

Mentoring Translational Science Investigators

Michael Fleming, MD, MPH

Ellen L. Burnham, MD, MS

W. Charles Huskins, MD, MSc

A PRIMARY MISSION OF THE NATIONAL INSTITUTES OF Health (NIH) is to train the next generation of clinical/translational scientists. The NIH K-series training grants are 3- to 5-year awards that provide protected time (up to 75% salary support) and research funding (up to \$50 000 per year) to new investigators following fellowship training to prepare them for R01-level funding. Examples of K awards include individual awards such as K01s, K08s, K23s, and K25s, along with institutional-based K programs such as K12s and the CTSA KL2.

The success of K programs in developing successive generations of clinical researchers is well established.¹ However, approximately half of K-funded scholars do not ultimately compete for R-level funding or develop sustainable research programs.¹ Many K-funded scholars, especially physicians, will leave a research environment by the end of their K-funding period and pursue other career opportunities. Although a number of institutional-level strategies have been implemented to support and train K scholars, strong, active mentorship is one of the most powerful predictors of academic success.

An effective mentoring relationship serves 2 key functions: a career function (ie, the scholar learns how to become a productive researcher) and a psychosocial function (ie, the scholar becomes enculturated with respect for the values and practices of his or her research team and institution). A relationship that accomplishes these functions prepares the scholar for a productive, fulfilling research career and provides a model for the scholar to eventually mentor trainees.

The Clinical Translational Science Award (CTSA) programs recognize this critical element of career development and research training and have stressed the importance of mentoring in every request for application since the program's inception in 2006. As a result, the CTSA Education Key Function Committee established the national Mentor Working Group in 2008 to develop a series of white papers and recommendations on the various programmatic elements of a comprehensive mentoring program. This multidisciplinary group included physicians, social scientists, educators, basic scientists, and leaders among the consortium of CTSA-supported universities. This Viewpoint summarizes the findings and recommendations of a 4-year effort by the Mentor Working Group (BOX).

Primary Mentor

The primary mentor is the person with whom the mentee works on a regular ongoing basis, asks for help with science and research,

seeks help to review scientific papers and grants, expects support and encouragement, and requests help in making connections with other researchers and funding agencies. A primary mentor may or may not serve as an academic mentor if the trainee and the mentor are in a different department, school, or institution.

Selection of Primary Mentors

Selection of primary mentors is critical for investigators embarking on a career in research who are transitioning to independence.² Interviews with 46 KL2 program leaders⁸ revealed 4 primary methods for pairing mentees and mentors. The first, selection of a mentor by an individual mentee, was used most commonly, usually in the context of applying for a career development award. A smaller number of institutions reported compiling names of "qualified" or "designated" mentors from within an institution to help narrow the search for the mentee. Less frequently, mentors were selected for mentees by a third party, such as the research training director or chairperson. Use of a combination of these strategies was also reported that involved varying amounts of formal guidance by CTSA program leaders.

No empirical data suggest that any one method of selecting mentors is superior. However, in the matching process, the mentee's training needs, existing skill set, level of independence, and career track must be considered to ensure a suitable match that benefits both individuals. Directors of research programs can ensure that careers remain on track by systematically evaluating the mentor/mentee dyad and giving careful consideration to matching of clinical/translational mentees and mentors.

Mentor Support

Mentors face increasing challenges in maintaining their own research programs while supervising mentees who may not directly contribute to the mentors' research agenda. Institutional strategies to support clinical/translational research mentors are important, including financial support.⁹ Although previous NIH roadmap K12 programs provided modest amounts of yearly salary support (approximately \$5000-\$10 000), the only current NIH program to financially support research mentor time is the K24 award. None of the current individual K programs for junior investigators offers monetary support for clinical/translational mentors. Aside from direct salary support, other support strategies such as enhanced mentor access to research infrastructure, academic credit and recognition for mentoring, peer support

Author Affiliations: Departments of Psychiatry and Behavioral Sciences and Family and Community Medicine, Northwestern University Feinberg School of Medicine, Chicago, Illinois (Dr Fleming); Department of Medicine, Division of Pulmonary Sciences and Critical Care Medicine, University of Colorado, Denver (Dr Burnham); and Division of Pediatric Infectious Diseases, Mayo Clinic, Rochester, Minnesota (Dr Huskins).

Corresponding Author: Michael Fleming, MD, MPH, Northwestern University Feinberg School of Medicine, 710 N Lakeshore Dr, Chicago, IL 60611 (m-fleming@northwestern.edu).

Box. Recommendations for Mentoring Research Trainees**Mentor Selection**

Institutional leaders (research deans, chairpersons, institutional research training principal investigators) responsible for the training of new investigators need to guide the process of selection and matching and not leave it to the new investigator alone to navigate this critical process.²

Mentor Support

Mentors need support, including protected time for mentoring and financial support to offset training costs, and formal academic acknowledgment of their mentoring from their institutions.²

Alignment of Mentor and Mentee Expectations

The mentees and primary mentor need to ensure the ongoing alignment of expectations using strategies such as individual development plans, compacts, and formal agreements.³

Mentor Competencies

Institutions should define skill-based competencies they expect mentors to have or acquire through training prior to serving as a primary research mentor.⁴

Mentor Training

Institutions should offer comprehensive, competency-based mentor training seminars or workshops for mentors and trainees at all levels.⁵

Mentor Evaluation

Institutions should implement competency-based evaluation of research mentors using validated measures and assessment procedures.⁶

Mentor Feedback

Institutions should provide formal feedback to mentors based on competency-based evaluations and offer additional guidance and training in areas that need improvement.⁷

groups such as mentoring academies, and consideration of mentoring activities in development of the promotion dossier were also deemed useful.⁹ Data from K scholar mentor focus groups suggest that mentor support is critical to expand the pool of clinical/translational mentors. Increased departmental, university, and government commitment is necessary to support mentors' time and resources to train the next generation of scientists.

Aligning Mentor and Mentee Expectations

Data from a systematic literature review, K scholar/mentor focus groups, and KL2 program director surveys were used to assess the potential value of mutually identifying and aligning clinical/translational mentor and mentee expectations.³ Mentors and mentees both believed aligned expectations were essential for effective mentoring but not always for the same underlying reasons. Both parties agreed that alignment discussions should be conducted early and frequently revisited throughout the relationship to ensure that

research milestones are met. Discussions regarding alignment may be particularly important to confirm responsibilities of multiple mentors working with the same mentee and to provide a means to inform program directors or chairpersons of specific mentoring assignments.

Different programmatic options have been developed to address mentor-mentee alignment. Informal methods include regular one-on-one meetings between mentor and mentee. Formal strategies include mentoring compacts, individual development plans, and mentor philosophy statements. These strategies have been associated with increased mentoring confidence but are not unequivocally linked to mentee success and are used in only a minority of KL2 programs. No "one-size-fits-all" mechanism to address alignment will likely work for all clinical/translational mentor-mentee dyads. Participation of training directors, chairs, or research deans in annual review of mentor and mentee expectations may facilitate the alignment process and help ensure that adequate resources are available.

Conclusions

Effective mentoring is broadly recognized as an essential element of research training. However, given the paucity of empirical evidence for what works to enhance research mentoring, and the substantial investment required to train a new clinical/translational investigator, a research agenda and funding mechanisms for research are needed to strengthen the evidence base for effective mentoring practices and programs.

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