

COMMENTARY**TRAINING AND DEVELOPING PHYSICIAN-SCIENTIST CAREERS TO ENHANCE MEDICAL RESEARCH IN GHANA****Tetteh EMA¹; Lawson HJO¹; Koram K³; Sampene-Donkor E²; Tette ARA⁴; Quarshie A⁵; Hodgson A⁶**

¹Department of Community Health; ²Department of Medical Microbiology, University of Ghana Medical School, Accra Ghana; ³Noguchi Memorial Institute for Medical Research, College of Health Sciences, University of Ghana, Legon; ⁴Nova Surgery Centre, No. 7 Mensah Danfah St., Ajiringanor, East Legon, Accra; ⁵Department of Community Health & Preventive Medicine, Morehouse School of Medicine, Clinical Research Centre, 720 Westview Drive, S.W., – Atlanta; ⁶Research and Development Division, Ghana Health Service, Accra.

Summary

A physician-scientist is a medical doctor who combines clinical practice with research. They often work in academic medical centers, research institutions, or hospitals, where they split their time between treating patients and conducting research to advance medical knowledge, develop new treatments, and improve public health. Their work is well recognized as they are reported to constitute 37% of Nobel Prize winners in Physiology or Medicine, and several prize winners in Chemistry. However, regardless of how inherently fulfilling this may be, in Ghana and many other regions of the world, increasingly fewer doctors aspire to become physician-scientists. Currently, there is a lack of clarity regarding the path to becoming a physician-scientist in Ghana and other African nations. So, for the young doctor of today who wishes to embark on a

research career, there are more questions than answers. The authors emphasize the need for structured programs, early commitment, and resource allocation to nurture the next generation of physician-scientists. They also examine the potential of integrating research-focused training into existing medical programs and the role of various stakeholders, such as universities and the Ministry of Health, in supporting these initiatives. The authors call for innovative approaches and strategic planning to enhance the capacity of Ghanaian doctors to pursue careers in medical research, ultimately contributing to global scientific advancement and improving healthcare in low and middle-income countries. They conclude that more needs to be done to develop more physician-scientists.

Introduction

Recent global events, notably the COVID-19 pandemic, have demonstrated the astounding outcomes that years of medical research can produce.¹ Research enhanced pandemic control through the rapid development of vaccines, diagnostic equipment and therapeutic agents. Today, low and middle-income countries like Ghana are building capacity to become proficient in vaccine development and production. Undoubtedly, this will require the experience of seasoned research scientists such as physician-scientists. Ghana, like many developing countries, is also experiencing both a demographic transition as well as an epidemiologic transition creating a need to train more physician-scientists to tackle this challenge. The contribution of physician-scientists to science is well recognized as they are reported to

constitute 37% of Nobel Prize winners in Physiology or Medicine, and several prize winners in Chemistry.² Postgraduate medical training through the Medical Colleges in Ghana and other West African countries has been the main source of training for physician-scientists and to a lesser extent the research units of the Ghana Health Service. The physician-scientist does two jobs, research and clinical work.^{1,3,4} Nonetheless, no matter how intrinsically rewarding this might be, in Ghana and many parts of the world, increasingly fewer doctors aspire to become physician-scientists and much less, Nobel Prize winners.^{2,4,6} This has been attributed to several factors militating against developing a research career such as lack of mentorship, the cost of research, inadequate technical skills and skills in grantology; lack of incentives in a climate of better salary structures in competing jobs such as clinical practice; lack of fulfillment from translating research into practice, not achieving a work-life balance, among others.^{2,4-7} Notwithstanding these issues, experience from the US indicates that innovative approaches and thoughtful planning with stakeholders can re-ignite interest.^{5,6,9} However, it requires a clear pathway, structured programmes, early commitment, resources, effective mentorship, diversity and stakeholder engagement as

Corresponding Author: Dr Henry J. O. Lawson
Department of Community Health, University of Ghana Medical School, P. O. Box 4236, Accra Ghana
Email Address: hlawson@ug.edu.gh
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well as some knowledge of the current priorities in research^{2,5-9, 10}.

Current Situation / Literature Review

Training of Physician-Scientists Globally

Physician-scientists are doctors who hold a Medical degree and perform medical research as their primary professional activity.¹¹ They engage in biomedical, clinical research, translational research and population-based research.^{11,12} These graduates currently work in academic institutions, research institutions and industries such as the pharmaceutical industry.^{7,9,11} While the majority have only medical degrees, many have second degrees such as PhD, MPH and MBA.^{11,12} They constitute a unique group of investigators because their clinical experience through patient care shapes their approach to research enabling them to contribute to biomedical research and translate the results of their scientific work into clinical practice.^{4,7,9} They operate from “bench to bedside” and “bedside to bench”, they determine disease mechanisms, discover vaccines, new drugs and devices for treating patients, engage in health disparities research, and study the epidemiology of disease, among others.^{1,2,12,13,14} Physician-scientists also play technical, advisory networks and consultancy roles at national level. This was evident during the COVID-19 pandemic.¹ Their work also informs policy.²

The increasing complexity of clinical research led to calls for more formal training and mentoring in research from medical school to residency, and career development planning for young doctors interested in research careers.^{2,6,7} This was because early exposure to research in medical school and as a young doctor was reported to influence the decision to choose a career in medical research, therefore, calls to incorporate research into medical school curricula and the training of young doctors have been made to promote succession.^{2,7,12,15} At the time, most German doctors, for instance, were reported to conduct research and produce a thesis as part of their training to be doctors.¹⁵ Medical Students in Ghana also wrote a dissertation as part of their medical degree³ In the UK, several institutions offer intercalated courses that enable medical students to interrupt their medical training and pursue a second degree usually with a strong research component.¹⁵

Clinical Fellowship schemes have also been instrumental in training young doctors and those in established post-graduate training programmes to become physician-scientists^{16,17,18} They may be formal and well-structured or informal.^{17,18} Nuttal et al, describe a well-structured and sponsored Research Fellowship Scheme of the Royal College of Surgeons of England which gave surgical trainees training in research and an opportunity to conduct research.¹⁸ A total of 531 publications were produced from the project and a third of the fellows who became consultants had some form of academic positions afterward. In addition to having indirect benefits to patients, half of the participants went on to receive funding for additional

research. Courses on various aspects also contribute to the professional development.

In the United States, MD-PhD programs were introduced in the 1950's to provide scientific training in research early and to enhance the translation of scientific research into clinical care^{9,14}. This became necessary because of the increasing length and sophistication of the training to become a clinician or an independent scientist, thus, it sought to combine the two and start the training early to reduce the training time¹⁴. In 1964, the Medical Scientist Training Programme (MSTP) was started by the National Institute of General Medical Sciences (NIGMS) and the National Institute of Health to fund the MD-PhD programmes.^{9,14} Another approach adopted by some institutions in the US was to add an additional year for research to the training programme during the MD programme, at which time, the resident does no clinical work or the training may be MD only with structured training in research during the preclinical years along a longitudinal fashion¹⁹.

Training of a Physician-Scientist in Ghana

Currently, in Ghana and other African countries, the path to becoming a physician-scientist is not so well-defined.⁴ Though undergraduate research programmes are well developed and linked to the curriculum, programmes for young doctors are mostly informal until they enter residency training.³ For instance, a young doctor who was about to complete the second year of his house job in the Eastern Region of Ghana informed one of the authors that he was now certain he wanted to embark on a research career and wanted to know what his next step should be. This doctor had previously demonstrated his interest in research after completing medical school by volunteering his services and participating in a research internship while waiting for his posting for a house job.³ He wanted to know this, amidst the uncertain climate of, competing job opportunities with greater financial incentives from private clinical practice, and an extended postgraduate training programme of at least 11 years from graduation to fellowship qualification for Ghana College of Physicians and Surgeons training and its sponsorship challenges; counting 2 years of housemanship, 2 years of being a medical officer to qualify for sponsorship, 3 years of membership training, 2 years of district service and 2 years to complete the Fellowship training. Eventually, this doctor's next posting to a district hospital came through, and while he was working there as a medical officer, he considered enrolling in a Master of Public Health (MPH) programme in Ghana. Rather, he chose to invest his energies into getting a research program in the USA so he could move there to further this career.

So, for the young doctor of today who wishes to embark on a research career, what were the options available to him after completing his house job? What additional research training can he obtain during the next two years of compulsory district rotation as a

medical officer? Who will supervise him if he wishes to do some research? What seed grants are available to him? Will the government pay him a salary and allow him to be attached to a research centre while waiting to join the post-graduate training programme? Does he then do a PhD in the basic sciences or start his fellowship training in the Clinical Sciences? After all there are many clinicians with excellent research careers who have not done a PhD. Who will pay him a salary if he opts for a PhD as he is not eligible to join the University without a PhD or completion of his residency training? Is the exposure to research during the several years of preparation and residency training sufficient for timely progression through a research career to retirement? In reality, most doctors in Ghana become physician-scientists after completing the Ghana College or West African College of Physicians or Surgeons residency training programmes and a dissertation that can yield several publications, which become the basis of their future research. Further opportunities for research productivity during these years are available but require planning, mentorship and working in environments that integrate research with clinical work.⁵ These considerations are not unique to would-be medical researchers in Ghana alone, they occur globally.^{2,4-9}

The Universities are the highest employers of physician-scientists in Ghana but until the recent start of a PhD programme, they generally do not offer special programmes tailored to their needs. Presently, there is a rising trend among young doctors in Ghana to do an MPH privately at a local School of Public Health and leave the country afterward. Some also do the course abroad. So is it time for the medical schools to offer comprehensive courses in clinical, laboratory and public health research such as a Master's course linked to the final year course in medical school and give a dual degree, e.g. MBChB-MPH during the gap of 6-8 months while newly qualified doctors are waiting for house job posting; re-introduce intercalated courses, or start MD/MBChB-PhD programmes as has been recommended?^{4,5,7,9} How can these programmes and research the students do to be funded? Is there also a need for some advocacy with the Ministry of Health or Ghana Health Service to provide and advertise a separate training track for research or academic track doctors and employ clinical research fellows?

The Ministry of Health through the Ghana Health Service is the highest employer of doctors in Ghana. It is responsible for employing housemen and medical officers and sponsors residency training. It has a health research directorate with research units in Kintampo, Dodowa, and Navrongo and is also supported by a research unit at Hohoe and Agogo Hospital, a Christian Health Association (CHAG) facility. These research units monitor populations linked to demographic surveillance systems that create the enabling environment for intervention studies, vaccines and drug trials. Eminent physician-scientists trained in these units

have gone on to become seasoned researchers. Even though these physician-scientists start their research career earlier, once they join the research unit, they also have an obligation to undertake clinical practice and are not posted there to do research full-time but they work like clinical fellows. In addition, they are granted study leaves with pay to pursue PhD programmes if they have served the requisite number of years thus gaining research experience at the postgraduate level, similar to MD-PhD graduates but lacking clinical specialisation^{5,9} It is not so for doctors in clinical practice who desire a PhD. This option was discussed with the young man, however, a clear pathway to access this choice was not presented as an option during the selection of his next rotation, and neither did he go out of his way to explore it. Eventually, he found a research programme with a training position in the US and left the country.

In recent times, a third alternative has emerged. The College of Health Sciences, University of Ghana has recently initiated a PhD programme in Clinical Sciences for doctors to create a focus on research in the clinical sciences. What is unclear is whether these efforts will yield physician-scientists actively engaged in research at a time when academic positions are not readily available, or they will be lured into clinical positions without research. Furthermore, integrating this with residency training needs to be considered as the MD-PhD programmes have done so the training time in both sciences can be combined and shortened. Thus, it needs monitoring. Research careers can be developed at any point along the training continuum, and opportunities for clinical research are available in some academic centres, regional and district hospitals through projects, and junior doctors, residents and early career researchers have participated in some of these projects.³ Figure 1 outlines the options for formal training available to medical graduates who wish to become physician-scientists in Ghana.

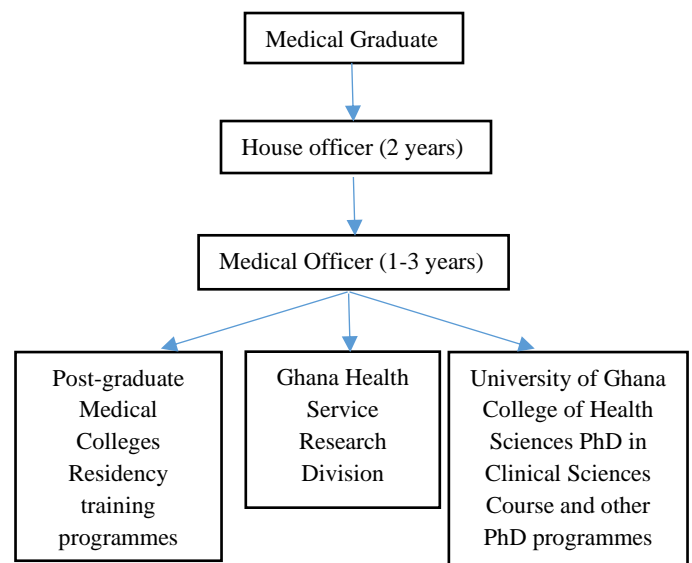


Figure 1: Pathways for formal training of physician-scientists in Ghana

Discussion

In spite of establishing MD-PhD programmes across the US, in the 1980's and 1990's a decline in the number of physician-scientist in the US and their grant applications to the NIH was noted.^{9, 14} This led to an investigation of the barriers that confront researchers in the clinical sciences.¹⁴ Their findings showed that trainees not in MD-PhD programmes were saddled with student debts after the training period; and it seemed more lucrative to enter clinical practice; training time to gain clinical competence and the time required to transition into an independent researcher had increased, and finding a work-life balance seemed challenging for younger colleagues, while NIH funding also decreased. There were also other additional demands on one's time and energy. Besides this, decline in the funding of academic centres in the US and increasing demand for revenue from clinical practice were reported to have led to increasing clinical care loads of academic physicians restricting the time for research.^{5,6} This highlighted the need for protected time for clinical research and more efficient use of the time dedicated to patient care.⁶ Measures were taken to address the challenges and the numbers have stabilized.⁹ However, the challenge now is how to prevent attrition and retain these doctors in research given the lower salaries in academic research compared to private practice.⁹

A four-pronged approach to tackle the problem of physician-scientists has been suggested.⁵ This included having research-focused postgraduate training or residency programmes for physician-scientists that integrate medical and research training using lessons learned from MD-PhD programmes; a reduction in the time from training to an independent research position by five years; and promotion of an increase in the numbers and diversity of trainees. Additionally, a centralized mentoring and oversight process facilitated by creating institutional career development offices has been advocated to reduce attrition. The Ghana College of Physicians and Surgeons (GCPS) has also restructured its formal training in research as others have suggested to deal with some of these challenges.^{4,7,6} The college is in the process of establishing a PhD/Fellowship track for its residents interested in pursuing academic/research careers as occurs in other settings.^{4,5,9} The curriculum has been designed and presented at two (2) state universities. The discussion is currently at the level of the Academic Board of these institutions, awaiting approval. The West African Colleges have similar arrangements with universities in Nigeria. Some doctors are pursuing MPH programmes after school, MPhil and PhD programmes in basic sciences subjects such as Medical Microbiology and Physiology. What is lacking is opportunities for research degrees in the clinical sciences.

Availability of funds is an important determinant of the capacity to carry out research^{4-5,14}. In the US apart from the funds from the Medical Scientist Training Programme, other support for MD-PhD programmes

are obtained from institutions, training grants, individual fellowships, and research grants⁹. Researchers in Africa find it more difficult to access funding for research owing to the limited research funds provided by the governments of these countries including Ghana.⁴ Furthermore, only a few researchers can access global funds dedicated to research due to unsuccessful applications, lack of training in grantology, and resolve to make an application⁴. Thus, training in grantology should be an essential component of the training of physician-scientists. In addition, training programs must establish links with funding institutions and form international collaborations to attract fellowships and grants for multicenter studies. These funding challenges can also be tackled by lobbying government, industry and other funders within the country.⁶

Mentorship in research is crucial for professional development and personal achievement.^{5,20,21} It involves a nurturing relationship between a mentor, usually a successful or experienced researcher and a mentee, or student, during which the changing needs of the mentee are identified and met over time through guidance, problem-solving, networking, critical thinking and advice^{5,20}. Good mentorship ensures the mentee's goals are met through action plans set to achieve them and that there are opportunities for review, critical reflection, problem-solving and research productivity through developing research proposals, grant applications, publications and presentations at conferences^{5,20}. Mentorship can also be used as a tool to address issues peculiar to minorities such as females in research and ethnic minorities²¹

Collaboration with academic institutions such as the Noguchi Memorial Institute of Medical Research, the Department of Medical Microbiology of the Medical School and other basic and clinical science units of universities, can provide mentors for biomedical research. Exchange programmes to expose trainees and physician-scientists to best practice environments and international mentors are also relevant. Additionally, creating centres of excellence in clinical research within the country can provide leadership, best practice experience and cutting-edge research; it can also stimulate innovation and support training in a focused area to promote scientific ventures that are not feasible within conventional funding from other sources²². They can also provide the infrastructure to support clinical trials, and longitudinal studies and address research priorities linked to international goals like the sustainable development goals (SDGs) as well as in-country research priorities.¹⁰

Additional uncertainties remain at the stakeholder level such as the need for the classification of grades of doctors by the MOH/GHS so that clinicians with academic degrees such as a PhD can be better placed and be adequately remunerated. Thus, uniform or near-uniform remuneration for physicians who join academic institutions with proper equivalences should be established concurrently to encourage more doctors to

go into research, though one may have to demonstrate additional workload.⁶ Government and other stakeholder support to meet funding needs can also be an incentive to retain these researchers. Other incentives such as research support for physicians while in training at all levels of the Health System in the form of infrastructure, mentorship and protected time should also be made available as others have suggested.^{4,5,7}

Exemption from some district rotations may be considered to shorten the duration of fellowship training and the time to scientific independence. These exemptions are currently only being offered in specialties with limited residents such as Psychiatry, Radiology and Anaesthesia and need to be diversified. At the same time, posting to some district hospitals, particularly those linked to the research units or districts integrate research with clinical work can be designated as places where mentorship and research experience can be gained by doctors on the physician scientist track and offered as clinical fellowships for 1-2 years.

Conclusion

Doctors desiring a career path in clinical research need clear pathways and structured programmes to develop their skills. Mentorship, funding and infrastructure are also needed. It is important that training in both clinical work and research roles commences early to boost productivity and set those desiring university tenure on a path to professorship. When mentored by physician-scientists and other seasoned researchers, these doctors can be instrumental in transforming wherever they work into centres for cutting-edge research so that research questions useful for clinical care can be generated, answered and translated into better patient outcomes. They can also assist with recruiting patients to make up the numbers for large international clinical trials, identifying patients with rare diseases for surveillance, and monitor and develop treatments. Just as field epidemiology graduates trained by the Centre for Disease Control have made a major impact on the control of epidemics in Africa¹⁰, these doctors can have a similar impact on the research front and a steady stream could pave the way for large longitudinal studies which are limited in Africa and perhaps, win Nobel prizes in the sciences from Ghana.

Recommendation

We recommend that academic institutions and the Ministry of Health collaborate with other stakeholders to define a clear pathway for training of physician-scientists, their career progression and ensure that this information is made available to doctors requiring postings. Furthermore, academic institutions, and the postgraduate medical colleges should offer courses tailored to the needs of doctors desiring research career in either public health, biomedical sciences and the clinical sciences. This should include research-focused postgraduate training and residency programmes for physician-scientists and provide technical skills

including skills in grantology. The Ministry of Health can offer scholarships for training, sponsor mentorship programmes, research fellowships, and provide competitive salary structures that are near or comparable with those of their colleagues who go into clinical practice/service delivery or incentives for pursuing a career in health research. Additionally, the Ministry of Health should provide funds for research and an environment where research findings can be translated into policy, including the establishment of clinical research centres of excellence. We also recommend that the length of training to become a physician scientist be examined and shortened where possible. Finally, we recommend that, the challenges with training these professionals be addressed so that they can contribute to research on issues emanating from national policies such as the National Universal Health Care roadmap and National Health Policy and strategy as well as the control of communicable and non-communicable diseases, diseases of nutrition and lifestyle, pollution, and reproductive and child health issues.

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