Research within a medical degree: the combined MB BS–PhD program at the University of Sydney

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ABSTRACT

- Along with its new graduate-entry medical program, the University of Sydney has introduced the Combined Degree (Research) Program which allows students to graduate with an MB BS and PhD.
- The program includes 2–3 years of full-time research between Years 2 and 3 of the 4-year MB BS program.
- The program aims to produce clinician–scientists committed to continuing research that reflects their experience of clinical practice.
- Eight women and 23 men have enrolled since the program began in 1998, with the first cohort graduating in 2003.
- The students have been active in helping to develop the program and establishing a society and other student support networks.

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THE COMBINED-DEGREE (MB BS–PhD) Program at the University of Sydney provides a novel opportunity for highly motivated students to commit to research from the outset of their medical training. Based on models from the United States and Canada, it is designed to support candidates throughout their training, in the hope that they will emerge with a commitment to sustaining their own research within medicine. As clinician–scientists, it is expected that they will be pivotal members of the local profession; the scientific questions they pursue will reflect their experiences of caring for patients.

Pathways to medical research in Australia

The former undergraduate-entry medical program at the University of Sydney provided opportunities for students to spend an intercalated year in basic research for the Bachelor of Science Medicine (Honours) degree. This program and similar programs at other universities have produced a core of students ready to undertake advanced research for a PhD or MD after graduating in medicine (see Box 1 for a personal perspective).

Another pathway for research training is available within specialist postgraduate medical programs. Research topics are directly relevant to the graduate's chosen specialty. This path will remain important, particularly for research focused on clinical disciplines. However, many candidates find it difficult to juggle research, clinical responsibilities and family life, and those without previous research experience may need longer to complete the training.

The new medical program at Sydney University aims to select highly motivated applicants with research experience, and to support them to complete both an MB BS and a PhD degree in a minimum of 6 years from enrolment.

Combined-degree programs overseas

Although new to Australia, combining a PhD with medical training has been possible in the United States and Canada since the mid-1960s. In 1964, the US National Institutes of Health established the Medical Scientist Training Program to produce clinician–scientists, with the hope that they would bring unique insights from clinical practice into research, and vice versa. Such courses are popular: in 1991, 107 US schools had combined-degree programs.[1] Around 2000 medical students pursue dual degrees each year, following a curriculum of at least 7–8 years (4 years of medical school and 3–4 or more years of PhD training). The National Institutes of Health fund the programs.[2] However, recently the numbers enrolling have been decreasing,[3] and the clinician–scientist is now seen as an "endangered species".[4,5]

Contributing to the rationale for combined-degree programs in the US were the constraints on research training after graduation from medical school, such as the need to repay student debts, perceived funding difficulties, reduced laboratory time, family commitments and reduced leisure time.[1,6] Such constraints, likely to have worsened in the past 10 years, are a greater deterrent for women.[7] In addition, students with pre-existing PhDs who enter medical programs are usually lost to later biomedical research.[8] The same barriers may apply to Australians, particularly as students now graduate with significant debt.

In addition, in the US, the embryonic clinician–scientist develops in a climate that is negative towards research.[1] Although realistic information is essential, students need to be encouraged by the opportunities, rather than discouraged by the difficulties of attaining funding or finding time for research. They need to be inspired by the rewards of an academic lifestyle rather than deterred by the financial

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1: Past research pathways — a personal perspective

Ann Sefton graduated from the 6-year medical curriculum, taking an extra year for the BSc (Med) (Hons) degree, and later completed a PhD.

"The stimulus of research was a revelation — a chance to think creatively, develop independence, learn new skills and take responsibility for experiments. It determined my future directions as I undertook a PhD after medical graduation and some hospital experience. In those days it was difficult to maintain basic research and clinical linkages."

bottom line that often burdens academics.[3,9,10] Candidates need to be guided and exposed to successful careers, and to learn how to combine research and patient care effectively. They must establish early which paths are feasible.[1,9]

The Sydney combined-degree program

The Combined Degree (Research) Program at the University of Sydney aims to produce graduates committed to continuing research from a medical perspective. Ultimately, as clinician–scientists, they will be vital members of the medical profession, posing research questions that reflect the insights they gain from caring for patients.

The Sydney MB BS program is a 4-year program after any first degree. Students admitted into the combined-degree program must have a good Honours degree or equivalent. They undertake a minimum of five semesters of full-time intercalated research. Candidates complete the 1st year of the MB BS program before they formally enrol part-time for a PhD. During the first 2 academic years, research is undertaken during unallocated time, vacations or formal "options".

At the end of their 2nd year, combined-degree candidates enter the PhD program full-time, with support from faculty (including advice, access to supervisors and sources of financial support) to ensure that they "hit the ground running". Candidates work for 2–3 years on their PhDs before returning full-time to 3rd year medical studies. At this stage, they have largely completed their research and focus on writing up their theses for submission. Candidates may continue PhD enrolment part-time during the last 2 years of the MB BS program, but must submit their theses before completing the final year to be awarded the combined MBBS–PhD degree (see Box 2 for a personal perspective).

2: During the combined degree — a perspective

Brian Power is a final-year combined-degree candidate.

"Although studying medicine was always the aim throughout my medical science degree, my appetite for research developed when I undertook a basic science honours project in a neuroscience laboratory.

The opportunity to conduct my own experiments and study medicine in combination was too good to let pass. Although at times challenging in my preclinical years to find a sustainable balance between basic sciences labwork and the medical texts, it was an invaluable lesson.

The full-time component of the PhD was busy but provided opportunities to be involved in teaching, and to develop a sense of community on campus with fellow combined-degree colleagues. On returning to the more demanding clinical period of training, the combination of writing/publishing and the wards has found a dynamic rhythm of its own. I'm looking forward to graduating and developing a balance between the bench and the bedside."

Students apply to join the combined program either on entry to the medical program or at the end of the 1st year. Applications require a detailed proposal and must show evidence of the candidate's ability to carry out advanced research (usually a first-class Honours degree). The selection process is rigorous, and only around five candidates with outstanding research potential are admitted each year. This approach ensures a consistently high calibre of candidate and is based on successful programs in the US.[1]

The combined–degree students

Since 1998, eight women and 23 men have enrolled in the combined program at the University of Sydney over six intakes, with the first cohort graduating in 2003. The sex difference needs to be explored, as the medical program attracts roughly equal numbers of men and women. Full-time research has been undertaken on campuses in Sydney and Canberra and as far afield as Singapore, the US and Germany. Many candidates have presented their research at international conferences. So far the group has published more than 30 articles in refereed journals, including one in *Nature*.

Candidates in the combined program show a range of interests remarkably similar to their counterparts in the US, from laboratory-oriented to clinical research. Popular specialties include biochemistry, neurosciences, pharmacology, physiology and molecular and cell biology.[2,11]

Student support initiatives

Students in the combined program have fostered a sense of community by forming their own society. At regular meetings, they present their endeavours and findings. The society provides a support network in the face of their demanding workloads and isolation from their medical colleagues. It also serves as a platform for discussing issues such as faculty policy. Society members sit on the Faculty's Combined Degree Program Committee, and the students themselves have played an instrumental role in establishing the program.

A student-led initiative also saw the establishment of a series of research seminars outlining research opportunities across the Sydney campuses for MB BS candidates in their first 2 years. Combined-degree students create an encouraging environment for new candidates through a welcome function, and publish and distribute an annual handbook. With the help of faculty computer experts, they maintain a helpful website.

Career guidance

Many US programs provide, in addition to research advisory committees, a career counselling committee, which

3: After the combined degree — a perspective

Andrew White is a graduate of the combined-degree program:

"My involvement with the combined-degree program has not only equipped me for a career in either academia or clinical medicine, but has also shown me the importance of meaningful integration between the two. Continually changing focus from learning clinical medicine to my pure basic research, and back again, has given me a knowledge base greater than the sum of its parts.

Being among the first, I had to be very self motivated. I studied the experience of MD/PhD students in Canada and the US for guidance and advice on how I should structure my time and study. I was even lucky enough to meet some as I travelled overseas to complete some of my research work. My postgraduate career path is less clear than that of my overseas counterparts, but, as I have done so far, I'll make my own path."

meets regularly with individual students to discuss their clinical interests. They focus on postgraduate training, provide counsel on opportunities and application procedures, and encourage candidates to contact relevant alumni. Candidates at the University of Sydney would certainly benefit from such a process.

Financial support

Successful overseas programs support students financially, covering not only the research component of the combined-degree program, but also medical tuition and related expenses. Candidates emerge from their training with little educational debt, a major help for those entering academic or research careers. Combined-degree candidates at the University of Sydney can access funding during their research training; the amounts reflect the weight of research activities at the time. Primary funding comes from competitive National Health and Medical Research Council Dora Lush Biomedical Research Scholarships and Australian Postgraduate Awards, available while undertaking full-time research. Financial support for the medical degree itself is not readily available — a problem for current (and future) students.

Reintegration into the medical program

The research components of US programs offer mechanisms to maintain clinical contact and knowledge so that students have a relatively smooth transition back into the final clinical years. Students at the University of Sydney have developed an informal weekly revision program modelled on the problem-based tutorials of the first 2 years of the medical program. Further, during the research component of their program, many candidates teach in 1st and 2nd year tutorials or casually within departments, enhancing their overall academic skills. As yet, no revision program focuses on clinical exposure during the research years, but students seek their own opportunities. A clinically-focused and flexible revision program towards the end of a candidate's full-time research component would be valuable in what can otherwise be a jagged transition.

Future paths

Graduates of combined degrees in the US choose a multitude of career paths, ranging from internal medicine through biotechnology to public health, and have a diversity of research interests, from basic science to clinical investigation.[11] They most often undertake residency training rather than proceeding directly to postdoctoral research, finding a niche and flourishing in academic medicine.[12-15] They divide their time variably between research and patient care, publishing, teaching and administration.[13] A recent survey found that they spend an average of 4.3 years in residency training after graduation before obtaining their first career position.[14] About 75% of combined-degree graduates had attained the rank of assistant professor or higher within 6–10 years of graduation.[15] Taken together, these data highlight the flexible nature of combined programs, the plethora of choices available to clinician–scientists, and the encouraging possibility of varied career opportunities.

What will be the outcomes for the University of Sydney graduates? A personal perspective appears in Box 3. Will the Sydney graduates meet Faxon's[16] 2002 prediction that, as clinician–scientists, they will ensure that the chain of scientific discovery ends at the bedside?

References

1. Martin JB. Training physician-scientists for the 1990s. *Acad Med* 1991; 66: 123-129.
2. National Institutes of Health. The careers and professional activities of graduates of the NIGMS medical scientist training program. Bethesda, Md: NIH, 1998.
3. Rockey DC. The physician-scientist: a new generation or the last? *J Investig Med* 1999; 47: 25-30.
4. Rosenberg LE. Physician-scientists — endangered and essential. *Science* 1999; 283: 331-332.
5. Miller ED. Clinical investigators, the endangered species. *JAMA* 2001; 286: 845-846.
6. Cadman EC. The new physician-scientist: a guide for the 1990s. *Clin Res* 1990; 38: 191-198.
7. Andrews NC. The other physician-scientist problem: where have all the young girls gone? *Nat Med* 2002; 8: 439-441.
8. Bickel JW, Sherman CR, Ferguson J, et al. The role of MD-PhD training in increasing the supply of physician-scientists. *N Engl J Med* 1981; 304: 1265-1268.
9. Littlefield JW. The need to promote careers that combine research and clinical care. *J Med Educ* 1986; 61: 785-789.
10. Culliton BJ, D'Auria JD. The physician-scientist really is an endangered species. *J Investig Med* 1998; 46: 417-419.
11. Sutton JS, Killian CD. The MD-PhD researcher: what species of investigator? *Acad Med* 1996; 71: 454-459.
12. Frieden C, Fox BJ. Career choices of graduates from Washington University's Medical Scientist Training Program. *Acad Med* 1991; 66: 162-164.
13. Wilkerson L, Abelmann WH. Producing physician-scientists: a survey of graduates from the Harvard-MIT program in health sciences and technology. *Acad Med* 1993; 68: 214-218.
14. McClellan DA, Talalay P. M.D.-Ph.D. training at the Johns Hopkins University School of Medicine, 1962-1991. *Acad Med* 1992; 67: 36-41.
15. Schwartz P, Gaulton GN. Addressing the needs of basic and clinical research: analysis of graduates from the University of Pennsylvania MD-PhD Program. *JAMA* 1999; 281: 96-99.
16. Faxon DP. The chain of scientific discovery: the critical role of the physician-scientist. *Circulation* 2002; 105: 1857-1860.

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