchical mentoring dyads. The members of each faculty member's mentoring team or network should reflect the protégé's individual needs and preferences, with special attention toward ensuring diversity in terms of area of expertise, academic rank, and gender.

A growing body of work both emphasizes the importance of mentorship in academic medicine and seeks to better explain or define the characteristics of effective mentoring relationships.[1] Previous authors have identified a number of specific behaviors exhibited by good mentors, such as providing role modeling, advocacy, sponsorship, guidance on writing and grant preparation, financial support, information about promotion processes, assistance with work–life balance, opportunities for networking, and, sometimes, simply advice.[2–5] Similarly, previous researchers have identified certain personal characteristics—such as altruism and accessibility—as common traits of good mentors.[3,5,6] Compatibility between the mentor and the protégé also seems vital to successful mentoring.[3,6,7] Understanding the characteristics of successful mentoring relationships is critical because evidence suggests that mentorship may influence a variety of outcomes, such as academic career choice, retention, and research productivity.[8,9]

Traditional conceptions of mentoring involve a dyadic relationship between a more seasoned expert and a less experienced protégé.[1,8,10] Yet, as Pololi and Knight[11] have argued, "additional mentoring models" and an "expanded vision" of mentoring may be the keys to improving mentoring effectiveness in academic medicine. Scholars from a number of fields have explored alternative approaches to the hierarchical, dyadic model,[12–16] including models for, specifically, academic medicine.[11,17–22] For example, Lewellen-Williams and colleagues[20] have described a multilevel mentoring paradigm for junior faculty members, including peers, senior faculty, and private practice physicians. Pololi and colleagues[22] have discussed the use of a peer group mentoring program focused on collaboration and team building. These new conceptions of mentoring seem to challenge both the hierarchical and the dyadic configuration of the traditional mentoring relationship.

Relatively few researchers have explored faculty members' personal experiences with alternative mentoring models, their perceptions of how mentoring relationships should be established and organized, or their observations about whether (and, if so, how) mentoring contributes to career development, outcomes, and success. Of note, a limited number of qualitative studies within academic medicine have focused primarily on evaluating the peer group mentoring model.[19,22] These studies report that participants perceived several benefits from this type of approach, such as opportunities to learn and expand their knowledge, a greater sense of empowerment, and reduced feelings of isolation; however, these particular studies each had sample sizes of less than 20 participants, and each was designed to evaluate a specific program within a single institution. Other qualitative studies in academic medicine have only

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briefly reported on personal observations regarding the benefits of having more than one mentor.[2,3,7,22,23]

The aim of the current study was to gain a more nuanced understanding of mentoring issues from the perspective of a large and diverse group of faculty clinician–researchers from a variety of institutions, all of whom were members of formal mentoring relationships as part of the National Institutes of Health (NIH) K08 and K23 award programs. These prestigious career development grant programs provide support for protected time, training, and resources so that early-career clinician–researchers can develop their research careers. Of note, the rigorous application process requires applicants to designate mentors and to specify a formal mentoring plan in support of an intensive, mentored research career development experience. Hence, K award recipients provide an ideal population through which to explore personal experiences with and conceptions of mentoring relationships.

Method

Study design and sample

We obtained approval for this study from the University of Michigan institutional review board. This study was part of a larger, grant-funded study on the NIH K award recipients' outcomes and experiences; two other reports in this issue of *Academic Medicine* present additional findings from this larger study.[24,25]

We adhered to a number of criteria believed to produce methodologically sound qualitative research.[26,27] These included purposive sampling of participants to ensure inclusion of a diverse range of perspectives, corroboration of findings through the use of investigator triangulation, and an iterative approach to data collection and analysis.

We selected potential interview participants from publicly available[28] lists of the 5,516 individuals who had received K08 and K23 awards between the years 1997 and 2009. We deliberately included both men and women and an oversample of racial and ethnic minorities. We conducted Internet searches to ensure inclusion of individuals who remained at their original institution at the time of the K award, those who had changed institutions, and those who had left academic positions (i.e., individuals in private practice, industry, and government). Specifically, we entered search terms based on information found through the NIH RePORT system[28] (i.e., first and last name, institution at time of K award, department, and e-mail address) into Google to locate current profiles on institution Web sites, relevant information in online news reports, or current listings in online physician directories (i.e., www.vitals.com, www.healthgrades.com). We included individuals who had gone on to attain further NIH funding as well as those who had not (as determined through the NIH RePORT system).[28] We ensured representation of individuals from a variety of career stages (based on their academic rank and on the year of their K award). We also ensured representation from the range of specialties (e.g., internal medicine and its subspecialties, surgery and surgical specialties, hospital-based specialties, and specialties focused on women, children, and families). In addition, we included non-MD clinical specialties, such as veterinary medicine, clinical psychology, dentistry, and optometry. We sought participants who represented both public and private academic institutions as well as institutions from all the regions of the United States (i.e., the Northeast, mid-Atlantic, Southeast, South, Southwest, Midwest, West, and Northwest).

We assembled lists of approximately 10 individuals to invite each week to participate in the interviews. Alongside the acceptance of invitations and the scheduling of interviews, we iteratively adjusted our subsequent invitation lists to yield a reasonably balanced representation of individuals from each of the relevant groups whom we aimed to include in our sample. We also asked the K awardees who agreed to interviews to provide the names and contact information of their mentors so that, alongside the protégés' views of mentoring, we could study the views of the mentors.

Data collection

We created an in-depth, semistructured interview guide to include both closed- and open-ended questions pertaining to a number of domains, including mentoring in academic medicine (see Supplemental Digital Appendices A–C, http://links.lww.com/ACADMED/A120, for the final version of the interview protocols). Regarding mentoring, we asked K award recipients to discuss the following:

- the genesis or development of their relationships with their mentors,
- the types of roles their mentors played,
- the specific ways in which their mentors had provided help,
- situations in which they wished they had received better mentoring,
- characteristics or aspects of mentoring that they believed made mentoring relationships work well, and
- their experiences mentoring others.

We asked mentors to discuss their mentoring experiences in general (including any instances when they felt they had been particularly helpful) and, more specifically, their history as mentors (including the number of years they had spent mentoring and the number of individuals they had mentored).

We sent an e-mail invitation announcing that we would be conducting one-hour semistructured telephone interviews to "gain insights regarding the determinants of success in academic medicine and the challenges that face those who pursue biomedical research careers." We e-mailed approximately 500 K award recipients between February 2010 and August 2011. We interviewed the K award recipients who responded as well as the willing mentors to whom these respondents referred us. Participation was voluntary, all participants provided informed consent, and we offered a $100 honorarium to all interviewees.

One of three researchers (including R.D. and D.S.) conducted each of the interviews. All three interviewers had graduate training in the social sciences and in qualitative research methods. We tape-recorded the interviews, and an independent professional transcriptionist transcribed the recordings verbatim. Data collection continued until we achieved thematic saturation, as described below.

Data analysis

We employed a thematic analysis approach, as described by Braun and Clarke.[29] One of three analysts (including R.D. and D.S.) with graduate training in qualitative methods initially

independently reviewed and thematically coded each transcript using QSR NVivo Version 8.0.332.0 SP4 (Doncaster, Victoria, Australia) software. Of note, the investigators involved in the analysis trained in different social science disciplines and at different institutions. They were also diverse in terms of gender, race, and age. Hence, we minimized the possibility of systemic bias and established validity through investigator triangulation,[26] a procedure in which multiple investigators from different disciplines analyze the data.

We coded transcripts while interviews were ongoing so that analysis could inform the conduct of interviews, and vice versa. We revised coding categories and identified quotations after at least two of us (R.D., D.S.) and the senior author (R.J.) had reviewed the transcripts. We held meetings regularly during the course of the coding to discuss and arbitrate differences in interpreting the evolving categorization of identified themes and in coding the quotations as representative of these themes.

We followed an iterative process by generally coding and discussing major themes first, followed by minor themes. We determined cross-cutting themes and recurrent patterns, in consideration of analytic connectedness. We repeated this cycle until we achieved thematic saturation,[26] the point at which novel themes stop emerging from the data and additional observations provide no new information.

To determine whether systematic differences existed across responses, we assessed the frequency with which individuals from different subgroups discussed each theme, and we also qualitatively compared the passages on each theme after grouping by these characteristics. For example, using tools such as Excel (Microsoft Corporation, Redmond, Washington) and NVivo, we sorted and highlighted quotes associated with each theme as male or female, determined the number of quotes per male and per female, and then reexamined them to determine whether there were any notable or systematic differences in response. Depending on the theme and the questions that we wished to explore, we repeated this process for a number of other subgroups (i.e., race/ethnicity, those still in academia versus those who had left, those who held an MD versus those who held an MD/PhD or PhD, senior faculty versus junior faculty).

Results

Of the 500 or so K awardees to whom we sent e-mails, 100 (about 20%) responded (see also DeCastro et al[24] and Sambuco et al[25]). All responses were from individuals accepting our invitation; we did not receive any responses explicitly declining participation in the study. Of these 100 respondents, 69 gave us the contact information of at least one of their academic mentors. We attempted to contact all 69, and 28 of those whom we invited accepted. Of the 128 participants, 54 were members of matched mentor–mentee pairs. The demographic and other characteristics of all 128 participants are detailed in Supplemental Digital Tables 1 and 2, http://links.lww.com/ACADMED/A121.

The average interview spanned 52 minutes. The final analytic dataset consisted of 513,730 words (1,108 single-spaced pages), not including interview questions. We expected some of the codes that emerged, and some developed de novo.

Six major thematic clusters emerged from our qualitative analysis, one of which related to mentoring. (The others were rejection and resilience[24]; negotiation and resources[25]; unequal treatment, conflict, and discrimination; time and balance; and, finally, goals and aspirations.) Mentoring was specifically discussed by all 128 interviewees (100 award recipients and 28 mentors). In this article, we report the results that pertain to three themes within the mentoring cluster: (1) the numerous roles and behaviors associated with mentoring in academic medicine, (2) the improbability of finding a single person who can fulfill all the diverse mentoring needs of another individual, and (3) the importance and composition of mentoring networks.

The roles and behaviors associated with mentoring in academic medicine

Our respondents' descriptions of mentoring in academic medicine included the mention of numerous activities and responsibilities. K award recipients and their mentors observed the following mentoring roles and behaviors: (1) teaching scientific knowledge and encouraging critical thinking, (2) cultivating skills such as negotiation, grant writing, research design, data analysis, manuscript writing, and publishing, (3) assisting with obtaining jobs and choosing a career path, (4) providing opportunities for networking, and (5) giving encouragement and personal advice. To illustrate, two mentors enumerate the many and various kinds of assistance they provided for their mentees:

> [I] helped people get jobs; helped people publish papers; helped people figure out that the academic life wasn't for them; helped people figure out the academic life was for them; helped people sort out the difference between true effect and confounding … helped people [with everything from minor tasks like] how to format a table [all the way] up to [major issues like] trying to decide if they can cure cancer … the whole spectrum of what people struggle with as they're trying to become investigators. (Male, Mentor)

> Certainly I've instructed [protégés] in how to think … about clinical research problems … think critically…. I help with writing, I turn into a copy editor … help write the K awards, write the grants, write the papers … help with stats … research design … then you get into how to negotiate your way in an academic environment, and even how to grow up a little bit, occasionally people will get a little more personal…. So pretty much the whole gamut of things. (Male, Mentor)

An individual mentor might engage in many different mentoring roles or behaviors depending on his or her relationship to each protégé, as described by one respondent:

> I mentor many, many people…. I have all sorts of different mentoring relationships…. [L]ike people at other institutions … for those people I tend to provide strategic career advice … try to provide them with opportunities…. [Then] there are the people [whom] I help with writing manuscripts … then there are people I help [with] writing grants…. Currently I'm helping … four or five people with that…. I mean, there are different functions. (Female, Mentor)

One mentor provided a particularly vivid description concerning the multiplicity of mentoring.

> [I]t's a poorly defined relationship—well, it's been defined but variously defined…. One of the best examples that I think of a mentor is this sort of Indian icon called a Ganesha, from India, a Hindu icon … a figure that has the head of an elephant

> with a trunk and multiple arms and little pot belly and it's supposed to represent sort of someone who removes barriers and opens pathways … my notion of what an ideal mentor is and what the relationship is. (Female, Mentor)

Correspondingly, K award recipients attributed multiple behavioral functions to what they perceived as the ideal mentor and generally did not view the mentoring role as being simply one-dimensional.

> I think the mentor has to recognize explicitly what the role of mentor is … there are multiple facets. (Male, K awardee)

> [S]even things that a mentor is supposed to be … trusted counselor, exemplar, host, role model, confidante or friend, and maybe teacher … you help [protégés] make professional contacts … position them to get certain appointments … counsel them both in their professional and personal lives … that is my idea of what mentoring should be. (Female K awardee)

Thus, participants were relatively consistent in their perceptions of the multiple responsibilities and diverse functions that mentors ideally perform.

"You just can't do everything": The improbability of finding a single person who can fulfill the diverse mentoring needs of another individual

In general, participants recognized that the likelihood of identifying a single person who can perform all the duties and possess all the characteristics expected of a good mentor is small.

> [T]here's no way that a mentor can be all things to all people and some mentors are good for just one thing. [S]ome mentors, very few of them, have the whole package: that nice person, professional relationship, [who] does funding and manuscripts and … can help you negotiate your system. There are very few of those. (Female, K awardee)

K award recipients at times referred to mentors who were helpful in some areas but inadequate in others.

> I feel that [my mentor] was very good at providing a good environment to work in, and so there was a lot of activity happening in the lab; a lot of things were getting done. In terms of actual career mentorship, I got essentially zero input from him. He was a little overextended; there were 30 people in the lab. (Male, K awardee)

> [My mentor] was certainly there in terms of [suggesting], "Oh, you need to achieve this and that to get here," but really in some circumstances was quite negative in providing the actual support to get there. (Male, K awardee)

> [E]ven though [my mentor] helped me a lot with the technicalities of grant writing [and research] … the one thing I felt like I was really lacking … from him [was] those connections, the networking, the collaborations. He just really didn't do that for me. He didn't introduce me to the people I need to meet. (Female, K awardee)

Notably, one K award recipient observed that senior faculty in academic medicine also play a multitude of other roles outside of mentoring that can sometimes detract from their mentoring activities:

> I haven't seen that many people who actually can combine a successful research career with a clinician career and be a warm, accepting, good-quality mentor. I've seen people who can get the grants, can continue seeing patients, but they usually aren't very available for mentees. (Male, K awardee)

One mentor admitted that at times he could not handle mentoring on top of all of his other professional and personal obligations. He concurred that this likely affected his ability to be a good mentor:

> I believe in my past I have been a good mentor…. I think where I was deficient came in the last decade…. I was section chief and I basically got pretty inundated with administrative work…. I allowed my lab to grow to 20 people … and that proved to really be too much…. I ended up being a pretty crummy everything, from section chief to mentor to scientist to father … you just can't do everything…. I'm positive, dead positive that I was not as good a mentor as I should have been. (Male, Mentor)

Hence, participants' responses suggest the improbability of finding a single person who can fulfill the diverse mentoring needs of another individual, especially because faculty mentors usually assume numerous roles and take on multiple obligations besides those related to mentoring.

The importance and composition of mentor networks

Related to the idea that no one individual can fulfill all the mentoring needs of a protégé is the idea that each protégé could or should develop a "network of mentors." We identified six subthemes related to the concept of building a network of mentors: (1) the recognition that protégés often receive help from multiple mentors with varying skill sets and areas of expertise, (2) the notion that protégés should identity their unique needs and actively seek out a more personalized and comprehensive mentoring portfolio, (3) the benefits of a mentor network in safeguarding against inadequate mentoring, (4) the need for peer mentors, (5) the influence of gender and the desirability of including at least one woman in a mentor network for a female protégé, and (6) the recognition that as mentoring needs change over time, so might the composition of the network.

"Everybody knows different things." A number of K award recipients described a type of mentoring arrangement in which a protégé receives help from multiple mentors. Some provided in-depth accounts, identifying each different mentor's strengths and recognizing, in particular, the value of using each mentor for help primarily in his or her own area of expertise. Indeed, one female K award recipient pointed out that she had many mentors, each of whom provided targeted assistance:

> I've had mentors who have fixed grants for me before they went out so that they got funded; fixed papers that got accepted. I've had mentors who suggested that I get myself on a certain committee…. I've had mentors who have taught me how to plan out a grant and taught me how to give a presentation and a mentor who taught me how to deal with conflict in the work place, and mentors who have opened doors for me with other investigators around the country, given me funding to do what I needed to do (Female, K awardee)

She highlighted the reality that "Everybody knows different things." Other participants also cited the benefits of capitalizing on each of many mentors' strengths:

> Some [mentors] are better at … navigating federal funding, some are better at navigating national organizations, some are just good for work–life balance or knowing about other courses to take to improve my skills and so I just kind of rely on them for these different aspects. (Female, K awardee)

> I have some mentors who are very strong in science who really understand the subject matter of the area that I'm

> working in…. I have mentors who I call politicians. They sort of know how to network…. I no longer rely on a single person for a mentor. (Female, K awardee)

> One mentor might help you … with your retention, promotion, and tenure process … another mentor [may be] more helpful in your day-to-day: in seeing patients and doing surgery, and another mentor [may be] helpful in your research interests … usually you have two or three people [whom] you need. (Male K awardee)

Some participants used the term "portfolio" to describe the practice of collecting different mentors. Others used terms such as "community," "multiple perspectives," or "team" to further indicate that, rather than a single individual, a *group* of mentors can benefit the protégé.

Actively seeking mentors. A number of K award recipients advocated identifying their own unique needs and then actively seeking out multiple individuals to form a more personalized and comprehensive mentoring team. One male K awardee noted, "I played a pretty active role in looking for mentorship," and another female awardee commented,

> You have to do a lot of seeking it out yourself … you have to figure out what you need and you have to go after it.

K award recipients generally recommended that protégés should consider factors such as similar interests, skill sets, personality, common background, style, and chemistry when searching for potential mentors. For example, one male K award participant advised, "[R]eally carefully evaluate the fit to be sure that the mentor is offering the things that you really need and that you will be a good match." Of note, one female K award recipient pointed out that, even when specifically looking, some minorities and women may have difficulty finding mentors of similar race or gender who can act as role models:

> I think women and minorities may not always have the same access to mentors just because … if they are looking for somebody [who's of] similar race or similar gender, you know, they may not be able to necessarily find role models. (Female, K awardee)

Although K awardees were generally more likely to discuss the topic, one mentor also specifically commented that protégés should take responsibility for finding helpful mentors:

> Find the people [who] help you … realize that you don't sit and wait for somebody to come and find you. (Female, Mentor)

Another mentor raised the issue of communication across a team of mentors, specifically pointing out that protégés should seek out a group of mentors who can work well together in terms of style and personality.

> I think mentoring is an interpersonal interaction and there are certain personalities that support each other … there are others [who] just don't work that well together for whatever reason, different styles, different personalities. And so, part of it is finding the right fit of a mentor and the people on that committee or that group [who] are going to be your support … you want to be sure that committee works together well. (Male, Mentor)

Safeguarding against inadequate mentoring. Some K award recipients who noted the improbability of finding a single person to represent every aspect of mentoring also perceived the benefits of having several different mentors.

> I think we always wish we had that one person who could be all of those things but they're not, so I utilize people in different ways. (Female, K awardee)

> Many people can serve many different mentoring roles; not one person can fit it all—fit every need. (Female, K awardee)

Other K award recipients discussed the need to obtain additional help from others when receiving inadequate support from primary mentors.

> My mentor wasn't giving me enough … help with the data, with the science … big picture strategy advice … there were people [who] were around [whom] maybe I could have at least gotten that kind of advice from, but I didn't quite get that…. I kind of thought of it as you had "a" mentor. I didn't quite get the "you should have many" mentors. (Male K awardee)

> When there were holes, and I saw them, and I wasn't getting what I needed from my own mentor … or I needed something more, I would go to these other people I would find who were usually in the realm. (Female, K awardee)

Some also recognized that ancillary mentors do not necessarily need to be people from within their own institution.

> I made a decision when I wasn't getting adequate mentorship … to develop some outside resources…. I tried to look outside of my institution to get different types of mentorship from different people. (Female, K awardee)

> [P]eople who are at other institutions have been helpful … my gut feeling is that they kind of encourage me to do what's best for me rather than having any issues with … how it's going to look from their standpoint. (Female, K awardee)

"Horizontal mentorship." Some K award recipients recognized the help that they had received from peers and junior colleagues in contrast to the more traditional type of mentoring support received from senior mentors. In general, these accounts referenced interactions based on mutual support, sharing, learning, and collaboration.

> I think being able to learn from colleagues at the same stage is something we haven't talked about … they are critical for helping me develop and achieve my goals at this stage … in often helping me think about things in a different way or learn from work that they have underway so that I don't replicate it…. I have colleagues [who] are good collaborators for multicenter studies and, through those peer-level relationships, I think there's a high degree of accountability to one another and that helps all parties involved move forward more reliably with their scientific goals whether they [are] writing a paper or getting a grant application done. (Male, K awardee)

One male participant acknowledged the benefits of these peer relationships but still perceived a distinction between peers and mentors.

> Peers are people who are at your same level, and mentors are people who are three steps ahead of you…. Peers are good for moral support and for collaborations … whereas mentors are more helpful in terms of career advice. (Male, K awardee)

In contrast, several female K award recipients either referred to their peers and junior colleagues as "mentors" or specifically used the term "peer mentor."

> I've had some really extraordinary mentors…. And, surprisingly, they weren't people who were all that senior; they were a bit more on the junior side. (Female, K awardee)

> It was not only the people above me [who] made me better … it was the people alongside me. My peer mentors

made me better … they shared ideas. I could share ideas with them; I could share emotional ups and downs; winning, losing…. I watched them do things and I was like, "I can do that" … lateral support is key…. We talk a lot about the vertical mentorship and there's a lot of horizontal mentorship that is very important. (Female, K awardee)

"Women sometimes need to talk to women." A number of female K award recipients discussed the idea that women could benefit from having at least one female influence in their portfolio of mentors. For example, one participant commented:

I do think women mentors are really important…. I think it's very important to have women just because I think it's important for women to see other women who have been successful…. I think it's nice to have at least one woman who's a good mentor. (Female, K awardee)

Another female K award recipient noted simply, but clearly, "[W]omen sometimes need to talk to women."

Besides generally acknowledging the need for female mentors and role models, female participants felt that women could provide guidance on specific issues such as workplace communication in a male-dominated environment, boundary setting, negotiation, and managing the demands of career and family life.

I think that probably women and men see mentorship in slightly different ways and it could be that women might consider having more than one mentor and I consider … having a woman mentor who just kind of talks about … the workplace issues of communication … it's something to consider as a woman in academics. Is it a good thing to have another woman you can talk with about communication issues and trying to move ahead? I think that's probably, for most women, something that would be helpful. (Female, K awardee)

I [had] very good female mentorship and role modeling during my fellowship and very successful women in science … who said women have to learn how to say "no" … a couple of women, actually, who really taught us about negotiating—even asking for raises, that men tend to have higher salaries, in part, because they ask and we don't ask. (Female, K awardee)

I started looking around for career mentors…. I wanted a senior woman who had a very successful career but also raised a family…. I continue to seek out those opportunities where I can meet with especially women who have navigated the waters and look to them for guidance and advice. (Female K awardee)

Lastly, one female K award recipient commented extensively on the lateral support that she received from female peers and colleagues.

You also take responsibility for your peer colleagues in terms of emotionally supporting them when they are [setting boundaries] and they feel bad about it…. I think it happens in women more frequently than men…. I came into this job I'm in with five other female faculty … we were all junior together … we were able to not only share what we were going through, but to share it through a lens of … day-to-day experiences that was common and that was helpful…. I have surrounded myself with peers … female colleagues at my level who do think to help another colleague…. Maybe she can use my research assistant…. Oh, I have a license for that computer if you need to use the program, go right ahead; little bits of sharing like "it takes a village" mentality. That type of day-to-day working together, I think has been crucial for me. (Female K awardee)

Recognizing changes over time. Some K award recipients, particularly from earlier cohorts, perceived reductions in their direct, ongoing interactions with senior mentors as they transitioned from being junior investigators to becoming more independent.

I have to say when you get to be midcareer, like me, you don't have as many mentors to help you. So I sort of feel like since I [have come] to this institution, I kind of have used all the advice and information I got as a junior faculty to try to propel myself forward. I don't really have any senior mentors [who] I really feel looked out for me here … that's the hard part about being in the middle. (Female, K awardee)

[Mentor] was my fellowship advisor and then my K award advisor and now my faculty advisor … our relationship has changed over the years … he was around a lot and we had a lot of ongoing day-to-day contact, whereas now … there is just days that go by that I don't see him or don't have a lot of input…. I used to just be able to walk by his office and stop in and chat, and now I need to make meetings…. So, the mentoring probably isn't as strong as what it was during my K award. (Female, K awardee)

Others recognized that as their mentoring needs changed over time because of progress in their careers, so, too, should their portfolios of mentors evolve and grow to remain effective.

As a mentee, my needs certainly have changed over the last 10 years. I've needed less input on manuscripts and grant applications…. I've wanted more mentorship … on general leadership skills development and growing a research infrastructure…. In my roles, I've transitioned and those sorts of things I need from those senior to me have certainly changed as well … as I grew, I found the people who I might have engaged as mentors early in my career weren't necessarily the best people to continue serving as primary mentors. (Male, K awardee)

Notably, a number of K award recipients discussed the influence of peer mentorship and collaboration when progressing toward the more advanced stages of their careers. Some described moving toward more collaborative relationships with their original mentors after becoming more independent.

[Mentor] and I are still in contact and, you know, may hopefully collaborate on papers, if not some grants in the future…. I've been able to maintain a relationship with and … go from a mentor/mentee relationship to more of a—one of colleagues. (Female, K awardee)

[Mentor] has 25 years more experience than I do so we'll never be on the same level but it's definitely changed to more, at times, a collaborative work. (Female, K awardee)

Others recounted that they had established new relationships with peers and junior colleagues based on collaboration and the sharing of knowledge.

In the early stage of my career…. I had a number of senior people who were really advising and consulting and strategizing and cheerleading … more recently I have a peer who I consider in many ways a mentor … who has played a critical role in helping my own science become more translational…. So I think as my career has matured, it sometimes takes a different form … that's much less formalized than, for example, my K award mentors. (Female, K awardee)

There is a particular person I've been working with lately … she's younger than I am … but she definitely has some skill sets that I don't have…. I think, that sort of interaction is really important. (Female, K awardee)

Thus, participants' responses suggest that a reduction in direct, ongoing interaction with senior mentors may mark the transition from junior to independent investigator, and engaging in collaboration, particularly with peers and colleagues, may be an important next step in that transition.

In sum, participants provided vivid descriptions of the ways they had responded to the limitations of traditional dyadic mentoring relationships and of how they had proactively assembled networks of mentors and peers whose characteristics served their specific and evolving needs. Except as noted above, we did not find systematic differences in responses by gender, race/ethnicity, or career status in this sample.

Discussion

Through qualitative research, we found that NIH career development (K) award recipients and their mentors believed that good mentorship involves multiple roles, skills, and characteristics, similar to those previously described in the literature.[1–8] Numerous K award recipients in this study noted that identifying a single mentor who could fulfill all of their mentoring needs was difficult, and some described how their own mentors had provided insufficient mentoring in certain ways. Our study participants observed that some characteristics of good mentors—such as being available and being prominent; possessing networking skills and possessing research skills—are unlikely to coexist in a single individual. Thus, a key insight that this study affords is the importance of building mentoring networks tailored to each junior faculty member's unique career trajectory and needs rather than relying on the more traditional conception of mentoring as a dyadic relationship with a single, more senior faculty member.

Our participants offered numerous insights regarding the need for what they described as a mentoring community, team, or portfolio. According to several participants, this type of mentoring system consists of not simply multiple individuals but, specifically, mentors whose areas of expertise, academic rank, and gender vary. Our participants indicated that the formation and evolution of a mentoring network seems best based on the protégé's individual needs and preferences.

These findings—along with the observation that faculty are traveling an increasingly complex and ever-changing career path that necessitates a more diverse set of guiding pespectives[30]—suggest the need for an alternative conceptualization of mentoring in academic medicine and are consistent with prior claims developed primarily in the fields of management and organizational behavior. In those fields, mentoring is more often viewed as a series of many relationships, all of which help the protégé grow and evolve.[30–35] In their seminal theoretical work, Higgins and Kram[32] proposed a reconceptualization of mentoring based on social networks theory and introduced the concept of the developmental network. They championed a theoretical readiness for alternative forms of mentoring based on the notion that protégés can receive mentoring from multiple developmental relationships. Similarly, De Janasz and colleagues[35] discussed at length the concept of "building an intelligent mentoring network." They suggested that protégés should learn from different types of mentors based on the competencies that they wish to build. They recommended a "360-degree" approach to mentoring; that is, protégés should seek out multiple mentors representing different career stages and status levels. Moreover, they pointed out that protégés should continuously examine and restructure their mentoring networks over time as they achieve and revise their professional goals.[35]

Notably, several of our participants discussed the support that they had received from peers and colleagues who were of similar or lesser professional status. Kram and Isabella[36] conducted an exploratory interview study that led them to characterize peer relationships as a unique form of developmental support. Our findings align with their analysis, which showed that peers provide emotional support and friendship as well as personal and job-related feedback. Of note, Kram and Isabella—like one of our male K award recipients—emphasized a distinction between peers and mentors, citing differences related to age, hierarchical status, and the direction of the exchange. Alternatively, McDougall and Beattie[37] proposed the concept of the "peer mentor." Results of their research indicate that peer mentoring may produce a number of benefits, such as friendship, networking, and stress management. McDougall and Beattie observed that protégés may feel inhibited with their hierarchical mentors or more comfortable discussing personal or professional issues with their peer mentors. They conclude that peer mentoring is generally a two-way process based on sharing and mutual learning.[37] Our findings are consistent with those of McDougall and Beattie: Some of our participants explicitly used the term "peer mentor." Further, even those who did not readily acknowledge the concept of peer mentoring tended to describe their relationships with peers and same-status colleagues in terms of reciprocal support, sharing, learning, and collaboration.

Another key finding of the current study is that many women academics believe in the benefits of having more than one mentor, and particularly at least one female mentor, in their mentor networks. Indeed, the hierarchical structure of the traditional mentoring model may serve to perpetuate homogeneity and the continued marginalization of women faculty members.[12,15] Gender differences in communication and language styles may make cross-gender mentoring relationships more challenging.[38] Moreover, gender differences in socialization may also lead women to benefit more from mentoring relationships that emphasize support and collaboration rather than independence and competition.[39] Our findings suggest that a network of multiple mentors, including peers and women, may mitigate the challenges related to gender in mentoring. According to some female participants, female mentors can serve specifically as role models of success for their junior counterparts in areas such as workplace communication, boundary setting, negotiation, and work–life balance. Given the relative underrepresentation of women in senior positions in academic medicine, a model of mentoring networks may also be an efficient means by which the larger population of junior female faculty members may reap the benefits of having a same-sex mentor without relying on that individual for all their needs. In addition, interaction with female peers and same-status colleagues may be especially beneficial in that these women can share

mutual experiences and resources as well as provide emotional support.

Strengths of the study include its large, rich set of narrative data and its adherence to sound qualitative research methods, including well-reasoned participant selection (i.e., purposive sampling), appropriate and thorough data collection (i.e., multiple interviewers from diverse professional and demographic backgrounds; data collection until thematic saturation), and a robust analytic approach (i.e., triangulation of the data among researchers trained in social sciences and qualitative methods and iterative examination of the data).[26,27] A limitation inherent to any qualitative approach is the sacrifice of some degree of breadth for depth; however, both our sample size (128 participants) and the quantity of our data were substantial.[40] Further, our use of purposive sampling and the fact that we collected data until we achieved thematic saturation should alleviate concerns related to breadth. Of note, we did limit our focus to individuals who had received (or mentored) prestigious NIH K awards, and therefore our results may not be generalizable to those who have a different set of capabilities or a different career focus. Nevertheless, we believe that the insights regarding mentoring that emerged have substantial face validity and seem applicable to faculty seeking careers in academic medicine more generally (see also DeCastro et al[24] and Sambuco et al[25]).

Conclusions

In sum, the findings of the current work suggest that mentoring networks, rather than mentoring dyads, are critically important in career development. We believe, therefore, that this model should be applied more generally within academic medicine. Members of the academic medicine community have previously promoted unconventional approaches to mentoring (e.g., collaborative, peer, multilevel) in response both to a shortage of available traditional mentors[17] and to the challenges experienced by underrepresented minority[20] and female faculty.[21] Our findings suggest that the need for alternatives to the traditional dyadic, hierarchical mentoring relationship may be generally beneficial for all junior faculty. Interventions are necessary to promote this reconceptualization of mentoring, and future research should specifically investigate the impact of such interventions or of different types of programs on protégés, mentors, and careers. Future research may also be valuable in evaluating the impact of formal mentor training programs in promoting the development of high-quality, smoothly functioning mentoring networks.

The K award program already encourages applicants to designate more than one mentor when doing so "is deemed advantageous for providing expert advice in all aspects of the research career development program."[41,42] Our findings suggest that those reviewing career development awards should presume that a network of mentors is indeed advantageous. Moreover, department chairs and division chiefs should promote the development of mentoring networks rather than focusing on identifying a single mentor for each junior faculty member they recruit. The multiple members of each faculty member's mentoring network should be carefully selected based on the protégé's individual needs and preferences, with special attention toward ensuring diversity in terms of expertise, academic rank, and gender. Our findings suggest that such an approach is likely to help build an environment conducive to success in the challenging and multifaceted careers of clinician–researchers, particularly women, in academic medicine.

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References

1 Sambunjak D, Straus SE, Marusic A. A systematic review of qualitative research on the meaning and characteristics of mentoring in academic medicine. J Gen Intern Med. 2010;25:72–78.
2 Straus SE, Chatur F, Taylor M. Issues in the mentor–mentee relationship in academic medicine: A qualitative study. Acad Med. 2009;84:135–139.
3 Jackson VA, Palepu A, Szalacha L, Caswell C, Carr PL, Inui T. "Having the right chemistry": A qualitative study of mentoring in academic medicine. Acad Med. 2003;78:328–334.
4 Aagaard EM, Hauer KE. A cross-sectional descriptive study of mentoring relationships formed by medical students. J Gen Intern Med. 2003;18:298–302.
5 Cho CS, Ramanan RA, Feldman MD. Defining the ideal qualities of mentorship: A qualitative analysis of the characteristics of outstanding mentors. Am J Med. 2011;124:453–458.
6 Leslie K, Lingard L, Whyte S. Junior faculty experiences with informal mentoring. Med Teach. 2005;27:693–698.
7 Williams LL, Levine JB, Malhotra S, Holtzheimer P. The good-enough mentoring relationship. Acad Psychiatry. 2004;28:111–115.
8 Sambunjak D, Straus SE, Marusić A. Mentoring in academic medicine: A systematic review. JAMA. 2006;296:1103–1115.
9 Lowenstein SR, Fernandez G, Crane LA. Medical school faculty discontent: Prevalence and predictors of intent to leave academic careers. BMC Med Educ. 2007;7:37.
10 Sambunjak D, Marusić A. Mentoring: What's in a name? JAMA. 2009;302:2591–2592.
11 Pololi L, Knight S. Mentoring faculty in academic medicine. A new paradigm? J Gen Intern Med. 2005;20:866–870.
12 Angelique H, Kyle K, Taylor E. Mentors and muses: New strategies for academic success. Innov Higher Educ. 2002;26:195–209.
13 Chesler NC, Chesler MA. Gender-informed mentoring strategies for women engineering scholars: On establishing a caring community. J Eng Educ. 2002;91:49–55.
14 Darwin A, Palmer E. Mentoring circles in higher education. Higher Educ Res Dev. 2009;28:125–136.

15 Driscoll LG, Parkes KA, Tilley-Lubbs GA, Brill JM, Pitts Bannister VR. Navigating the lonely sea: Peer mentoring and collaboration among aspiring women scholars. Mentoring Tutoring Partnership Learn. 2009;17:5–21.
16 Jacelon CS, Zucker DM, Staccarini JM, Henneman EA. Peer mentoring for tenure-track faculty. J Prof Nurs. 2003;19:335–338.
17 Bussey-Jones J, Bernstein L, Higgins S, et al. Repaving the road to academic success: The IMeRGE approach to peer mentoring. Acad Med. 2006;81:674–679.
18 Mayer AP, Files JA, Ko MG, Blair JE. The academic quilting bee. J Gen Intern Med. 2009;24:427–429.
19 Moss J, Teshima J, Leszcz M. Peer group mentoring of junior faculty. Acad Psychiatry. 2008;32:230–235.
20 Lewellen-Williams C, Johnson VA, Deloney LA, Thomas BR, Goyol A, Henry-Tillman R. The POD: A new model for mentoring underrepresented minority faculty. Acad Med. 2006;81:275–279.
21 Files JA, Blair JE, Mayer AP, Ko MG. Facilitated peer mentorship: A pilot program for academic advancement of female medical faculty. J Womens Health (Larchmt). 2008;17:1009–1015.
22 Pololi LH, Knight SM, Dennis K, Frankel RM. Helping medical school faculty realize their dreams: An innovative, collaborative mentoring program. Acad Med. 2002;77: 377–384.
23 Koopman RJ, Thiedke CC. Views of family medicine department chairs about mentoring junior faculty. Med Teach. 2005;27:734–737.
24 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.
25 Sambuco D, Dabrowska A, DeCastro R, Stewart A, Ubel PA, Jagsi R. Negotiation in academic medicine: Narratives of faculty researchers and their mentors. Acad Med. 2013;88:505–511.
26 Giacomini MK, Cook DJ. Users' guides to the medical literature: XXIII. Qualitative research in health care A. Are the results of the study valid? Evidence-Based Medicine Working Group. JAMA. 2000;284:357–362.
27 Giacomini MK, Cook DJ. Users' guides to the medical literature: XXIII. Qualitative research in health care B. What are the results and how do they help me care for my patients? Evidence-Based Medicine Working Group. JAMA. 2000;284:478–482.
28 National Institutes of Health Research Portfolio Online Reporting Tools (RePORT). Reports, data, and analyses of NIH research activities. http://projectreporter.nih.gov/reporter.cfm. Accessed December 13, 2012.
29 Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3:77–101.
30 De Janasz SC, Sullivan SE. Multiple mentoring in academe: Developing the professional network. J Vocat Behav. 2004;64:263–283.
31 Molloy JC. Development networks: Literature review and future research. Career Dev Int. 2005;10:536–547.
32 Higgins MC, Kram KE. Reconceptualizing mentoring at work: A developmental network perspective. Acad Manage Rev. 2001;26:264–288.
33 Higgins MC. The more, the merrier? Multiple developmental relationships and work satisfaction. J Manag Dev. 2000;19:277–296.
34 Higgins MC, Thomas DA. Constellations and careers: Toward understanding the effects of multiple developmental relationships. J Organ Behav. 2001;22:223–247.
35 De Janasz SC, Sullivan SE, Whiting V. Mentor networks and career success: Lessons for turbulent times. Acad Manag Exec. 2003;17:78–91.
36 Kram KE, Isabella LA. Mentoring alternatives: The role of peer relationships in career development. Acad Manage J. 1985;28:110–132.
37 McDougall M, Beattie RS. Peer mentoring at work: The nature and outcomes of nonhierarchical developmental relationships. Manag Learn. 1997;28:423–437.
38 Robinson JD, Cannon DL. Mentoring in the academic medical setting: The gender gap. J Clin Psychol Med Settings. 2005;12:265–270.
39 Mayer AP, Files JA, Ko MG, Blair JE. Academic advancement of women in medicine: Do socialized gender differences have a role in mentoring? Mayo Clin Proc. 2008;83:204–207.
40 Yamazaki H, Slingsby BT, Takahashi M, Hayashi Y, Sugimori H, Nakayama T. Characteristics of qualitative studies in influential journals of general medicine: A critical review. Biosci Trends. 2009;3:202–209.
41 National Institutes of Health. Mentored clinical scientist research career development award (parent K08) funding announcement. http://grants1.nih.gov/grants/guide/pa-files/PA-11-193.html. Accessed December 21, 2012.
42 National Institutes of Health. Mentored patient-oriented research career development award (parent K23) funding announcement. http://grants1.nih.gov/grants/guide/pa-files/PA-11-194.html. Accessed December 21, 2012.