Leadership Lessons: Developing Mentoring Infrastructure for GEMSSTAR Scholars

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See related editorial by High et al. in this issue.

Through the National Institute on Aging's (NIA's) "Grants for Early Medical/Surgical Specialists" Transition to Aging Research (GEMSSTAR) U13 grant, the NIA and the American Geriatrics Society (AGS) developed three transdisciplinary research conferences with a focus on mentoring and leadership skills development. The NIA's GEMSSTAR program evolved from two earlier programs, the AGS' Dennis W. Jahnigen and the Association of Specialty Professors' T. Franklin Williams Career Development Scholars Awards. It supports the continued cultivation of the next generation of medical and surgical specialty researchers with an interest in aging research. The award requires both geriatrics and specialty mentoring and currently provides up to $150,000 a year in direct support to scholars. Additionally, the award requires that scholars have a professional development plan that is complementary to the GEMSSTAR award. The U13 conferences, focused on frailty, models of aging, and cognition, brought together GEMSSTAR scholars, former scholars, innovators, mentors, and leaders in aging research, the specialties, and geriatric medicine. This article describes the themes of each of the GEMSSTAR U13 conferences and highlights the lessons learned on mentoring, team science, aging research networks, and work-life balance. We plan to use these lessons to guide the support we provide to the growing group of emerging leaders who are poised to lead the transdisciplinary research network of the future. **J Am Geriatr Soc 67:650–656, 2019.**

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In 2010, the National Institute on Aging's (NIA's) Grants for Early Medical/Surgical Specialists' Transition to Aging Research (GEMSSTAR) was announced. This mechanism evolved from two earlier programs, the Dennis W. Jahnigen (American Geriatrics Society [AGS]) and T. Franklin Williams (Association of Specialty Professors) Career Development Scholars Awards (Jahnigen and Williams, respectively). Recognizing that providing infrastructure for innovative and impactful group or peer-to-peer mentoring under the tutelage of successful mentors is an essential component of transspecialty research involving aging populations, both the Jahnigen and the Williams programs included scholar networking meetings and events (both stand alone and at the AGS).[1,2] Together, the Jahnigen (79) and the Williams (104) programs trained 183 scholars, in 24 specialties, many of whom are now mentoring the next generation of researchers pursuing aging research through the GEMSSTAR and other award mechanisms.[3,4]

Like the Jahnigen and Williams programs, GEMSSTAR supports the continued cultivation of the next generation of medical specialty researchers with an interest in aging research. The award requires both geriatrics and specialty mentoring and currently provides up to $150,000 a year in direct support to scholars. Additionally, the award requires that scholars have a professional development plan that is complementary to the GEMSSTAR award. To date, the NIA has made 111 GEMSSTAR awards and the NIA renewed its commitment to this mechanism in 2015, announcing an additional 5-year cycle. NIA staff report that the award may be permanently renewed in 2019, to eliminate the need to reapply every 4 years. To provide opportunities for networking, AGS continues to convene scholars during its annual meeting, offering both networking events and dedicated opportunities to present. Both NIA and AGS saw an additional need for stand-alone scholar meetings, and in 2014,

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NIA awarded AGS a U13 conference grant in support of a series of transdisciplinary GEMSSTAR conferences that were focused on high-priority topics at the aging/specialty interface and included mentoring and skills-building experiences.

This article provides observations and lessons learned from leading three U13 theme-based transdisciplinary research conferences with a focus on the mentoring and leadership skills development aspects of those conferences.[5–8] In particular, the attention to leadership skills was a novel approach for a U13 conference series that both AGS and NIA believed was vital to advancing the following shared goals: (1) accelerate innovation across geriatrics and gerontology by uniting leaders across fields and linking NIA programmatic goals with GEMSSTAR meetings; and (2) expand the pool of physician scientists in aging research by developing and filling key gaps in faculty development training. One significant challenge that was identified by both AGS and NIA was that the conferences, while important, did not meet all the mentoring and career development needs of the GEMSSTAR scholars and that there were missed opportunities to support potential GEMSSTAR scholars through mentoring and research consultations. In 2018, to address this challenge, the NIA released a request for applications to serve as the Clinician-Scientists Transdisciplinary Aging Research Coordinating Center, which we believe will address many of the lessons we learned through this conference series.[9]

The three U13 conferences were focused on frailty, models of aging, and cognition.[5–7] All provided a forum for past and current GEMSSTAR awardees to interact with innovators, mentors, and leaders in aging research, the specialties, and geriatric medicine. This was also an opportunity to further develop leadership skills at a formative time in their careers. The agendas and select presentations from each meeting are archived at https://www.americangeriatrics.org/programs/geriatrics-specialists-initiative/gemsstarjahnigen/gemsstar-u13-conferences.

Throughout each conference, presenters emphasized the value of mentorship, continual learning, transdisciplinary collegiality, effective communication, and seeking additional sources for data and collaboration. During each conference, mentors from multiple specialties and from the National Institutes of Health (NIH) shared their research experience, expertise, and career development advice with GEMSSTAR scholars. In addition, GEMSSTAR scholars had the opportunity to network one on one with these mentors over meals or in breakout "shark tank" sessions, where they learned how to deliver an effective 2-minute "elevator speech" describing their research. In small group session, they had the opportunity to learn how fellow GEMSSTAR scholars approached experts for research input and to develop their own peer-to-peer mentoring networks. The themes, resources, and key lessons of these mentoring and career development opportunities are summarized in Tables 1–3.

The U13 conferences offered an opportunity to elucidate for GEMSSTAR scholars how to identify and develop

Table 1. First GEMSSTAR U13 Conference Mentoring Activities: Integrating Frailty Research Into the Specialties

Topic	Speaker	Key Take-Away Themes
Career Development		
Career development tips	Kevin High, MD, Wake Forest School of Medicine	• "Team science" offers benefits and challenges • R01 path accelerated by K-award, but 50% of first-time R01 did not have K-award • Achieving sustainable work-life balance essential for academic physicians
The power of bridging disciplines	Jeremy Walston, MD, Johns Hopkins Medicine	• Mentor selection is key, mentoring teams are essential • Multiple geriatric examples exist of transdisciplinary strength at the intersections of expertise • Self-assessment prior to prospective mentor interviews a useful exercise • Common mentor-mentee challenges can be overcome
Resources and Method for Junior Investigators		
Essentials of pilot study and design	Kenneth Schmader, MD, Duke University	• Writing and conducting pilot studies are challenging and require insights into sample size, analysis, budget, extrapolation to larger studies, and funding
The Frailty Tool Box: measurement tools	Ravi Varadhan, PhD, Johns Hopkins Medicine	• Two predominant paradigms of frailty with no transdisciplinary consensus • Frailty measures are increasingly used in oncology, cardiology, and surgery
Accessing mentorship and collaborators at aging centers and networks	Kevin High, MD, Wake Forest School of Medicine	• Aging research networks include Pepper Centers, ADRC, OAIC, Nathan Shock Centers, Roybal Centers, Resource Centers for Minority Aging, and GRECC
Using existing databases to answer research questions in aging	Steven Kritchevsky, PhD	• Existing data can establish junior investigator's intellectual niche, expand professional network, and generate preliminary results • Data sources exist at NIA, CDC, and NACDA

Abbreviations: ADRC, Aging and Disability Resource Center; CDC, Centers for Disease Control and Prevention; GEMSSTAR, Grants for Early Medical/Surgical Specialists' Transition to Aging Research; GRECC, Geriatric Research, Education, and Clinical Center; NIA, National Institute on Aging; NACDA, National Archive of Computerized Data on Aging; OAIC, Older Americans Independence Centers.

Table 2. Second GEMSSTAR U13 Conference Mentoring Activities: Models and Studies of Aging

Topic	Speaker	Key Take-Away Theme
Resources for Junior Investigators		
Large databases: pros/cons/limitations	Joachim Ix, MD, MAS, Nephrology, University of California, San Diego	• Existing data can answer questions more efficiently than collecting data, though limited by available measures and samples • Observational work complements productivity with natural ebb and flow of other projects • Provides opportunity to collaborate in topic-oriented work group • Respecting intellectual property and investigator's time are key elements to successful collaboration
Baltimore Longitudinal Study of Aging	Stephanie Studenski, MD, PhD, Geriatrics, National Institute on Aging	• BLSA established in 1958 and expanded in 2008 to understand normal aging • Includes measures of inflammation, immunity, nutrition, and physiologic parameters linked to outcomes like mobility and cognitive performance • BLSA aims to be responsive to emerging research questions in aging
Health and Retirement Study	Alex Smith, MD, MS, MPH, Geriatrics, University of California, San Francisco	• Longitudinal survey of 20,000 nationally representative community-dwelling adults aged 50 years and older beginning in 1992 • Major focus on health and wealth with aging into retirement
Career Development		
Getting started: large project	Dalane Kitzman, MD, Cardiology, Wake Forest	• Path to discovery, innovation, and funding sometimes unexpectedly nonlinear, but persistence can be rewarded—start over, and over, and over • Select important questions, and the answer will be relevant regardless of results • Relentlessly pursue the truth, adapt and enjoy the journey
After the R03: scaling up your research program	Robin Barr, DPhil	• Consider three overlapping paths–acquisition of research skills, accrual of data, and building a field • Early-stage investigators benefit from a 10-point R01 funding line advantage • R21 requires less work, but preliminary data still beneficial
Career development: Do's and Don'ts	Stephanie Studenski, MD, PhD, National Institute on Aging	• Conceptual framework connecting mechanisms, assumptions, and outcomes orients you and your key stakeholders • Seek critical feedback to understand blind spots in your proposal and delivery, but do not let feedback deter • Write from the readers' perspective and use high-impact visuals focusing on the take-home message • Develop management skills by learning from experienced administrator

Abbreviations: BLSA, Baltimore Longitudinal Study of Aging; GEMSSTAR, Grants for Early Medical/Surgical Specialists' Transition to Aging Research.

mentoring relationships in aging research. Early career investigators confront an array of challenges when seeking mentorship, including identifying appropriately aligned and available mentors, finding opportunities to engage those mentors, and adjusting to mismatches between the mentor-mentee priorities and research trajectory.[10] Mentee misconceptions of mentor's expectations for academic output, capacity to respond to queries, or credit for scholarly output can sour relationships before the research has matured.[11] Individual mentor's approach to providing research and career development guidance also varies depending on personality and leadership style.[12] Some serve as a coach to promote skill development in distinct domains, others serve as a behind-the-scenes sponsor providing resources or key exposures, and others serve as connectors.[13] By design, the U13 incorporated knowledge of GEMSSTAR's funded proposal and institutional resources when linking potential mentors with the junior investigators most likely to benefit. Our approach provided mentees the opportunity to observe different approaches to mentoring, while discussing their scientific concept and career development with mentors to whom they would otherwise not be exposed.

THE CONFERENCES

Frailty

The first U13 conference, focused on integrating frailty into aging research across surgical and medical specialties, occurred March 2 to 3, 2015, with 73 attendees (including 31 GEMSSTAR and 3 Jahnigen/Williams scholars). This topic was chosen because frailty is a concept without universally accepted measures and there are at least 75 frailty assessment instruments across specialties with scant consensus on how to incorporate the competing philosophies into transdisciplinary research.[5] Given the scientific uncertainty around frailty and the need for GEMSSTAR scholars to understand this concept, senior researchers provided attendees with guidance on using appropriate tools that would fulfill research goals and provide them with an understanding of the frailty research landscape. There was a particular emphasis on the role of Pepper Centers, Alzheimer's Disease Research Centers, Nathan Shock Centers, Resource Centers for Minority Aging, and Geriatric Research Education and Clinical Centers as resources for mentorship and funding opportunities.

Table 3. Third GEMSSTAR U13 Conference Mentoring Activities: Impact of Cognitive Impairment Across Specialties

Topic	Speaker	Key Take-Away Theme
Resources for Junior Investigators		
Introduction to the NIH Toolbox	Molly Wagster, PhD, Division of Neuroscience, NIH	• Common data elements by NINDS underway to harmonize information and streamline dementia research • Similar efforts to align vocabularies and measures underway by Alzheimer's Disease Neuroimaging Initiative and the Cancer Biomedical Information Grid • The NIH Toolbox can be downloaded from iTunes App Store
Inclusion of racial and ethnic minorities	Raj Shah, MD, Family Medicine, Rush University Medical Center	• Socioeconomic factors, like poverty, housing, and inequality, render larger impact on health than individual clinical interventions • NIA has a health disparities research framework • Pitfalls include failure to consider research questions requiring diversity, not engaging the study population initially and long-term, suboptimal information sharing, and inadequate curiosity about diverse life experiences
Big data in cognitive research	Dan Mungas, PhD	• Bigger data sets are often less tailored to needs of a specific research query • Consider both the size of the data source and whether that source was designed for research in weighing value for your question • Publicly available data sets for cognitive aging include the Health and Retirement Study, National Alzheimer's Coordinating Center, and the Alzheimer's Disease Neuroimaging Initiative
Career Development		
NIH primer on what you wanted to know but were afraid to ask	Sue Zieman, MD, PhD	• Understanding NIH key to finding the right fit for your grant • Use NIH RePORTER and Assignment Request Form to obtain the most appropriate review • Preliminary specific aims essential when conversing with program officers
Getting to know PCORI	Steve Clauser, PhD, MPA, Program Director, PCORI	• PCORI funds research exploring which care options work, for whom, under what circumstances • Engages patients, caregivers, clinicians, insurers, and employers in selecting research foci and throughout the research • Aging-related PCORI funding for cancer, cardiovascular disease, mental health, neurological disorders, multiple comorbidities, respiratory disease, and functional limitations
The science of team science	L. Michelle Bennett, PhD, NIH Intramural Research Program	• Team of experts is not synonymous with expert team • Team leadership requires mix of self-awareness, shared success and accountability for problems, mentoring, managing up and across, and creating a safe environment for difficult conversations

Abbreviations: GEMSSTAR, Grants for Early Medical/Surgical Specialists' Transition to Aging Research; NIA, National Institute on Aging; NIH, National Institutes of Health; NINDS, National Institute of Neurological Disorders and Stroke; PCORI, Patient-Centered Outcomes Research Institute.

Models of Aging

The second U13 conference explored models of aging and occurred September 22 to 23, 2016, with 110 attendees (including 46 GEMSSTAR and 6 Jahnigen/Williams scholars). This topic was chosen to provide GEMSSTAR scholars with an understanding of how geroscience informs subsequent clinical and implementation science.[6] Senior and mid-career aging researchers provided personal experiences in their early research challenges seeking funding amidst disappointing study results. The essentiality of selecting an important question followed by the relentless pursuit of truth through adaptation, persistence, and knowledgeable advisors underscored a message of fulfillment by enjoying the journey of discovery. Presenters emphasized that while critical feedback is necessary to recognize misconceptions and blind spots in the logic underlying research ideas, incorporating alternative perspectives should not destroy investigators' enthusiasm. Some advantages and foreseeable challenges associated with generating preliminary data from existing data sources, like the Baltimore Longitudinal Study of Aging and the Health Retirement Study, were reviewed.[14,15]

Cognitive Impairment

The third U13 conference reviewed the transdisciplinary impact of cognitive impairment and occurred on March 26 to 27, 2018, with 109 attendees (including 52 GEMSSTAR, 7 Jahnigen/Williams, and 4 Beeson scholars). This topic was chosen because of the challenges that cognitive impairment presents for aging researchers.[7] Large data sets applicable to dementia research, such as the Health and Retirement Study and Alzheimer's Disease Neuroimaging Initiative, were explored with expert guidance on weighing the suitability of these resources for the research question. The NIH Toolbox (http://www.healthmeasures.net/explore-measurement-systems/nih-toolbox) was introduced as a central repository of neurobehavioral measurement instruments that clinical researchers should use as measures of cognition and other components of aging. Since methods to screen for and confirm dementia and delirium are frequently misaligned between specialties and healthcare settings, NIH Intramural Research Program expertise on the science of team science outlined key components of successful cross-disciplinary collaborations. Opportunities to expand aging research through Patient-Centered Outcomes Research Institute funding priorities were also presented.

LESSONS LEARNED

Mentoring

A total of 129 GEMSSTAR scholars attended the three conferences, with 35 attending one, 31 attending two, and 11 attending all three. Similarly, the mentors attending each conference varied based on conference topic, which further impacted the development of sustainable mentoring relationships. One future approach would be to restructure how we approach mentoring at the in-person meetings so as to focus more on the opportunity for one-to-one consults with national experts and NIH staff with a specific research or career development question in mind. In addition, this could be coupled with more frequent virtual "office hours" that would bring together scholars and potential scholar. In terms of peer-to-peer networking and mentoring, we believe an important enhancement would be to establish a virtual networking platform that would bring together the transdisciplinary, transspecialty aging research community. Such a network would also help to address one challenge inherent in cross-specialty mentoring, which is the different expectations and approaches that specialties bring to research. As an example, surgeons often must meet specific board certification requirements related to their surgical skills (eg, maintain a case log) that can make it harder for a young investigator to devote the requisite time to a new investigator award. In addition, we believe peer-to-peer networking across disciplines would be enhanced by the creation of self-organized "pods" of GEMSSTAR scholars, as has been done in the Emerging Leaders in Aging program.[16,17]

Team Science

The emergence of team science only serves to highlight the importance placed on development of leadership skills in the GEMSSTAR, Jahnigen, and Williams grants. While downstream funding success often improves when a transdisciplinary approach is used, working across medical and surgical disciplines presents pragmatic challenges, particularly for the early career investigator.[18] Working across specialties and disciplines magnifies the inherent challenges of team science. These include alignment of the visions of key team stakeholders to guide the team's research plan and resource allocation within the financial constraints of research funding streams.[19] Transforming enthusiasm into sustainable academic productivity is essential, but also difficult with fluctuating funding streams and silos of care teams and disconnected clinical hierarchies. Nonetheless, team science is a necessary path forward for complex geriatric syndromes, like frailty and cognitive impairment. One lesson learned is the ongoing need to emphasize for more junior investigators that building a team requires an ongoing investment in the individual members of the team. Across the conference series, presenters acknowledged the importance that their research teams had in their success. In the future, further emphasis on how to develop high-performing teams that foster open communications, allow for constructive disagreement, and provide for individual and team assessment would be important.[20] We see further infusion of leadership skills development across early career awards as an important future focus in NIH career development awards. Mechanisms for accomplishing this type of skills development include peer-to-peer mentoring (as above), participation in existing leadership development courses, and thoughtful integration of this area of focus into activities that support early career investigators across specialty societies and other venues where they meet.[21]

Aging Research Networks

A third cross-cutting opportunity highlighted by all three U13 conferences was the vast array of NIH resources and aging research networks available to GEMSSTAR scholars and other early career investigators. For example, the NIH Toolbox provides a central repository of measures to evaluate cognitive, emotional, and functional status that is agnostic of specialty or population.[22] There are also a number of existing research networks (Pepper Centers, Veteran's Affairs Geriatric Research Education and Clinical Centers, and Alzheimer's Disease Research Centers) that provide opportunities for collaboration, funding streams, and transdisciplinary mentorship for early and mid-career researchers in aging. Finally, numerous sources of big data exist for preliminary hypothesis testing to generate proof-of-concept articles to support grants and maintain academic productivity while collecting new data. Unfortunately, these mentoring and data resources often exist in institutional or specialty silos and it is unclear from available data how much the current GEMSSTAR scholars accessed these resources. We see development of a centralized transdisciplinary, transspecialty network that highlights these resources in a more longitudinal way as a logical next step in supporting early career investigators in aging research. Steps to doing so will require engaging leading aging researchers who are involved in the existing research networks, leading specialty researchers who may not currently focus on aging but who are grappling with implementation of the new NIH Across the Lifespan policy in their own research,[23] as well as leading researchers who are at institutions without such centers but who access the

centers to inform their research. The goal here would be to leverage these existing investments in developing research networks to support the emerging medical and specialty researchers in accessing the resources and mentoring that they need at this stage in their career.

Work-Life Balance

Finally, GEMSSTAR scholars and mentors across specialties confront common challenges balancing personal and research commitments with patient care duties. These challenges are particularly evident for GEMSSTAR scholars practicing in a procedure-oriented field. GEMSSTAR planners purposely selected mentors capable of advising mentees on overcoming funding setbacks and maintaining a robust research portfolio, while maintaining wellness amidst a healthy work-life balance based upon personal experience.[24] Illustrating mentors' personal journeys of success on top of failure—and the persistence that rendered opportunity from disappointment—opened mentees' perspectives around shared challenges and like-minded determination between specialties and across funding streams.[25] In addition to the value of peer-to-peer constructive feedback provided by the small group sessions, the U13 attendees also obtained the perspective that unanticipated grant rejections, incomplete understanding and acceptance of aging research priorities within specialties, and work-life balance were ubiquitous across fields and stages of careers. This highlights the value of continuing regular in-person meetings around cross-cutting aging themes to provide early-stage investigators to view research through the understanding of shared challenges and peer's approaches that facilitate transdisciplinary cross-institutional relationships.

FUTURE DIRECTIONS

The vision, supported by private foundations, NIH, and the AGS, to incorporate aging principles within various medical and surgical specialties has seen unprecedented interest, success, and growth, leading to several innovative models of care and a thriving community of researchers and scientists committed to this field. The recent Request for Applications for the Clin-STAR offers a number of opportunities to build upon prior GEMSSTAR U13 experiences and further accelerate the growth of emerging leaders who are poised to lead the transdisciplinary research network of the future.

Success is failure turned inside out...
And you can never tell how close you are
It may be near when it seems so far.
So stick to the fight when you're hardest hit
It's when things seem worst that you must not quit.
Excerpt from Edgar A. Guest poem Don't Quit

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1. C.C. is co–principal investigator on the GEMSSTAR U13 award. C.C. has participated as invited faculty for Emergency Medical Abstracts and Best Evidence in Emergency Medicine continuing medical education lectures. C.C. serves as Board Member for the following: (a) Chair, Schwarz-Reisman Emergency Medicine Institute International Advisory Board; (b) Deputy Editor-in-Chief, *Academic Emergency Medicine* journal; (c) Editorial Board, *Journal of the American Geriatrics Society*.
2. A.H. receives research funding from GSK, Celgene, and Novartis. A.H. served as a consultant for: MJH Healthcare Holdings, LLC, Pierian Biosciences, Boehringer Ingelheim Pharmaceuticals, and Sanofi. A.H. serves as Board Member for the American Society of Clinical Oncology.

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