A conceived model of “physician scientist” cultivation: exploring the double degrees of MD-PhD program

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To the Editor: With the rapid economic growth and improvement of people’s living standards in China, ever-greater demands for high-level health-care services are expected. These expectations are bringing new challenges to the development of clinical doctors. However, the traditional path for doctor training is inadequate to meet these challenges, as both clinical and scientific practices are important for doctors but difficult to integrate into medical education. Thus, the current medical training system is challenged to combine scientific research training with conventional clinical training. To provide possible solutions, Health Science Center (HSC) of Xi’an Jiaotong University (XJTU) has been exploring a new mode of developing physician scientists: The Double Doctoral Program (DDP).

Modern industrialization and urbanization, combined with an aging population and unhealthy lifestyles among the young, accelerate the incidence of certain diseases, such as circulatory disorders and malignant tumors. In addition, the prevalence of public health education via multiple media platforms also raises people’s general expectations and requirements for higher quality health-care services. However, the treatment of a number of diseases is still outdated, providing only symptomatic relief rather than sustained cures, as there is little or no in-depth medical knowledge about these diseases. And the unbalanced geographical distribution of health-care resources makes illness treatment in certain areas even more difficult. Therefore, the responsibility of pushing back these frontiers falls on the shoulders of future physician scientists.

The Doctorate of Medicine and of Philosophy (MD-PhD) training mode was initially proposed several decades ago in North America to select and train future physician scientists capable of balancing and exploring both clinical and scientific areas. As this led to a global discussion about the future of the medical field, between 2009 and 2012 the Ministry of Education and the National Health Commission of the People’s Republic of China issued a series of official opinions on medical education reform. The “Opinions on Medical Education Reform” issued in 2012 emphasized the need for internationalization of 8-year MD programs. Given the increasing importance of scientific research in clinical practices and the expansion of United States MD-PhD programs, the DDP was proposed and implemented in HSC — a sound response and bold innovation of an internationalized pathway for future physician scientists in China.

To maximize the program platform, HSC has been cooperating with three internationally renowned institutions: Karolinska Institute, Institute Pasteur, and Emory University. Our first joint program with Emory University can be traced back to 1992, when the Radiology Department of the First Affiliated Hospital of XJTU and Emory University jointly provided several radiology courses for Chinese radiologists. After returning home, these trained professionals significantly contributed to the development of radiology in China. In recent years, joint research programs between XJTU HSC and Emory University have remained active in a variety of areas, including urologic surgery, oncology, pediatrics, and so on. Professor Rikard Holmdahl from Karolinska Institute currently holds the title of Director of the Theme Center for Inflammatory Disease in XJTU’s Department of Medical
Biochemistry and Biophysics. As a chair professor in the Changjiang Scholar Program, Prof. Holmååldh has successfully applied for multiple national-level research projects with other experts at XJTU HSC, A Sino-Sweden Inflammation Research Institute is also being established. Collaboration with Institute Pasteur is in development; both parties are confident about its future, as a 5-year agreement has just been signed. These historical foundations between XJTU and the three institutions facilitate development of the international implementation of the DDP.

Only enrollees in the 8-year MD program (Zonglian Pilot Program) in HSC are eligible for candidate selection. Those MD candidates who are still finishing their medical research are also encouraged to apply for the DDP, during which they will spend an extra 2 years abroad in any of the three aforementioned institutions to earn a PhD degree. To be successfully enrolled in the DDP, candidates must first complete all courses in their MD program with excellent academic performance, and they must pass ideologymorality and professional knowledge tests. Based on the students’ volition and their supervisors’ recommendation, HSC will further organize a panel to evaluate the students’ overall performance, including interest and skills in scientific research, basic knowledge, and English proficiency. Practical aspects of the evaluation process may vary as requested by the cooperating institutions. For example, the first group of students admitted to Emory University also received custom-designed online interviews and tests conducted by three Emory professors. This ensured the high caliber of the recruited and sponsored students.

To ensure the successful outcome of the program, HSC adopts a “3 on 1” mentorship mode, in which three mentors collectively supervise and guide one student. Students may meet different challenges during their PhD programs, such as fulfilling the need for clinical and scientific skill training, experimental skills guidance, and funding.[3] Through mutual selection between students and mentors, each student is assigned two mentors from HSC—focusing on basic medicine (BM) and clinical medicine (CM), respectively—and a third PhD mentor from the cooperating institution. Through discussions over time, students and supervisors jointly decide on the specialization and research orientation. The CM mentor oversees the overall program process and clinical skill training. The BM and the PhD mentors participate in the student’s entire study process as well; they are also responsible for scientific research training and guidance in experimental methods, especially during the PhD period. Through this approach, complementary strengths of the three supervisors are maximized and not only benefit students in different stages of the DDP but also ensure that students graduate on schedule.

During their time overseas, students are instructed by the three supervisors with the aim of developing advanced scientific research ability through elaborately designed, creative, and personalized cultivation strategies. Furthermore, considering the medical background of the enrollees, clinical observations and medical events are also integrated into their time overseas. Qualification for graduation must of course conform to HSC’s degree-granting requirements. Students must finish their dissertations and prove their competency for the PhD and MD degrees. Meanwhile, XJTU HSC signs a contract with the enrollees stipulating the responsibilities and obligations of both parties. Students who graduate from this program will be offered priority to work at XJTU or its affiliated hospitals. It should also be noted that all enrollees are fully sponsored by China Scholarship Council, XJTU, and the cooperative institution.

Five enrollees were sent to Emory University in July 2017, and nine students left for Emory University and Karolinska Institute in 2019. The long-term effectiveness of the pilot medical DDP needs to be tracked and further evaluated.

China is a vast country with unbalanced levels of regional economic development and different levels of health-care services that vary greatly across the nation. There is an urgent need for physician-scientists who possess advanced research ability and have mastered the latest clinical techniques. Therefore, traditional programs in medicine must adapt to meet the requirements of the new era. The DDP aims to meet this need by developing qualified medical graduates into both qualified practitioners and physician-scientists with advanced scientific research ability, global perspectives, and solid theoretical foundations. Implementation of the program can not only promote cooperation between XJTU and renowned foreign medical institutes but also strengthen the mobility of professionals and the sharing of education resources. The DDP is also crucial to the development of teaching and researching, which boosts the process of bridging the gap between the disciplines of cooperating institutions. Accordingly, the operation and management of the program can bolster friendship and cooperation between the parties, particularly in terms of development of new educational disciplines, scientific research, and student development. This program can also encourage more publications and joint international research programs. Most importantly, the collective effort of three mentors can benefit the students in building both a solid foundation for their future development and long-term collaboration between the institutions involved.

It should be noted that at this point more extensive implementation of the DDP is less likely, for two major reasons: the prolonged cultivation period and resource limitations, including facilities, faculty, and funds. Nevertheless, the development of physician scientists should still be considered a long-term goal for all medical schools in China in the light of its vital role in maximizing limited resources and cultivating elite physician scientists.

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**Conflicts of interest**

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