Doctoral Education in Context

Perspectives from Africa

Edited by
Jan Botha, Liezel Frick, Nompilo Tshuma

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4 Eccleston Place, Somerset West, 7130
Cape Town, South Africa
info@africanminds.org.za
www.africanminds.org.za

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CHAPTER 10

Doctoral supervision in the context of the physician scientist

Susan Williams

South Africa has a population of 62 million. The country has 26 public universities with a total enrolment of 1.1 million students. Doctoral enrolments in South Africa have increased from 9 994 in 2008 to 23 588 in 2020 (CHE Vitalstats). Between 2000 and 2018, a total of 32 025 doctoral students graduated at South African universities. Doctoral graduates increased from 972 in 2000 to 3 339 in 2019 (SciSTIP Tracer Study).

The **University of the Witwatersrand (Wits)** is located on two campuses in Johannesburg. It became an independent university in 1921, tracing its origins to the South African School of Mines established in 1896. Wits has produced four Nobel Prize recipients, including Nelson Mandela, who was a Law student at Wits from 1947-1949. The university has five faculties and 33 schools. In 2021 it had 1 174 full-time academic staff members and 42 175 students, including 2 470 doctoral candidates.

1. Introduction

The supervision of medical doctors undertaking doctoral studies has distinct challenges. This chapter seeks first to understand this group of researchers and then to explore these challenges. The term 'physician scientist' has been selected to refer to medical doctors who have training in research and spend a substantial proportion of their time on research.

Physician scientists, also called 'physician investigators', are part of the broader group of 'clinician scientists' (or 'clinician investigators') that also

includes other clinical researchers like nurse scientists, dentist scientists, veterinarian scientists, and others. Although physician scientists are the specific focus of this chapter, the discussion applies to the broader group and would therefore be useful to readers in the wider medical field who work with clinician scientists/investigators.

This chapter will explore doctoral supervision as it relates to physician scientists. This group of researchers, who often have dual careers, is necessary for furthering medical research and will benefit from the doctoral journey. The doctoral journey, and doctoral supervision, of this group needs to be tailored to address specific challenges and to ensure that they acquire appropriate professional skills.

2. The need for physician scientists

Physicians have specific skills and attributes that make them ideally suited to conducting research. First, they have human contact with their patients and a deep understanding of the disease processes affecting them. They are therefore uniquely aware of patient concerns, patient needs, knowledge gaps and treatment burdens that may inform research directions (Ley & Rosenberg, 2005). Second, they are perfectly positioned to test hypotheses in clinical settings as well as to enroll patient participants in clinical trials. The physician with research training and expertise can complete this cycle by understanding the mechanisms and systems (be they laboratory or otherwise) through which research may be conducted to test hypotheses and analyse results. Ultimately the physician scientist may identify clinical challenges, research these challenges and analyse the findings, such that they may be returned to the bedside in true translational research (Dickler et al., 2007).

With the aid of physician researchers, research inquiry that begins in a clinical setting and leads to laboratory experimentation and discoveries may be translated into practical solutions for clinical medicine. The physician researcher can therefore act as a conduit between laboratory and patient (Cornfield et al., 2013). The enormous healthcare burdens Africa faces, in particular, require dedicated scientific research from appropriately trained clinical researchers (Kramer et al., 2015; Tette et al., 2020).

Despite the strong case for physician scientists and their ability to advance scientific discovery in clinical medicine, the proportion of medical doctors actively conducting research worldwide is very low (in 2011 only 1.6% of physicians in the United States were also active scientific researchers) (Garrison & Deschamps, 2014). This proportion has been declining over the last few decades

(Ley & Rosenberg, 2005; Hall et al., 2017, Garrison & Deschamps, 2014). This is in stark contrast to the state of doctoral studies in other fields worldwide (Cyranoski et al., 2011). In Africa, this is a specific concern, with very few clinically trained medical doctors pursuing research careers and poor support for physician scientists (Kramer et al., 2015; Grossman, 2016; Adefuye et al., 2018). A reduction in research scientists who are also trained clinicians threatens scientific advances in healthcare. The factors underlying the worldwide decline in the proportion of physician scientists, and the low numbers in Africa, are interrelated and sometimes indivisible issues related to funding, time, support and motivation (Adefuye et al., 2018).

An understanding of these motivators and challenges can provide a foundation for successful supervision of the physician scientist's doctoral studies to completion.

3. Challenges for physician scientists

Physicians are often discouraged from research-oriented careers because research is remunerated poorly in comparison with clinical work (McKinney, 2017). A career incorporating research is inherently riskier financially than a (financially) safe clinical career (Cornfield et al., 2013). Research is expensive and requires funding and this is in short supply worldwide. Furthermore, clinicians must compete with full-time scientists for this scarce funding. Full-time basic scientists tend to be better funded than their clinician scientist counterparts (Dickler et al., 2007). They frequently have better research and publication records, partly because they do not have clinical demands on their time, but also because laboratory research may be faster than clinical or translational research. The funding challenges are particularly evident for early-career clinician scientists, including doctoral students, who are further impacted by poor funding opportunities for their supervisors and mentors (Cornfield et al., 2013). This is compounded by poor support for unfunded junior clinical researchers by their medical schools. It appears that many medical schools are more likely to invest in the provision of clinical services that are much more lucrative (Cornfield et al., 2013). Medical schools are conflicted by simultaneously attempting to provide medical services while still furthering research in the resource-constrained health sector (Grossman, 2016).

Time is the next big challenge facing physician scientists. Clinical practice is demanding work and is time intensive. It frequently requires after-hours work and emergency calls. Research must compete on an uneven footing and frequently loses out to clinical demands (Lingard et al., 2017). The physician

researcher is forced to battle to create protected time for research, a battle that is frequently lost. The time required for academic and administrative responsibilities further compounds the problem, as does any attempt to achieve a 'work-life' balance. Time is, consequently, also a challenge for the physician scientist supervisor, who is also confronted with all the aforementioned competing demands and must still find time for demanding doctoral supervision (Grossman, 2016).

Because so few physicians are also active researchers, the physician scientist's journey is often a lonely one. The isolated scientist may be demotivated as he addresses different career issues from those of his fellow clinicians and divisional chiefs (Cornfield et al., 2013). A lack of understanding of the importance of the research role of the physician scientist (and a disproportionate valuing of the clinical role) may result in poor research support at both departmental and institutional levels. This is further exacerbated by a lack of suitable mentors (Dickler et al., 2007).

An unrewarded (apart from financially) career may also be demotivating. Because physician scientists must divide their time between their clinical work and their research work, this may mean that they meet neither the targets for promotion on a research track nor on a clinical track (Cornfield et al., 2013).

4. Do physician scientists need a doctorate?

It is possible to be an active physician scientist without having a doctoral degree, however obtaining a doctorate provides numerous potential benefits.

From the outset, the doctoral journey ensures proper training in research methodology, such that the physician becomes skilled in critical evaluation, is properly equipped to design quality studies and to interpret the findings of these studies as they become an authority in their chosen field. Furthermore, the journey develops interpersonal skills, including communication and project and team management. Leadership is a key skill that is developed during the doctoral journey that translates into success for multidisciplinary research teams (Montalvo-Javé et al., 2016).

These benefits for the individual and research teams have knock-on benefits on the health system, where risk factors and disease trends may be identified, or new treatments developed. Additionally, physicians with a doctorate are more involved in teaching and the development of academic programmes (Montalvo-Javé et al., 2016). Together, these will enhance healthcare institutions. Better patient care and outcomes and more motivated staff are expected

in research-active hospitals, that then have a higher academic profile and therefore attract a better calibre of academic staff (Ahmed et al., 2021).

Physicians with doctorates are much more likely to obtain grant funding than those without as evidenced by grant data from the National Institute of Health (NIH) in the United States (Hall et al., 2017; Dickler et al., 2007). This reflects a measurable consequence of the numerous benefits of the doctoral journey.

Doctorateness (Wellington, 2013) implies both the knowledge and skills the doctoral journey equips the physician scientist for a successful research career. The physician scientist with a doctorate has presumably reached a threshold, experienced liminality, developed the critical and analytical skills necessary to cross that threshold, has developed theorising skills and has made an original contribution (Trafford & Leshem, 2009). The very specific skillset inherent in 'doctorateness' may be achieved outside the formal degree environment, but with less predictability. The doctoral degree is still the most effective way of establishing physician scientists (Daye et al., 2015).

5. Format of the doctoral degree for physicians

In South Africa there are no simultaneous MD-PhD degrees available of the sort that are available in the United States, Canada and the United Kingdom. The doctoral journey therefore begins after the completion of medical training. This is not necessarily a disadvantage, since it appears that physicians obtaining PhDs after their primary medical training (as opposed to those who obtain simultaneous MD-PhDs or doctoral degrees followed by medical training) are more likely to pursue careers in biomedical research (Kearney et al., 2007). These more mature students may have already begun research careers that they wish to augment with their doctoral studies. Alternatively, they may have, through their clinical work, identified research questions in their selected fields and it is the desire to answer these that has led them to enroll for a targeted doctorate. Higher completion rates may result than for the younger student enrolling in an MD-PhD as a career choice without first having experienced clinical practice.

The unfortunate consequence of a qualified medical doctor pursuing doctoral studies is that the student is seldom a full-time student. Most clinicians are working in their chosen field. Even those working in academic departments are still predominantly undertaking clinical responsibilities. A PhD involving course work is therefore generally not an appropriate model.

I completed all my postgraduate training at the University of the Witwatersrand (Wits University) in Johannesburg, South Africa. At Wits, physician scientists typically complete a thesis-based doctorate although

publication-based doctorates are rapidly gaining popularity. The latter have the advantage of focusing the research into smaller, publishable outputs that allow faster dissemination of scientific findings that might have clinical relevance. A valid concern with thesis-based clinical research is that it may, in fact, never be published. This has been corroborated by a 2012 review which found that a large proportion of doctoral projects in clinical research are not published (Caan & Cole, 2012). It further found that clinical doctoral students who completed a doctoral thesis and graduated on that basis were more likely to never publish their evidence than those who began publishing their clinical research before completing the degree (Caan & Cole, 2012). My own PhD was thesis-based and the advantage, for me, was that I did not have to rely on the very slow response rates of medical journals to complete my studies. However, writing the papers after I had graduated was difficult because I did not have graduation as a motivation, and I had reached a saturation point with my research. I wanted nothing more than to pack my research away and never look at it again. As a result, I encourage my students to pursue a publication-based degree or at least to write the thesis and publications simultaneously to ensure that their contribution reaches the broader scientific community.

6. Professional skills for the physician scientist

There are certain professional skills that the physician doctoral student should acquire during their doctoral journey. These include research methodology, grantsmanship, time management and human subject protection and research ethics knowledge and skills (Lingard et al., 2017).

Medical doctors receive very little research training during their undergraduate degrees (Dickler et al., 2007). At Wits University, where I studied, there is a research component incorporated into our postgraduate (master's) degrees. This degree, however, coincides with medical specialization, so the research component is often overwhelmed by the clinical component of the degree and the time intensive aspects of patient care. Before a physician can become a scientist, therefore, there is a need for some formal training in research methodology. The supervisor should be in a position to facilitate this training.

The aspirant physician scientist needs protected research time (Cornfield et al., 2013, Kramer et al., 2015). In South Africa, the South African Medical Research Council (SAMRC) offers clinician scientist PhD fellowships that provide a stipend for clinician PhD students, allowing them time away from their clinical responsibilities. The Discovery Foundation also offers fellowships and grants to physician scientists. The supervisor should have knowledge of

these and other resources available to assist their students with negotiating the time and financial implications of pursuing a career incorporating research. This may assist with time management, but specific coaching with respect to time management skills is also an imperative that will be necessary for a post-doctoral research career.

Clinical research is expensive, and grant funding should be secured by the students themselves, unlike basic science research in well-funded research laboratories.

Grantsmanship is therefore a skill that requires formal training for the physician scientist to be successful (Daye et al., 2015). This goes beyond the actual process of writing a grant and includes learning about the sources, mechanisms and review processes of research grants (Back et al., 2011).

The supervisor is required to guide the student in the responsible conduct of research. Most physician scientists undertake clinical research involving human participants (Hall et al., 2017), and that means that particular care must be taken when considering the ethical implications of the research. Procedural, intrinsic and extrinsic ethical issues have been described that should be considered whenever embarking on research (Stacey & Stacey, 2012). An important intrinsic concern specific to physicians are the power dynamics of the physician–patient relationship, particularly when the patient is the study participant. The extrinsic issues of unintended consequences are very relevant for clinical research that may have far reaching consequences for disease-affected individuals as well as for the hospitals treating them and even national and international health sector stakeholders.

7. The role of the supervisor

The first role of a supervisor is to understand his or her own research identity (Guerin et al., 2015). My research identity is that of an ophthalmologist scientist, one of only five in the country (two graduated after me and two have nominally retired). My clinical expertise is in the sub-specialty of glaucoma and my research expertise is in genetics and glaucoma. And yet I am called upon to supervise any ophthalmologist wishing to pursue doctoral studies at my own institution, anywhere in the province and sometimes anywhere in the country, whether I have the relevant subject-specific expertise or not. Recognising my own limitations in this regard has been an important aspect of my development as a supervisor. My challenge is not unique among physician scientist supervisors, who are a scarcity in Africa (Grossman, 2016). In an acknowledgement of the potential pitfalls of supervising an unfamiliar topic or methodology,

we should be prepared to consider co-supervision models and collaborations, not merely within the discipline (where we can consider collaborating with sub-specialist clinicians who may not be researchers but are subject experts) but within the broader scientific community (perhaps collaborating with basic scientists with specific methodological strengths). We need to be honest with our students about our own strengths and weaknesses if we are to provide them with the necessary support in their journey (Heyns et al., 2019).

Unfortunately, in instances where appropriately qualified supervisors are a scarcity, the supervisor may not have the luxury of selecting their students. The challenge of providing suitable support for a student whose research does not align with our own is only one aspect of this dynamic. Even more challenging is having a student 'foisted' upon us who may not even be a suitable doctoral candidate. In my own experience, expert physicians who have successfully completed specialist training may choose to pursue a doctorate simply because it seems like the logical next step in a life of studying. They may consider the doctoral road as another 'notch on the belt' in a life of scholarship, whereas I think that it is only the correct direction for a physician scientist intent on a career in clinical research. Learning to negotiate the tricky task of dissuading the unsuitable 'would-be' PhD candidate is a skill that could potentially transform our supervision, providing us with more time and capacity for appropriate students. I have not yet been successful in dissuading any student of mine from beginning doctoral studies. Nor have I had the courage to refuse to supervise a colleague, since that would prevent them from registering at my university (where the only barrier to pursuing doctoral studies for a physician is to have the agreement of a suitable supervisor). I hope that as I mature as a supervisor and possibly as my capacity to undertake supervision diminishes (based on the number of students I am currently supervising), that I learn these skills and can execute them with compassion.

The physician doctoral student, in this country, is a mature student. Typically, they have completed at least fifteen years of graduate and postgraduate studies. Supervising such a student has both advantages and disadvantages compared to the supervision of a young postgraduate. The advantages are that they are generally academically confident and dedicated students. The power dynamics of the supervision relationship are therefore less pronounced. They may even be reversed: for example, one of my students is the head of department at another university. Another trained me, clinically, when I was a student and is currently my clinical superior. In this setting the student may have very strong ideas and opinions with little regard for input from the supervisor. In this context particularly, although the same is true for any supervisory relationship,

an unequivocal memorandum of understanding (MoU) is indispensable. If this is properly considered and negotiated, it can provide coherent guidelines for the relationship and provide security for both student and supervisor (Heyns et al., 2019). My first attempts at supervision were without the protection of an MoU and were fraught with misunderstanding. I shall not make that mistake again.

8. Supervisory models and styles

The traditional supervisory model for physician scientists is the apprenticeship model, although the co-supervision model is more frequently used nowadays. Co-supervision is particularly important where research is cross-disciplinary. This is frequently the case for clinical research, where the research may be part patient-based and part laboratory-based. Co-supervision, with both clinical supervisors and basic scientists, provides complementary expertise and supervisory skills (Yoon et al., 2013). This was my experience. My PhD was on the genetics of glaucoma. I had two supervisors, an ophthalmologist and a geneticist. Neither would have provided sufficient knowledge support on their own, but together their support was comprehensive. Likewise, I am now co-supervising an ophthalmologist together with a pathologist because my student's research incorporates tumour cytology. I can confidently leave the cytology component of his research to his co-supervisor and know that he is not being misguided by my weakness in that area.

Physician scientists need quality mentors (Lingard et al., 2017). This appears to be a shortfall of many physician scientist doctoral programmes because poor mentoring (or no mentoring) is a frequent complaint of physician scientists (Yoon et al., 2013). Most physician scientist supervisors tend to have directorial management styles when there is a need for a more contractual or even pastoral style (Gatfield, 2005). The doctoral supervisor should, preferably, be in a position to provide support outside the specific task-driven aspects of doctoral research. Mentoring skills can be learned (Lingard et al., 2017) and should be acculturated into any physician scientist supervisory programme. Effective mentorship of the physician scientist entails understanding the numerous challenges facing the physician doctoral student and working, together with the student, to find solutions. For example, the supervisor may be able to have some impact on the work environment by lobbying their medical school to improve the academic culture to respect research such that it is more nurturing of physician scientists (Dickler et al., 2007). The supervisor can help create a community of physician scientists, so that the doctoral students feel less isolated (Lingard et al., 2017). This can be cross-disciplinary, national and even international with the use of

virtual meetings. Such multidisciplinary collaborations are an effective tool for increasing physician scientist productivity. Finally, the supervisor should understand the competing influences not only of demanding clinical work, but also of family and children since the student is usually an older student.

9. Conclusion

Doctoral supervision, the art of guiding a novice towards successful 'doctorateness', is arduous. The specific task of supervising a physician on their doctoral research journey has unique issues. Most of these issues are situational. Understanding the context of a split career and developing our own supervisory, mentoring and research skills will enable us to support the next generation of physician scientists.

References

Adefuye, A. O., Adeola, H. A., & Bezuidenhout, J. (2018). The physician-scientists: Rare species in Africa. *The Pan African Medical Journal, 29*.

Ahmed, M. H., Husain, N. E., & Elsheikh, M. (2021). Why Sudanese doctors should consider a research career or PhD degree after their postgraduate medical training. *J Public Health Emerg, 5*, 16.

Back, S. E., Book, S. W., Santos, A. B., & Brady, K. T. (2011). Training physician-scientists: A model for integrating research into psychiatric residency. *Academic Psychiatry, 35*, 40–45.

Caan, W., & Cole, M. (2012). How much doctoral research on clinical topics is published? *BMJ Evidence-Based Medicine, 17*, 71–74.

Cornfield, D. N., Lane, R., & Abman, S. H. (2013). Creation and retention of the next generation of physician-scientists for child health research. *JAMA, 309*, 1781–1782.

Cyranoski, D., Gilbert, N., Ledford, H., Nayar, A., & Yahia, M. (2011). The PhD factory: The world is producing more PhDs than ever before. Is it time to stop? *Nature, 472*, 276–279.

Daye, D., Patel, C. B., Ahn, J., & Nguyen, F. T. (2015). Challenges and opportunities for reinvigorating the physician-scientist pipeline. *The Journal of Clinical Investigation, 125*, 883–887.

Dickler, H. B., Fang, D., Heinig, S. J., Johnson, E., & Korn, D. (2007). New physician-investigators receiving National Institutes of Health research project grants: A historical perspective on the "endangered species." *JAMA, 297*, 2496–2501.

Garrison, H. H., & Deschamps, A. M. (2014). NIH research funding and early career physician scientists: Continuing challenges in the 21st century. *The FASEB Journal, 28*, 1049–1058.

Gatfield, T. (2005). An investigation into PhD supervisory management styles: Development of a dynamic conceptual model and its managerial implications. *Journal of Higher Education Policy and Management, 27*, 311–325.

Grossman, E. (2016). 'My supervisor is so busy…': Informal spaces for postgraduate learning in the Health Sciences. *South African Journal of Higher Education, 30*, 94–109.

Guerin, C., Kerr, H., & Green, I. (2015). Supervision pedagogies: Narratives from the field. *Teaching in Higher Education, 20*, 107–118.

Hall, A. K., Mills, S. L., & Lund, P. K. (2017). Clinician-Investigator Training and the need to pilot new approaches to recruiting and retaining this workforce. *Acad Med, 92*, 1382–1389.

Heyns, T., Bresser, P., Buys, T., Coetzee, I., Korkie, E., White, Z., & Mc Cormack, B. (2019). Twelve tips for supervisors to move towards person-centered research supervision in health care sciences. *Medical Teacher, 41*, 1353–1358.

Kearney, R. A., Lee, S. Y., Skakun, E. N., & Tyrrell, D. L. (2007). The research productivity of Canadian physicians: How the timing of obtaining a PhD has an influence. *Academic Medicine, 82*, 310–315.

Kramer, B., Veriava, Y., & Pettifor, J. (2015). Rising to the challenge: Training the next generation of clinician scientists for South Africa. *African Journal of Health Professions Education, 7*, 153–154.

Ley, T. J., & Rosenberg, L. E. (2005). The physician-scientist career pipeline in 2005: Build it, and they will come. *JAMA, 294*, 1343–1351.

Lingard, L., Zhang, P., Strong, M., Steele, M., Yoo, J., & Lewis, J. (2017). Strategies for supporting physician-scientists in faculty roles: A narrative review with key informant consultations. *Acad Med, 92*, 1421–1428.

McKinney, R. E., Jr. (2017). The daunting career of the physician-investigator. *Acad Med, 92*, 1368–1370.

Montalvo-Javé, E. E., Mendoza-Barrera, G. E., Valderrama-Treviño, A. I., Alcántara-Medina, S., Macías-Huerta, N. A., & Tapia-Jurado, J. (2016). The importance of master's degree and doctorate degree in general surgery. *Cirugía y Cirujanos (English Edition), 84*, 180–185.

Stacey, A., & Stacey, J. (2012). Integrating sustainable development into research ethics protocols. *Electronic Journal of Business Research Methods, 10*, 54–63.

Tette, E. M., Gyan, B. A., & Koram, K. A. (2020). Perspectives on research internships for medical students and young doctors in Ghana: An opportunity to replenish the stock of physician investigators? *Advances in Medical Education and Practice, 11*, 473.

Trafford, V., & Leshem, S. (2009). Doctorateness as a threshold concept. *Innovations in Education and Teaching International, 46*, 305–316.

Wellington, J. (2013). Searching for 'doctorateness.' *Studies in Higher Education, 38*, 1490–1503.

Yoon, J.-Y., Appleton, T., Cecchini, M. J., Correa, R. J., Ram, V. D., Wang, X., Ng, E., Speechley, M., & Wilcox, J. T. (2013). It begins with the right supervisor: Importance of mentorship and clinician-investigator trainee satisfaction levels in Canada. *Clinical and Investigative Medicine, E269–E276*.