

Perspectives on Research Internships for Medical Students and Young Doctors in Ghana: An Opportunity to Replenish the Stock of Physician Investigators?

This article was published in the following Dove Press journal:
Advances in Medical Education and Practice

Edem MA Tette ¹

Ben A Gyan²

Kwadwo A Koram ³

¹Department of Community Health, University of Ghana Medical School, Accra, Greater Accra Region, Ghana;

²Department of Immunology, Noguchi Memorial Institute for Medical Research University of Ghana, Accra, Greater Accra Region, Ghana; ³Department of Epidemiology, Noguchi Memorial Institute for Medical Research University of Ghana, Accra, Greater Accra Region, Ghana

Abstract: The corona virus pandemic undoubtedly demonstrates the growing need for research in medical science. However, with the decline in physician scientists world-wide, innovative ways are needed to engender interest in research among medical students and young doctors to replenish the stock of physician investigators. One way of doing this is to create compulsory and elective projects for them. We describe research internships created for medical students at the Noguchi Memorial Institute for Medical Research to expose them to the rudiments of biomedical research and proposal development. We also describe research internships for doctors waiting for house job postings or keen to do research who needed mentorship. Though the response has been positive, the full impact will be realized with time. The recognition that training should be backed with a supportive environment, mentorship and clear career paths for physician scientists is also mentioned.

Keywords: research, internship, medical students, doctors, physician scientist, investigator, extracurricular research, medical education

Introduction

Globally, declining numbers and activities of physician-scientists over the years, especially in Africa, have been reported¹⁻⁵ These scientists complement other researchers in the health sciences and have contributed to the recent advances in medicine which have improved the quality of life and life expectancy globally. By definition, physician scientists are medical graduates with an interest in basic science or clinical research including translational and patient-oriented research as well as the evaluative sciences, who perform this as their primary professional activity.⁴⁻⁶ Most of them engage in both clinical work and research, and their unique experience enables them to develop clinically relevant research questions, improve patient recruitment and monitoring during clinical trials and translate research findings into practice.⁴⁻⁶ The Ebola epidemic of West Africa in 2014 revealed a critical gap in research. The urgent need for these professionals became even more apparent during and after the epidemic.^{5,7,8}

Current evidence indicates that early exposure to research through medical school or as a young doctor, influences the choice of a career in research.^{6,9-11} For this reason, several calls have been made for the medical school curriculum and training of young doctors to include research as an essential component to promote

Correspondence: Edem MA Tette
Email edemenator@googlemail.com

succession.^{4–6,9} This is supported by the report that undergraduate research played a role in the discovery of insulin by Charles Best, a medical student and his supervisor Frederick Banting which led to the award of a Nobel prize.^{9,12} In addition, Enerst Duchesne's earlier studies on the antibiotics properties of *Penicillium glaucum*, Paul Langerhans' discovery of the islets of Langerhans and administration of ether as anaesthesia for surgery by William E. Clarke are among the discoveries made by medical students.¹² Furthermore, a report suggests that undergraduate education in some colleges tend to produce more Nobel Laureates than other colleges and this has been linked to the selection of students and training which may well include exposure to research in these settings.¹³

One way of stimulating the interest of doctors in research is to create research projects for medical students to do.^{4,9} Traditionally, University of Ghana Medical School has achieved this through mandatory writing of long essays or dissertations in the final year of medical school, during the Community Health component of the medical course. In addition, medical students are exposed to research methods through community diagnosis surveys carried out during the Community Health rotations in the 1st clinical year and the final year. Thus the emphasis has been on public health research. After this experience, the majority do not do any more research until they enter the residency programmes of the West African College of Physicians or College of Surgeons, and Ghana College of Physicians and Surgeons when a research project becomes mandatory.

It is against this background that an internship programme for medical students of the University of Ghana to generate an interest in biomedical and clinical research was initiated by a seasoned researcher, a former Director from the Noguchi Memorial Institute for Medical Research (NMIMR), and a lecturer of the Department of Community Health. The goal of the programme was to provide medical students with exposure to laboratory-based research and proposal writing. In addition, to this undergraduate training, some medical school departments in recent years have created research internships for doctors-in-waiting for their house job postings and other young doctors. Among these are internships in child health, coordinated at the Department of Community Health to provide these doctors with opportunities to participate in research. We describe three (3) internships in research that are available for medical students and young

doctors to provide them with exposure and opportunities to participate in research.

The Internships for Medical Students

The internships for medical students were carried out as part of the research internship that had already been running at the Noguchi Memorial Institute for Medical Research (NMIMR). The institute was set up in 1979 and is the leading biomedical research facility in Ghana. It is a component of the College of Health Sciences, University of Ghana and has nine departments which include, Animal Experimentation, Bacteriology, Clinical Pathology, Electron Microscopy and Histopathology, Epidemiology, Immunology, Nutrition, Parasitology, and Virology. It was built through the joint efforts of Professor E. O. Easmon, former dean of the medical school, Professor Kenji Honda of Fukushima Medical School in Japan, the Government of Japan and presented as a donation to the Government and people of Ghana. This was to honour the distinguished Japanese researcher Dr. Hideyo Noguchi, who researched into yellow fever in Ghana and died from the disease in the country in 1928. Altogether, 10 students have undergone the internship so far.

Research Internships After the 1st Clinical Year

Students in the first clinical year who had demonstrated exceptional skills in research during the 1st clinical year community diagnosis survey and students who expressed an interest in research were selected for the internship. Two (2) to three (3) interns have attended at a time for a period of 3–6 weeks during the students' vacation. The internship provided exposure to the rudiments of biomedical research. Prior permission was obtained during the curriculum review process in 2014. A student's description of the internship was as follows, "The attachment program lasted for four weeks excluding weekends. Work began at 8:00am and continued till about 2:30pm. A typical day's work involved working in the laboratories at the facility and assisting the researchers perform various biological experiments. There were also teaching and learning sessions in the various laboratories to explain the methodology and steps in performing the various experiments. On Wednesdays, the whole facility had a meeting where researchers presented the progress of experiments or research they were working on. Senior members of faculty then made inputs on how best to forge ahead with the

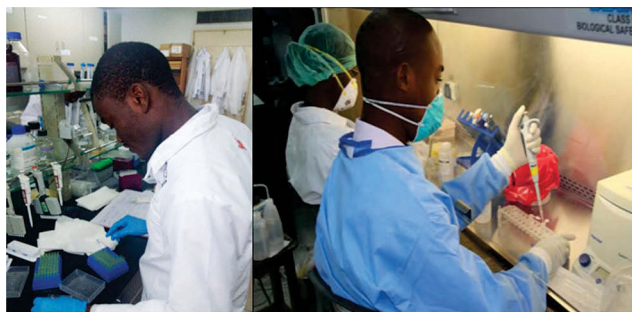


Figure 1 Students working in laboratories at the Noguchi Memorial Institute of Medical Research.

research; junior members and students also had the opportunity to ask questions and learn from the deliberations that occurred." **Figure 1** shows students working in laboratories at NMIMR during this internship.

Research Internships After the 2nd Clinical Year

Research internships for 5th year medical students who had completed the 2nd Clinical year were carried out in 2017 during the vacation period before the final year to explore the possibility of doing laboratory-based research as part of the final year student dissertation. Three students opted to do this during their elective period. They successfully developed a research proposal at the end of the internship linked to a project that was already running at the institute. However, they were unable to use this research project for their final year dissertation because of the time it takes to obtain ethical approval, challenges with synchronizing the students' rotations for joint data collection, lack of protected time for data collection, and travel time between the NMIMR, on the Legon campus and the Korle Bu Teaching Hospital (KBTH) campus where the students reside. Since the work was going to be linked to ongoing research at NMIMR, funding was not expected to be a problem. However, one would envisage that funding for such projects may present a challenge in future.

Feedback from the students has been positive. This statement was made by some of the students in their report, "All in all, it was a very valuable experience and we will like to express profound gratitude to the Department of Community Health and NMIMR for the opportunity." One of the students who had undertaken the 1st clinical year internship in the previous year, joined those who did the internship after the 2nd clinical year. While waiting for his house job posting, he spent the time assisting with research at the cardio-thoracic

unit. The programme has run for three (3) years from 2015–2019. The internship in 2018 was suspended because of some operational challenges but it continued in 2019.

Research Internships for Doctors

The research internships in Child Health at the Department of Community Health have mainly involved studies on child mortality, nutrition, developmental conditions and neonatal health. These projects are usually already designed and have ethical approval. However, in some cases the doctors have requested mentorship to design their own studies. These studies were conducted at Princess Marie Louise Children's hospital in Accra and other Ghana Health Service facilities, in partnership with the department. The Princess Marie Louise Children's Hospital (PML) is an 81 bed hospital located at the commercial centre of the capital, Accra, along the southern coast of the country. It attends to children and young persons under the age of 18 years and houses the largest in-patient and out-patient service for rehabilitating mal-nourished children in Ghana.

Participating doctors have included doctors waiting for their house job postings, house officers, medical officers and post-graduate residents. Depending on their level, they participate in proposal development, do data collection, data entry or supervise other data collectors. They are also exposed to data analysis and contribute to solving some of the administrative issues that arise during research. The internship is entirely a practical exercise as it is assumed that these doctors have learnt the basics of research methodology from medical school. No formal lectures on research are given except the training that is necessary for data collection and entry. Other theoretical aspects of research are explained as they are encountered and when writing a manuscript. The doctors are usually given a stipend from the coordinator's research allowance from the University of Ghana or a funded research project when available.

No formal advertisement is usually made. Interested doctors often come and see the coordinator to express their interest in research. However, three doctors were specifically recruited for a study on neonatal health in the Upper West region, the most rural region in Ghana and whose capital is a driving distance of approximately 692km from Accra.¹⁴ Two of the doctors were selected because they lived in the region and had carried out research on problems they had observed there during their student holidays. This was part of their student dissertations under the supervision of the coordinator, the lecturer involved with student internships. Both of them

were working at the Upper West Regional Hospital (UWRH) at the time of the call for the funding and participated in writing the proposal. Unfortunately, by the time the funding came through, they had both come down South for further training but were sufficiently motivated to take time off and go back there to participate in the research. The third student, also supervised by the coordinator, had identified a problem in the region but was unable to do it there as part of her student dissertation as she had originally intended and so did it in Accra. However, it was modified and included as a separate objective in the neonatal study. Altogether, 5 scientific papers involving 1 resident, 4 house officers and 1 medical officer have been published.^{15–19} There are 2 other manuscripts, one by a resident and another with a house officer waiting for posting, near publication, among others at different stages of development. Five papers have also been presented at meetings, national and international conferences including two by the residents and one by a house officer.

Medical research forms the basis of evidence-based medicine, which underlies the ethos of medical practice today.^{4,9} Thus exposure to research and publications have become a necessary part of the portfolio of today's young doctor.⁹ This has necessitated, the use of new and innovative ways to engender an interest in research careers among medical students and young doctors to stimulate in them, a desire for a career in research, an agenda which is actively being pursued by medical schools today.^{4,20–22} According to recent reports from the USA, some of these measures have improved recruitment of physician scientists and steadied the decline there.^{2,6}

The Cleveland Clinic Learner College of Medicine has one of these innovative programmes created specially to train physician investigators.²¹ It provides medical students with a learning experience in basic, translational and clinical research prior to selecting a topic for a 12–15 months master's level thesis. The University of Leiden in the Netherlands also offers a similar extracurricular honors research programme from the second year of medical school consisting of four tracks which are different in content and approach.²² These include an MD/PhD track, the Journey into Biomedical Sciences track, the Clinical Research/Epidemiology track, and the Free Research track. Similarly, there are programmes in India that encourage research among medical students. One of these is a grant scheme offered by the government to promote research and administered by the Indian Council for Medical Research which is similar to what is being

done at NMIMR.²³ Another such programme, the Problem Solving for Better Health (PSBH) global programme, trains medical students to develop research proposals in answer to research questions and it has received high patronage in India.^{23,24} Their product, a research proposal is similar to what the 2nd Clinical year interns accomplished. Students of the University of Kuwait are also reported to engage in a variety of extracurricular research-related programmes.²⁵

Generally, there is paucity of published literature on research among medical students and young doctors in Africa.^{5,23,26–28} However, researchers from South Africa, Rwanda, and Kenya have found a positive experience or attitudes to research among medical students, interns and residents.^{26–28} Nevertheless they have also identified barriers which have occurred consistently, such as a lack of time, mentorship, funding and knowledge of research methods as militating against undertaking research during their training. Lack of opportunities for voluntary or extracurricular research was also reported by the paper from South Africa and a paper on the research experience of Nigerian medical students which compared it with what pertains in the United States of America.^{26,29} Similarly, the study from Kenya reported that the publications from their cohort were mainly from students who had undertaken intercalated courses emphasizing the importance of such programmes.²⁸ Consequently, to promote research, the barriers need to be removed and opportunities for extracurricular research created.

To expand research among medical students at UGMS, suggestions have been made for the medical curriculum be reviewed to free extra time for a research track to enable students to opt for in-depth training in research, similar to the study from Leiden.²² To achieve this, suggestions have been made to exempt students who opt to do research, from other parts of the community health course such as the district rotation in the final year of medical school which hitherto has been mandatory. This is debatable as these graduates may not satisfy the current training requirements of the Medical and Dental Council (MDC), Ghana and would lose the exposure to health services in rural areas where the majority of Ghanaians live. While this is true, the MDC may also need to review its research requirements and align it with modern trends in medical education while other options are considered. Closer collaboration in research between clinicians, at KBTH and researchers at NMIMR could also remove some of the barriers.

Another way of resolving the bottlenecks identified during the medical student internships is to create opportunities for the interns to work on the research proposals

they developed from these internships during the period they are waiting for their postings as House Officers or Medical Officers. If this is done, then hopefully, with time, this training experience can be formalized into a clinical fellowship, a Masters in Science degree or MD, as the studies from Cleveland and Leiden have done. This would enable the students to receive more in-depth training, formal credit for their efforts, generate publications and contribute to the University's ranking.^{9,21,22,28} The effort will not only equip the next generation of researchers with publications to make them more competitive, but will also enhance their capacity for critical thinking, innovation and ability to provide answers to health problems in Africa and across continents. Although the response to these internships has been positive so far, we recognize that training alone is not enough; it must be backed with a supportive environment, advocacy for a clear career path which addresses postings, grants, infrastructure, further education, mentorship, issues relating to service commitments and remuneration as others have found.^{2,4,5,6,30} When this is done, the succession process to replenish the stock of "physician-led" investigators can be better managed.

Conclusion

Globalization, threats from public health emergencies, such as the Ebola epidemic and the COVID 19 pandemic, rapid development of innovative technologies and the increasing complexity of research methods have highlighted the need to train more physician-scientists. This report describes the modest efforts being made to involve medical students and young doctors working in Ghana in research. It is early yet and more time is needed before one can evaluate these programmes to establish whether participants in these internships are on track to become the physician scientists of tomorrow, nevertheless, it has a promising start.

Ethical Consideration

Written informed consent was obtained from all medical students who have participated in the internship and the young doctors who have been mentioned in connection with the internships in this study. In addition, written informed consent was provided by the students featured in the photographs for their images to be published. Formal ethical clearance was not obtained as this is a description of a training program and exemptions have been provided to other similar studies.

Acknowledgment

We are grateful to the medical students and young doctors who have participated in the internships and to Building Stronger Universities Initiative Platform on Human Health (BSU-PHH) and SAVANA Signatures Tamale. We also acknowledge, Daniel DeGraft-Amoah of the Department of Community Health, and Yeetey Enuameh and Daniel Gyaase, Center for Disability and Rehabilitation Studies KNUST for their assistance. We are grateful to Dr Amadea Tette for her assistance in funding this publication.

Funding

No special funding was obtained for these training interventions. However, the research by the young doctors who participated were funded from the research allowance of the supervising doctors and ongoing research projects funded by Building Stronger Universities Initiative Platform on Human Health (BSU-PHH) and Global Affairs Canada through Savanna Signatures, Naluro Estates, Tamale.

Disclosure

Dr Edem M. A. Tette reports grants from Savana Signatures, Tamale, Ghana and Building Stronger Universities Initiative Platform on Human Health (BSU-PHH) during the conduct of studies reported in this paper. The authors report no other possible conflicts of interest in this work.

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