

Deriving Competencies for Mentors of Clinical and Translational Scholars

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Abstract

Although the importance of research mentorship has been well established, the role of mentors of junior clinical and translational science investigators is not clearly defined. The authors attempt to derive a list of actionable competencies for mentors from a series of complementary methods. We examined focus groups, the literature, competencies derived for clinical and translational scholars, mentor training curricula, mentor evaluation forms and finally conducted an expert panel process in order to compose this list. These efforts resulted in a set of competencies that include generic competencies expected of all mentors, competencies specific to scientists, and competencies that are clinical and translational research specific. They are divided into six thematic areas: (1) Communication and managing the relationship, (2) Psychosocial support, (3) Career and professional development, (4) Professional enculturation and scientific integrity, (5) Research development, and (6) Clinical and translational investigator development. For each thematic area, we have listed associated competencies, 19 in total. For each competency, we list examples that are actionable and measurable. Although a comprehensive approach was used to derive this list of competencies, further work will be required to parse out how to apply and adapt them, as well future research directions and evaluation processes. *Clin Trans Sci* 2012; Volume 5: 273–280

Keywords: mentoring, mentor, competencies, translational

Introduction

The importance of research mentoring in guiding the mentee towards a successful professional career has been well established in the literature.^{1,2} This mentoring relationship is based on a mutual expectation of the mentee developing professional competence in their chosen field and charting and implementing their own career plan, guided by their mentor. Over time, the relationship will evolve and the needs of the mentee will change, therefore changing the nature of the relationship.^{3,4} This paper is part of a series of white papers examining methods of developing, nurturing, and improving the research mentoring relationship for junior investigators in clinical and translational (C/T) science. For the purpose of this series of papers, we have used the following definition of research mentorship to shape our discussion: “Research mentorship refers to a dynamic, collaborative, reciprocal, and sustained relationship focused on an emerging researcher’s acquisition of the values and attitudes, knowledge, skills, and behaviors necessary to develop into a successful independent researcher.”

The intersection of knowledge, skills, and attitudes form the building blocks of a competency. To be competent in a behavior is to possess the knowledge, skills, and attitudes that comprise that behavior.⁵ Using several complementary approaches we have derived a list of core competencies for C/T research mentors and the roles and tasks expected to achieve them, focusing on deriving competencies that are actionable and that can be read as a job description for research mentors of C/T research scholars. C/T science is intrinsically interdisciplinary and seeks to bridge major areas of science. Thus, a single mentor cannot be expected to fulfill all the roles expected of him/her and a team of mentors with complementary skills may be needed.

Attempts to categorize the mentor’s role have been heavily influenced by Kram who summarizes mentor functions into two broad categories: career functions and psychosocial functions.

She clarifies, “While career functions serve, primarily, to aid advancement up the hierarchy of an organization, psychosocial functions affect each individual on a personal level by building self-worth both inside and outside the organization.” Taken together these functions should enable individuals to navigate the challenges of each successive career stage.⁶

The nature of the mentoring relationship and the challenge in identifying what makes a good mentor leads us naturally to use qualitative methods to understand the mentor–mentee dynamic and what makes the relationship flourish, or not. Cho et al. analyze mentees’ letters of nomination for a prestigious lifetime achievement award to identify some of the key qualities of outstanding mentors as described by their mentees.⁷ Nature’s Guide for Mentors⁸ also uses nominations for a mentoring award as a source for deriving attributes of “good” mentors and mentoring. An effort to build on this evidence will require more comprehensive methodology.

C/T mentees have their own set of unique challenges. In this paper, we identify what mentoring competencies are necessary for mentors of C/T scholars to exemplify. The impact of these efforts will hopefully be twofold: a framework to underpin both mentor training and evaluation programs. By clarifying expectations through an interpretable and concise list of competencies, our aim is to provide a structured approach to mentoring.

Methods

This paper is one in a series of white papers funded in 2009 by the American Recovery and Reinvestment Act that address the issue of mentoring junior investigators in clinical/translational research. The authors of these white papers include members of the National Clinical Translational Science Award (CTSA) mentor working group.⁹ For this paper, a range of methods were used to arrive at a final list of suggested mentor competencies,

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DOI: 10.1111/j.1752-8062.2011.00366.x

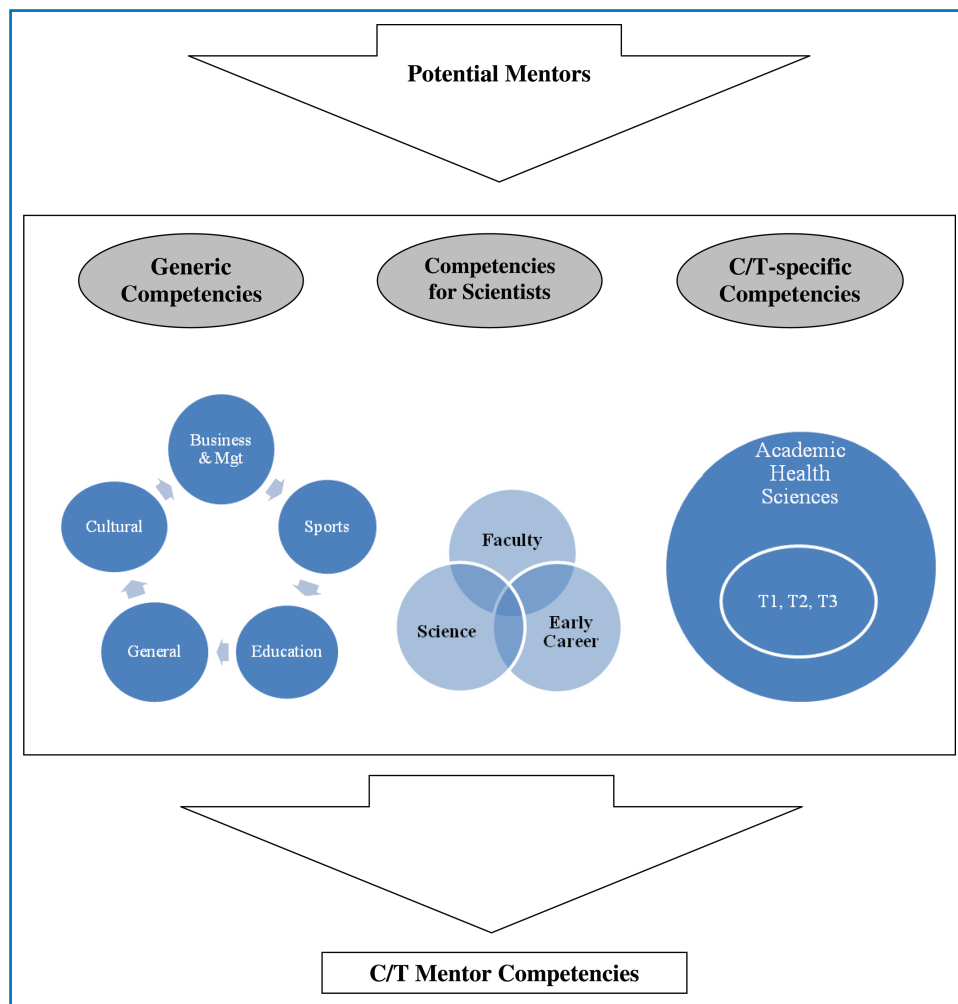


Figure 1. Conceptual Framework for Compiling Competencies. This figure shows the multiple considerations that preceded the compilation of a final list of competencies. A mentor of a C/T junior investigator will exemplify generic and more scientist specific competencies, but also possess unique competencies pertinent to the interdisciplinary nature of the mentees’ work.

including focus groups, a literature search, reverse engineering, review of exemplar curricula, mentoring evaluation forms, and expert panel input.

Focus groups

Focus groups with junior C/T investigators and mentors were conducted at four CTSA sites including the University of Wisconsin in Madison, Vanderbilt University, the University of Colorado Denver, and the University of North Carolina at Chapel Hill. Similar questions were asked at each focus group. The focus groups were taped, transcribed, and entered in a qualitative database. A total of 55 scholars and 44 mentors across the four sites participated.⁹

Literature search

A literature and web search was performed, followed by an examination of individual citations (in articles/books and web-pages/web-sources) to identify reports applicable to describing competencies. In order to distill our list of competencies to those specific for mentors involved in C/T science, a strategy of progressive filtering was applied. We looked at mentor competency literature from a variety of disciplines including sports, business

management, education, etc., then further refined our research and culled competencies focused on academic health sciences literature (see Figure 1). Finally, we looked at literature more specific to C/T research, which was limited.

We searched for the following terms and combinations of terms on PubMed and Psycinfo, between 1985 and July 2011: “mentor competencies,” “mentor faculty,” “mentor translational research,” “mentor CTS,” “mentor science,” “mentor qualities,” “mentor responsibilities,” “mentor role,” “mentor task,” “mentor characteristics.” Strategies like berry picking (based on information gleaned through initial searches, ideas were refined, and search queries evolved (Bates, 1989)), footnote chasing, citation searching, and browsing through relevant journals were used. A research assistant then went through the condensed literature and compiled a list of characteristics that were most common. The predominant focus of the literature identified was on a traditional, dyadic model of mentoring (one-to-one, senior-to-junior, face-to-face). Competencies were rarely described, much more common was a description of important characteristics of mentors, and roles and tasks a mentor should perform. We compiled a list of those characteristics and tasks and that list was used by the expert panel as described in the “Expert Panel” section below.

Reverse engineering

Although the literature was helpful in laying out the general mentoring characteristics, we needed a better sense of the unique C/T research components. We turned to the C/T scholar competencies developed in 2010 by the Education Key Function Committee. These competencies were created and finalized between January 2008 and April 2009, through a process of in-person and webcast meetings.¹⁰ We engaged in a “reverse engineering” approach with an expert panel to identify the role a mentor plays in supporting the scholar’s growth in their expected scholar competencies. A table was created by listing these scholar competencies and members of the panel were asked to consider two questions: (1) How important is the mentor’s role in helping the mentee achieve a specified/certain competency? (2) How does this translate into a mentor competency?

Curricula review

To further address the mentor’s perspective, curricula already in place at two CTSA institutions were used to derive mentor

competencies. These two curricula were from University of Wisconsin Madison, which recently adapted the Entering Mentoring syllabus¹¹ for mentors of junior C/T investigators, and the University of California San Francisco.¹² They were chosen partly because members of these schools were represented in our committee. It should be noted that in a recent survey and interview with CTSA education leaders, it was clear that very few programs have formal syllabi for training mentors (or mentees) on how to mentor. Although eight schools reported having training curricula, most have lectures or breakout sessions to discuss mentoring, and some hope to use University of Wisconsin Madison's syllabus for their future training endeavors. Aims and objectives of the training programs were used to guide the development of these competencies (available upon request from authors).

Mentor evaluation forms

From a programmatic and evaluation perspective we reviewed mentor evaluation forms provided by other institutions with CTSA awards that were readily available: Columbia University, Mayo Clinic, University of Illinois at Chicago, and University of New Mexico (<http://www.ctsaweb.org/federatedhome.html>). Each unique mentor competency or attribute was abstracted from the four evaluation forms into a summary table (available upon request from authors).

Expert panel

Finally, to produce a select list of competencies from the various tasks, job descriptions and characteristics from the results of the methods used above, the group of six experts used their background knowledge and expertise to reflect on the input received from the various methodologies. They distilled and collapsed the wide-range of results into a concise list of recommended mentor competencies especially as they relate to C/T scholars and their mentors. The expert panel produced examples to demonstrate roles and tasks mentors could perform to fulfill these competencies.

Results

The various methodologies described above informed our conceptual approach towards compiling a list of suggested competencies for mentors of C/T junior researchers. Our review of the literature revealed a broad set of desired attributes or generic characteristics that span the field of mentoring. These positive mentor characteristics, in some cases framed as competencies, cut across disciplines like business and management, sports, education, and the health sciences. However, beyond these generic competencies, the health sciences mentor requires additional skills to guide their mentee through the research process. *Figure 1* illustrates the transition from generic to more C/T specific mentor competencies.

Although specific knowledge, skills, or attitudes for mentors of C/T researchers were not widely available in the literature, we identified eight major categories of mentor characteristics from a wide range of literature that while "generic" (i.e., mentors of any type of mentee should possess some or all of these characteristics) are relevant to C/T research mentors:¹³⁻²⁰ (1) Leadership; (2) Empowerment; (3) Strategic Perspective; (4) Integrity Skills; (5) Judgment Skills; (6) Political Skills; (7) Creative Thinking; (8) Communication Skills.

The above characteristics are of an overarching order. We took these characteristics and along with the results of the other methodologies, created a discrete set of competencies, listed in *Table 1*. The competencies are organized by thematic areas. We list the relevant competencies for each area and then provide actionable examples for achieving these competencies. Later we discuss each of the thematic areas and some associated competencies. Throughout the discussion we link back to the importance and unique challenge of mentoring a C/T junior investigator, and address C/T specific competencies in the sixth and final thematic area.

Communication & managing the relationship

At its core, mentoring occurs within the fluid dynamics of an interpersonal and interdependent relationship and "the interpersonal skills brought to the relationship influence how the relationship gets started, how it unfolds over time, and the range of possible functions."⁶ Because each mentoring relationship is unique, being able to reflect upon and identify specific characteristics of effective communication becomes important in order to maximize the potential within each dyad.

In the mentoring curriculum Entering Mentoring, Handelsman et al. distinguish elements of effective communication and ask mentors to reflect on and practice:¹¹ (1) Providing constructive feedback, (2) Communicating effectively across diverse backgrounds, disciplines, generations, ethnicities, positions of power, etc., (3) Identify different communication styles, (4) Engage in active listening.

The authors' elaborate, "Good communication helps to develop a positive working relationship between mentor and mentee by helping the mentee to better understand directions and feedback from the mentor, feel represented and understood, and motivated to learn from the mentor. When mentoring, effective communication involves more than providing information or giving advice; it requires asking questions, listening carefully, trying to understand a mentee's concerns or needs, demonstrating a caring attitude, remaining open-minded, and helping to solve problems."

While clear communication is essential throughout the mentoring relationship, focus group participants reiterated that it is of particular importance early in the development of the relationship. Not only do frequent conversations confirm the fit of the mentor and mentee pair, but also mitigate the potential pitfalls in the lab where "you have multiple people with competing interests and it can be disastrous."

To avoid both a mentor/mentee mismatch and miscommunication around roles and responsibilities, it is important that expectations are aligned and clearly communicated. Early conversations should revolve around helping the mentee identify their own goals and what they are seeking from the mentoring relationship. Once mentors understand the goals of the mentee, the mentor should help them map out the steps towards achieving their goals, including formal organizational requirements and informal expectations and roles. The more precise a mentor can be about the expectations for each stage in the process of goal achievement the better, and if possible give the mentee examples, templates, and other resources one can use to understand the expectations of formal requirements. Formal, written goals and expectations help to prepare the mentor and mentee for the fact that the development of the mentee's master plan is an ongoing, iterative process. As such, the mentor needs

Thematic Areas	Competencies	Examples
Communication & Relationship Management	Align expectations	Align and communicate mutually beneficial expectations for mentoring relationship.
		Make explicit institutional and discipline-specific norms, standards, and expectations.
	Address availability and accessibility	Demonstrate commitment to mentee/make mentee a priority (e.g., being available for meetings as needed, providing prompt feedback to emails, grants, papers).
		Establish frequency of meetings and interim communication modes.
		Enhance Interactional Skills
		Engage in active listening.
		Ask probing questions.
		Actively promote feedback.
		Effectively manage conflict and disagreement.
Take into consideration perspectives and realities other than mentor's own.		
Foster a sense of belonging and trust.		
Effectively negotiate dialogue across diverse backgrounds, disciplines, departments, generations, ethnicities, and positions of power.		
Psychosocial Support	Attend to cultural diversity issues	Understand how individual differences and cultures influence mentoring relationships.
		Communicate effectively across diverse dimensions including varied backgrounds, disciplines, ethnicities, positions of power, and styles.
	Serve as role model	Provide work-life balance guidance.
		Demonstrate positive leadership skills (e.g., demonstrate how to build a research team, manage a lab, how to find, hire and keep good people).
	Establish capacity to reflect on and enhance relationship	Tailor amount and type of psychosocial support to the personality, circumstances, and response of the individual mentee.
		Acknowledge and celebrate mentee's successes.
Career and Professional Development	Prepare and guide implementation of a career development plan	Identify gaps in mentees knowledge in order to create a realistic career development plan.
		Adjust mentee's responsibilities over time to foster their independence.
	Guide development of professional skills	Develop strategies for and guide mentee on professional skills and career development.
		Provide information and guidance to navigate academic/institutional environment
		Help mentee understand the fiscal realities of an academic career (e.g., negotiations with industry, working with contracts and grants, PI responsibility for fiscal management).
		Actively promote mentee within institution and discipline.
		Help mentee navigate institutional systems.
Assist mentee in expanding professional network	Link mentee to colleagues within and outside the institution (e.g., via emails, meetings, etc.).	
	Professional Enculturation & Scientific Integrity	
Model and instruct ethical behavior	Model and teach ethical conduct in research for mentee such as the protection of research subjects and conflicts of interest.	
	Socialize to culture and rules of science	Establish rules and guidelines to uphold integrity of mentee's data.
Research Development	Assist mentee in designing and implementing a research training plan	Diagnose mentee gaps in knowledge and experiences.
		Identify and assess relevant local and national resources (e.g., courses, workshops, etc.).
	Assist mentee in designing and implementing a research plan	Collectively identify educational resources and experts to fill gaps.
		Guide mentee to formulate and evaluate appropriate research questions.
		Guide mentee to create a robust study design.
	Guide mentee to develop a sustainable plan for implementing projects.	

Thematic Areas	Competencies	Examples
	Provide guidance for scientific problem solving	Establish a monitoring process to regularly assess that research goals and benchmarks are being met.
		Help mentee anticipate potential problems and solutions that may occur over the course of a project.
C/T Investigator Development	Assist mentee in formulating clinical and translational research questions.	Assist mentee in identifying potential testable research hypotheses.
		Guide mentee to apply translational research strategies to clinical or basic research study designs.
	Model and advise mentee on building and managing an effective multidisciplinary team	Participate, initiate and coordinate interdisciplinary mentoring team activities.
		Demonstrate and advise mentee on strategies to develop high performing and successful interdisciplinary teams.
	Identify mentee developmental and scientific needs across the translational aspects of research and assist them in designing strategies and establishing linkages/networks to meet those	Assist mentees in fulfilling the range of competencies expected of them by identifying their gaps in knowledge and advising them on appropriate tasks to fill these gaps.
		Understand personal gaps in expertise and knowledge in order to link mentee to experts in those topic areas and disciplines.

Table 1. Derived competencies for mentors of junior clinical and translational investigators.

to meet with mentees frequently to assess progress toward goals and expectations and to be prepared for changes to the mentee’s course.

Finally, it is important to recognize that communication skills are important not only for establishing shared understanding but also for developing trust. “Meaningful coaching, counseling, friendship, and role-modeling are almost impossible in a situation characterized by low trust and minimal communication.”⁶

Indeed, when asked to react to the statement “The effectiveness of the mentoring relationship is enhanced when the mentee and mentor share an understanding of the expectations they have of each other,” focus group mentees replies confirmed the relationship between communication and trust:

“I think it’s true sort of from two perspectives. One, if you’ve got enough communication to be able to tell each other what you expect, then you’ve got enough trust and enough sort of ability to deal with each other in a professional way that you can both—so that’s—if you can get to that point it means the process is going okay. And then second, you don’t have the misconceptions of what you’re supposed to be—what the mentor is supposed to be doing and that the mentee is supposed to be doing.”

“From my experience, you need to have really, really wide open lines of communication, which also means you need to have a lot of trust in your mentor because my mentor’s lab program is ginormous compared to mine. And if I’m sharing all of my data with him, if there was any thought on my part that he might try to pop on or take something, then those lines of communication will be closed like that because I would get destroyed.”

Psychosocial support

This thematic area is exemplified by mentoring behaviors such as motivating, nurturing, encouraging, and empathizing. A relatively broad competency within this area is “attending to cultural diversity issues.” A mentor should be able to communicate effectively across diverse dimensions including differences in demographic characteristics (race, ethnicity, and gender), scientific disciplines, and levels of power and seniority. Moreover,

understanding how individual differences and cultures influence mentoring relationships is important. Serving as a role model is commonly endorsed by young researchers as a characteristic highly valued in their mentors, although what role modeling comprises is often not well specified. One example would be providing guidance on work-life balance, a topic of increasing concern to young professionals who are trying to weigh competing personal and professional concerns. Another example would be providing support during difficult periods of manuscript and grant rejection, research roadblocks, and interpersonal conflicts. Resiliency is an essential attribute that a mentor can try to both role model and instill.

Generational and phase-of-career differences create inevitable gaps between what a mentor can provide and what his or her protégé needs in certain situations. When this occurs, “encouraging peer mentoring” is another valuable competency. Empowering mentees to seek guidance and help from other investigators and faculty at their level of training (or at least closer to their cohort in stage of career) can enhance what the more senior mentor can provide, just like siblings and parents have complementary supportive roles in the family unit. Because each mentoring relationship is unique and the mentee’s needs for support are more often longitudinally revealed than disclosed in advance, the “capacity to reflect on and enhance the mentoring relationship” is especially important for psychosocial support. While all mentor competencies need to be adapted and fine-tuned to the individual mentee, the type and amount of psychosocial support optimal for a specific person is among the most highly variable, fluctuating and unpredictable needs. Thus, tailoring support to the individual mentee’s personality and circumstances rather than a one-size-fits-all approach is optimal.

Celebrating one mentee’s research achievements and success is often over looked. Arranging special recognition events, whether it be formal announcements in the university press or websites, or a simple lunch with a research group can carry a mentee through the lonely hours of writing papers and grants. All too often research mentor focus on dealing with scientific

problems and challenges and miss the opportunity to celebrate the outstanding work of our mentees.

Career and professional development

For junior investigators in C/T research, professional development must include learning how to get grants, publish papers, and develop effective leadership and management skills.²¹ Guiding mentees to master these skills may take a team of mentors with complementary skills. Mentoring behaviors in this thematic area are focused on guiding the mentee to proactively plan their personal and professional development, achieve success through implementing the plan, and maintain a healthy work-life balance.

A key mentor activity in this area is assisting the mentee to prepare a comprehensive and realistic plan to guide their career and professional development. It is important for a mentor to promote effective communication with the mentee in order to chart their professional goals, as mentioned under the “Communication and Relationship Management” thematic area above. To accomplish this, the mentor will need to “develop strategies to assist the mentee to identify gaps in their knowledge, skills, and experience and to collaboratively set realistic expectations for the scholars’ growth and independence.” In addition, the mentor must be aware of the academic and institutional systems and timelines in which the mentee operates, and the opportunities and resources that might be available to support their academic and institutional advancement. The mentor should “develop strategies to effectively guide and assist the mentee with implementation of their plan.” Setting up a system for regular contact to monitor progress and assist the mentee to problem solve or revise the plan as necessary is vital. Other strategies might include providing or assisting the mentee to identify opportunities for developing needed skills, helping them to prioritize demands and opportunities, and to identify problems with time-management and avoid activities that may be detrimental to implementation of their plan. The mentor should also actively promote the mentee within the institution and their discipline by identifying and providing opportunities for collaboration and networking and encouraging and supporting their attendance and presentations at local and national meetings. The mentor may need to advocate for the mentee to have adequate opportunity to do their academic work such as negotiating for fewer clinical responsibilities. The mentor will also need to build the mentee’s confidence and adjust their responsibilities over time to foster their independence.

The mentor should develop strategies to help the scholar to understand the fiscal and leadership responsibilities of an academic career and acquire the necessary skills such as negotiating with industry and others, working with contracts and grants, hiring and managing staff, and team leadership. Strategies might include role modeling, sharing responsibilities, role-play, reviewing budgets and other documents, and providing timely feedback after meetings. Mentors should also provide opportunities for mentees to discuss work-life balance, guide them to have realistic expectations and help them to develop strategies to ensure their goals for their personal and family life are met.

Professional enculturation & scientific integrity

The NIH mandates all researchers receiving training funds to undergo responsible conduct of research training.²² However, beyond the institution’s role, it is necessary for the mentor to understand his/her role. Though the need to promote ethical and

responsible conduct in research is well established,²³ the mentor’s responsibilities in this domain seldom appeared in most of the methods employed in this paper. The literature on promoting ethics and responsible conduct in research is inconclusive on the role of the mentor in supporting and educating the mentee on these issues. Further, it is not given that mentors themselves have been adequately trained to provide such guidance to their mentees.^{24,25} Through the expert consensus process, it was established that while not a common theme, it is an important consideration in a compilation of mentor competencies.

It is important for the research mentor to establish guidelines with the mentee and model ethical and responsible conduct of research such as the protection of research subjects. Mentors need to teach mentees the skills required to ensure integrity in research. The interdisciplinary focus in C/T research means that the process of enculturation needs to move beyond the narrow field of the mentee’s primary discipline to an awareness of other disciplines and the scientific community more broadly. Mentoring on ethics issues is not solely the responsibility of the research mentor. The pressure to produce results can be overwhelming. Advising mentee on research principles and the quality of their data will further promote the integrity of the mentee’s data. Therefore it is important for all mentors advising mentees on career and professional development to emphasize the interconnection of “good science” and ethical research conduct.

Research skills development

Teaching one’s mentee how to conduct research is a key competency for research mentors. Some would argue this is the primary and most critical role of a primary research mentor. Teaching research skills in C/T science includes identifying current level of knowledge in research design, measures, outcomes, sampling, statistical analysis, bias, and regulatory issues. Using a standardized self-assessment questionnaire with a mentee can be helpful in assessing the mentees perception of their current skill level and areas that need additional training.²⁶ Asking the mentee to critique previously submitted NIH grants and published papers in the mentees area of interest can also help to assess a mentee’s readiness to begin their own research studies.

Once the mentees skill level has been ascertained a research mentor can help the mentee design a set of training experiences to assist them to acquire the knowledge and skills they need to carry out research. This may include formal course work, seminars, working with secondary data sets, attending regional, or national training events, participating in group projects and spending time at other universities with content experts. It is unusual for a research mentor to have all the scientific knowledge, experience and skills needed to train young investigators in clinical translational science.

Another key aspect is to help a mentee develop a research study that is focused on a targeted and appropriate research question. This can be accomplished in the time available and is based on the current state of the art. It is important for the mentor to tell the mentee difficult to hear information. For example “You don’t have the resources to answer this question.” “We don’t have the methods or measures to address this question.” “You will not be able to build a sustainable research program that focuses on this area.” “While this is an interesting question I wouldn’t start with this one.” “This is not a fundable area of research based on current federal funding priorities.” Mentees often react negatively to the realities of a research career but this is a primary role of a research mentor.

The ongoing assessment of how their mentee's research is going is another primary responsibility. Many research studies and experiments do not produce the intended result. Some will not get past the IRB application. As all successful mentors know, one learns more from research failures than experiments or protocols that go exactly as planned. It is important for mentors to support and encourage mentees who are struggling. Sharing one's own failures and challenges can be helpful. Sometimes mentees need to take a break or to reevaluate whether they have the fortitude and commitment to develop sustainable externally funded research program. Dealing with peer review and conducting high level clinical translational science can be daunting to the young investigator.

C/T investigator development

Most of the competencies listed above would apply to any mentor whose mentees are aspiring scientists, including aspiring C/T scientists. Yet should we expect that mentors have specific competencies in order to effectively serve mentees in C/T sciences? We believe that they should and that these C/T mentor competencies derive largely from the Core Competencies in C/T Research. The CTSA Education and Career Development Key Function Committee formed an Education Core Competency Work Group to define the training standards for core competencies in C/T research. The work group's final recommendations for core competencies include 14 thematic areas that should shape the training experiences of junior investigators by defining the skills, attributes, and knowledge that can be shared across multidisciplinary teams of clinician-scientists.^{10,27} Although we do not expect every individual mentor to be fully knowledgeable and competent across each of the 14 thematic areas and the full range of translational sciences, there are certain specific elements that are essential. In particular, C/T mentors are expected to have the capacity to:

Assist mentees in formulating clinical and translational research questions. Developing C/T investigators are expected to learn how to formulate well-defined clinical or translational research questions to be studied in human or animal models. Mentors should have the capacity to help them identify basic and preclinical studies that suggest potential testable clinical research hypotheses as well as research observations that could be the basis of clinical trials. Furthermore, they should be able to assist their mentees to integrate elements of translational research into basic or clinical study designs, such as the collection of biological specimens nested in population studies, clinical trials or studies of community-based interventions as well as incorporate regulatory precepts into the design of a clinical or translational study.

Model and advise mentees on building and managing an effective multidisciplinary team. Future C/T investigators are expected to lead interdisciplinary team-based efforts that match the particular translational objectives of the research. Mentors will need to help them develop strategies to effectively meet the challenges of identifying the necessary expertise and merging scholars from diverse backgrounds into a high performing team. Needed skills include the ability to clarify language differences and translate concepts across multiple disciplines, implement group decision-making techniques and manage conflict. An important element of this competency is demonstrating these capacities by initiating, participating, and coordinating interdisciplinary mentoring team activities.

Identify mentee developmental and scientific needs across the translational aspects of research and assist them in designing

strategies and establishing linkages/networks to meet those needs. Although mentors are not expected to be experts across the full range of translational research, they should be able to assist mentees in fulfilling the full range of C/T competencies they are expected to achieve. In other words, they need not have proficiency in, for example, population sciences, health disparities, statistics, commercialization, national policy, or community engagement. But C/T mentors should be able to help mentees identify their gaps in these and other areas relevant to their C/T training goals, provide advice, suggest tasks, and educational experiences within their range of expertise and link them with appropriate resources, networks, and experts in areas of C/T research outside their own expertise.

Discussion

Our attempt to specify specific competencies for mentoring developing C/T investigators is just a starting point. Further evolution will require broader experience in applying and adapting the competencies and significant efforts in research and evaluation.

Applying and adapting competencies

One important issue in applying and adapting competencies is achieving balance. When developing these competencies, we were aware that we wanted to develop a set of competencies that are achievable for the average research mentor. Not all mentors are expected to be an expert in all six domains and to demonstrate all 19 competencies that a mentee might expect from their mentors. We focused on competencies that were measurable rather than on attributes such as kindness and caring that are perhaps important at an interpersonal level in the mentor-mentee relationship but are both difficult to teach and measure.

The competencies outlined here are all encompassing and not all mentors can be expected to show competency in all six domains. Furthermore, mentoring has been moving towards a team-based approach, where a group of mentors fill in the gaps in professional skills and knowledge for a given mentee. Some mentors will advise the mentee on their research, while others will be beneficial in helping the mentee with their professional and career trajectory. In this team based approach it is important that both the mentee and the program ensure that these competencies are being met by the group of mentors.

One of the characteristics of a K award is that scholars can come from different training backgrounds. Mentoring a researcher trained as MD versus a PhD can present different challenges. MD's are more likely to have extensive clinical knowledge but less basic science expertise, and the reverse is probably true of PhD trained scientists.

Implications for research and evaluation

This paper lays out suggested competencies for C/T research mentors developed by expert consensus informed by review of existing literature and other sources. There has not been any actual testing or evaluation of these suggested competencies, nor of strategies to apply and adapt them. There are at least four implications with regard to further research and development. First, further research should be done to validate the competencies derived by our multimethod approach. Prospective studies may show some competencies are more important than others, or lead to discovery of competencies not revealed in our preliminary work. Second, accurate ways of measuring competencies should

be developed in order to assess current mentoring practices, provide feedback, and pinpoint areas within individual mentors or institutions that require enhancing training. Third, training programs should be developed and evaluated to enhance mentoring competencies, analogous to faculty development programs on teaching and other professional competencies. Fourth, strategies for accurately identifying a particular trainee's mentorship needs would be helpful in tailoring competencies that are most salient to that particular trainee. Just as no individual mentor may be equally effective across all competencies, each trainee is unique and may benefit more from some competencies than others. Developing and testing tailoring strategies would enhance the application of these competencies

Conclusion

Using a variety of methods we have created a discrete set of competencies for mentors of junior investigators working in C/T research. By outlining the generic, and science specific and especially C/T specific competencies, we hope to shed light on the components that promote and facilitate an effective mentoring relationship.

Acknowledgments

We would like to recognize the contributions of the CTSA mentoring working group who include Charlie Huskins, Mayo Clinic; Anne Marie Weber-Main, University of Minnesota; John Hamilton, Duke University; Vance Fowler, Duke University; Melissa Begg, Columbia University; Henry Blumberg, Emory University; Richard McGee, Northwestern University; Emma Meagher, University of Pennsylvania; Jeff Probstfield, Washington University; Wishwa Kapoor, University of Pittsburgh; Howard Bauchner, Boston Medical Center; Lauren Taylor, Northwestern University; Chris Pfund, University of Wisconsin-Madison; Stephanie Schiro, University of Wisconsin-Madison; David Wilde, NIH/NCRR; Ellen Burnham, University of Colorado Denver.

Conflicts of Interest

The authors have no relevant financial disclosures or other potential conflicts of interest to report.

Funding

This publication was supported by National Institutes of Health (NIH) Grant Numbers UL1 RR025011-03S1 and by NIH/National Center for Research Resources Clinical and Translational Science Award Grant Numbers UL1 RR024156 (Columbia University Irving Institute for Clinical and Translational Research), UL1 RR025011 (University Of Wisconsin-Madison Institute for Clinical and Translational Research), UL1 RR024992 (Institute for Clinical and Translational Sciences, Washington University in St. Louis), UL1RR025761 (Indiana Clinical and Translational Science Institute), UL1 RR024131 (University of California, San Francisco Clinical and Translational Science Institute), UL1 RR025741 (Northwestern University Clinical and Translational Sciences Institute). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the NIH.

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