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Overstretched and overlooked: solving challenges faced by early-career investigators after the pandemic

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The coronavirus disease 2019 (COVID-19) pandemic has had a detrimental effect on research. However, little has been done to identify and solve the unique challenges faced by early career investigators (ECIs). As a group of American Cancer Society-funded ECIs, we provide recommendations for solving these challenges in the aftermath of the pandemic.

Early career research during global pandemic

The COVID-19 pandemic has resulted in unique stressors affecting ECIs, including graduate students and postdoctoral fellows (ECI-trainees), and assistant professors (ECI-faculty). Some of these stressors include heavier workloads, job insecurity, limited or decreased funding, and geographic instability [1,2]. Furthermore, under-represented ECIs bear a disproportionate burden of these challenges. Investigators who belong to gender, racial, and ethnic minority groups; are first generation college students; or are economically disadvantaged, are less likely to receive independent federal research funding and less likely to pursue principal investigator positions [3–8]. Emerging evidence suggests the pandemic has only exacerbated these disparities [9,10] and pandemic-related setbacks will negatively affect the diversity of the scientific workforce for years to come [11].

Several senior scientists of varied disciplines have published recommendations for investigators to maintain research productivity during the pandemic. While these recommendations are valuable and well-intentioned, advice that is relevant to established investigators may be difficult or impossible for ECIs to implement. Many established investigators were able to turn to writing, submitting, and publishing manuscripts during the 'work from home' time to maintain productivity, however ECIs might not have sufficient data or collaborators to conduct and publish reports of secondary data analyses. Additionally, reductions in animal colonies during laboratory (lab) shutdowns had more long-term negative effects on ECI research, given that many ECIs may not have had enough time to generate preliminary data or fully establish their colonies. Further, established investigators generally have older children that do not require constant care, while ECIs tend to have increased caregiving responsibilities in the context of school and childcare closures [11]. Finally, senior investigators have a larger established network so they can build collaborations virtually, whereas ECIs are trying to build their network, which is difficult to do from home. Even though it is largely acknowledged that ECIs face a unique set of challenges, published recommendations for ways to support ECIs are limited. Finally, for many ECIs, there may be things lost during the pandemic that are not returning, such as ECI-specific funding opportunities or faculty job openings.

As American Cancer Society-funded ECIs, we believe our perspective provides a unique angle to help institutions and individuals develop effective strategies to promote success and career advancement. Herein, we bring to light the negative, long-term impacts of the pandemic on ECIs. We highlight the aftermath of the pandemic on work–life balance, promotion, tenure, funding, networking, and mentoring, and make recommendations that can help remediate these problems. We hope these ideas mitigate the impact of the pandemic on the careers of ECIs, particularly those who are under-represented in the sciences.

Work–life (im-)balance

When educational institutions, child and elder care facilities, and individual and family support services abruptly shut down in early 2020, ECIs had to take on significantly more personal responsibilities. While working from home decreased commute time, the need to perform day-to-day household tasks and care for children and other dependents significantly halted productivity. This increase in personal responsibilities had a disproportionate impact on female scientists [11], who traditionally are primary caregivers of children and the elderly [12]. Given that female scientists were under-represented among independent research grant awardees [4] and principal investigators [3] before the COVID-19 pandemic, an institutional response to this dilemma is urgently needed.

One obstacle to gender parity in the sciences is a lack of quality, affordable childcare. In some regions of the United States, the annual cost of full-time care for one child exceeds 40% of the federally established postdoctoral stipend [13]. Even when parental leave policies are in place, it is rarely feasible for ECIs to step away from the research environment for an extended period. Institutions that offer affordable, on-site childcare allow ECIs who are parents to balance personal responsibilities with scholarly productivity and maintain a presence in the research environment. The provision of on-site childcare can be a cost-effective investment in ECI

retention. Institutions such as the University of Toronto and the University of California, Los Angeles have established demonstration schools that provide early childhood education while serving as research and practicum sites for the university's education majors. Another innovative solution is to create an institutional childcare network in which vetted students offer intermittent childcare or K-12 tutoring services to university faculty, students, and staff.

In addition to ensuring ECIs have access to dependent care, institutional leadership can initiate changes in workplace culture that will benefit ECIs. For example, female academics bear a higher burden of academic service responsibilities than their male counterparts [14]. Temporarily exempting all ECIs from service-related responsibilities would promote gender parity and permit ECIs to focus on scholarship. Likewise, department chairs can advocate for additional administrative, teaching, and research support staff to allow ECIs to use their time judiciously. Institutional leadership at all levels can support ECIs with dependent care responsibilities by creating an environment where families are welcome, acknowledging that personal responsibilities may not be visible and maintaining flexible schedules and remote work options for the foreseeable future [15].

An often under-discussed topic of paramount importance affecting ECIs, even in prepandemic times, is mental health. In the past year, facing COVID-related illnesses and deaths, grappling with career uncertainty, and coping with political and social unrest have placed significant strain on our cohort. ECIs whose identities are under-represented in the sciences bear an added level of stress. In addition, within the ECI cohort, researchers at different career stages experience different pandemic-related stressors. For example, ECI faculty might worry more about securing research funding, while ECI postdocs might be more concerned with hiring freezers that prevent them from securing faculty positions, and ECI graduate students may experience anxiety related to meeting graduation requirements and future career prospects. To promote the well-being of all ECIs, it is necessary to create a supportive and inclusive work environment [15], where our diverse experiences during and beyond the pandemic are acknowledged and valued. This practice should be standard for all labs, departments, and universities and employers at all levels should be held accountable to these guidelines. In addition, principal investigators should not pressure ECIs to increase productivity to compensate for time lost during the pandemic; instead, mental health should be emphasized. At the institutional level, universal health days and workshops on work–life balance should be implemented. Hotlines and other mental health or stress management resources to address depression, anxiety, and burnout would help identify ECIs in need of extra help and address those concerns as they occur.

Promotion and tenure

While scientific productivity has been significantly hindered for all investigators, ECIs, including clinician-scientists that have been diverted from research to assist with pandemic-related patient care, have been disproportionately impacted. Many ECIs focus on a single project and had limited alternatives for working remotely during the shutdown. In lab settings, social distancing restrictions, limited access to equipment and cores, and supply chain interruptions have made it extremely difficult for ECIs to regain research productivity. For clinical researchers this was exacerbated by decreased recruitment of patients for non-COVID-19 research. In addition, many institutions required extensive reductions in animal colonies during shutdown. While established investigators might be able to argue that these animal models are indispensable for their research, ECIs might not have such negotiating power, leading to years of lost research. Lastly, many institutions implemented hiring freezes during the pandemic, limiting the extent to which administrative and research support has been available to ECIs. In a world where the principal metric of ECI productivity is number of papers published, this loss of experimental momentum is bound to negatively affect the perceived effectiveness of the ECI in their path to independence.

Despite acknowledging the adverse impact of the pandemic on research productivity, most institutions and universities have not provided a clear plan or policies to move forward. Although some institutions have extended the tenure clock, it is essential for institutional leadership to provide written expectations and guidelines for how job applications, promotion dossiers, and related personnel issues will be reviewed given the current research environment. In addition, institutions should increase flexibility in tenure review criteria and allow candidates for promotion to select the area of performance that is emphasized during formal evaluations. Oregon Health and Sciences University is one example of an institution that has already adopted this individualized approach. Allowing candidates for promotion to prioritize teaching, service, or research would acknowledge that the experiences of ECIs during the pandemic have been diverse and largely contingent on individual circumstances. Conversely, a fixed review model could disadvantage many ECIs, particularly women and those with dependent care responsibilities. ECIs may further benefit from the inclusion of preliminary data and preprints (e.g., submissions to *BioRXiv*) in formal evaluations. Professional development opportunities, such as workshops on grant writing and reviewing, job interviews, and contract negotiations, may further prepare ECIs to advance to the next stage of their career. These professional development opportunities should

be specifically tailored to the different ECI career levels to accomplish the most efficient support. In addition, ECI-graduate students should be granted extensions on thesis and graduation requirements. Mentors could also provide a clear 'COVID-19 impact statement' for job applications to further support their trainees. It is critical that the academic community and established investigators safeguard ECI-trainees by providing support and resources for this future generation of scientists.

Funding

Another significant concern plaguing ECIs is decreased opportunities for research funding. Many funding agencies have smaller budgets as a result of the pandemic and, unfortunately, the first opportunities that have vanished are ones originally designated for ECIs. We believe these smaller grants and path-to-independence awards are essential for our success and ask funding agencies to consider developing new ECI-specific opportunities, modify current grants not accessible to ECIs, increase the dedicated funding envelope for ECI grants, and extend ECI eligibility windows for at least 1 additional year as lab activities are slowly returning to normal. Funding agencies should also consider identifying reviewers with diverse backgrounds and experiences so that the grant review process can be done equitably and with empathy. Inviting ECIs to participate in the review process, for both funding and scientific publications, will aid in career development, as is often viewed favorably for tenure and promotion.

It is also imperative that funding agencies consider and offer formal guidance on how pandemic-related slowdowns in productivity will be accounted for in an equitable manner. For example, the National Institutes for Health (NIH) has issued clear guidelines to allow for extensions of F and K fellowships available to ECI trainees. An innovative grant mechanism recently announced by the NIH, the Katz R01, does not require preliminary data and instead measures rigor via careful citation of already published literature, which favors ECI faculty whose labs were affected by the shutdown. Furthermore, funding agencies should automatically offer no-cost extensions to all ECIs without requiring justification. In addition to no-cost extensions, funding agencies should allow for a break in reporting for all ECI groups. We suggest reporting deadline to be re-evaluated at the end of 2022 to allow for all ECI groups to focus on lab activities during the recovery period. In the short term, funding agencies could also reassign unused travel funds to flexible funds for childcare expenses or to cover other needs; provide bridge-funding to cover salary for grants that cannot be completed; or increase financial support for grantees who are patients or are immunosuppressed.

Finally, a lot can be done at the institutional level. Universities could help ECIs by absorbing core facility costs to remove barriers related to equipment access and on-campus services. An extension to the timeline for start-up funding and provision of additional funds to account for loss of resources during the pandemic and the drastic increases in supply cost would go a long way in helping starting faculty. Universities should further commit separate emergency funds for ECI faculty so they, in turn, can extend support for graduate students, postdoctoral fellows, or other personnel.

Mentorship and networking

During the pandemic, many opportunities for mentoring and networking have disappeared. Abrupt and continued lab shutdowns or socially staggered lab openings have hindered interactions for spontaneous discussions within the lab. Minimal interactions between researchers, mentors, and collaborators stalled projects and left trainees feeling lost and unsure of how to advance their own careers, creating a climate of uncertainty that may result in many ECI trainees seeking alternative career paths. In addition, many ECI faculty have faced great difficulties to virtually support trainees while maintaining the level of productivity needed for promotion and tenure. One way to compensate for the reduced in-person or informal gatherings is the leveraging of platforms such as Microsoft Teams, Slack, Twitter, and even online gaming, where lab members and research community can create threads about topics of interest (work or life related) or just decompress. These forums are low-cost, high-return tools that help create a sense of community within labs and scientific networks. Moving forward, mentors and mentees should also analyze what modifications worked during the pandemic (staggered shifts, virtual one-on-one meetings, more days off-site) and re-evaluate career needs and timelines (new or extended funding, additional career development) to establish new work and mentoring plans.

The transition of all meetings and conferences to a virtual format have led to decreased opportunities for networking. Even when ECI trainees and faculty are invited to give talks, there is minimal interaction with participants. With travel restrictions gradually lifting, our new priority should be to make up for lost time. We suggest the following: (i) Scientific conferences should invite diverse ECIs to give presentations, organize sessions, and include ECIs as reviewers for conference abstracts. This could be achieved by assigning an equal amount of ECI faculty and trainees or through requiring gender balance for each session. (ii) Dinners or social events should be organized for invited speakers with a small number of participants, facilitating more intimate discussions between all ECI groups and established investigators. We also suggest placing more emphasis on smaller workshop-style meetings rather than large conferences to enable more meaningful interactions. (iii) Registration fees should be waived or ECI trainees that

come from ECI faculty labs should be offered increased financial travel support to ease financial hardship. Additionally, established investigators should support ECI trainees by declining speaking invitations and endorsing their trainees instead. Similarly, department chairs should proactively promote ECI faculty for speaking engagements. Finally, institutions and funding agencies could build mentoring and networking networks between ECIs and established investigators, filling the void left by no in-person meetings and conferences.

Concluding remarks

With the arrival and distribution of the COVID-19 vaccines, research procedures are slowly shifting back to their prepandemic state. However, many of the concerns we address here will have more impactful negative consequences on many ECIs, as compared with established investigators. We believe the suggestions presented here are long-term solutions that provide a framework to aid in the success of ECIs. Our solutions provide greater flexibility, alleviate uncertainty and fear, and provide a restructuring that is needed to build a resilient, flexible ECI workforce. In essence, prepandemic workloads, stress levels, and pressures faced by ECIs were not sustainable: we have a unique opportunity to recognize the failure points in the system, as revealed by the COVID-19 pandemic, and make impactful changes that will benefit the next generation of scientists.

Declaration of interests

No interests are declared.

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https://doi.org/10.1016/j.trecan.2021.07.005

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