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EDITORIAL

RESEARCH ORIENTED MEDICAL SCHOOL CURRICULA TO NURTURE UNDERGRADUATES IN PREPARATION FOR THE FUTURE PHYSICIAN SCIENTISTS: RELEVANCE FOR DEVELOPING COUNTRIES

Jay Shah[1,*], Gehanath Baral[2], Ganesh Dangal[3], Harish Chandra Neupane[4]

[1]Department of Surgery, Patan Hospital, Patan Academy of Health Sciences (PAHS), Lalitpur, Kathmandu, Nepal
[2]Department of Obstetrics and Gynecology, Nobel Medical College, Biratnagar, Nepal
[3]Department of Gynecology and Obstetrics, Kathmandu Model Hospital, Kathmandu, Nepal
[4]Department of Surgery, Chairman & Managing Director of Chitwan Medical College, Bharatpur, Chitwan, Nepal

INTRODUCTION

Medical schools with research-oriented curricula shape the undergraduate (UG) from early-stage for a competent physician to practice evidence-based medicine (EBM), to critically analyze, utilize and generate evidence. Continued research output adds to the pool of evidence. The UG research writing publication (URP) stimulates students to integrate new knowledge into practice. This helps to meet the expectation of society for healthcare service delivery and planning.[1-3] Teaching, learning, and competency with integrated URP motivates medical graduates for a lifelong scholar, help in career choices, and develop leadership.[3-5] Academic medical institutes play an important role to nurture medical students for a competent and research-oriented physician which is an endangered species.[6-9] This is worrying that health research has a low priority in the developing countries. There is a need to enhance the overall research capacity starting from the early years of undergraduate as a long-term strategy to develop and implement need-based health policies and services.[10,11]

IMPORTANCE OF RESEARCH-ORIENTED PHYSICIANS AND PHYSICIAN-SCIENTISTS

There is a shortage and decline of research-oriented physicians and physician scientists worldwide.[12] Medical schools have an important role to play in developing competent physician who is lifelong learners and seek evidence from published literature as well as contribute to the pool of literature by generating evidence with research and publication. Integration of URP helps stimulate students from early years to become a competent physician who is required to have the ability to understand and integrate new knowledge into practice. Society expects doctors not only to be trained professionals in medical knowledge and skills but also to practice EBM and be engaged in planning through research which generates further evidence to improve the health of the population. Research-oriented physicians have a role for both, practicing clinicians and scientists.[1,2,13,14]

Modern medical education requires all three core components: learn, teach, and be competent in research writing publication. This will allow the physician to be a lifelong learner to apply knowledge and skill to solve problems scientifically. The URP is getting attention as an integral part of medical education.[1-5,13,14] This helps in critical analysis and leadership during the professional career. Early exposure to URP is a strong motivation to improve learning and for future specialization. Thus, encouraging medical students for URP should be given priority to build the foundation and inculcate enthusiasm for a research-oriented physician to effectively practice EBM.[3,4] The benefit of early URP experience helps students find out and also encourage them to get engaged in research and generate evidence in their future professional career.[15,16]

Educationists and medical schools have a responsibility to look for ways to aid the students in motivations for research and publication. Study shows that influence of extrinsic motivation (e.g., improving biodata) may be of greater importance than intrinsic motivation (e.g., interest/passion) for medical students to get engaged in URP.[5] Medical students' participation in URP remains low despite the benefits, and thus there is a need to find out the obstacles identified by the students, and develop strategies to motivate them to increase their participation in research.[1,2,17,18]

REVITALIZING THE ENDANGERED SPECIES OF RESEARCH-ORIENTED PHYSICIANS

Research-oriented physicians are an endangered species worldwide. Research writing publication is integral to clinical excellence and an important factor for the development of physician-scientists. Unfamiliarity with scientific methodology among junior physicians is the most important factor, among various other issues like busy work schedules, mentorship, and funds. The postgraduate program emphasizing clinical research found that age <40 y, generalist, and those who had begun publishing research as course projects were likely to take research in their future career.[19] Academic medical institutes have an important role and responsibility in nurturing medical students for future research-oriented physicians.[6] And, this is where medical school curricula could play an important role to get students engaged in research and produce a value-added physician.[7,8]

The life of a physician-scientist is rewarding, but the path is demanding and difficult if not exposed to research while in medical school. Research-oriented physicians are mostly self-taught in writing and publications. Research-oriented medical education (ROME) complements the EBM. Integration of ROME into the existing curriculum of medical schools is logical to meet

the needs of the fast pace of modern medicine. This helps UG health science students understand research and innovations in healthcare practice, planning, and service delivery. Simply being aware of the need for research is not sufficient when medical students lack 'why and how' of the research methods, the utilization in practice, and participating in the research publication.[20] The study from sub-Saharan UG health sciences students in medical and allied science found that previous or current voluntary research involvement was the significant factor for future participation in research.[9]

TRAINING MEDICAL STUDENTS FOR RESEARCH WRITING PUBLICATION

Mentoring is a crucial part of the curriculum for URP to prepare naive medical students. Most mentors are too senior, often also mentoring the postgraduates. This demands flexibility to meet the individual and changing needs of mentees. Also, consistency in the mentoring process is crucial for compliance with the prevalent codes and conducts of EBM practice.[21]

Mandatory courses in medical schools alone or combined with the preference in future enrollment for residency are important motivations for the URP. The students' perspectives of URP in the Gulf Cooperation Council (GCC) countries found that the majority (87.3%) believed that they could conduct research and present at conferences. The top three motives for conducting research were improving research skills, earning research publication, and improving patient care. Interestingly, a majority (75.0%) mentioned that future acceptance to a residency program was an important factor. Also, two-thirds (63.6%) of the surveyed students said that compulsory research methodology course was the reason they practiced URP.[14] Thus it is in the interest of all, the academicians in medical school, and society as a whole to have an in-built program in the curriculum to expose and engage UG students in research writing and publication during early years.

Findings from multicenter studies show that major motivations for medical students enrolled in 8-years program (graduating with a degree equivalent to masters) were engaged in research to meet the graduation requirement and employment (75.8%). Only a quarter (24.2%) mentioned research interest as a motivation.[22] The study also found that more students who had been engaged and produced research output were motivated for the need of research requirement compared to students without a research output (71.4% vs. 55.2%, p = 0.046).

The factors affecting medical student participation in research in Lagos, Nigeria, shows, main barriers were funding (79.6%), facilities (77.8%), biostatistics in the curriculum (76.0%), training in research methodology (74.7%), time (73.3%), and mentoring (58.8%) among 221 participants.[23] Similarly, a survey among students in a medical school from Nepal found positive perception and attitude towards research but there were several barriers for research, e.g., funding (71.5%), dedicated time (61.7%), and administrative approval (46.6%).[24] Other barriers include lack of mentors, training courses, priority for research and research culture.[25]

Understanding and using the principles and methods of scientific research writing and publication during medical student research projects (MSRP) helps in learning research methodologies and develop skills for the critical analysis of literature.[26,27]

Considering research is useless (odds ratio 4.57) was found to be a major factor among medical students for the lack of research interest.[28] This further emphasizes the need for research writing publication during UG to produce a research-oriented physician with an understanding and be able to use the research findings. The research projects will help in preparing the medical graduates not only to follow the evidence but also to generate evidence. Study shows Indian medical students have insufficient exposure and participation in scientific research techniques and methodologies in the UG medical curriculum. Not including prior research experience and publications in the selection procedure for post-graduates is a demotivation.[29,30]

THE LONG-TERM STRATEGY OF UG RESEARCH WRITING PUBLICATION

The active URP program is essential to prepare the future generation of research-oriented physicians. Medical students are a crucial target population for the long-term strategy in research writing and publication. Health research improves health care but it has a low priority in developing countries, in South Asia, and Nepal. The medical school should work to enhance the overall research capacity starting with the UGs as a long-term strategy for capacity building, for a research culture to address the health issues.[10]

This is a misconception that medical students do not produce quality research publication. The UGs contributed 10% of the publications in Medline-indexed output from top universities.[31] A 3 year spiral mandatory UG student research program integrated into the curriculum with an assessable output in terms of presentation in conference and journal article publication revealed that 2/3rd of students found the URP beneficial.[32]

The URP selective of 4-weeks modules in longitudinal community-based research during 3 y from 2nd to 4th years was found beneficial for the development of research competencies.[33] This study emphasized the actual participation of students to identify the problem for the development of research protocol, approval from the institutional ethics review board, collecting data, write a report and implement the findings in a primary health care setting. Medical school projects and report writing exercises are of limited value as these reports are not required and also not suitable for publication in scientific journals. The dedicated mentoring to prepare the student to write a report suitable for submission to a peer-reviewed journal has been found helpful for students in formulating a hypothesis, to conduct a literature search and critical appraisal, increase their skill in data collection, and write a report in the form of a

research paper for publication in peer-reviewed journals. Such exercise had a positive impact on their careers in medicine.[34]

A recent study from India shows a majority of the students agreed with the importance of research (88.6%, 195/220) and that it should be included in the curriculum (72.7%, 160/220) but most of the student reported they had no chance of participation (76.8%, 179/220) in research, which reflects the need of reform in the curriculum.[35]

In Nepal, most medical schools and universities' curriculum on research mainly focused on the introduction to research and statistics without emphasis on practical training leading to research output for publication. Patan Academy of Health Sciences School of Medicine, Nepal, has a mandatory interactive training workshop on 'research writing and publication' during the internship year in addition to a longitudinal community medicine course with report writing, and quality improvement projects.[36] Still, there is a lack of emphasis and measures to assess research output for the effectiveness of the curriculum on URP. Thus, there is need for detailed, effective research and publication-based training in the UG curriculum.[25,29]

The research culture of the organization, support for the structured program with supervision enhances the interest and research output of scholarly work.[11] Research experience and publication as a medical student have a positive influence on future research involvement and professional career.[37,38] To achieve this, the medical students should be trained in the principles of scientific research and encouraged for scholarly publication. A dedicated student section in academic journals is a good start to encourage students to publish their research work.

The Nepal Association of Medical Editors (NAME, http://name.org.np/) since over a decade has been aspiring to capacity build and develop a culture of research, writing and publication by providing trainings and workshops for authors, reviewers and editors.

A long-term strategy includes involving and training medical students during early years to enhance the overall research capacity and health needs of society. Involving medical students in research simply as enumerators (data collectors) because they are easily available labor force has limited benefit or even lead to dissatisfaction with research. For example, asking students to fill the prepared proforma from patient's charts and then hand over the data to the faculty/principal investigator without involving them in the concept, design, and scientific thought process of research and publication is not beneficial. Proper mentoring is necessary to nurture the students to get them interested in research and publication. Research experience of student help them improve their skills in literature search, critically appraise articles, improve self-learning, and generate interest for research, writing, and publication. In the long term, this will help address health service delivery and future planning to improve the health of the population.

CONCLUSION

There were considerable disparities in curricula content, teaching/learning methods for 'research writing and publication' in medical schools and universities. The curricula and training workshops on research output are far from ideal. The interactive teaching learning method of presentation and training workshops in the medical school undergraduate curricula is necessary. Training and early exposure, exposure across all stages of medical school for an integrated and practical approach in research writing publication pathways, is needed to prepare and rejuvenate the endangered species of clinician-scientist.

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AUTHORS' BIOGRAPHY

Dr. Jay Shah, Department of Surgery, Patan Hospital, Patan Academy of Health Sciences (PAHS), Lalitpur, Kathmandu, Nepal; President of Nepal Association of Medical Editors; Chief editor of JPAHS; Former Vice-Chancellor of PAHS, Nepal.

Dr. Gehanath Baral, Department of Obstetrics and Gynecology, Nobel Medical College, Biratnagar, Nepal; Member Nepal Association of Medical Editors; Chief editor of NJOG, Chairperson of Nepal Health Research Council.

Dr. Ganesh Dangal, Department of Gynecology and Obstetrics, Kathmandu Model Hospital, Kathmandu, Nepal; Gen. Sec. Nepal Association of Medical Editors; President of Nepalese Society of Obstetrics and Gynecology; Editor of JNMA.

Dr. Harish Chandra Neupane, Department of Surgery, Chairman & Managing Director of Chitwan Medical College, Bharatpur, Chitwan, Nepal.

*Correspondence to: Jay Shah, Department of Surgery, Patan Hospital, Patan Academy of Health Sciences (PAHS), Lalitpur, Kathmandu, Nepal. Email: drjaywufei@hotmail.com

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