

## Clinician Scientists in Public Sector Hospitals—Why and How?

E Shyong Tai, <sup>1</sup>MB ChB, PhD, FAMS

### Introduction

The Singapore Biomedical Sciences (BMS) initiative was launched in June 2000 to develop the Biomedical Sciences cluster as one of the key pillars of Singapore economy. Beginning in the late 2000's, the initiative evolved with an increasing focus on establishing a critical mass of high quality clinician scientists in the belief that this will facilitate the successful implementation of the research initiatives. In this editorial, I hope to share my thoughts in relation to 2 questions. Firstly, in an environment where we are short of clinicians to deliver essential services in our public hospitals, and a workforce that increasingly seeks work-life balance, why should we encourage clinicians in public hospitals to participate in activities that do not directly contribute to patient care? Secondly, if we do want clinician scientists in our public health institutions, how do we find them and retain them?

### My Personal Experience

I was trained as a physician in the United Kingdom and returned to Singapore in 1991 where I received training, first in internal medicine, then in endocrinology. I secured my first grant from the National Medical Research Council (NMRC) in 1997, as a registrar, and eventually, became one of the 7 physicians to embark on the “clinician scientist scheme” in the Singapore General Hospital. I committed 8 years to working on a number of research projects, earning a PhD in the process. I like to think that I became a pretty credible clinician scientist. In 2010, I accepted an appointment as head of the Division of Endocrinology in the National University Hospital. All of a sudden, I was confronted with the very real issues of filling up rosters for clinical duties, scheduling clinicians to teach and examine under- and post-graduate students, shortening waiting times for new appointments in the specialist outpatient clinics, discharging patients early to ease the bed crunch, all of which were far more urgent and pressing than the need for research. Why should I encourage or even allow the clinicians in my division to do research? Here are my thoughts after 4 years as the head of endocrinology.

### Challenges for Healthcare Providers in The Future

Over the next several decades, our population will age rapidly. This will result in a great increase in the demand for healthcare as the prevalence of chronic diseases increases. At the same time, we will see a decline in the number of individuals in the workforce, who are required to provide the care that we will all need. The healthcare issues of the future cannot be solved by simply increasing the number of healthcare providers. They will simply not be available. Nor is the solution to make healthcare providers “just work harder”. Recognising this, the Ministry of Health, along with our public health institutions, has begun a process that will transform the landscape of healthcare in Singapore. I believe that this process of transformation will pose challenges for the healthcare providers of the future. While I cannot purport to know what precise changes will take place, I think we can make some predictions about some of the characteristics of the healthcare environment of the future, which may help us identify some of these challenges.

Firstly, change is inevitable, and given the way things move in Singapore, it will occur rapidly. There will also be a great deal of uncertainty. All countries, including the most developed ones, are struggling with many of the same issues and it is not evident that the solution has been found. As such, healthcare providers of the future will need to possess the same kind of creativity and innovation that allowed Jeff Bezos, through Amazon, to transform the business of selling books. They will also need to be prepared to carefully measure the outcomes resulting from any changes they implement, which will allow them to change track using data to guide the next strategy.

Secondly, it is likely to involve the development and use of new technologies, and it will be an incredibly data rich environment. In addition to the great gains made in the biomedical sciences, the advent of the internet and mobile technologies has changed the way we communicate and interact in our daily lives. These technologies have the power to enable the healthcare transformation that is required.<sup>1</sup> To begin with, the widespread adoption of electronic medical records will lead to the accumulation of mountains of data

<sup>1</sup>Division of Endocrinology, Department of Medicine, National University Health System, Singapore

Address for Correspondence: Dr Tai E Shyong, Division of Endocrinology, Department of Medicine, Yong Loo Lin School of Medicine, National University of Singapore, National University Health System, 10 Medical Drive, Singapore 117597.

Email: e\_shyong\_tai@nuhs.edu.sg

about our patients over time which can now be mined to predict and prevent adverse outcomes in our patients. This will allow us to transform our healthcare system from one that is primarily reactive (i.e. treating the patient when he or she comes to us with a symptom) to a proactive one, where we predict an adverse outcome and put in place measures to prevent it. These data will also facilitate clinical decision support, which will reduce unjustified variation in the healthcare provided and reduce errors. Finally, mobile technology can be used to enhance our interactions with patients, moving away from the “office consult” as the primary channel of communication, not just between patient and healthcare provider, but even between different healthcare providers. They also serve as a novel channel of communication through which we can engage our patients so that they can better participate in their own care. Our National Electronic Health Record is a great example of the technology that is being built to support our healthcare system.<sup>2</sup> However, technology is only an enabler. To take advantage of these opportunities, clinicians will need to decide what technologies are required, when they should be deployed, and how to interpret the data that is collected using these technologies. As such, they need to become familiar with the technologies and their capabilities, and be familiar with handling and interpreting large volumes of data that will be collected.

Finally, integration and coordination of care for individual patients needs to take place across institutions and throughout a patient’s lifetime as his or her health and social circumstances change. This requires the healthcare leaders of the future to be able to influence other healthcare providers and build collaborations that do not rely on the traditional levers of appraisals and salaries, and often take place (given the new technologies available) without opportunities for a handshake, or a face-to-face conversation.

### **What Does This Have To Do with Clinician Scientists?**

As clinician scientists, our ability to do work that is funded and eventually gets published is dependent on the creativity of the investigator. A competitive funding environment makes innovation a key component of every successful grant application. One must constantly question the status quo and seek to do better than what is currently available. Clinician scientists are taught to withhold judgment until they have collected data in a rigorous manner, and interpreted the said data with scientific discipline. Clinician scientists are also used to being wrong. My research career is strewn with hypotheses have proven to be false, often through studies that I have conducted myself. But good clinician scientists always learn from these mistakes, and use that data to refine their next hypothesis. They are also used to failure. With a 15% to 20% success rate for grant funding in Singapore, I have written more grants that have not been

funded, than grants that have been funded. Failure to accept acknowledged guidelines, indecisiveness in the face of insufficient data, being wrong, frequent failure; these are not attributes that we commonly associate with physicians, who often have to make decisions on the spot, when faced with life threatening situations, sometimes in the absence of adequate data because the randomised clinical trial simply has not been conducted yet. Nonetheless, I believe that these attributes will serve them well during the next several decades as we transform the healthcare system.

Clinician scientists are also used to taking technologies that they have never used before, and seeing if they can use it to answer the questions that they are interested in asking. Or they develop new technologies to solve problems that they have in the clinic.<sup>3,4</sup> Finally, the current research environment has required clinician scientists to develop the leadership skills to manage the complex healthcare system of the future. When I started out studying the genetics of human disease, we were carrying out what we thought were large studies involving a few hundred patients.<sup>5</sup> Over time, we realised that these studies were largely underpowered, and could lead to misleading conclusions. Today, it is appreciated that large datasets (often in the tens to hundreds of thousands of samples) are required to make discoveries that we are confident in. The result is papers and publications that involve hundreds of authors.<sup>6</sup> These investigators came together because they realised that together, they could achieve something that each could not achieve on their own. They were prepared to share the “glory” of authorship with others for a common purpose, of learning more about the biological processes that underlie human disease. In this context, not only do clinician scientists learn to handle large volumes of data, they are forced to acquire the ability to build collaborations based on a common purpose, to negotiate agreements and concessions between parties, to communicate across the world often without an opportunity to get to know each other face to face. These same skills will be required to unite the diverse components of Singapore’s healthcare system, which includes public health institutions, private sector providers, voluntary welfare and non-profit organisations, multiple government agencies, patients and their families, together in a common purpose: providing for the health of a population.

I encourage clinicians in the Division of Endocrinology to undertake research not just because they may find a cure for the key diseases that plague mankind. I believe that having research as part of the division helps me create an environment where creativity and innovation can thrive, where clinicians can challenge current beliefs, and be wrong, in the “safe” environment of the well-controlled clinical trial or research protocol. Where they can learn to embrace, or develop, new technologies; handle large

volumes of data; and acquire the skills they will need to lead future generations through the transformation that is coming. Failure to provide this environment not only fails to develop innovation and creativity in our existing clinicians, it actually propels the most innovative and creative of our profession out of the public sector. A close friend and a mentor in the private sector told me once, “E Shyong, you need to realise that the skills required for a successful career in research and the skills required for a really successful career in the private sector are the same. They are just applied to achieve different ends.” If we fail to provide an environment where creativity and innovation thrive, then the most innovative clinicians will find other environments in which to exercise their creativity, in building their businesses in the private sector; and they will be extremely successful.

### Recruiting and Retaining Clinician Scientists

Having created the right environment, how then, do we recruit and retain clinician scientists in public sector healthcare? The provision of funding for salaries and research funding for clinician scientists at all different levels (through the National Medical Research Councils Talent Development Scheme<sup>7</sup>) is necessary but insufficient. One thing I have learnt is that clinician scientists are highly motivated individuals. It is this motivation that allows them to continue even when their experiments fail, or their grants do not get funded, or their papers get rejected. This motivation comes from a sense of higher purpose and I have become convinced that our ability to recruit and retain clinician scientists in our public health system is highly dependent on our ability to give them this sense of purpose. How do we do that? I believe that many clinician scientists are physicians first and scientists second. For this reason, clinician scientists often aspire to excellence in their field of clinical service, and not just their research. We don't like being the odd balls in the hospital, traipsing in and out of the lab, blissfully unaware of what it takes to treat a real patient. As such, we need to give them opportunities to shape clinical care and become leaders in their field. To this end, I have believed for a long time that the very existence of the term clinician scientist is detrimental to our ability to attract and retain these highly creative and motivated people in our healthcare system.

### Convergence

This brings me to my final point, which relates to convergence. I believe that dividing the practice of medicine into 3 missions: research, education and clinical service, and telling clinician scientists that their role is only to work in one of these areas, is not only artificial, it makes it less attractive for clinician scientists to stay in the system.

There is only one mission: to provide state-of-the-art care for our patients of today and to reshape the healthcare system in a way that will provide for the health of our future generations. To achieve this, we need to give our patients the best care available (clinical service), develop new treatments and more effective ways to deliver and fund healthcare (research), and prepare our medical students and junior doctors for this role (education). We all need to do this together, with each of us contributing to each of these roles in different proportions at different times, depending on our interests, skills and aspirations. Convergence is also important for maintaining work-life balance. I often tell young clinician scientists that the best way to meet their aspirations, of being excellent clinicians, educators and researchers, is to seek convergence in what they do. Their research should be as close to what they do in the clinic as possible. They should approach their clinical work with the same scientific discipline as they might a laboratory experiment, and where they have a novel idea, they should formulate an experiment and carefully measure and evaluate the outcomes of any changes that they make. Then they should write about it and teach it to future generations of clinicians. In this way, one piece of work can satisfy our need to do research, provide clinical service and educate future generations. It's time to bring research, clinical service and education in medicine together.

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