

COVID-19 and the Early-Career Physician-Scientist

Fostering Resilience beyond the Pandemic

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ABSTRACT

The coronavirus disease (COVID-19) pandemic has created significant stressors for the academic and scientific community, with unique challenges for early-career physician-scientists. The pandemic-related disruptions have significantly affected research productivity, access to mentoring, professional development and networking opportunities, funding, and personal wellness. This is especially true for pulmonary and critical care medicine faculty because of the burden of specialized clinical care responsibilities that the COVID-19 pandemic has demanded. Departmental, institutional, and national leadership should foster open dialogue to identify and mitigate these challenges to promote ongoing career development of early-career physician-scientists. Implementation of thoughtful interventions to address these challenges will provide essential support for junior faculty and help retain a generation of physician-scientists.

Keywords:

grant funding; pulmonary; mentoring; professional development; wellness

The coronavirus disease (COVID-19) pandemic has created significant stressors for the academic and scientific community, posing unique challenges for early-career physician-scientists. The pandemic and

resulting disruptions to normal operations are affecting research productivity, access to mentoring, professional development and networking opportunities, funding, and personal wellness. These disruptions are

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compounded for faculty at high COVID-19-volume medical centers where clinical responsibilities must be prioritized. Recognizing the current research challenges and implementing interventions to address the impact of COVID-19 will foster resilience in junior faculty and retain a generation of scientists (Table 1).

PRODUCTIVITY

Disruptions in research operations are creating unanticipated barriers to productivity—beyond simply the inability to generate new data at the bench or enroll participants in clinical research studies. Establishing an independent laboratory as a junior investigator takes time, energy, and resources. Normal early-career start-up activities including purchasing, hiring, establishment of animal colonies, and initiation of clinical studies were deferred to variable degrees during the pandemic response. For some investigators, COVID-19 has necessitated the premature termination of long-term experiments to comply with institutional guidelines. Extensive time may be required to reinstate long-term studies and rederive cell lines, disease models, and animal colonies after extended periods of shutdown. These obstacles lead to significant delays in obtaining the experimental results and initiating subsequent studies that build on those findings. The inability to finish, produce, or access data limits manuscript and grant submissions at a time when productivity is essential to building a long-term research career (1). Inequities in progress and publication also arise on the basis of a junior investigator's area of research, as some types of studies can still be performed remotely and continue, whereas others require in-person visits or laboratory work that will be completely shut down. Some academic institutions have

frozen or reduced start-up funding and suspended hiring of research staff because of financial strain from the pandemic. These limitations create additional barriers and limit opportunities for individuals looking for new or first-time faculty positions. Many physicians are diverting time and energy to preparing for the anticipated and eventual resurgence of patients with COVID-19, even in areas without an initial heavy case burden. Faculty in pulmonary and critical care medicine are especially impacted, given the nature of their clinical work within overburdened pulmonary and intensive care units (ICUs).

Institutions can help early-career physician-scientists maintain productivity despite these disruptions. Departmental leaders can formalize meetings with junior faculty to identify and plan for anticipated decreases in productivity. Senior investigators can meet with junior colleagues to help revisit and revise old or abandoned manuscripts, moving them toward submission. Collaborative groups of junior and senior faculty can review existing literature, identify novel funding opportunities, and generate ideas and plans for preliminary data for future grants. Departmental leaders, collaborative groups, and junior faculty members should identify, share, and encourage the use of online resources for members of junior faculty laboratories who are unable to complete experiments because of social distancing or quarantine restrictions to facilitate the acquisition of new laboratory skills related to ongoing or future projects. Sites such as edX.org and classcentral.com provide free online courses in a variety of scientific areas including the biological sciences. Junior faculty should also prioritize writing portions of manuscripts and grants. For early-career clinical researchers, institutional support for the

Table 1. Interventions to address the challenges for junior faculty

Challenge or Barrier	Proposed Intervention
Productivity	
Loss of laboratory skill-set development	Engage laboratory members using online learning for specific laboratory techniques
Disruption of the tenure and promotion timeline	Offering an extension to the tenure clock Adjust promotion expectations
Inability to hire new research staff	Excluding junior investigators from hiring freezes
Loss of communication opportunities with leadership	Scheduling specific meetings to address ongoing concerns or challenges faced
Funding transitions	
Gaps in funding	Institutional commitment during anticipated gaps in funding Extend the funding application and completion timeline for active mentored awards Extend early stage–investigator status
Professional development	
Major conferences cancelled	Engage junior faculty in virtual presentations and actively incorporate them in committee activities Account for virtual involvement in promotion applications
Mentorship	
Loss of mentor/mentee interactions	Increase communication between junior and senior faculty outside of established mentor relationships, including nonclinical mentors
Wellness	
Disruptions to child, elder, and family care	Creation of centralized resources for child, elder, and pet care
Increased risk of faculty dropout	<ul style="list-style-type: none"> • Ensure an environment of inclusion, equity, and value within the institution • Create peer-support groups • Identify role models to promote how to connect with purpose and adapt to changes
Increased risk of burnout, physical and mental exhaustion	Promote and provide resources for self-care, including: <ul style="list-style-type: none"> • Mindfulness applications • Counseling services • Virtual exercise communities • Mental health support

development of electronic study visits such as telemedicine visits can facilitate creative hybrid approaches to enrollment and data collection. Junior faculty members can request exemption from institutional hiring freezes. Many institutions have taken steps to extend tenure clocks (2) and adjust promotion expectations as concrete steps that mitigate the loss of productivity from the pandemic (Table 1).

MENTORSHIP

Mentorship is essential for the success of early-career investigators (1, 3), providing mentees with feedback on research projects and academic pursuits, advice and advocacy for career development, and opportunities for networking (4–6). Positive mentorship experiences are associated with decreased burnout and increased retention of junior faculty (4, 7). Mentors in turn benefit from the energy and ideas their mentees generate, resulting in increased productivity and professional growth for both (8, 9). Effective mentorship is particularly important for women and underrepresented minorities, who report increased difficulty in finding mentors and experience higher rates of attrition (10–13).

The pandemic presents several unique barriers to effective mentorship. First, it is difficult to sustain regularly scheduled meetings between mentors and mentees in the face of social distancing and competing clinical and administrative responsibilities. Second, the time demands from increased clinical service, new clinical leadership positions in COVID-19 ICUs, and dependent care at home are stretching the physical and mental bandwidth of mentors and mentees. Pulmonary and critical care junior faculty are dedicating significant time and energy into new and necessary clinical care roles, contributing to physical and emotional exhaustion. Finally, even

when ongoing mentorship is technically possible, early-career investigators experiencing disruptions in laboratory operations, clinical study recruitment, and teaching responsibilities have fewer work products on which to receive critical feedback from their mentors.

Despite these challenges—and indeed perhaps because of them—mentorship remains the cornerstone of early career development. Mentoring relationships are built on a foundation of mutual respect, clear expectations, personal connection, reciprocity, and shared values.

Maintaining regular communication, via in-person and virtual meetings, will ensure that mentors and mentees are aware of competing obligations and understand delays in responses and follow-up on tasks. Our institutions have encouraged regular check-ins between mentors and mentees. The frequency of these interactions is driven by the needs of the mentee, who should state clear goals for each interaction. Perhaps most importantly, clear and frequent communication will ensure that the mentor and mentee can devise collaborative solutions to inevitable delays in meeting milestones through creating detailed plans to prioritize effort and experiments as laboratories reopen. Prioritization is key in times of strain: the “stones, pebbles and sand” analogy (14) to fill a jar becomes critical at this juncture. Mentors should help mentees determine the most important activities or “stones” to prioritize and add to the jar first and then help them determine how fill in the jar with “pebbles” (shorter-term goals of less importance) and “sand” (minor tasks). Junior faculty can create a document listing both short- and long-term goals with realistic and attainable deadlines based on each active project or role that should be shared with their mentor. This would also

help to identify roles or tasks that may not be essential for career growth and could be postponed to a later time or eliminated entirely.

Mentors often serve overlapping roles for mentees, including as teachers, advisers, and sponsors. In the era of COVID-19, mentors' most important roles may be as advocates and confidantes, as their mentees face immense unease and uncertainty in their career development (8). It is important to also ask about life stresses outside of work, such as childcare and family obligations, to identify challenges early. Potential interventions include providing lists of resources for backup childcare or universities' assisting to expand daycare, preschool, and sick-child care options or subsidize costs for faculty. Mentors should openly acknowledge with their mentees that the pandemic is affecting productivity and encourage mentees to be compassionate with themselves.

CAREER DEVELOPMENT

As junior faculty advance, they also depend on networking and professional development opportunities for continued career development (6, 15). The pandemic has disrupted meetings and conferences at a local, regional, and national scale, which compromises critical venues for junior faculty to network, collaborate, and gain recognition for their work. Furthermore, presentations at these conferences, together with the assumption of leadership roles in national societies, are important components in promotion and tenure criteria.

Sustaining opportunities for career development will require action at a local and national scale. At a local level, institutions can provide alternative

approaches for engagement between junior and senior faculty to help foster new collaborations and career growth.

The University of Pittsburgh has junior faculty participate in two programs, SPRINGBOARD program for new faculty investigators and the Career Mentoring Program, that formalize senior faculty-led mentoring groups and supply knowledge of institutional resources, skills in managing teams, and negotiation and navigating the tenure/promotions process (<https://medfaculty.pitt.edu/faculty-development>). Universities should ensure during the tenure evaluation process that junior faculty are recognized for these virtual presentations. At the society level, many meetings are transitioning to an online format. It is important to engage junior faculty in these presentations at multiple levels to prevent them from becoming merely webinars for top senior researchers to present findings. Professional societies need to identify ways of adapting networking technology to create interactive spaces during online conferences for junior researchers to engage with each other and senior researchers in their fields in a practical and productive manner. Finally, many societies rely on national meetings to engage members in committees and other leadership roles. Senior faculty members who hold leadership positions can reach out to engage and incorporate junior faculty in positions remotely, especially those who are not already involved in society leadership. For examples, the American Thoracic Society has also made it easier for junior members to express their interests through the Get Involved site. Many professional societies have early-career professional committees that seek new members to help in the planning of society projects with the goal of helping to develop junior faculty leaders.

RESEARCH FUNDING TRANSITIONS

Disruptions in productivity, mentoring relationships with senior scientists, and interruptions in networking and professional development opportunities will likely translate into decreased or delayed success in securing research funding. Successfully navigating funding transitions is an important milestone for early-career investigators (16, 17). Physician-scientists are especially vulnerable during the transition from career development (K series) awards to independent research grants (R series) (17). Many early-career physician-scientists are facing delays in R-level submissions or resubmissions as a result of research shutdowns during the pandemic, increasing the chances that they will experience gaps in funding. At the same time, the uncertain financial impact of the pandemic may affect bridge funding available from academic medical centers and small foundation grants. Finally, independent research funding opportunities may become unpredictable if governments and private foundations have new limitations on their financial resources. Although the National Institutes of Health (NIH) has dedicated funds to COVID-19 research, early-career physician-scientists may have more difficulty pursuing COVID-19 research than senior scientists with large, well-established, and well-resourced research programs. Physicians have a more difficult time pursuing these new research directions, given increasing patient obligations and time demands. This is especially true for pulmonary and critical care faculty members because of the nature of their clinical work. In the same context, junior faculty may feel pressure or a need to pursue COVID-19-related projects, which may hinder overall progress if not related to their primary

research efforts. Ultimately, COVID-19-related funding losses for promising early-career physician-scientists may lead to a devastating loss for our future biomedical research workforce.

Important interventions could include an increase in institutional commitment to bridge funding for junior faculty during expected gaps. The NIH has extended the eligibility time for K99/K00 applicants by 8 months (two receipt cycles), given the disruptions owing to COVID-19. To proactively account for lost time, additional 1-year timeline extensions could be offered for early-stage-investigator status and for application to and completion of all mentored research development awards in the K and F series. Academic institutions and the NIH should heighten their focus on preexisting racial, ethnic, and sex disparities in research funding that may be exacerbated by the COVID-19 pandemic. To best understand the impact of the pandemic, as well as ongoing and future interventions on junior faculty, it is critical to measure and quantify the impact. Such assessments could be done by public and private funding agencies on the basis of data from their grant recipients over a period including before and several years after the pandemic. Institutions could also measure these effects internally in the context of their unique COVID-19 clinical burden.

EFFECT ON ACADEMIC CENTERS WITH A HIGH COVID-19 VOLUME

The privilege of contributing to the health of our community during the pandemic is magnified at centers experiencing a significant surge in COVID-19 cases, yet so too are the challenges for early-career physician-scientists. The rapid and robust clinical response at high-volume centers has required an all-hands-on-deck approach, regardless of faculty track. For physician-scientists, the *physician* plunges

into direct patient care, clinical operations, and COVID-19–related education, whereas the *scientist* abandons in-process grants and manuscripts, with research staff secluded at home without guidance to maintain productivity. This time of shifted effort is not captured on a curriculum vitae and may escape institutional memory in several years at the time of reappointment and promotion decisions. Furthermore, the psychological toll of working at high-volume centers during the pandemic is even more difficult to measure (18), and the full impact on critical care faculty likely has not yet fully manifested. Indeed, when the high volume of COVID-19 cases dwindles, many faculty will experience an immediate aftermath phase of exhaustion, disillusionment, and, for some, a long-term phase of ongoing post-traumatic stress disorder that will further stymie budding academic research careers (19). Thus, it is important to recognize and prepare for a postpandemic accelerated burnout syndrome that may disproportionately affect early-career physician-scientists at high-volume centers.

PERSONAL WELLNESS

Wellness involves a complex integration of physical, mental, spiritual, and social health (20). It requires continual practice and supportive infrastructure—essentially, resilience to life stressors (21). It is fundamental to the mission of health care and is thus linked to early-career investigators' professional identities. However, the early-career period poses a myriad of challenges to individual wellness, even under normal circumstances. Physician-scientists find meaning and purpose in a combination of professional and personal activities that have been fundamentally disrupted in ways that threaten personal resilience. Shifting from workdays spent intensely and purposefully

doing research to workdays spent not doing research makes us call into question the things valued most and increases the energy required to pursue them. Shifts in demands have developed in areas such as homeschooling, eldercare, and providing social support within the community. Lifestyle questions require additional thought: What are the right balances between providing clinical care and doing research in a time of crisis, between following public health measures and restarting research, between protecting time for deep thinking and attending to family needs, or among research, family, and self-care? Furthermore, social distancing limits participation in the arts, spiritual communities, sports, exercise, dining out, and spending time with others outside one's immediate family—normal self-care activities that buoy an individual physically, mentally, and spiritually.

Many early-career physician-scientists are trying to establish professional habits, norms, and rhythms from which to draw cognitive and emotional flexibility to cope with these dilemmas. Mentors, role models, and social supports have competing responsibilities, their own stressors, or simply reduced availability owing to social distancing. It is difficult to maintain optimism and face one's fears amid the new uncertainty piled on top of the normal early-career stressors.

WOMEN AND UNDERREPRESENTED GROUPS

Although everyone is facing increased stress and anxiety, a differential impact is likely for female faculty (22–24) and underrepresented groups, potentially exacerbating long-standing inequities and achievement gaps. Female and single-parent faculty may be inequitably burdened with household responsibilities such as childcare or homeschooling, creating an imbalance in work–home

duties. These responsibilities are difficult to account for and impact research productivity. Junior faculty of color may have additional requests of their time, such as mentoring and service on diversity and inclusion committees. It is paramount that the work environment for women and underrepresented minorities promotes inclusivity, value, and equity. Those most disadvantaged should receive the most support to ensure career advancement and foster their resilience.

The academic professional community can systematically foster resilience among junior research faculty during COVID-19 (25). First, it can provide social support in the form of centralized resources for the provision of childcare, eldercare, and pet care (26). Second, it can directly acknowledge junior investigators' fears and outline plans to address them, from extending promotion timelines to advocating sustenance of the fragile funding pipeline (2). Third, it can offer wellness resources, such as mindfulness applications, counseling services, and virtual exercise communities (26) to combat burnout. Fourth, it can identify strong role models within our research communities and amplify their examples of how to live our values, stay connected to our purpose, and adapt to changing circumstances. Fifth, it can promote peer support, mentoring, and other activities within our research communities to create a sense of value and belonging, share coping strategies, and prevent dropout. Finally, it can take a proactive approach to identifying those who are struggling most, commit to and listen to their needs, and actively address them. As an example, the University of Pennsylvania instituted a check-in process for all faculty during the height of the pandemic. The Pulmonary Division developed an

automated text-based application that messages individuals regarding 1) availability to do clinical work if needed (on the basis of all responsibilities including research, childcare, etc.), 2) a scaled question about overall well-being (a poor score triggers a phone call from division leadership to check in), 3) a "yes" or "no" question about interest in speaking with division leadership about anything, and 4) a link to the university's COVID-19-specific resources on mental health and well-being. Currently, the system has moved from daily check-in messages to weekly messages, given a reduction in COVID-19 volume. Similar supportive systems may help to identify and support faculty members during challenging times.

CONCLUSIONS

Recognizing the unique challenges facing academic junior faculty in the aftermath of the pandemic is the first step toward creating more professional stability. Looking past the initial COVID-19 response, we have transitioned to a new daily environment both at work and at home. As academic institutions and individuals, we must be proactive in recognizing these changes to determine how junior faculty can adapt and thrive. To help early-career physician-scientists build resilience and endure these challenges, institutional and national organization such as the NIH should focus on addressing expected losses in productivity and funding gaps, foster mentorship, and ensure wellness. Such supportive measures will ensure the presence of generations of physician-scientists, despite the current and future healthcare crises.

Author disclosures are available with the text of this article at www.atsjournals.org.

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