Developing an Introductory Radiology Clerkship at Perdana University Graduate School of Medicine in Kuala Lumpur, Malaysia

Sarah Wallace Cater  
*The Johns Hopkins University School of Medicine, Baltimore, MD, USA, sarah.cater@dm.duke.edu*

Lakshmi Krishnan  
*The Johns Hopkins University School of Medicine, Baltimore, MD, USA*

Lars Grimm  
*Department of Radiology, Duke University Medical Center, Durham, NC, USA*

Brian Garibaldi  
*The Johns Hopkins University School of Medicine, Baltimore, MD, USA*

Isabel Green  
*The Mayo Clinic, Rochester, MN, USA*

Follow this and additional works at: https://hpe.researchcommons.org/journal

Part of the Health and Physical Education Commons

**Recommended Citation**  
Cater, Sarah Wallace; Krishnan, Lakshmi; Grimm, Lars; Garibaldi, Brian; and Green, Isabel (2017)  
"Developing an Introductory Radiology Clerkship at Perdana University Graduate School of Medicine in Kuala Lumpur, Malaysia," *Health Professions Education*: Vol. 3: Iss. 2, Article 8.  
DOI: 10.1016/j.hpe.2017.02.004  
Available at: https://hpe.researchcommons.org/journal/vol3/iss2/8
Developing an Introductory Radiology Clerkship at Perdana University Graduate School of Medicine in Kuala Lumpur, Malaysia

Sarah Wallace Cater\textsuperscript{a,b,*}, Lakshmi Krishnan\textsuperscript{a,c}, Lars Grimm\textsuperscript{b}, Brian Garibaldi\textsuperscript{a}, Isabel Green\textsuperscript{d}

\textsuperscript{a}The Johns Hopkins University School of Medicine, Baltimore, MD, USA
\textsuperscript{b}Department of Radiology, Duke University Medical Center, Durham, NC, USA
\textsuperscript{c}Department of Medicine, Duke University Medical Center, Durham, NC, USA
\textsuperscript{d}The Mayo Clinic, Rochester, MN, USA

Received 16 May 2016; received in revised form 23 January 2017; accepted 3 February 2017

Available online 7 February 2017

Abstract

Purpose: In recent years, several well-known medical schools in the United States have partnered with foreign institutions to promote the post-graduate model of medical education and the concept of the academic medical center. One such example is Perdana University Graduate School of Medicine (PUGSOM) in Malaysia, founded in collaboration with the Johns Hopkins University School of Medicine in 2010 with the hope of setting a new standard for biomedical research and patient-centered care in Southeast Asia. One issue for educators at PUGSOM was how best to integrate radiology into the clinical curriculum. Given radiology’s global importance, a core clerkship was proposed; however, a major challenge lay in creating content that was rigorous and relevant to the Malaysian setting.

Methods: After interviewing practicing Malaysian radiologists, attending medicine ward rounds, and performing a literature review of successful radiology curricula, two senior American medical students from Johns Hopkins developed a two-week introductory clerkship combining experiential learning with online, case-based lectures featuring diseases and technology pertinent to the Malaysian environment.

Results/discussion: To our knowledge, this is the first example of a course developed by medical students in the United States for medical students in the developing world. The project serves as an example of the type of mutually beneficial international exchange intended by global partnerships in medical education.

© 2017 King Saud bin AbdulAziz University for Health Sciences. Production and Hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Keywords: Education; Global health; Medical school; International; Technology

*Correspondence to: Department of Radiology, Duke University Medical Center, 2301 Erwin Road, Box 3808, Durham, NC 27710, USA. Fax: +1 919 613 5716.
E-mail address: sarah.cater@dm.duke.edu (S.W. Cater).

Peer review under responsibility of AMEEMR: the Association for Medical Education in the Eastern Mediterranean Region.

http://dx.doi.org/10.1016/j.hpe.2017.02.004
2452-3011 © 2017 King Saud bin AbdulAziz University for Health Sciences. Production and Hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
1. Introduction

1.1. Perdana University Graduate School of Medicine (PUGSOM)

Established in 2010 under a public-private partnership, Perdana University Graduate School of Medicine (PUGSOM) is the first graduate-entry medical school in Malaysia, created to provide an alternative option for Malaysian students with undergraduate degrees who were not able to gain entry into medical school after high school or developed the desire to become a physician later in life. Johns Hopkins University School of Medicine was chosen as a Western partner in this endeavor for its leadership in medical education and its novel “Genes to Society” curriculum, which integrates biology, culture, and environment and promotes research alongside patient-centered care.1

Johns Hopkins is not the first American medical school to collaborate with a foreign government to promote the post-graduate model of medical education. In 2007, Duke University partnered with the National University of Singapore (NUS) to launch Singapore’s first such medical school.2 Likewise, Weill Cornell Medical College partnered with the government of Qatar in 2001 to create the Gulf nation's first medical school,3 providing pre-medical education for recently graduated high school students as well as a four-year post-graduate curriculum based on the US model.4

1.2. The curriculum

PUGSOM enrolled its inaugural class of 24 students in 2011. Johns Hopkins provided administrative leadership including vice deans, a founding dean, and a CEO, who in turn recruited several full-time faculty members from Baltimore to deliver pre-clinical courses and serve as clerkship directors.5,6 Early research on this inaugural class showed that PUGSOM students rated their learning environment highly, with many variables – including teaching, faculty, and engagement – scoring higher than they did at a comparison medical school in Malaysia, or even the Baltimore campus of Johns Hopkins.7,8

Clinical rotations take place at Hospital Kuala Lumpur (HKL), a public, tertiary-referral hospital operated by the Malaysian Ministry of Health, and one of the largest hospitals in Asia with over 2300 beds. HKL is a major teaching hospital, staffed with Malaysian residents under the traditional “Commonwealth” system, including house officers (the rough equivalent of interns), medical officers (junior or senior residents), registrars (chief residents), and consultants or specialists (attending physicians). PUGSOM students rotate through pediatrics, obstetrics and gynecology, internal medicine, surgery, neurology, and psychiatry.

2. Problem

2.1. Radiology education at PUGSOM

One challenge for PUGSOM was how best to integrate radiology education into the curriculum. Most modern imaging modalities are available at HKL, including computed tomography (CT), magnetic resonance imaging (MRI), and nuclear medicine. Additionally, all PUGSOM students must pass the US Medical Licensing Examinations (USMLE) – which covers basic radiology topics – whether they plan to practice in the US or not. A good foundation in radiology was felt to be essential, and a required clerkship was proposed.

In the spring of 2014, two authors (SWC and LK), both senior medical students at Johns Hopkins, travelled to Kuala Lumpur to assist in the development of a radiology clerkship for PUGSOM students. Project development involved six months of preparation in the US, followed by four weeks of in-country experience at PUGSOM and HKL. The following describes the experience of creating the course and explores the challenges of curriculum development in this unique setting.

3. Approach

3.1. Clerkship goals

Our primary goal was to create a two-week introductory radiology course for second-year PUGSOM students transitioning into their clinical years. A major challenge lay in creating content relevant to the Malaysian setting, while providing adequate preparation for the USMLE. To gather necessary data, we interviewed and observed multiple practicing radiologists at HKL, attended medicine rounds to better understand how imaging was integrated into clinical work, and performed a literature review of successful radiology curricula.

A second goal was to explore ways in which technology could make didactic components of the course self-sustaining. Computer-assisted online learning is particularly effective at teaching radiology principles to medical students,9–11 especially when presented in a case-based format.12 It offers a means to cater to American content and pedagogy while eliminating the cost of flying faculty from the US.
Finally, it allows students to perform continuing education, returning to lectures as a refresher when needed. Duke-NUS in Singapore served as a model for the successful integration of online learning.\(^2\)

A final goal of the project was to foster ties between practicing radiologists at HKL and faculty at PUG-SOM. We hoped that our outreach would increase buy-in to the PUGSOM program and promote longstanding collaborations between the two institutions.

3.2. Radiology in Malaysia

As a middle-income country, Malaysia has already undergone much of the epidemiologic transition towards chronic diseases.\(^3\) Common entities encountered on cross sectional imaging include cancer and stroke. However, a large burden of infectious diseases remains. For example, we visited during a historic outbreak of Dengue Fever, with more than 48,800 cases and 92 deaths from January to July of 2014.\(^4\)

Access to radiology images at HKL is cumbersome. Studies are still processed on film, and hospital-wide Internet access is absent. All plain films are read in a reading room by several radiologists and masters’ students (the equivalent of residents), reading up to 200 films per day from a variety of sources, including the emergency department, outpatient clinics, and Ministry of Health programs such as a large tuberculosis screening initiative (Image 1).

At HKL, demand for high-resolution CT greatly exceeds supply. Over 200 requests are received daily, with less than 100 studies accommodated. For this reason, clinicians are required to physically visit the reading room and ask the on-call radiologist for approval of all CTs. Radiologists at HKL emphasized that many of the house officers (equivalent to American interns) did not have adequate training on imaging indications and risks, including the appropriateness of contrast administration. Such a system is efficient at preventing inappropriate imaging, and requests are frequently turned down.

Ultrasound is widely used at HKL due to its availability and affordability. One senior radiologist typically supervises several masters’ students, who perform and interpret 50–100 studies per day. There are no dedicated sonographers. Screening liver ultrasounds are very common due to the large burden of hepatitis B and cirrhosis among a sizable unvaccinated population. Ultrasound is a first line modality to follow metastatic liver cancer, diagnose abdominal or pelvic fluid collections, and follow renal disease. Radiologists perform all gynecology ultrasound studies, while obstetricians perform obstetric sonograms.

The radiologists at HKL were unanimous in their encouragement of our radiology course. They recommended focusing on imaging indications, risks, and provider communication, and were highly amenable to accommodating PUGSOM medical students for observation and teaching.

4. Course development and outcomes

In collaboration with Hopkins and PUGSOM faculty, the medical student authors utilized a six-step method of curriculum design to create their clerkship.\(^5\) When appropriate, guidelines provided by the Alliance of Medical Student Educators in Radiology (AMSER) were utilized.\(^6\) A preliminary course blueprint included objectives, learning strategies, a reading list, and proposed lectures.

Our core curriculum included introductory online lectures on radiologic vocabulary and communication, followed by a series on X-ray, CT, and ultrasound, the modalities most common at HKL. Each modality-specific lecture began with a primer on basic physics,
indications, and safety, segued into a review of anatomy, and concluded with a strategy for imaging interpretation. Using video editing software (ScreenFlow 4.5.1; Telestream LLC, Nevada City, CA), online interactivity was emphasized with embedded videos and quiz-based assessment.

Whenever possible, we featured the American College of Radiology Appropriateness Criteria\textsuperscript{17} to emphasize best practices. Radiation stewardship was a consistent theme. Our primary textbook was Learning Radiology: Recognizing the Basics by William Herring, MD,\textsuperscript{18} a book already available at the HKL bookstore for purchase by students. We integrated links to several excellent publically available resources, including TeamRads.com anatomy cases from Johns Hopkins.\textsuperscript{19} Real images from our own personal collections were featured. For summary and review, we prepared four “mystery case” lectures on cholecystitis, appendicitis, pulmonary embolism, and trauma that integrated multiple modalities, with the cases unfolding over time as they would in a real clinical scenario. Finally, a pre- and post-test were created, and an end-of-course evaluation.

Several online presentations were piloted on fourth year students at PUGSOM. Integrating their feedback, we recorded a total of twenty lectures and uploaded them to a password-protected YouTube channel. The clerkship schedule was divided into time spent on independent study with the online courses and one-on-one clinical sessions with faculty at HKL. The course as a whole served to prepare students for the wards and the USMLE, and to introduce them to the specialty of radiology. The curriculum was handed off to local administrators in July 2014.

5. Discussion

To our knowledge, this is the first example of a course developed by medical students in the US for medical students in the developing world. Our model shows that, if done appropriately and supplemented with real world experience, online courses offer a sustainable and efficient method of quality medical education. As more American medical schools seek to spread their curricula and brands abroad, and as technology continues to advance, electronic courses will likely become a mainstay.

Our experience reinforced the importance of fieldwork when translating information to a new environment. There were many technological, cultural, and epidemiological differences between Malaysia and the US that we would not have otherwise recognized. Fieldwork also creates invaluable opportunities for fostering interpersonal relationships. Overall, the project serves as an example of the type of mutually beneficial international exchange intended by global partnerships in medical education.

Disclosures

None.

Ethical approval

The study met institutional criteria for exemption from institutional review board review.

Funding

Funding was provided by The Johns Hopkins Dr. Mohan Swami Institute for International Medical Education.

Other disclosures

None.

Acknowledgements

This project was supported by the The Johns Hopkins Dr. Mohan Swami Institute for International Medical Education. An early abstract was featured as a poster presentation at the RAD-AID Conference on International Radiology for Developing Countries in Baltimore, MD, on October 24, 2014. Of note, Johns Hopkins ended their contract with PUGSOM in the summer of 2014, and the medical school is currently affiliated with the University of California, San Diego.

References


Sarah Wallace Cater MD graduated from The Johns Hopkins University School of Medicine in 2014 and is currently a diagnostic radiology resident at Duke University Medical Center in Durham, North Carolina, USA.

Lakshmi Krishnan MD DPhil graduated from The Johns Hopkins University School of Medicine in 2014 and is currently an internal medicine resident at Duke University Medical Center in Durham, North Carolina, USA.

Lars Grimm MD MHS is an assistant professor of radiology at Duke University Medical Center in Durham, North Carolina, USA.

Brian Garibaldi MD is an assistant professor of medicine at The Johns Hopkins University School of Medicine, Baltimore, Maryland, USA, and former Director of the Preclinical Curriculum at Perdana Graduate School of Medicine, Selangor, Malaysia.

Isabel Green MD is an assistant professor of gynecology and obstetrics at The Mayo Clinic, Rochester, Minnesota, USA, and former Director of the Clinical Curriculum at Perdana University Graduate School of Medicine, Selangor, Malaysia.