Preprints in Health Professions Education: Raising awareness and shifting culture

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Abstract

A preprint is a version of a research manuscript posted by its author to a preprint server prior to peer review. Preprints are associated with a variety of benefits including the ability to rapidly communicate research, the opportunity for researchers to receive early feedback, and broad unrestricted access. For early career researchers preprints also provide a mechanism for demonstrating research progress and productivity without the lengthy timelines of traditional journal publishing. Despite these benefits, a minority of health professions education (HPE) research articles are deposited as preprints, suggesting that preprinting is not currently integrated into HPE culture. In this commentary, the authors introduce preprints, describe their benefits and related risks, and discuss potential barriers that might cause HPE researchers to hesitate to deposit them. In particular, the authors propose the barriers of discordant messaging and the lack of formal and informal education on how to deposit, critically appraise, and use preprints. To mitigate these barriers, several recommendations are proposed to facilitate preprints in becoming an accepted and encouraged component of HPE culture, allowing the field to take full advantage of this evolving form of research dissemination.

A search for "medical education" or "health professions education" on the popular preprint servers bioRxiv and medRxiv returns over 1,000 preprints, of which 88 were deposited in just the first three months of 2022. These preprints cover topics ranging from integrating climate change into the medical curriculum[1] to understanding the effects of medical school on mental health and sleep.[2] Several are now peer reviewed and published in health professions education (HPE) journals (e.g., *Academic Medicine*, *Medical Education*, *Perspectives on Medical Education*), suggesting that some HPE researchers are aware of preprints and that there may be growing interest in them. However, given that 22,285 articles were published in HPE journals between 2013-2020,[3] it appears that a minority of HPE research is preprinted. In this commentary, we introduce preprints, their benefits and risks, and the potential barriers hampering their widespread use within HPE. As advocates for open science and regular depositors of preprints, we believe scholarship in HPE will benefit from widespread acceptance and encouragement of preprints in HPE culture. We propose several recommendations that we believe will allow the field to take full advantage of this evolving form of research dissemination.

What are preprints and why do scholars use them?

Different disciplinary communities define "preprint" differently, but in medicine this term generally refers to "a complete manuscript posted to a preprint server by authors before peer review and publication in a journal".[4(p.1840)] Preprint servers, such as medRxiv and bioRxiv, are online repositories that can be used to find, read, and download preprints. Although preprint servers do not organize external peer review, most perform at least a basic screening check of preprint submissions.[5] medRxiv, for example, requires preprints to be full scientific research reports without any obscenity, plagiarism, or patient identifiers; a member of the scientific community must also vouch that preprinting the work would not pose a risk to patient or public health.[6] Many preprint servers also include comment functionality, allowing authors to receive feedback from readers in advance of formal peer review.

Preprints are a growing form of open science with wide-ranging and well-established benefits, which individuals should balance with their related risks (see Table 1). For example, the near immediate availability of preprints can accelerate the dissemination of research in-progress and enable a discussion of the work faster than the average 180 days it takes for HPE research to be published.[3] Demonstrating in-progress productivity is especially important for early career researchers (ECRs), who typically have fewer peer reviewed publications on their CVs but are also more likely to be on the academic job market. Additionally, in comparison to more established researchers, ECRs place more value on the opportunities preprints provide for receiving feedback and raising awareness about their research.[7] As research outputs are free to post and read, preprints offer a more affordable way for ECRs, who are less likely to have funds

to cover article processing charges, to participate in open science. Additionally, preprints are freely accessible providing for wider and fairer reach.

Although preprints are becoming more popular in the life sciences, fears about preprint risks prevent some scholars from posting them. For example, a researcher might be concerned that their research ideas could be "scooped" or that their target journal will not accept their manuscript submission if it has been preprinted. Additionally, some researchers have reservations that a special interest group could misuse a preprint to promote their own agendas or that depositing a preprint may trigger a publisher to raise questions about copyright or licensing issues. Researchers' fears are particularly prevalent in clinical medicine, where preprints remain controversial. At the center of these debates are concerns that patients may seek out preprints (or stumble on them through media coverage), misunderstand them, and make health decisions based on flawed evidence.[8] Preprints are actively covered by some journalists[9,10] and can circulate widely on social media.[11]

While patient risks are realistically limited in HPE, there is a chance that learners, educators, or institutions could be harmed if inaccurate information from a preprint was implemented. Yet, researchers have reported that HPE educators engage in limited implementation of evidence in their practice and that they face multiple constraints in their efforts.[12,13] Beyond fears of harming the HPE community, we thus propose that hesitancy surrounding preprints in HPE is primarily a result of our academic culture—of discordant messaging related to preprints within the field and a lack of explicit and implicit training on how to post, evaluate, and use them.

Discordant Messaging

For preprints to become an accepted part of HPE culture, there must be clear messaging about whether and how to post them. However, HPE authors are likely to encounter discordant messaging. A recent scan of 74 HPE journals reported that while most (n=53) allow preprints, 11 disallow them.[14] These conflicting policies send a mixed message about the acceptability of preprints within the field and may cause authors to hesitate to deposit a preprint in order to keep all publication opportunities open. Moreover, the following journals allow preprints only on a case-by-case basis: *Academic Medicine, Evaluation in Health Professions, Family Medicine, Journal of Graduate Medical Education, Journal of Occupational Therapy Education, and Nursing Education Perspectives*.[14] Case-by-case preprint decisions add another level of discord and confusion. We recommend that journal editors avoid case-by-case decisions on preprints or, if they opt for this approach, that they make the criteria for their decisions transparent in the author guidelines. Lastly, journal preprint policies can be difficult to locate. We propose that journal editors should clearly state their preprint policy in their publication's author guidelines, so that authors can consult these guidelines when selecting a target journal. In addition, the journal's editor often writes these guidelines, suggesting that the contents reflect the editor's

stance on a topic or policy. In contrast, some HPE journals point to their publisher's generic preprint policy. While this approach provides a greenlight to deposit a preprint, it fails to provide clarity on the editor's stance on preprints and may cause author hesitation.

Discordant messaging about preprints is not unique to manuscript submission; it can also affect the peer review process. For example, one of us (LM) submitted a manuscript, which had previously been posted as a preprint, for peer review at an HPE journal. Despite declaring the preprint in the cover letter, a reviewer expressed dismay that they had found this manuscript "published" online and that the editor should investigate further. This reviewer's comment sent the message that posting the preprint was a cultural faux pas (i.e., duplicate publication), which clashed with the journal's policy of accepting preprints and reinforced confusion and fear about them. Another discordant message that has surfaced in HPE and other fields is that preprints are ephemeral and can be removed once a manuscript is published.[15] This is incorrect. Upon deposit, preprints become part of the permanent scholarly record. In rare circumstances (e.g., a preprint poses a health risk), a preprint can be withdrawn, but its metadata will remain with a notice about the reason for withdrawal.

Lack of training about preprints
The two latter examples are evidence of discordant messaging, but also highlight a lack of knowledge about preprints (e.g., an informed reviewer would understand that a preprint is not considered a dual publication). This lack of knowledge is not unique to HPE; many undergraduate science, technology, engineering and mathematics majors are also unfamiliar with preprints and struggle to differentiate them from peer reviewed articles.[16] This potential lack of awareness has implications for authors considering preprinting, but also has implications for their use within HPE. We propose that for preprints to become a part of HPE culture, they must be purposefully integrated into both the formal and "hidden curriculum"[17] of HPE trainees.

Formal Curriculum
To our knowledge, preprints are not formally introduced in HPE training. This absence likely exacerbates hesitation to deposit preprints. We also propose that this gap represents a missed opportunity for learners to authentically engage with the scholarly communication process and to learn to be critical consumers of preprints. In other fields, educators have leveraged existing mechanisms like journal clubs to introduce preprints, which is also a viable option for HPE. For example, faculty at the University of Kansas Medical Center offer a graduate course that introduces preprints using a journal club format and engages students in drafting and submitting a collective peer review to preprint authors.[18] This activity, unlike traditional journal clubs that critique published manuscripts, challenges trainees to act as "live" peer reviewers, providing authentic feedback to their peers, as they would if they were solicited by a journal for peer review. In addition to providing hands-on peer review experience, this initiative provides trainees with a window into the pre-polished version of a manuscript, allowing them to see that

manuscripts are often not as perfect as they seem upon publication. Finally, preprint-based journal clubs may also benefit researchers, as trainee "peer reviews" that are emailed to a corresponding author or posted to a preprint server comment section could help to improve the quality of the final manuscript. In contrast, trainee reviews of articles read in traditional journal clubs are not typically shared with study authors; even if they were, it is unlikely that they would be used, given that the articles are published.

Preprint-based journal clubs are just one example of how preprints could be integrated into the formal HPE curriculum. Educators could also integrate the versioning functionality of preprint servers into their coursework to teach trainees about the iterative nature of authoring manuscripts and of the research process more broadly. Preprints could also be compared with their final, peer reviewed versions. Not only would this demonstrate the ways in which peer review can shape a published article; it would also provide trainees with examples of peer reviews. Educators could also consider using preprints widely covered in either social or traditional media as case studies to spark class discussions about the risks and benefits of knowledge mobilization.

Informal Curriculum
While formal training about preprints is important, fostering a strong preprint culture in HPE will require integrating their use into the hidden curriculum through informal training activities such as role modeling and mentorship. Doing so is essential because these activities communicate implicit norms and values to the next generation of HPE professionals about what types of research outputs are valuable, credible, and, ultimately, worth using.

To succeed in a precarious and competitive job market, young researchers often feel pressure to follow the scholarly conventions of their discipline, including "publish[ing] in top journals".[19] As mentioned earlier, only a minority of HPE papers are currently preprinted, suggesting that preprints are not yet an established research convention within the field. Paired with the discordant messaging from journals and reviewers, the low levels of uptake may signal that preprints are abnormal or undesirable, discouraging junior scholars from posting them. To shift this implicit message, established HPE scholars—particularly those in positions of power, privilege, and visibility—need to normalize preprints by posting, reading, sharing, and citing them. Senior scholars can further signal the legitimacy of preprints by listing them in their CVs and online profiles (e.g., Google Scholar, ORCID) or by sharing them on social media platforms (e.g., Twitter, ResearchGate). Finally, mentoring trainees in how and why to post preprints, as well as how to read and critically evaluate them, could further support the development of a rewarding and sustainable preprint culture within HPE scholarship. Such mentorship could not only increase awareness of the risks and benefits of preprints among HPE researchers, it could also help them gain skills in how to evaluate the quality of research, rather than simply relying on proxies such as journal reputation or peer review status.

Conclusion

In this commentary, we have argued that preprints have wide-ranging and well-established benefits, but are currently underused within HPE. Unless preprints become an established part of our research culture, this low level of uptake is likely to persist. Yet, encouraging our community to use preprints is not enough. To support wide uptake of preprints, and to maximize their benefits for young scholars and practitioners, preprints need to become a part of both the explicit and "hidden" curricula that we use to train the next generation of HPE professionals. To develop a vibrant and sustainable preprint culture, it's up to HPE teachers, supervisors, and mentors to lead the way: to post, read, teach, and recognize the kinds of preprints our field wants to see in the world.

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