Factors Associated With Successful Research Departments:

A Qualitative Analysis of Family Medicine Research Bright Spots

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BACKGROUND AND OBJECTIVES: Inadequate resources have led to family medicine research divisions at varying stages of development. The purpose of this analysis was to identify the factors that family medicine research "bright spot" departments perceive to be crucial to their success.

METHODS: In this qualitative analysis, we identified bright spot dimensions and used a snowball sampling approach to identify medical school-based departments considered to be research bright spots. With 16 leaders from eight departments, we conducted semistructured interviews, covering historical events, leadership, partnerships, mentors, faculty selection, and training. We recorded and transcribed interviews and used a template-driven approach to data analysis, iteratively defining and modifying codes. At least two reviewers independently coded each interview, and coding discrepancies were discussed until consensus was reached.

RESULTS: We identified the following themes: (1) Leadership was committed to research; (2) Research was built around teams of researchers; (3) Interdisciplinary teams facilitated by partnerships allowed the department to tackle complex problems; (4) The convergence of researchers and clinicians ensured that the research was relevant to family medicine; (5) Departments had cultures that engendered trust, leading to effective collaboration; (6) These teams were composed of intrinsically motivated individuals supported by mentorship and resources; (7) When deciding which questions to pursue, departments balanced the question's alignment with the individual researcher's passion, relevance to family medicine, and fundability.

CONCLUSIONS: A commitment to research from an engaged chair, partnerships, integrating front-line clinicians, and supporting intrinsically motivated individuals were important for bright spots. Applying these concepts may be an important strategy for generating knowledge.

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The family medicine research enterprise suffers from a gap between the haves and the have-nots.[1-3] According to an Association of Departments of Family Medicine (ADFM) survey, 43% of departments had no or minimal research capacity compared to 22% with significant or extensive capacity. This disparity is reflected in National Institutes of Health (NIH) funding for family medicine, which is simultaneously small and concentrated at three departments.[4,5] Participation in NIH Clinical Translational Science Awards (CTSAs) has been similarly inconsistent, even though family medicine research aligns with the program's focus on community engagement and practice-based research. While family medicine faculty held leadership positions in a third of CTSAs, a majority of departments were not involved either because their institution lacked a CTSA or the department lacked expertise.[6,7]

The barriers to enhanced research in family medicine are numerous. Brocato and Mavis found that 80% of family medicine faculty spend a half day or less on research and, on

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average, published less than once per year.[8] Others have cited inadequate infrastructure, the high cost of launching investigators, weak culture, insufficient funding, and scarce research training across residents, fellows, and faculty.[9-11] Two recent initiatives have been launched to address these barriers. The Building Research Capacity program—an initiative between the ADFM and the North American Primary Care Research Group (NAPCRG)—provides capacity building assistance to all family medicine departments and residency programs.[1] Similarly, the Family Medicine for America's Health (FMAHealth) Research Tactic Team aimed to galvanize the research community.[12]

Scholars have sought to identify characteristics and develop models that describe productive research organizations. Using surveys and interviews of faculty at the University of Minnesota, Carole Bland developed a model built on individual, institutional, and leadership characteristics.[13,14] This research describes the "integration and interplay" of individual and institutional features with a synthesis that is dependent on effective leaders.[14] Bland writes about individuals with passion who have been aided by formal mentoring and protected time. At the institutional level, productivity was facilitated by a safe culture built to test new ideas, a high degree of cooperation, and a vibrant network of colleagues. An ADFM project capturing lessons from successful family medicine departments identified similar themes and concluded that chair leadership, chair investment, team development, and network opportunities were critical for productive departments.[11] Our objective was to determine the extent to which the Bland model applied to family medicine and identify the factors that family medicine research bright spots perceive to be crucial to their success with the hope that these lessons can be applied across the discipline to stimulate research activity.

Methods

In this qualitative analysis, we conducted 30-minute, semistructured interviews with leaders at family medicine research bright spots. To define bright spots, we consulted content experts, including department chairs, the FMAHealth Research Tactic Team, the Robert Graham Center Research Team, the American Board of Family Medicine Research Team, the Society of Teachers of Family Medicine's Research Committee, the NAPCRG Research Advocacy Committee, and the ADFM Research Development Committee. Based on their input, we identified dimensions of family medicine research bright spots, which experts described as having high impact (outside of family medicine, in the popular press, or changes policy) and conducting research that is aligned with family medicine principles. These bright spots have high productivity or high and sustained grant funding with a diversity of funding streams and researchers. They draw from a robust network of partners, including practice-based research networks. They are exemplars in training researchers, mentoring productive faculty for their own departments and the discipline as a whole. Experts also described idea bright spots that have seeded the discipline with important methods or ideas and genealogical bright spots, which were historically important for the discipline.

Data Sources

Starting from these experts and applying the above dimensions, we used snowball sampling to identify medical school-based departments they considered bright spots and interviewed two key informants (typically a current or former chair and a research director) from eight departments (Table 1). These interviews were recorded and transcribed. We used questions adapted from Carol Bland's work, *The Research-Productive Department*, specifically asking about historical events, leadership, partnerships, mentoring, faculty selection, and training.[13]

Analytic Plan

We used a template-driven approach to analysis. Using a priori hypotheses, we started with the three categories and codes (individual, institutional, and leadership) embedded within Bland's model. During the coding process, these codes were modified and refined in an iterative fashion, and emergent codes were added. All of the authors participated in the coding process and agreed on the codes and code definitions in the initial and final codebooks. At least two reviewers independently coded each interview, and coding discrepancies were discussed until consensus was reached. Themes arising from codes and subcodes were similarly reviewed by two reviewers with discrepancies discussed until consensus was reached.

The American Academy of Family Physicians Institutional Review Board approved this protocol.

Results

Interviewees discussed successful research endeavors at system, institutional, departmental, and individual levels, which sometimes overlapped or were interdependent. At the department level, participants reflected on the importance of peer-to-peer interactions, selection of personnel, funding, and clinical integration. Additionally, these leaders discussed concepts that spanned multiple levels, such as leadership, mentorship, investment, partnership, pipeline, and the extent to which the research aligned with family medicine.

Leadership

Our respondents identified department leadership as a factor critical to success. Specifically, bright spot departments had leaders that value research and committed resources to support it (Table 2 identifies codes

Table 1: Description of the Participating Family Medicine Research Bright Spots

	Number	Percentage
Departments	8	
Region		
Northeast	0	0.0
Midwest	4	50.0
South	1	12.5
West	3	37.5
Department Size		
Mean faculty per department	90	
≥101	2	25.0
51-100	5	62.5
0-50	1	12.5
National Institutes of Health (NIH) Funding		
Total NIH funding (2012-2017)	$83,464,140	
Mean NIH funding (2012-2017)	$13,910,707	
≥$10.1 million	4	50.0
$5.1-10 million	2	25.0
$0-5 million	2	25.0

Notes: The number of faculty was determined by summing the number of faculty (excluding adjunct, instructors, administrative staff, and visiting professors) on department websites. NIH funding from 2012 to 2017 for each department was calculated using NIH RePORTER (Research Portfolio Online Reporting Tools).

related to leadership and provides illustrative quotes). The chairs did not need to be researchers, but needed to understand the research process, potential sources of revenue, and infrastructure. They viewed challenges and crises within the department and institution as opportunities to conduct research. For example, one chair was asked by the institution to assume control over a failing network of primary care clinics; in addition to turning the clinics around financially, the department used the opportunity to study practice transformation. Bright spot chairs and research directors were proactive in cultivating partnerships and asking outside experts for technical assistance. While these leaders took action to support research, luck also played a role. Several acknowledged that they benefited from fortuitous circumstances, such as the chance relocation of researchers to their states and the hiring of young researchers who developed into highly productive scholars and in the process changed the trajectory of their departments and the specialty.

Teams

Bright spots understood the importance of teams to research success (Table 3 provides codes and illustrative quotes regarding the influence of teams), with respondents saying that members of teams have something "more together" than they do "separately" and that "research…is a team enterprise." Citing the complexity of problems addressed in primary care, multiple leaders said that researchers needed connections to other researchers, preferably those with different skills and research backgrounds. The most successful researchers had extensive networks of partners within the department, within the institution, and nationally. Individuals without connections tended to have greater difficulty remaining funded. These departments were strategic about developing partnerships and identified collaborators who "have things [the department doesn't] have." Specifically, these partners can provide funding for researchers, technical expertise, and access to patients. Several respondents discussed nontraditional partners, such as lawyers, designers, engineers, and journalists, with one chair declaring that "family medicine is going to succeed on the strength of its partnerships and the stranger the better." Ultimately, research success elevated the status of the department within the institution, with other departments viewing family medicine researchers as content and methods experts, seeking assistance with projects, and proposing new partnerships.

With respect to the balance between physicians and PhD researchers, there was not a consensus, with some lamenting the resources needed to train physicians to conduct research and others saying that PhDs lack frontline clinical experience. Similarly, there was disagreement about whether these teams should be built around department-level research foci, including chronic disease prevention and management, women's health, disability research, population health, mixed methods, and practice transformation. While some respondents indicated that having a focus facilitated collaboration and mentorship, others were more cautious, citing a failed department experiment decades ago that mandated a singular research focus.

To ensure that the research was relevant to family medicine, bright spots brought together researchers and clinicians (Table 3). Rather than just "getting on the funding hamster wheel," these departments were concerned about how the work informs the practice of family medicine. One leader indicated that the important job as the chair was "forcing the research and clinical faculty into small spaces and not letting them away from each other." Clinics were seen as critical "laboratories"

Table 2: Codes, Subcodes, and Quotes Related to Bright Spot Leadership

Code	Definition	Illustrative Quotes
Department leadership must be committed to research		
	Bright spots…	
Leadership/ commitment to research	Have leaders who value research and commit resources to support it	F2: "the biggest thing is that you have a chair that wants research to be part of our portfolio and that supports research and, uh, empowers us to both do research and find researchers and train new researchers and keep things going." E1: "I think it's pretty clear nationally, no matter what the medical school or medical center, research loses money. The question is how can you afford it?...the best practice nationally is Stanford and they lose 20% of the investment...Why do you do it? Because, um, this is how you both change care and change policy and, um, how you make a reputation for your department."
Institution/ opportunistic	Emerge where departments are opportunistic, translating crises into opportunities for research.	G1: " the university purchased a primary care network in the late 90's and proceeded to get into huge financial trouble with it. I was, at that point, department chair...and asked to take over the...leadership of the, uh, community clinic's group to restructure and then to business turnaround which we did, uh, as a clinical delivery system activity. And, as we did so, we had an opportunity, as we recovered financially, had an opportunity to begin opening new practices and doing so in a way that was intended to be future primary care delivery model. The language wasn't there yet but make this medical home, um, as a delivery system model to create a next-generation primary care practices. That, in turn, became a platform for us to do health services research. That happened because that was something that I was committed to doing on that clinical platform or laboratory. So it was a little more fortuitous in that we took advantage of that to begin our health services research program." H1: "our dean…said you have to publish one paper a year. This department was among many who said you're nuts, we can't do that. Well we can now but we had to spend two or three years building that capacity which we didn't have before."
Leadership/ vision	Have leadership that makes strategic decisions that are advantageous for research. They are proactive in generating research opportunities for their departments.	A1: "There's a lot of tension in my executive leadership team between they want to say '...why are you doing so much in the depression center? Why are you offering to staff the school of public health residency programs?' There's a lot of push-back from the kinds of things I do for others outside of our department. And the reason I do that stuff is because I want their partnership and I want them to owe me." H1: "I invited outside people to…help us re-define our research trajectory toward the regular NIH path…and not resting on training grants, and we're title VII… we spent most of our research staff time on complying with the requirements of title VII and not very much on producing the actual research. With that input, of outside we had three people come in...we learned a few things and we directed ourselves, with the dean's help, in the K award career path for NIH researchers, and actually had to hold back for about five years on the kind of support we could offer the average faculty member who taught and saw patients."
Leadership/ the role of luck	Have benefited from fortuitous hires and circumstances	F2: "we've had luck with recruiting people into our department, as well as grow our own." D2: "We've had a couple of really pivotal recruits: [a researcher] was one who, again, has just been an amazing researcher, an amazing mentor, touched many, many people, and has been just a huge influence on the discipline. So he was a major recruit. Another individual that we just happened to recruit was [another researcher] who really helped us bridge between primary care and genetic research. He has been a key person with our affiliation over at the [affiliated center]." A2:"I think that was another critical explanation for [our success was]...the fortuitous relocation of a guy [who] had helped found [a] family medicine residency. He relocated to [the city], uh, to work with...the employer community on developing health and wellness programs."

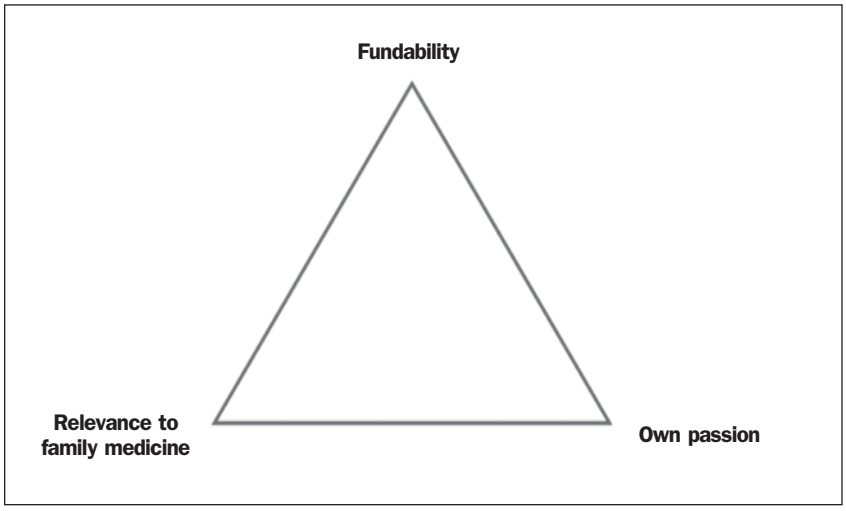
for innovations, and some reported that funding from clinics made the research possible. This interplay was important for the relevance of the questions pursued by researchers while simultaneously developing the research skills of the clinicians. Some departments were developing programs to tap into the scholarly potential of all faculty, though there is an inherent tension. While critically important, the questions developed by clinical faculty often need refinement, are not easily funded by external sources, and draw resources away from career researchers.

The tension among fundability, relevance to family medicine, and personal passion was discussed by several respondents (Figure 1). While many acknowledged the importance of a question's fundability for the sustainability of the research enterprise, several discussed that the defining questions for family medicine were "almost unfundable." An additional factor was the interests of junior researchers who were often trained to pursue fundable questions in areas related to their mentors' research. One respondent lamented that this approach may unintentionally suppress innovative, groundbreaking new ideas coming from younger researchers.

To be effective, respondents indicated that teams needed to meet a minimum size threshold and have quality peer interactions (Table 3). Given the team-based nature of research, multiple leaders said that having a critical mass was important. Similar to efforts to converge clinicians and researchers, bright spots sought to encourage interactions between researchers by physically locating them adjacent to one another, having opportunities for researchers to share their work, and creating organizational charts that encouraged collaboration.

Within this milieu, the department sought to actively build cultures that valued collaboration. Respondents mentioned that researchers that did not place value on "getting along" were less likely to be successful. The quality of interactions between team members was important because it allowed researchers to support, be held accountable to, and provide honest feedback to one another. Bright spots facilitated these interactions by building a foundation of trust. One department had retreats where researchers immersed themselves in work but also set aside time for members to "get to know each other" as people.

Figure 1: Factors Influencing the Prioritization of Research Questions That Teams Pursue



Identifying and Supporting Researchers

To compose these teams, bright spot departments identified passionate researchers and provided them with resources (Table 4). Bright spot leaders reported that they spent a lot of time finding talent. Specifically, they sought individuals with "fire in the belly," which they described as intrinsic motivation, "curiosity," and "passion." One interviewee said that trying to transform talented faculty members into researchers was less likely to be successful without "fire in the belly." While intrinsic motivation was important, leaders also indicated that it was insufficient in isolation without resources and further training. Once again, respondents cited luck as a factor in recruitment, specifically for those departments that were the only medical schools in their states or were in geographically desirable locations. To identify these individuals, bright spots often hired from within. There was disagreement with respect to the effectiveness of department fellowships to serve this purpose. Some found fellowships incredibly important, with one saying that the Robert Wood Johnson Clinical Scholars Program developed some of the "strongest and most successful researchers." Others said that the fellowships infrequently generated "somebody who's fully committed to research," more often created "clinician teachers," and sometimes produced faculty that left for other schools.

While every department saw mentorship as critical to faculty development, their approaches differed. Some bright spots had formal mentorship programs, assigning junior faculty to senior researchers, not hiring younger faculty without an identified mentor, and paying mentors for time spent working with junior faculty. These more formal relationships facilitated an apprenticeship model where junior faculty learned by working on the projects of their mentors. Other bright spots had more organic mentoring programs, which involved providing junior faculty

with opportunities to meet and learn from national networks of senior faculty. There was also disagreement with respect to protected time to write grants. One department acknowledged that it took 2 to 5 years and 75% funding to launch an NIH research career, and multiple commented that this is the predominant model in academia. Several bright spots reported that they could not afford to provide this time; instead, the lack of a safety net helped identify those researchers with passion and motivated researchers to find and secure funding. Respondents noted that, in contrast to nonclinician researchers, clinician researchers had the ability to increase clinical effort to fund their time.

Discussion

In this qualitative analysis, we found that bright spots excelled at leveraging a commitment to research from an engaged chair, cultivating partnerships, integrating frontline clinicians, developing a trusting culture among team members, and identifying and supporting intrinsically motivated individuals. While these themes were common across our sample, the approaches to attaining them were heterogeneous, suggesting the existence of multiple paths to the same destination.

Our findings both confirm and deviate from Bland's model.[13] Within our sample of family medicine bright spots, we also found that motivation at the individual level, collaborative culture at the institutional level, and a research orientation at the leadership level were all important for success. While Bland's model does discuss interdisciplinary collaboration as an institutional feature, team-based research is not a pillar. In contrast, family medicine departments are largely built around teams of researchers. Though this study did not assess whether teams are central to non-family medicine departments, we hypothesize that team-based research has flourished in family medicine due to the pluralistic and generalist perspective of family medicine and the complexity of the problems faced in primary care. At one time, scientific discovery had been dominated by solitary scholars like Isaac Newton and Albert Einstein. A shift to teamwork has been documented across disciplines. A National Academy of Medicine report observed that 90% of all science and engineering publications have two or more authors.[15] The mean number of authors increased from less than two in 1960 to three and a half in 2000.[16] There was a similar increase in the percentage of papers authored by teams that spanned multiple institutions. This shift in the scientific process mirrors the shift occurring in the delivery of care and in education, where team-based care and interprofessional education have gained wider acceptance.[17,18]

Charged with assessing and galvanizing the family medicine research enterprise, the FMAHealth Research Tactic Team has sought to identify strategies to stimulate research across the discipline. Our findings have important lessons for all departments interested in enhancing inquiry. For example, all bright spots have non-family medicine departments that can serve as potential partners. Many of these bright spots found ways to collaborate with pediatric, obstetric/gynecology, and surgical departments. One chair said that the first step he made to enhance research was to meet researchers at other departments, find out about their questions, methods, and needs, and identify potential areas of collaboration. Second, we found that chairs within departments had tremendous influence over research capacity even if they were not researchers. Departments are often undergoing transitions and experiencing crises. The chairs at bright spots embraced these challenges as opportunities to study the impact of what they did next. Finally, departments are filled with intellectually curious, passionate educators and clinicians who have the potential to play pivotal roles in developing research capacity. Bright spots systematically identified internal scholars and connected them with training opportunities within the institution.

There are several limitations that should be considered when interpreting our findings. First, we only included bright spot departments; our findings may differ if we had interviewed additional schools. We did not include residencies or policy centers not affiliated with academic institutions, though we believe that enhancing scholarship within residencies is critical to building research capacity across the discipline. Some of these lessons may be applicable to residencies, though we hypothesize that residencies have unique challenges and opportunities. Because our definition of bright spots included research productivity and funding, our bright spots were successful at obtaining NIH funding. Excluding this dimension from the definition may have led us to interview a different set of schools and lead to different conclusions. Finally, our interviews lasted 30 minutes. Longer interviews may have allowed us to explore additional facets to these research enterprises, including financing, retention, training of senior faculty, and faculty diversity.

In summary, leveraging a commitment to research from an engaged chair, building partnerships, integrating frontline clinicians, developing a trusting culture among team members, and supporting intrinsically motivated individuals were critical factors to the development of research bright spots. These lessons can used by all family medicine departments to enhance research.

Table 3: Codes, Subcodes, and Quotes Related to Bright Spot Teams

Code/Subcode	Definition	Illustrative Quotes (*Quotes in Italic are Negative*)
The team is the fundamental building block of the research enterprise		
	Bright spots…	
Department/ team	Recognize the importance of teams in the research enterprise	D1: "we [my collaborators and I] have something more together than we have separately." H2: "One of the old rules was everybody writes a paper on their own…Research and evaluation is a team enterprise…you've got to bring other people in to do parts of the work, to do parts of the writing, to run parts of the study…they're banded together to be able to produce scholarship as a team. Where it's too big for any one person and the experienced ones sort of open a task for the less-experienced ones: Kind of like bicyclists, breaking…the path for the others riding behind."
To tackle complex problems, the team must be interdisciplinary		
	Bright spots…	
Partnerships/ partners	Seek a diversity of disciplines in order to tackle complex problems. These collaborators can be found within or outside of the department.	G1: "Really important part of developing researchers in our department is that you have disciplinary links that extend outside the department. So, for example, we have an [affiliated center] here and, um, a couple of our PhD faculty are… [conducting] research that collaborates heavily with folks in the [affiliated center]." F1: " Our most successful researchers…have put together collaborations of people who are just not a bunch of family doctors but they may be people who are sociologists, journalists, or engineers, or statisticians; and I think that [researchers] that work in a family medicine department, have more skills in those areas because of their…generalists and pluralistic perspectives…I think that's an advantage...family medicine researchers have a certain amount of agility; they have agility…many of the researchers that I see in basic science and maybe in some of the biomedical clinical sciences don't have…We find collaborators and partners in different places…."
Partnerships/ partners	Recognize that partnerships provide resources the department does not have	A1: "So, providing the resources—they aren't always in the department—it's making partnerships more than it is buying resources… There's a lot of push-back from the kinds of things I do for others outside of our department. And the reason I do that stuff is because I want their partnership and I want them to owe me… They have things that we don't have." D1: "The [affiliated center] funded [our researcher] who was just getting [a PhD]... They funded her start-up for four years as a faculty member. We hired probably four or five other faculty members over the next 5-6 years on training grants for the [affiliated center] and so we had a bunch within the physicians group who proposed shared resources so we could provide research infrastructures which supported the kind of research we wanted to do."
Partnerships/ partners within the institution	Recognize that the department benefits from partners within the institution	C1: "I would say 90%, if not 100%, of our grants are cross departmental with OB, internal medicine, or with public health...I think the more inter-disciplinary you are, the better." E2: "our successes are in great part because we link with the center for health services researchers. We are feeders in that center and then we link with our schools of public health here, very strong people, very collaborative; and then with other departments but the work we wind up doing then is frequently—it's what can get published—and our collaborators value us so they will also pull us into projects that may not be central to what we are doing hopefully." F1: "if you don't have local collaboration and mutual support then, you know, the likelihood of developing new faculty is small and, you know, the really successful faculty will wall themselves off into their own little space and they may get grants to do stuff but they're probably not going to contribute in a big way to the rest of the departmental culture of research."

Table 3, continued

Code/Subcode	Definition	Illustrative Quotes (*Quotes in Italic are Negative*)
To tackle complex problems, the team must be interdisciplinary		
	Bright spots…	
Partnerships/ partners outside the institution	Recognize that the department benefits from partners outside the institution, including those within the broader community and state	D2: "the founding chairman of the department...had a strong vision for city-wide engagement of family medicine...our primary clinical affiliation until now has been with university hospitals but...there are three major health system players...And we have traditionally, um, engaged with all of them." D1: "We collaborate a lot with the health department and other local entities."
Partnerships/ unconventional partners	Cultivate diverse partners, particularly unconventional ones, to obtain unique perspectives	A1: "I think family medicine is going to succeed on the strength of its partnerships and the stranger the better in my view...I can give you some examples of partnerships that I didn't expect to, um, be as useful as they've turned out to be: One of the best ones is with lawyers. We have a medical/legal partnership: My god can lawyers help. You want to get into the functional determinants of health? You're going to have some really strange partners, and lawyers are among the strangest." F2: "We do quite a lot of work with the nursing school. We do work with the engineering school. We do work with journalism. We do a lot of work with informatics."
Leadership, department/ team composition	Have, or is trying to figure out how to maintain "the right mix" of expertise that allows research to flourish (draw from other disciplines or departments…). This also includes how to balance different types of researchers within the department.	C1: "We have a statistician faculty. We have epidemiology, we have a health economist. … We have three or four, two or three grant management administrators… we have research coordinators … [maybe we will] hire a social media expert for research." C1: "We have both; about 2/3 to ¾ MD's and ¼ to 1/3 PhD. We're trying [to move to] even ½ PhD's; but I personally believe that we need to have at least half MD's because no matter how good the PhD is, they're not on the front lines of family medicine." B1: "I think we've also been really successful in recruiting PhD-trained investigators across many of the medical sciences, social sciences, public health sciences, because they want to work alongside family medicine and they'll learn to work in a department that is clinically active and where there is staff that they can access and contribute to. So our research staff now is primarily PhD-trained probably two-thirds and then one-third clinician researcher more or less."
Leadership, department/ research themes	Establish a research focus/theme of specialized expertise (benefits include allows branding, helps researchers collaborate along common goal, enhances recognition by external forces, etc) though not all departments embraced this strategy	F1: "We have sort of a shared common theme of issues related to chronic disease, so we say chronic disease prevention and management is really sort of our primary focus. ... It's only valuable to have a big theme...if it creates some kind of synergy or leverage that enables, you know, where the success of some help to enable the success of others." A1: "That's a major inflection point. I think that really, um, that really caused me to realize, okay, if you go to the place where you need to change your fields or change your, change your substrate, in order to manage the content that you care about, that field itself becomes the content. So we've got that in two areas: One of them is practice transformation and the other is in...integrating primary care into community and population health." *E2: "I would say that we don't have a focus…I know that some departments say, okay, we're doing women's health or we're doing preventive health services and we'll recruit people, new investigators, who that's their areas of expertise or focus, or they've learned some method and can then bring them over to those areas, and we have not done that…We have brought on investigators who show a lot of promise as investigators and then we relied on the fact that they say our medical center and university generally is just a very open place."* *E1: "I was very aware of the experiment at the University of Oklahoma where they... [said] all of the department's going to be focusing on family and the role of family in family medicine, and it failed. It brought in a lot of people and it wasn't that productive or wasn't where the money was."*

Table 3, continued

Code/Subcode	Definition	Illustrative Quotes (*Quotes in Italic are Negative*)
To tackle complex problems, the team must be interdisciplinary		
	Bright spots…	
Institution/ perception of family medicine research	Are perceived within the institution as a leader in research with unique expertise can lead to partnerships	F2: "Within the school of medicine, um, actually we lead in the school of medicine when it comes to any type of clinical or translational research." C2: "we've become the institution's mixed methods go-to people in our department, but those mixed methods guys can help our other faculty get funded as well because they have that method's expertise." A2:"Assets like [our statistician], she is a statistician and she's just totally devoted to the mission of the department of family medicine, and this is her home base, but everybody on the campus uses her. She brings credit to the department by being a go-to person."
Institution/ perception of family medicine research	Are optimistic about family medicine's role in research within the institution	F1: "We now have a collaboration going with some vascular surgeons who previously only looked at things like limb salvage and mortality and so in working with our people they're looking more at functional status and looking at how functional status helps to predict success….. It's just sort of blown up the world of vascular surgery for beginning to think about things that are actually really much more patient-centered outcomes." C2: "I do think PCORI and CTSA have played a big role in that, um, and even AHRQ to some degree, and the VA…there's a culture change where the funders are looking for more impact on the short-term…because there are other people saying why are we paying for this? And…the kinds of research that we do can have visible and short-term results that can be publicized…in a way that basic research science can't." *A2: "my own personal view is that family medicine research is struggling because it's not authentic. Most academic departments of family medicine are very busy doing health services research and, in fact, believes that they are one in the same thing. What is sorely neglected is clinical research in family medicine; very little clinical discovery going on in family medicine research."* *C2: "the dean of the medical school here...talks about discovery medicine, discovery research, and by discovery research he means basic science; and he's fairly derogatory towards the kind of science that we do, which is not basic science but is more community-based participatory research implementation."*
Convergence of researchers and clinicians ensures that the research is relevant to family medicine		
Family medicine alignment/ convergence of clinical and research enterprises	Emerge when departments converge their research and clinical enterprises and navigate the tension between conducting research that is sustainable and relevant to family medicine. The questions that are relevant to family medicine may not be fundable.	E2: "our young researchers particularly have to go after research questions that are fundable rather than the questions that are perhaps the most important questions or the ones that are in line with their passions…we should be looking to them for the groundbreaking new ideas: But, instead, what we teach them is this is how you get grant funding...I see people not pursuing...their areas of passion...I see researchers just getting on the funding hamster wheel and do not get back to what they have a passion for. And then it makes our research rather homogeneous too." B2: "Researchers are out after research /money and they are being judged by whether they get grants, but they're not being judged by whether they produce any evidence that's any use to people who practice in our field…at least part of the definition needs to be that it somehow elevates or improves the delivery of care by family doctors.And I think a lot of well-funded research fails that test because the kinds of things that clinicians most want to know are usually not the easiest things to give money to study." A2: "whoever leads your proposed [PBRN] will discover that their primary job will be managing what comes up with what comes down. The idea there was questions bubbling up from people holding forth at the front lines of medicine, where medicine meets society, meets the community. The things they're struggling with and the questions they have. These are the defining ingredients of the family medicine research enterprise but they are almost un-fundable." A2: "there is or at least should be substantial disagreement about what constitutes a bright spot. I can crystalize that like this: I think we've got a lot of departments of family medicine that their definition of a bright spot starts with your first dimension of funding and diversifying their revenue streams, and then teaching other people how to do research…what the [PBRN] practices did is they invariably asked questions that were really important to them for which there were holes in the science-based holes and the clinical knowledge base…for which the established research enterprise, like NIH, did not give a damn. That led to tensions between doing the research that the doctors in practice wanted to do versus what we could raise money for."

Table 3, continued

Code/Subcode	Definition	Illustrative Quotes (*Quotes in Italic are Negative*)
Convergence of researchers and clinicians ensures that the research is relevant to family medicine		
	Bright spots…	
Family medicine alignment/ convergence of clinical and research enterprises	Ensure that their research has relevance to patients in family medicine practices. Departments are also seeking to move research into and engage communities to ensure the research is relevant to patients.	B2: "in so many places with successful research, there's a wide gulf between what clinicians and researchers do." B2: "My most important job was as the chair was forcing the research and clinical faculty into small spaces of not letting them away from each other."E1: "the clinician researchers, the big R researchers, they need to be close enough structurally and even physically to the clinician teachers that there's interplay and that's one of the reasons why keeping a teaching role for them is important because I think they're very helpful to the clinician teachers." A2: "[Practice based research] moved the research enterprise out of the hospital, off the hospital floor…what the PBRN did is, it said, that's not where the phenomenon are…So…we moved it into practices. But, you know what, we didn't get it in the community and that's what's going on now, and that's the place where there's now a new bright spot emerging and it's the departments that are actually doing community-based participatory research and who cleaned it up with their practice-based research enterprise. And when the practices in the community are working on the same question, it is nothing short of magical…The brightest spot for family medicine research is working at that nexus of CBPR, PBRN, and questions that actually come from the community and the practices themselves." F2: "I mean, personally as a physician, my being in clinic is essential to, uh, for ferrying research ideas."
Family medicine alignment/ convergence of clinical and research enterprises	Recognize that clinics are laboratories for research	G2: "we just launched a program…in West Africa where we have one of our major operations where we had broken down the barriers between primary care and public health…we have created a community-based agent group and they are, they link to the health care system but then work in the community…We've actually…brought that kind of thinking back here to our community and…we have…what we call community health coaches." B1: "another big key in strategic development...is that we have been able to successfully partner with...other organizations that really provided the laboratories, the infrastructure to do research."
Family medicine alignment/ convergence of clinical and research enterprises	Acknowledge the critical role of clinical revenue in funding research and help its clinicians see value and opportunity in the research enterprise	F2: "You know, our clinicians work very, very hard.They're money funds most of the mission. I appreciate them." B2: "we built a research program largely out of profits that we generated in our clinical system." *G2: "We don't have a lot of, sort of, excess clinical dollars to then sort of prop-up a research program because our research program has to be pretty, um, rigorous and competitive and that it needs to attract the sorts of funding that allows them to do what we do."*
Family medicine alignment/ convergence of clinical and research enterprises	Acknowledge and overcome inherent difficulties in convergence	H2: "the three missions: Care, education, and research…they should be interlocking and mutually reinforcing enterprises…In practice, most people feel like these are separate or even competing. I got multiple masters." F1: "I think [convergence is] so much harder in family medicine. It's either harder in family medicine or we've failed miserably."

Table 3, continued

Code/Subcode	Definition	Illustrative Quotes (*Quotes in Italic are Negative*)
Convergence of researchers and clinicians ensures that the research is relevant to family medicine		
	Bright spots…	
Family medicine alignment/ convergence of clinical and research enterprises	Acknowledge that convergence enhances the scholarship of all faculty though the primary focus remains on career researchers	H2: "it's become evident that the family medicine research enterprise needs to include more than…a dozen funded career researchers that we also need to tap into the scholarship of more of the clinician and educator – clinician educators – of the general faculty: And why?...there's all this stuff going on in real time. How do you evaluate what you're doing? And how do you tap into the scholarly potential of all of your faculty...This is an unfunded part of our mission. It isn't clinical revenue. It isn't research revenue. It's part of who we are, a part of what we're expected to do as an academic family medicine." A2: "The development of practice-based research networks first locally and then nationally provided an engine to pull faculty and fellows and residents and, most importantly, practice clinicians into the research enterprise and that, in my view, this has huge explanatory effects for why [our department] wound up being seen as a place to do research."
To enable collaboration, team members must trust each other		
	Bright spots…	
Leadership/ critical mass	Have developed the critical mass of researchers needed to get the program started	A2: "I think that we've had success of joining up on the campus with other departments and other research enterprises and thereby uniting a critical mass of investigators that cared about what they thought primary care was." E1: "we went from that good core of three stable NIH level investigators…to 15." F1: "when they brought in [three researchers], that really created a nidus of faculty who had some research experience...a very specific commitment by the department to change the course that was going on…We started to develop a critical mass of people."
Department/ peer to peer interaction	Have strategies for facilitating interactions among researchers and between researchers and clinicians, including the physical location of work spaces, opportunities to convene, and organizational structure.	B2: "There are things so that people run into each other...systematic department meetings, weekly conference group reports their progress... So the clinics are talking about we have a problem with getting the phones answered on time and the researchers are talking about whatever new grant they just got.It kind of keeps everybody familiar with the larger picture." F2: "we have about 10 PhD and MD researchers located on the same hallway. Um and I think that's very important. I think location is collaboration…. …water cooler talk, a forum in something called research think tank…for ideas that are half to three-quarter baked. We do mock reviews on most of our federal grants we put in." G2: "We...also created mission structures where we look across the divisions by missions and sort of created a matrix structure...our cross-department mission structure was our research committee and they have pulled together a group from across the department and have started to look at a strategy that is not division-specific but is department-specific and what that's led to is a lot more sort of permeability...For the new constellations of folks who are coming together, the type of work they can do is getting broader."

Table 3, continued

Code/Subcode	Definition	Illustrative Quotes (*Quotes in Italic are Negative*)
To enable collaboration, team members must trust each other		
	Bright spots…	
Department/ culture	Have cultures that nurture research and researchers; cultures of inquiry, of evaluation, of scholarship, of collaboration, of innovation, etc. But are also flexible and adaptable/malleable to changing external pressures	G2: "There's a strong entrepreneurial spirit at our institution that our department embraces heavily. We are a very collaborative institution as well and so that collaboration both within and outside of the department, um, is pretty impactful." H2: "…and then to build up a culture of inquiry, a culture of evaluation, provide some germinal training experiences in a group to give them confidence and have them actually produce things, even small things like [conference] presentations and posters at the local, state and ad the family medicine research forum...." F1: "...the culture of the department is that the faculty work hard and strive to get along with each other. ... I think that's incredibly important because that then leads to the whole aspect of collaboration and mutual support...., I think then if you have an environment where people can trust each other and feel supported then that enables an environment in which people can be critical of each other and hold each other accountable, so then that promotes the opportunity for people to read each other's stuff."
Institution/ culture	Have cultures that nurture research and researchers; cultures of inquiry, of evaluation, of scholarship, of collaboration, and of innovation. In particular, the dean's support is critical.	B2: "The president, around the time that I became the chair in '98, was clearly wanting to make this place, um, a research intensive institution." G2: "we kind of have that permission to think creatively and, um, develop things. There's a strong entrepreneurial spirit at our institution that our department embraces heavily. We are a very collaborative institution as well and so that collaboration both within and outside of the department, um, is pretty impactful" H1: "our new dean...said...we need everybody to publish: We want, on the average, every faculty member in your department to come up with one publication a year. This scholarship isn't just for the career NIH researchers."
Department/ culture	Have cultures where getting along and collaboration are valued	D2:"we have [a culture of] being open and sharing, sharing things early in terms of project ideas. It's a very positive environment, encouraging environment, optimistic even in the face of adversity, and I think those qualities that help keep each other going." *F1: "If I were to look back at examples of research faculty in our department that have not been successful, it's the people for whom that getting along with other people was not a high value."*
Department/ peer-to-peer interaction	Have created cultures where trust has emerged from these environments, facilitating honest communication	D1: "we do retreats where we immerse ourselves in work but then, as part of that, we go for walks, we try to have it in nature where there's a nice place and we can go for walks. We go for a nice meal together. So we hang out together and get to know each other as a person. I'm thinking that's when you find out what's personally meaning to people and then if you're going to ask them to do something you know how well something resonates with them." F1: "if you have an environment where people can trust each other and feel supported then that enables an environment in which people can be critical of each other and hold each other accountable...whether that's improving care quality or showing up to clinic on-time or whatever."

Table 4: Codes, Subcodes, and Quotes Related to Identifying and Supporting Researchers

Code	Definition	Illustrative Quotes
To populate these teams, find those with fire in the belly and support them with mentorship and resources		
	Bright spots…	
Individual characteristics /intrinsic motivation	Identify researchers with fire in the belly, or intrinsic motivation	A1: "And by find talent, that can be, that can mean recognize residents who can think like a researcher or have a kind of curiosity and passion that suggests they're likely to ask and answer important questions. Or it can be recruiting. I spent a lot of energy making relationships with people all over the place...So, #1, find talent." G1: "I'm thinking of individual faculty that are highly motivated in a particular content area, but don't have much in the way of methodologic experience so that the motivation and you got to select for that. You can't infuse that into somebody. I think that's part of the problem we've had in the past is that we try to talk people….we hire people as clinician teachers and the we say, oh by the way, we want you to do some research and that's not what they came for…the fire in the belly has to be there to some extent." E2: "we can identify pretty well people who want to be researchers but then it's harder to know, I mean, research takes so many skills from writing to organization to long-term planning to getting along well with others to just being productive and being product-oriented and, um, it is harder to know those"
System/ geography	Acknowledge that the location of the department can provide an advantage with respect to recruiting and partnerships	B1: "We're the only medical school in the state – the only allopathic medical school in the state...There's not like three or four other allopathic medical schools, you know, blocks from here...somebody might say that would be a structural disadvantage" A2: "Another critical environmental factor was: We were the only medical school in our state but being the only medical school was a huge advantage to us." E2: "it's a nice place to live. It's a rich university. They find collaborators here. If they're not from the area, they say this is a pretty nice area, and they want to stay."
Training and workforce/ pipeline	Recruit from within to identify promising researchers	F2: "Our residency obviously is a feeder for our faculty and is important in its own rites." A1: "I'm asking questions continuously of our residency directors, of our researchers, of our medical student education people. I ask questions like this all the time: Does this person seem like they want to have a life as a faculty? Can they think like a researcher? Do they have research chops or is that they care the most about? Anybody who seems pride and promising – I...flag those people for us and we figure out whether they've got a future"
Training and workforce/ fellowships	Recognize that fellowships are an internal pipeline, can be a source of productivity, and future faculty; however, many fellows leave	E1: "We think it's really important that fellowships focus on productivity...for researchers... you got to get publications and grants out...it isn't...a navel-gazing time but you've got to get that transition to fellowship that's, in some cases, develop a K award but you've got to get stuff out...we believe in fellowships and we're willing to support them over a long period of time...the output and the productivity of the fellows is really very good, um, and we've been able to hire a fair number of them." C2: "we've had quite a few faculty go through that 2-year fellowship [Robert Wood Johnson Clinical Scholars Program] and helps with research and the people who, the family medicine doctors who have been through that program have really been some of our strongest and most successful researchers of our time" F1: "I think it would have been smarter to line up fellows with the research activities of existing faculty much more closely. We didn't do that...we went through RWJ. We had some money from HRSA through the title VII grants. We received a NRSA grant. We only had that for about one cycle, um, and then lost that funding. We continued to fund it through HRSA. We still have an academic fellowship program, a 2-year residential academic fellowship program here but it's really self-funded and it's only...relatively infrequent that we generate somebody who's fully committed to research out of that fellowship program...I don't think at this point we really have a residential fellowship program that is capable or functioning in such a way that it's going to turn out very many people after two years fully prepared to write their K award."

Table 4, continued

Code	Definition	Illustrative Quotes
To populate these teams, find those with fire in the belly and support them with mentorship and resources		
	Bright spots…	
Mentorship	Provide mentorship at the department level, which demonstrates a commitment to research	F1: "Those are all just really incredibly helpful people…who were just so willing to…share their time and energy with young people in other departments. I think that one of the things that has made a good department is that we've had a number of other people who have been willing to do that…I think probably the reason that those people did that is because you get back when you put the time and energy in, you get back something."
Mentorship/ mentors	Have mentors that develop researchers by opening doors, providing honest feedback, and teaching how to conduct research though there is a downside to not allowing junior researchers to pursue their own questions	F2: "[My mentor] said…you can be your own engine but it's extremely difficult. It will take you twice as long, three times as long to be your own engine and drive your own train, in the unique area of expertise…or you can hook up your caboose and ride…figure out whose caboose you want to be and hook up and ride. And that's what I did." H1: "It's like an apprenticeship model...You watch the plumber do this a while before you're allowed to do it on your own."F1: "I will not even recruit somebody to our department, a young researcher to our department, unless we have a designated mentor who I think will be able to facilitate their work. I think that there was a time when we left things at kind of ad hoc or, you know, we just kind of see how things would go, and I think that's probably not a good strategy."
Mentorship/ formal vs informal	Recognize that finding a mentor can be informal and organic…	B1: "We also shared kind of a shared mentorship model where you have scientists that were drawing from this larger network…[Mentorship is] more informal…having a chair who has been here a long time who knew a lot of other chairs and who knew a lot of national leaders and who could informally have conversations with them." A2: "[He] was at that meeting and about two days into it I decided he was the smartest person at the meeting…I was totally intimated by him but I got my courage up and after one…session…he was surrounded by people and I waited until they were gone and when he turned around I introduced myself as a resident and told him I was interested in research and what should I do? [He] said to read Life of a Country Doctor by Will Pickles and…[the] biography of Jim Mackenzie, and he walked off. That's how I met him.
Mentorship/ formal vs informal	…though other programs use a more formal approach to mentorship	F1: "if they're doing something that's pretty independent and we know that... there's a mentor in the department who can be very helpful in terms of helping to design the study and providing sort of methodological mentoring, then obviously you need to have a content mentor that's coming from someone else...I would consider that part of the job of the local mentor to try to help identify that person." C1: "For every new faculty, I have, we pay for a mentor…And we pay for mentors for at least three years. We have education RVUs…So we're paying right now people…for the mentoring."

Table 4, continued

Code	Definition	Illustrative Quotes
To populate these teams, find those with fire in the belly and support them with mentorship and resources		
	Bright spots…	
Department/ protected time	Exhibit heterogeneity regarding the extent to which departments can provide protected time to launch a career in research.	H1: "[An experienced researcher] was trying to tell me it takes 2-5 years, about 75% funding, to launch a career into NIH research and I thought that was preposterous. If we were generous, we'd give 20-30% to people to newly funded research and she was equally distrustful of my thought about that. I didn't believe her...And then I made a lot of phone calls to others that I learned here in other departments it take 2-5 years, 3-5 years, mostly supported by K awards" D1: "I think it's a little bit "eat what you chew" environment, so I hate that being part of the answer, but that does provide a little a bit of the motivation. I think it is more of an intrinsic motivation; but there is a little bit of a motivation that you just have to keep going. You have to get funded in order to be able to keep doing this kind of work." B2: "If she doesn't get a grant, she can't just shrug her shoulders, go to the clinic and get a pay increase, which is actually what the MD-faculty can do. Most of us went to medical school because we like being clinicians and, you know, so your sense of security, um, well you can just…we have a bunch of people who did research fellowships and then kind of ended up mostly as clinician teachers in the end." E1: "since the last 15 years...we have not supported new research hires with time. Um so that's pretty brutal....I think there are some plusses and minuses...it really makes people hungry for grant dollars...And then the downsides of that are stress, um, did we take them away from the areas they could have maybe gotten themselves funded or contributed the most in terms of importance?"
Department/ resources	Have mechanisms to support research and researchers (ie, bridge funding, research services, dedicated time, etc)	A1: "Find talent. Get out of their way and make sure they've got their resources that they need." H2: "we began to really focus on that and supply infrastructure, research infrastructure, research services, some bridge funding, and what we call research investment where you allow a certain amount of money for people to get started because we realize that it takes a long time to make federally-funded researchers from faculty, and you got to start in the pipeline and get them…." C1: "appropriate support [contributes to productivity]. We have research assistants and coordinators...The money from the yearly supplement from the university...helps to support our research infrastructure. Having grant [support] and adequate space...We have database support...mentors and supervised training. I would say 75% of our research faculty take at least one, if not more than one, course every year or two in some area. We have mock study sessions. We actually work with internally as well as pay external people - I think it's $500. We do a mock study session for any grant, that we require for every grant that's being submitted to NIH. They typically tear apart the grant which is good because then the researchers conduct them better."
Institution/ resources	Are within institutions that have mechanisms to support research and researchers	C2: "the University...is pretty much a powerhouse for getting grants, funded grants, uh, outside of the department. So we exist in an environment that is set up to make researchers successful. …. to give you a couple of examples, um, [the university has] Grant Boot Camps…so investigators can actually go to these classes where the teach you how to write a K and get funded, and then teach you how to write an R and get it funded over the course of a year, where you meet with a group of people and a senior mentor." D1: "I was asked to be an associate director for the [Affiliated Center]. …. It helped me get the comprehensive status and they started helping to hire faculty members. So we hired a whole bunch of faculty members either with direct support of the [Affiliated Center] or by putting them on training grants the [Affiliated Center] had. They would fund the first couple years of start-up and helped them get started. So we basically got our research division on the back of [affiliated center] money. Then when we applied for CTSA we ended up having a practice-based research network sharing resources as part of that."

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REFERENCES

1. Ewigman B, Davis A, Vansaghi T, et al. Building research and scholarship capacity in departments of family medicine: a new joint ADFM-NAPCRG initiative. Ann Fam Med. 2016;14(1):82-83.
2. Post RE, Weese TJ, Mainous AG III, Weiss BD. Publication productivity by family medicine faculty: 1999 to 2009. Fam Med. 2012;44(5):312-317.
3. Bowman MA, Lucan SC, Rosenthal TC, Mainous AG III, James PA. Family medicine research in the United States from the late 1960s into the future. Fam Med. 2017;49(4):289-295.
4. Cameron BJ, Bazemore AW, Morley CP. Federal research funding for family medicine: highly concentrated, with decreasing new investigator awards. J Am Board Fam Med. 2016;29(5):531-532.
5. Cameron BJ, Bazemore AW, Morley CP. Lost in translation: NIH funding for family medicine research remains limited. J Am Board Fam Med. 2016;29(5):528-530.
6. Ewigman B; North American Primary Care Research Group. CTSAs and family medicine research—time to get connected. Ann Fam Med. 2008;6(2):181-182.
7. Ewigman B, Johnson MS, Davis A, et al; CTSA Strike Force Members of the CTSA Strike Force. An update on family medicine participation in clinical and translational science awards (CTSAs). Ann Fam Med. 2009;7(3):275-276.
8. Brocato JJ, Mavis B. The research productivity of faculty in family medicine departments at U.S. medical schools: a national study. Acad Med. 2005;80(3):244-252.
9. Bolon SK, Phillips RL Jr. Building the research culture of family medicine with fellowship training. Fam Med. 2010;42(7):481-487.
10. Lucan SC, Barg FK, Bazemore AW, Phillips RL Jr. Family medicine, the NIH, and the medical-research roadmap: perspectives from inside the NIH. Fam Med. 2009;41(3):188-196.
11. Kuzel A, James P; Association of Departments of Family Medicine (ADFM). Research development stories from 7 departments of family medicine: 7 lessons for all departments. Ann Fam Med. 2011;9(4):373-374.
12. Family Medicine for America's Health. Research Tactic Team. Family Medicine for America's Health. https://fmahealth.org/research-tactic-team/. Accessed May 6, 2018.
13. Bland CJ, Weber-Main AM, Lund SM, Finstad DA. The Research-Productive Department. Hoboken, NJ: John Wiley & Sons; 2005.
14. Bland CJ, Center BA, Finstad DA, Risbey KR, Staples JG. A theoretical, practical, predictive model of faculty and department research productivity. Acad Med. 2005;80(3):225-237.
15. National Research Council (US), Cooke NJ, Hilton ML, eds. Enhancing the Effectiveness of Team Science. Washington, DC: The National Academies Press; 2015.
16. Wuchty S, Jones BF, Uzzi B. The increasing dominance of teams in production of knowledge. Science. 2007;316(5827):1036-1039.
17. Mitchell P, Wynia M, Golden R, et al. Core principles and values of effective team-based Health Care. Washington, DC: The National Academies Press; 2012.
18. Committee on Measuring the Impact of Interprofessional Education on Collaborative Practice and Patient Outcomes, Board on Global Health, Institute of Medicine. Measuring the Impact of Interprofessional Education on Collaborative Practice and Patient Outcomes. Washington, DC: National Academies Press; 2015.