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Teaching transfusion medicine research methods in the developing world

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A vital research enterprise has been essential to the development and maintenance of high levels of transfusion safety in developed countries. Virology, immunology and clinical pathology research contribute to the development of sensitive and specific assays for infectious disease, accurate matching of blood components to the recipient, and approaches for the production of high quality, sterile and contaminant-free blood components. Equally important are epidemiologic and clinical research efforts aimed at developing accurate statistics on transfusion related infections and other complications, to evaluate hypotheses on transfusion-related disease and implement clinical trials of new transfusion therapies. Developing countries often struggle with a lack of trained personnel and financial resources to carry out their routine operations, and are deprived of clinical research that could guide blood safety policy appropriate to their populations and resources. Even though there is often a willingness to perform research in these countries, the means are often lacking to start the process with precise research questions and continue it with rigourous study designs based upon sound epidemiological and logistical considerations.

To help develop intellectual capital in transfusion medicine research in developing countries, Blood Systems Research Institute (BSRI) and the University of California San Francisco (UCSF), together with other blood centers in the USA and Europe, have long welcomed medium-term trainees from developing countries. However these six-week to six-month internships are relatively expensive, require the trainee to be absent from their blood center and family for long periods of time and for this reason are suited to only small numbers of trainees. Instead, over the past five years, we have developed a novel two-week research training course which is given in-country. The course is based upon the format of a six-week course directed by Professor Steven Hulley at UCSF[1] and is centered on the development of a feasible transfusion research protocol.

Mornings are devoted to lectures devoted to specific topics in transfusion medicine research and clinical research methodology, including choice of the research question and hypotheses, study design, choice of subjects, definition and measurement of variables, data analysis and calculation of sample size. Lecture content is specifically adapted to issues in transfusion-related research with real-life examples and interaction with the participant projects. In the

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afternoons, practical workshops allow each trainee to develop a one paragraph research question into a 5 to 6 page research protocol under the direct guidance of the course faculty-preceptors. The expectation is that the protocol will be complete and ready for implementation in the participant's country. Each afternoon's writing assignment follows the morning lectures and readings from the course textbook[1]. Research questions are chosen mainly by the subject in consultation with their mentor or supervisor at their home blood center, but course faculty suggest modifications to assure that the protocol describes precise hypotheses, appropriate study design, adequate sample size and available resources.

Trainees are generally MDs, PhD's or senior technicians who work in blood centers in Latin America, Africa or Asia. We choose younger candidates whose careers will benefit most from the training and who have the potential for future leadership in transfusion medicine research in their home countries. Applicants are chosen on the basis of their curriculum vitae and letters of recommendation from their home country supervisors, with certification that adequate release time will be given to the trainee after their return from course so that they may accomplish their research. During the course, trainees are evaluated on the basis of their written research protocol, and their participation in a peer review session on the last day of the course during which each trainee is assigned to present a verbal critique of one of their colleague's protocols in the group setting. This exercise, which simulates a protocol or a grant application review committee, reinforces the lessons of the course teaches the ability to give criticism constructively and to receive and benefit from peer feedback.

Over the past four years, the course has been given eight times to a total of 84 trainees. The course was initially developed for Brazil and Latin America under seed grant funding from BSRI, and has been given in Sao Paulo (2004; 9 students), Buenos Aires (2005; 13 students), Tegucigalpa (2006; 7 students) and Belo Horizonte (2008; 16 students). Subsequently, it was incorporated into the curriculum of the Ecole Pasteurienne d'Infectiologie, a new master's degree granting program in public health at the Institut Pasteur in Paris, France. That course, given in French to an average of 10 trainees annually in 2007, 2008 and planned for May 2009, is oriented primarily towards blood bankers from Francophone Africa. Finally, an unrestricted educational grant from Novartis Vaccines and Diagnostics (Chiron) and co-sponsorship by South African National Blood Service allowed the development of a South African venue for the course. Courses have been given in Johannesburg (2007; 12 students), Durban (2008; 10 students) and tentatively Cape Town (2009) with trainees drawn initially from South Africa and eventually from all of Anglophone sub-Saharan Africa.

Another innovation is an annual competition for mini-grants of approximately $5000 apiece to allow alumni of that year's training course to accomplish their newly-designed research projects. Applications consist of the research protocol developed by the trainee together with their curriculum vitae. A committee reviews the applications and awards grants according to the following criteria: scientific merit of the research protocol; promise of the candidate for a research career; and need for external funding to accomplish the research project in their blood center.

Several alumni from the course have also participated in longer training experiences in San Francisco directed at specific research interests or laboratory technique, or at data analysis and manuscript preparation in a 6-week course developed by the Center for AIDS Prevention Studies (CAPS) at UCSF. Our aim is to assist the most promising candidates to develop independent research careers by mentoring them in the development of additional research projects of applications for external grant funding. To date, there have been a total of six published research articles [2-7], another four manuscripts in preparation, and more than 10 abstracts submitted to international scientific conferences.

This issue contains two articles which exemplify a new approach to developing transfusion medicine research capacity in low and medium resource countries. Tayou-Tagny et al. present a cross-sectional survey of current blood collections, infectious disease testing and blood center organization in Francophone Africa. Most of the contributing authors were participants in the first Francophone Africa research training course described below. The article gives reason for hope: national blood policies adopted in five out of seven countries, systematic screening for infectious disease in all (at least most of the time). However much remains to be done: only a minority of blood center personnel are well trained in transfusion medicine, only two countries have 100 percent volunteer donors and component preparation remains the exception rather than the rule.

Laperche et al. describe a collaborative approach to infectious disease marker test external quality assessment (EQAS). Starting from the same network described in the Tayou Tagny article, the French National Institute of Transfusion Safety (INTS) provided pedigreed serum aliquots in a blinded fashion to participating blood center laboratories. The results were provocative. Whereas sensitivity and specificity of traditional enzyme immunoassays was acceptable at most centers, the sensitivity of rapid tests was unacceptably low, particularly for HBsAg. The use of rapid tests in a pre-donation screening algorithm may still be defensible, but these tests ought not be used without subsequent enzyme immunoassay testing of the donated blood unit. The study is another outcome of our recent training activities in transfusion medicine research.

Future plans for the course include the development of a two-week, in-country scientific manuscript writing course to help trainees publish and disseminate their research findings. We also hope to offer selected alumni of the 2-week course opportunities for longer internships or even Master's degree education in San Francisco, Paris or Sao Paulo. Finally, a planned website will allow us to facilitate communication and networking between trainees and alumni of the program, to post announcements regarding future courses and conferences of interest to alumni, to aid in collaborative writing of manuscripts, and to post grant opportunities for which the alumni may be eligible. We are currently in the process of applying for grant funding to continue current training activities and to fund these future plans.

In summary, we have developed a unique short course program directed at the development of transfusion research capability rather than operational skills. Initial results from the program are encouraging, and we hope that it will be successful in addressing critical needs for intellectual capital among blood bankers in developing countries. We are aware that other centers have developed training activities in developing countries and would encourage them to incorporate training in research in their outreach activities.

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References

1. Hulley, SB., et al. Designing Clinical Research. Vol. 3. Philadelphia, Lippincott: Williams and Wilkins; 2007.
2. Goncalez TT, Sabino EC, Murphy EL, Chen S, Chamone DA, McFarland W. Human immunodeficiency virus test-seeking motivation in blood donors, Sao Paulo, Brazil. Vox Sang 2006;90:170–6. [PubMed: 16507016]
3. de Almeida Neto C, McFarland W, Murphy EL, Chen S, Nogueira FA, Mendrone A Jr, Salles NA, Chamone DA, Sabino EC. Risk factors for human immunodeficiency virus infection among blood donors in Sao Paulo, Brazil, and their relevance to current donor deferral criteria. Transfusion 2007;47:608–14. [PubMed: 17381618]
4. Goncalez TT, Sabino EC, Chen S, Salles NA, Chamone DA, McFarland W, Murphy EL. Knowledge, Attitudes and Motivations Among Blood Donors in São Paulo, Brazil. AIDS Behav 2008;12(4 suppl):S39–47. [PubMed: 18389356]
5. Almeida Neto C, Murphy EL, McFarland W, Mendrone A Jr, Chen S, Chamone DAF, Sabino EC. Changes in the Profile of Blood Donors with Reactive Serologic Tests for Syphilis in Sao Paulo, Brazil, and its relevance to blood bank practice. Transfusion 2009;49:330–6. [PubMed: 19040599]
6. Tayou Tagny C, Diarra A, Yahaya R, Hakizimana M, Nguessan A, Mbensa G, Nébié Y, Dahourou H, Mbanya D, Shiboski C, Murphy EL, Lefrere JJ. Characteristics of blood donors and donated blood in Francophone Sub-Saharan Africa. Transfusion. in press
7. Laperche S, Boukatou G, Kouegnigan L, Nébié Y, Ould Boulahi M, Tayou Tagny C, Yahaya R, Tapko J-B, Murphy EL, Lefrère J-J. Transfusion safety on the African continent: an international quality control of virus testing in blood banks. Transfusion. in press