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Integrating Clinical Perspectives into Graduate Education

Sarah E. Henrickson[1], **Amma F. Agyemang**[1], **Salil Garg**[1], and **Janet P. Hafler**[2]

[1]Harvard -MIT M.D./Ph.D. Program

[2]Yale School of Medicine

1.2 Introduction

1.2.1 Translational Research Training for Graduate Students

The training of a Ph.D. biomedical researcher is traditionally focused on the core biomedical sciences and basic immune processes with little focus on learning the application to disease mechanisms, clinical trials or the culture of clinical medicine. The Harvard Immunology Program at Harvard University historically trained Ph.D. students in the core sciences as well as in the specifics of basic research in immunology, but there was no curricular content designed to address the integration of the clinical aspects in the field of immunology with the related basic science. This has become of increasing importance with the decline in physicians entering into the basic sciences and clinical research[1-6]. While this decline can be partially addressed by M.D.-Ph.D. programs, the length and nature of these programs does not make them ideal for many students interested in translational research, leading to an increasing need for Ph.D. scientists to conduct mechanistic, clinically related research. Across the United States, a number of institutions have designed innovative programs designed to yield focused clinical exposure for biomedical engineering[2], neuroscience[3], immunology and biomedical informatics programs[7], among others, along with careful consideration of designing translational research training programs in a more general sense[8]. In addition, a recent $10 million training grant from the Howard Hughes Medical Institute (HHMI), developed to foster the training of future translational researchers, has allowed 13 graduate schools across the US to modify their Ph.D. curricula[9]. This program will hopefully help determine best practices in clinical exposure for Ph.D. students. In the Harvard Immunology program, we re-designed a course in order to bring together physician-scientists and both M.D.-Ph.D. and Ph.D. students with the aim of integrating science with clinical medicine.

Ten years ago, a course designed by two leading immunologists in the Harvard Program in Immunology, one an M.D. clinician physician-scientist and the other a Ph.D., and a doctorally prepared educator had the goals of introducing Ph.D. students to the culture of

Janet P. Hafler Ed.D, Assistant Dean for Educational Scholarship, Yale School of Medicine, 367 Cedar Street, New Haven CT 06510, janet.hafler@yale.edu, W 203.737.5952, F 203.737.4199.

medical research and the application of basic science to human disease. Here the definition of a curriculum, originally framed by Tyler[10] as a set of four questions, was implemented. The course was designed based on those definitions which are as follows: what are the educational purposes; which learning experiences will be useful to achieve those purposes; how can those learning experiences be organized for effective instruction; and how can their effectiveness be evaluated? With the goals specified, several teaching strategies were identified as important for effective teaching: active student involvement, setting clear expectations, case based discussions, interaction with real patients, and role modeling by physicians of clinical competence[11]. The course description and its evaluation are presented.

1.2.2 Course Overview

The course was designed to include both in-class seminars and experiential learning (in the form of clinic visits), in order to provide students with both the basic science foundation and the clinical realities of core, immunologically relevant conditions. The seminars were scheduled as a weekly lunch series where physician-scientists from HMS would address the pathophysiology of the disease under study. Students rotated through one clinic session with each faculty member in the course. The list of specific diseases, each part of the core curriculum in immunology, included asthma, diabetes, immunodeficiency, inflammatory bowel disease, multiple sclerosis and rheumatoid arthritis.

In the clinic, with permission from the patients, each student observed patient encounters, interacted with patients and developed an understanding of the realities of living with the diseases being studied in the laboratory. After the students rotated through each clinic they had the opportunity to select one area and return for three more clinic sessions in that specialty. They wrote a final paper in which they proposed a new clinical protocol, including the basic science of the proposed therapy and how the efficacy of the therapy might be monitored in patients.

1.2.3 Educational Context

A number of programs have individually undertaken coursework or curricula to introduce various populations of Ph.D. students to clinical information[2, 7, 12]. Faculty members are trying to identify best practices, and through the HHMI training grant to 13 programs, the dissemination of best practices may be forthcoming[9].

1.2.4. Introducing a Teaching Role for M.D./Ph.D. students

An innovative part of this course is the training and the inclusion of M.D./Ph.D. students in the education of their peers in the Ph.D. program, as teaching assistants (TAs) in the course. Their role was to serve as facilitators between their graduate student peers and the physician-scientists who teach in the course. To help the Ph.D. students better understand the clinical information in the lunchtime clinical lecture sessions and the patients seen in the clinics, the M.D./Ph.D. students taught three introductory sessions on the physical exam and relevant, disease-related physical findings. The M.D./Ph.D students also attended all the sessions, to provide continuity, and they assisted in the assessment of the students. This TA experience served as one mechanism for the M.D./Ph.D. students to fulfill their graduate teaching

requirement and allowed them to be involved in the teaching of key clinical information to their Ph.D. peers.

1.3 Methods

A summative evaluation utilizing a survey instrument was conducted to examine student perceptions of the course. This study was approved by the Harvard Medical School/Harvard School of Dental Medicine Office for Research Subject Protection and the Federal Assurance number is FWA00007071. A total of nine participants (out of twelve students in the course) responded on a prepared survey instrument. The survey instrument combined opportunities for thirteen open-ended qualitative responses along with twenty-five Likert-scaled items[13], with choices running from 1 (not helpful) to 5 (extremely helpful), and three yes or no questions. Topics covered included: course content, lunchtime seminars, TA-facilitated tutorials, faculty, clinic experiences, and course design/objectives and organization. Participants could respond specifically to what they found most helpful and least helpful to their learning, as well as provide suggestions they might have to improve the course.

1.4 Results

Each of the nine students who responded indicated that the course helped him or her better understand clinical immunology. One student mentioned that the course “relat[ed] what I am learning in class and studying in the lab to real situations.” Another mentioned that it “put a ‘face’ to a disease.” While another said they had “learn[ed] what the patients are looking for from research, seeing gaps between research and therapies. Also, overall students gained a general sense that ‘my research is worth something’.”

When asked what from the course played the most useful role in their learning, the clinical sessions (on a scale from 1-5 with 5 being the highest) scored the highest (mean = 4.56), the lunchtime seminars followed (mean = 4) and then the TA-led sessions (mean = 3.11). 43% of the students wanted to learn more exam techniques and 44% wanted more time to practice the techniques. Given the course design, which integrates experiential and didactic sessions, the student's perceptions seem to indicate that the balance is appropriately distributed.

The first group of M.D./Ph.D. students who were trained as TAs, helped design their role as in the course. All 3 TAs reported positively about their experiences in the course as one TA stated it was a “wonderful opportunity to re-learn the physical exam and carefully consider the key components of the physical exam to pass on to their peers.” Having been out of the clinics, and medical school, for 6-18 months, they all reported a desire to retain their skills and an interest in using their skills to benefit their Ph.D. student peers. As one said, she had a “concern about how to maintain clinical skills and clinical knowledge, and this course provides an opportunity to practice key skills by deciding what information is truly necessary and then finding ways to teach the material in a practical and interesting format”.

1.5 Discussion

This curricular framework could be used as a template for broadening the education of Ph.D. students and incorporating M.D./Ph.D. students into the field of academic medicine. Providing M.D./Ph.D. students a role that allows them to draw on their experiences and work with Ph.D students gives them a chance to consolidate their own knowledge and integrate their own experiences in the M.D. and Ph.D. aspects of their education.

1.6 Conclusion

We present the curriculum and evaluation of a course with the goal of exposing Ph.D. students to the culture of medical research generally and specifically to the application of basic science to human disease. We believe this review of our experience at the Harvard Medical School will be useful to other graduate programs attempting to bridge the gap between basic scientists and clinicians in conducting research by bridging traditional Ph.D. instruction and clinical medicine.

Acknowledgments

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Highlights

Following are the three bullets I believe you need for Dr. Janet Hafler's article in Clinical Immunology:

1. We examine a curriculum that gives Ph. D. students basic science and clinical exposure.
2. We found peer-to-peer teaching to be very effective.
3. We model a framework that can be used as a template for all graduate students.