

EDITORIAL

Doing a PhD: ten golden rules



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“I’m not belittling your discovery. Most discoveries are made regularly every fifteen years; and it’s fully a hundred and fifty since yours was last made.... That’s something to be proud of....”

George Bernard Shaw
 The Doctors Dilemma, 1912

A PhD or doctoral thesis is an internationally recognized academic degree awarded at postgraduate level by universities and higher education institutions following submission of a thesis or dissertation. The awarding of the degree is based on extensive and original research in the awardee’s chosen field. It can be a long, arduous and intensive process for the PhD candidate. Advice from peers and mentors is valuable to sustain this course of action. These ‘golden rules’ tips are an amalgamation of advice from PhD students and mentors aimed at making the process easier¹.

RECOGNISE THE VALUE OF RESEARCH TO THE INDIVIDUAL AND TO SOCIETY

Think about your reasons for doing a PhD and remember that research is a core skill for all clinicians and researchers. The management and analytical skills one will acquire from a period of dedicated research will be invaluable in your later career as a clinician. There is of course the value to others in society from your research as well as an opportunity to improve outcomes for children and families. There is evidence that doing research may increase resilience and grit (Halliday et al.)². In addition, this resilience helps one to cope with rejection and to avoid burnout. It is suggested that the novelty and added value of research and ability to change clinical management also gives a deep sense of purpose.

SELECTING YOUR AREA OF RESEARCH

There is a huge variety of research areas. Biomedical research encompasses “basic research” (or bench science)³, from fundamental scientific principles in a preclinical setting with the goal of obtaining new knowledge that may or may not translate to healthcare, to clinical research, involving people and clinical trials and the goal of obtaining new knowledge that will impact on healthcare. Within this spectrum is applied research, or translational research, conducted to expand knowledge in the field of medicine and with the goal of changing our understanding of health and disease. Research methods are broad in variety including audits to clinical trials to basic science to quality improvement. Most clinicians are constantly involved in research without even realising it. The development of physician-scientists

experienced in forming and participating in multidisciplinary teams that address complex health problems is vital and has been prioritised internationally⁴.

SELECTING THE TIMING AND PATHWAY OF OBTAINING A PH.D

There is no optimal time to start research training but research skills are valuable early in your career. There are many options for timing of a Ph.D.: before, during (intercalated = MD PhD programme) or after medical school or when in a more senior position. Ninety percent of students who completed a thesis during medical school went on to further research (Park et al.)⁵.

SELECTING A SUPERVISORY TEAM

When selecting a supervisor/mentor for the Ph.D. consider the research project, their expertise in this area and your relationship with them. Consider your interest in the project, their track record for publishing and supervising students to completion. Remember that the research tools you’ll learn may be more important than the topic of the project itself. Ideally join their research meetings and speak to their research team members in advance. Important elements to organise in advance are choosing an area of research, getting funding, and securing time out from specialty training. There are many helpful resources to assist in planning timelines and funding sources (RCPCH Research Toolkit (<https://academictoolkit.org>), US Grant applications (<https://usagrantsapplications.org/v9/>)). The roles of clinical and research mentors is to support novice researchers, to ensure the success and completion of any research, and, in particular to assist the writing up of a thesis or Ph.D. thesis.

Supervisors/mentors with a strong track record for publication and supervision of higher degrees may have the advantage of being experienced but may also have a larger number of trainees so they can be less accessible. Conversely being the first Ph.D. student may have advantages with an enthusiastic and motivated supervisor/mentor with more time.

Since no one mentor can do it all, most trainees require “wrap around” mentoring. Maybe one mentor is good in study design and another is good in time management. Also consider adding non-traditional members to your supervisory/mentor team. Participative research is vital when conducting clinical research. Patients’ and public involvement (PPI) means involving anyone touched by the research in the actual planning and conduction of the research⁶. PPI aims to develop research that addresses patients’ and the public’s expressed needs, and thereby improve the success, cost-effectiveness and impact of research. Furthermore, close involvement of patients and the public can facilitate rapid dissemination and implementation of research findings. Children’s right to autonomy and to be heard and express their opinions in relation to their own health care are protected in the Convention on the Rights of the Child and were initially introduced by Dr. Janusz Korszak (Henryk Goldszmit)⁷ a Paediatrician, Children’s author, Polish-Jewish educator. The James Lind Alliance highlights multidisciplinary groups including

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families in Research prioritization which is valuable to understand key areas for research prioritization in child health. Families and parents have been incorporated in research supervisory teams in PhD programs. They make excellent members of a mentor Team⁸.

FUNDING SOURCE IS VITAL

Your Supervisor/mentor should have experience in seeking funding for research projects but timing is crucial. The preparation for the Ph.D. and writing of grant applications should begin at least 2 years in advance. Local research bursaries or charitable funds may be an option, as are the Wellcome Trust (www.wellcome.ac.uk) and the National Institutes of Health (National Institutes of Health (NIH) | Turning Discovery Into Health). Many established supervisors/mentors will have funding in place and will not require the student's input into the grant writing process. During the writing of the thesis, applying for grants including smaller grants for travel and projects from portions of the thesis are also useful for career development. For example, grants are available from the European Society for Paediatric Research and the Society of Pediatric Research, USA (Research grants—European Society for Paediatric Research (espr.eu); Awards | Funding—Society for Pediatric Research www.societyforpediatricresearch.org/research-funding/). Funding for child health research has remained static and not increased with trends in funding for adult medicine^{9,10}. This has become increasingly stark during the COVID pandemic as children have relatively less morbidity compared to adults¹¹.

EXPECT A CHALLENGING START

It takes at least 6 months to settle into a Ph.D. project with the move from clearly defined clinical tasks or a structured teaching programme to self-directed time management. Students may need a logbook to record a portfolio of new clinical and laboratory skills as well as ethics committee training, data protection, statistical support, good clinical practice for clinical trials and data management and compliance issues. Many Ph.D. programmes are structured with student selected and mandatory modules.

In addition, there may be a need to educate clinical teams such as nursing and medical staff about the project so that you can obtain their help in recruitment and consent.

Collaboration with staff in the laboratory will also be necessary. Most Ph.D. projects require extensive management of time, teams, and budgets in either the laboratory or clinical settings, all useful in the trainee's future dealings as a consultant or faculty member. Patience is required as processes may be slower than in the clinical arena, especially if you are starting a new project with no research infrastructure in place. This is a good time to plan training and education in research and to learn about publishing, grant writing, grant management, dissemination and career development¹².

START WRITING AND PUBLISHING IMMEDIATELY

Writing skills are often learnt early on in school and are not always nurtured in undergraduate training. Therefore, depending on stage of development, a PhD candidate may therefore lack confidence in their writing ability. A thorough review of the up-to-date literature allows you to develop expert knowledge in your chosen subject, will help protect against duplication of previously published work, will ensure originality and will help to develop your own writing skills. Consider your first project as writing a review article in your research area in conjunction with your supervisor/mentor.

Writing this review will expand your knowledge and understanding of the world of publishing. Resources for writing include writing groups such as "Shut up and Write" (<https://shutupwrite.com/>) to allow concentration on writing tasks in a group setting. Your supervisor/mentor can set writing goals and revision support¹³.

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WRITE YOUR THESIS AS YOU GO ALONG

This is essential. Often the Ph.D. research will be the first time that many students and clinicians will have written a scientific paper, and the quicker you can start writing the better. The introduction to the Ph.D. thesis can be started early on and related to the review article. Ongoing writing projects make completing the thesis much less daunting. Methods should be completed throughout the thesis and vitally before leaving the lab or work environment where the research was carried out. Reading each other's theses and sharing experiences with other Ph.D. students is very helpful.

RESEARCH PEER GROUP

The camaraderie of working among colleagues as part of a multidisciplinary team in hospital medicine or in a student class are more difficult to replicate in a research setting. Researchers often describe feeling isolated during their research. There are long hours spent alone in the laboratory, at the computer, or collecting data. Most Research centres or groups aim to welcome and support new Ph.D. students. Research units also allow cross fertilisation of ideas and techniques among the student group. Ph.D. programmes aim to foster a collaborative environment allowing students to co-publish and share techniques and expertise such as statistics. This is also an opportunity to foster collaboration in grant and paper writing and learn new research techniques. For example systematic reviews and Cochrane require a team of investigators and joining these groups is very beneficial to learn new methodology^{14,15}.

ATTEND NATIONAL AND INTERNATIONAL MEETING AND SUBMIT ABSTRACTS TO THEM

Most Ph.D. projects last at least 3 years so the final project results will not be available until the end of this period. Interim results or findings can be submitted to national or international meetings as abstracts. Keep up to date with relevant meetings and deadlines for abstracts, which will help you to set goals for completion of the research. Meetings are also good places to discuss your research and to foster collaboration and for inspiration.

CONTINUE CLINICAL WORK BUT IN MODERATION

In the case of students who are already clinicians retaining some clinical work is up to the individual. However, loss of clinical skills is often given as a reason to avoid research. Covering a shift in the hospital from time to time can help keep up your clinical skills and can help financially and help to maintain confidence when re-entering the clinical world. Clinical work can also help you keep a focus on the importance of research in the training pathway to becoming a consultant/attending. Funding bodies explicitly state the amount of time allowed in the clinical setting. The Wellcome Trust, for example, specifies in its postdoctoral fellowships a maximum of 8 h of clinical work a week. For NIH K awards, 25% of the time is spent in clinical work.

ENJOY THE EXPERIENCE

Although many clinicians perceive that research is not always a core part of their workday, the skills acquired from the experience (interpersonal, clinical, statistical, writing, and presenting skills) are invaluable and cannot be gained without going through such a process. Completing a Ph.D. is the first steppingstone in a long research career¹⁶. So enjoy the experience, and when you are a

consultant/attending it will all be worth it. You can then supervise a few theses or Ph.D.s yourself. The collaborations you have developed with other researchers will help to foster research that improves child health outcomes.

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REFERENCES

1. Armstrong, K. & Molloy, E. J. Doing a higher medical degree. *BMJ* **342**, d3792 (2011).
2. Halliday, L., Walker, A., Vig, S., Hines, J. & Brecknell, J. Grit and burnout in UK doctors: a cross-sectional study across specialties and stages of training. *Postgrad. Med. J.* **93**, 389–394 (2017).
3. Molloy, E. J. & Bearer, C. F. Translational research is all-encompassing and lets everyone be a researcher. *Pediatr. Res.* **90**, 2–3 (2021).
4. Molloy, E. J. et al. The future of pediatric research: European perspective. *Pediatr. Res.* **81**, 138–139 (2017).
5. Park, S. J., Liang, M. M., Sherwin, T. T. & McGhee, C. N. Completing an intercalated research degree during medical undergraduate training: barriers, benefits and postgraduate career profiles. *N. Z. Med. J.* **123**, 24–33 (2010).
6. Molloy, E. J., Mader, S., Modi, N. & Gale, C. Parent, child and public involvement in child health research: core value not just an optional extra. *Pediatr. Res.* **85**, 2–3 (2019).
7. Molloy, E. J. Dr Janusz Korczak: paediatrician, children's advocate and hero. *Pediatr. Res.* **86**, 783–784 (2019).
8. Molloy, E. J. et al. Parental involvement in a multidisciplinary PhD programme in neonatal brain injury [version 1; peer review: 2 approved with reservations]. *HRB Open Res* **3**, 40 (2020).
9. Gitterman, D. P., Langford, W. S. & Hay, W. W. The uncertain fate of the National Institutes of Health (NIH) pediatric research portfolio. *Pediatr. Res.* **84**, 328 (2018).
10. Gitterman, D. & Hay, W. That Sinking Feeling, Again? The State of National Institutes of Health Pediatric Research Funding, Fiscal Year 1992–2010. *Pediatr. Res.* **64**, 462–469 (2008).
11. Fleming, P. F. et al. Paediatric research in the times of COVID-19. *Pediatr. Res.* **90**, 267–271 (2021).
12. Bearer, C. F., Chalak, L., Fuentes-Afflick, E. & Molloy, E. J. The rewards of peer-reviewing. *Pediatr. Res.* **87**, 2 (2020).
13. Shah, J., Shah, A. & Pietrobon, R. Scientific writing of novice researchers: what difficulties and encouragements do they encounter? *Acad. Med.* **84**, 511–516 (2009).
14. Molloy, E. J. & Bearer, C. F. When research goes wrong: the importance of clinical trials methodology. *Pediatr. Res.* **88**, 518–519 (2020).
15. Molloy, E. J. et al. Developing core outcome set for women's, newborn, and child health: the CROWN Initiative. *Pediatr. Res.* **84**, 316–317 (2018).
16. Cheng, T. L., Tarazi, C., Molloy, E. & Bearer, C. F. Introduction-Standing on each other's shoulders. *Pediatr. Res.* **81**, 137 (2017).

COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

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