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The Clinician Scientist – An endangered species?

Annual Oration – Royal Victoria Hospital – 5th October 1995

Ingrid V Allen

I am grateful to my fellow members of staff for doing me the honour of asking me to give this, the 168th, annual oration, but honour and pleasure of course are not synonymous, and this occasion for me, while a great honour, is a qualified pleasure – probably for the audience too, so our sympathies are mutual. There is however one aspect which is pleasurable, and that is to be introduced *as a lady*. Since my appointment to the staff of this hospital I have been described by various epithets, all justified but not all entirely complimentary; it is therefore a singular honour to be described not only as a lady but as "the first lady".

In a way it shows how far medicine has come from those early days, for example here in Belfast, when to quote from J C Beckett and Theodore Moody's History of Queen's:-[1] "In April 1891, nine women medical students and twenty three men –(medical students were always intelligent), petitioned President Hamilton thus:- *We, the undersigned, beg to draw attention to the following facts with regard to the position of women studying at Queen's College: Women, though allowed to attend the lectures at the aforesaid College, do not hold the legal status of students. They may enter for examinations, but are not eligible for any of the prizes or scholarships. As this position is clearly an anomalous one, we think that in the interests of justice some change should be made. We therefore humbly petition you to take such steps as shall seem to you advisable to obtain for women studying at Queen's College a position equal to that which they now hold in the Royal University, in which all degrees, honours exhibitions, scholarships and prizes are open to students of either sex."*

Beckett and Moody go on to say in the patrician style of the professional historian:- "Hamilton not only supported this, but to allay any doubts about the ability of women to profit by higher education he quoted the opinion of Professor Redfern: *'The continued successes of females in the intermediate and various university examinations for some years past forbid any further speculations as to their chances in intellectual competitions with men. No one would dare at present to suggest that they will not be able to hold their own in intellectual struggles on any subject, if they have equal advantages with men"* – and the rest of course is history.

The first woman to graduate in medicine at Queen's, Dr Elizabeth Bell, did so in 1893, and today I look across at our student body, a total reflection of the gender composition of the young adult population. You will notice my use of the politically correct word 'gender' rather than 'sex' – I wonder whether today Sir William Osler would get away with his light-hearted quip that in medicine there are not just two sexes but three – men, women and women physicians. I would add a fourth, male surgeons, and say "long live humour and sex, two very important components of life". The serious point is that today, at last, the gifts of men and women are fully used in the cause of medicine.

This of course is our students' day and our Chairman has already welcomed you and given you a flavour of the culture and philosophy of this great hospital and it is as an extension of those ideas that I have chosen, as the subject of my Oration, The Clinician Scientist – an Endangered Species? In defining clinical science and the role of the clinician scientist, the cardinal issue is our acceptance that medicine is a science in its own right. That is not to say that the practice of medicine for the majority demands the establishment of new facts or principles, but rather that in the practice of medicine the opportunity exists to advance knowledge, and

Department of Neuropathology, Royal Victoria Hospital, Belfast BT12 6BA.

Ingrid V Allen DSc, MD, FRCPath, Professor of Neuropathology.

this opportunity can only be exploited fully by the application of basic science to the more applied science of clinical practice. In accepting this fact we should not think too narrowly as to what the relevant basic sciences are – they cover a wide spectrum, from the most fundamental and structural, for example physics and chemistry, through to cognitive psychology, social science, engineering and economics.

Thus it has been stated that "Medical History involves social and economic, as well as biological content, and presents one of the central themes in human experiences".[2]

In all cultures, although the practice of medicine has involved elements of the religious and the intuitive, the overwhelming element has been and is scientific.

If primitive man could use medicinal plants for their specific antifebrile, laxative, emetic, antispasmodic, diuretic, analgesic, sedative, stimulatory and hallucinatory effects (Lyons, History of Medicine),[3] with what greater certainty can we in this age affirm the Hippocratic view of medicine as a science in its own right, and with Hippocrates say "there is no science which has no basis in fact".[4]

We too would endorse the view of Flexner (1910),[5] expressed over 2000 years after Hippocrates, but not deviating from the Hippocratic logic. In Flexner's ideal medical education, two principles operate – first that the basic sciences, (that is chemistry, physics and biology) provide the intellectual foundation of modern medicine, and secondly that the scientific method should be applied to the practice of medicine as well as to research. "It makes no difference to science", said Flexner, "whether usable data be obtained from a slide beneath a microscope or from a sick man stretched out on a bed".

Flexner's seminal report was based on the nineteenth century successes of European, including British medicine, and laid the framework for twentieth century successes in biomedical research in the United States.

If therefore we accept medicine as a science, and scientific endeavour the basis of advance, then the medical scientist as an individual is of enormous importance. A clinician certainly, but one whose major role is to establish new facts, new principles and new methods. Of course, throughout history such individuals have existed. Among the most famous for example is Joseph Lister, who used and acknowledged the work of Pasteur in his studies of wound sepis. This illustration indicates precisely the role of the clinician scientist, as do many less famous but nevertheless important local examples.

I will quote one – the late Dr Lewis Hurwitz,[6] when working here in Belfast with Professor Molly McGeown in the very early days of renal transplantation, used an interdisciplinary approach involving clinical neurology, biochemistry, transplantation technology and neurophysiology to show the beneficial effect of renal transplantation upon the peripheral neuropathy of chronic renal failure.

The achievements of the scientific approach are legion, and the need for dedicated clinician scientists has become increasingly great as the biological revolution has taken off and its translation into clinical practice becomes a realistic goal. It is the clinical investigator who serves this function and is the vital bridge between basic science and improvements in health care. It is therefore paradoxical, that many now consider the species of clinician scientist to be endangered. The most extreme and pessimistic view was expressed by Professor Gordon Gill at the University of California at San Diego, in his essay on 'The End of the Physician Scientist'.[7] He describes how from the 1960s to the 1980s biomedical research enterprise in the United States passed largely out of the realm of clinicians and into the realm of non-medically qualified postdoctoral scientists. He states that similar changes occurred in Europe, including the United Kingdom, in the 1990s. "Like it or not" he concludes "the separation of Physicians and Scientists is well advanced" – "partial attention to either science or medicine is no longer enough".

Many disagree with this view and I hold myself among them. I would emphasise the diversity of medical research, and recognise that some will be done by medically qualified scientists and some by other scientists, and that these two are complementary. Molecular biology will enrich clinical medicine enormously, but it is only the starting point to an understanding of phenotype, and epidemiology will continue to hold the key to preventive medicine.

The particular difficulty for the clinician scientist is in gaining sufficient knowledge of the relevant basic sciences, while retaining and developing

essential clinical skills. Many would agree with Judah Folkman who has recently succinctly described the negative attitudes that are likely to surround the budding clinical investigator of today when he states that: "The individual who attempts to combine investigation with a clinical career travels the toughest road, however fruitful it may be in the end. His counterpart in basic science thinks he is a dilettante researcher, his clinical colleagues think he is unsafe, and his mother-in-law says, – He's 35 years old and still working on rats. When will he be a real doctor?"[8]

However in contemplating the potential adverse factors influencing the clinician scientist, I would like to quote from John Gardner and would agree that in fact "we are faced with a series of great opportunities brilliantly disguised as insoluble problems".[9]

No one wants clinical science to fail and it is therefore essential that the necessary changes in medical training, in the practice of medicine, and in the allocation of resources are managed correctly. Several factors operate including the exponential growth in science, greater specialisation in science and medicine, competition for resources and the perhaps timely death of the renaissance amateur clinician scientist.

Medicine faces some specific and indeed unique challenges, in that the emerging biological principles and the associated technology apply to the whole of medicine, while medicine itself is still held in the stranglehold of a systematised anatomical framework. These intellectual and logistical challenges are only now being considered by medical schools and teaching hospitals throughout the world, and as yet no pattern of planning has emerged which gives us confidence in looking to the future.

At the same time as we face these issues, we are reorganising, again world wide, the medical curriculum, postgraduate medical training and health care delivery, the latter dictated by market forces, while underlying ethical dilemmas remain.

At times like this we would endorse the words of Gaius Petronius, Arbiter, Proconsul at Bithynia in AD 65:-[10] *"We trained hard but it seemed that every time we were beginning to form teams we would be reorganized. I was to learn later in life that we tend to meet every situation in life by reorganizing, and a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency and demoralization".*

So let us consider how the clinician scientist may be affected by all of these changes. First of all in the training of tomorrow's doctors. The curriculum has to be a compromise, balancing the pursuit of knowledge for its own sake with the requisition of practical skills essential for safe practice. The solution put forward by the General Medical Council is a reasonable compromise, and allows each medical school to put its own distinctive 'stamp' on its training.

The emphasis is on a core curriculum of factual teaching supplemented by and with equal emphasis on special study modules:- *"The greatest educational opportunities will be afforded by that part of the course which goes beyond the limits of the core, that allows students to study in depth in areas of particular interest to them, that provides them with insights into scientific method and the discipline of research and that engenders an approach to medicine that is constantly questioning and self-critical".*[11]

However, without being cynical, one wonders if all the members of the General Medical Council really mean what they say. The Council goes on to enumerate attitudinal objectives which a training in medicine should achieve. There are twelve in all, each worthy, but that relating to the acceptance of the responsibility to contribute to the advancement of medical knowledge is listed last – let us hope that heavenly influences operate here and the last indeed shall be first.

Our limited academic resources, however, present us with a challenge and the new curriculum is a potential threat to clinical research. For the best of educational reasons it is labour-intensive for the teachers, yet it is unreasonable and educationally unsound to assume that all the teaching will be done by the non-research-active, and indeed the strongest case can be made for sufficient critical teaching mass so that the most active researchers have the time and the support to impart their knowledge and enthusiasm to the next generation. This requires careful planning so that limited academic resources are used to the full and, where possible, future doctors, dentists and nurses are taught together and National Health Service doctors have sufficient time to honour their teaching obligations. Equally, the importance of non-medical scientists cannot be over-

emphasised. Whether working in the Health Service or in the University, their career structure and security of tenure should be such that they can contribute fully to the teaching programme and to medical research and health care delivery. This latter group is particularly important in intercalated BSc degrees and in combined MB/PhD programmes where the medically qualified obtain the fundamentals of other branches of science which they can then apply in their future career. These intercalated degrees have been shown in several studies to be the key elements in the future careers of many leaders of academic medicine and of clinical researchers. The undergraduate curriculum therefore cannot be looked at in isolation but forms a continuum with postgraduate medical training and impinges on the training of other professionals involved in health care delivery. It must be emphasised that all medical practitioners should have the capability to play their part in the sciences of clinical audit, research on outcomes, and use of information systems.

Some of these skills will be attained in the undergraduate curriculum, but it will be necessary to continue at a postgraduate level, perhaps with the attainment of a Master's degree in research methodology.

For the few, aspiring to be academic leaders and clinician scientists, a more flexible training programme is essential, with three/four years set aside to learn laboratory or statistical and epidemiological skills. It is the need for this carefully planned programme which poses one of the major threats to the survival of the clinician scientist. The difficulties of planning such a programme, taking into account the Calman recommendations for postgraduate medical training, and the even greater difficulty of funding such a programme in the present atmosphere of uncertainty, both academic and NHS, present us with a major challenge. The Medical Committee of the Higher Education & Funding Councils has noted a fall in the number of applicants for academic posts and the House of Lords Select Committee on Science and Technology in its recent report "Supporting Research and Development in the NHS", alerts us further to this danger.

Lord Walton and his committee state:- "The evidence that an increasing number of doctors are choosing a career in clinical practice rather than academic medicine is very powerful''.[12] The Committee go on to ask that the government should give urgent priority to this problem so that the issue can be analysed and appropriate remedies implemented. What about other resources essential to clinical science? The NHS has been described as the largest and potentially the best human biology laboratory in the world. This is probably true, but as with all large organisations, the prioritisation for the use of resources and the measurement of effectiveness of that use is difficult, and several general points have to be made. First, it is government that determines research expenditure and for all governments expenditure in biomedical research is in competition with expenditure on other branches of science, some of which may have more political or economic short-term benefit. Most governments have in the last few decades maintained absolute levels of expenditure for medical research but have not managed to maintain relative values; for example, only recently have defence research budgets been cut, and moreover many politicians seem unaware of the financial benefits which have resulted from medical research.

Would that the public, who are perhaps more intelligent than some of our politicians, know for example that to take some statistics from the United States:-[13]

- The introduction of lithium for the treatment of Manic Depression has saved 145 billion dollars in hospitalisation costs in 25 years.
- Potassium citrate treatment for preventing kidney stone recurrence saves an estimated 400-870 million dollars per year.
- The haemophilus influenza B vaccine for meningitis a further 350-450 million dollars annually.
- The disputed and expensive Interferon therapy recently on trial for multiple sclerosis has reduced hospitalisation by 25%.

In addition new rational therapies are on the horizon for Alzheimer's disease which will give not only many millions a new lease of life, but unfortunately may mean that certain world statesmen will be in office even longer!

How sad then, that funding for research is proving increasingly more difficult to obtain and that only 25% of National Institutes of Health and 20% of Medical Research Council's alpha-rated

projects receive funding. This is particularly detrimental at a time when these funds have to be spread even more thinly, including not only traditional clinical science, but Health Services research. It is therefore imperative that in welcoming and implementing the Culyer report on research in the Health Service,[14] the government recognises that while the principles enunciated by Culyer are rational, the resource required for proper implementation is probably greater than that presently available. Let us hope that these issues are of sufficient importance to the enfranchised of this country that they are addressed in the various party political manifestoes before the next general election.

But what of Northern Ireland with its medical school and teaching hospitals? Much has changed in my view to modify the opinion expressed by Sir Peter Froggatt and Professor Barry Bridges in their history of the first 150 years of the Belfast Medical School,[15] when they state that research, while not wanting, was never a prominent feature of this medical school.

Sir Peter and Professor Bridges emphasise that their views are largely based on achievements before 1948, and that the advent of the National Health Service and the development of full-time academic units have had a significant beneficial effect on research output. Our distinctive cultural characteristics, summarised as a social cohesion despite political differences, with pragmatism and sound clinical orientation, together with our pride in learning, give us a firm basis, building on the developments of the last 50 years, to become a major medical research centre.

I would like to consider these opportunities under three headings – Regional planning, Regional collaborations and Critical research mass. First of all let us consider regional planning. It is encouraging that in Northern Ireland as in other parts of the United Kingdom some framework for research has been laid down. The Universities, stimulated in part by the funding council's Research Assessment Exercise, have formulated their individual research strategies, and the Department of Health has more recently begun to define its research priorities. Nationally, efforts are being made to maximise on resource and to prevent the divergence of medical school and Health Service priorities. How much more important that we, in a small region of 1.6 million people should achieve this objective. It is therefore encouraging that at last there appears to be some movement on the appointment of a Regional Director for research and development. Given the advantage that we can learn from others' mistakes, let us hope that we can formulate a structure which embraces biomedical research for the province and thus enables all players to achieve maximum output.

We expect and indeed hope that the Culyer report will be implemented in Northern Ireland and it is therefore important that this Hospital defines its core research facilities and is ready to benefit from the national competition. How encouraging therefore that the Trust Board has decided to increase further our research profile by advertising for a Clinical Research Fellow at consultant level.

Secondly what of the very fruitful collaborations we can develop to further our research? These clearly range from the local to the national and international, and again should be focused, strengthening our mainstreams of research but not stifling individual curiosity. Indeed it is this very process of focusing, by which a research culture is achieved, which stimulates the individual and leads to a response with new and original ideas. Many schemes for collaboration exist but I would like to mention the potential for industrial collaboration. The Northern Ireland Industrial Research and Technology Unit (IRTU), linked to the National Office of Science and Technology, has long been concerned that biomedical research has not developed overall to a significant degree in Northern Ireland, though in some branches major success has been achieved: the reasons for this are various and beyond my capability of analysis. Certainly if we attempt to develop genetic biotechnology, we have many highly successful competitors, frequently based adjacent to the great graduate institutes of the world, such as Cambridge, England, and Cambridge, Massachussetts. How much better that we consider some other enterprise; for example could this Hospital, working together with the medical school's new Department of Telemedicine, and through the good offices of IRTU, find an appropriate industrial partner to exploit these new developments in medicine? I would hope these and other worthy examples should get serious attention.

Finally, our achievement of critical research mass, and here we have particularly interesting

opportunities. Perhaps, uniquely in Europe, we have an intellectual continuum, within a few square miles, of basic science, all clinical specialties at secondary and tertiary level, incorporating Queen's University and its medical school and the major Belfast teaching hospitals: this in a region of 1.6 million people, with a strong primary care and community base. We have an excellent infrastructure and our objective must be to become the leading medical centre in Ireland, with a planned use of resources including basic science, community, and acute hospital facilities. The latter of course must be the hub of the biological research wheel, while the dispersed community services are essential for epidemiological research. Almost certainly we have not achieved optimum planning in these respects and will only do so if several principles are adhered to. First and foremost the decisions must be based on science and on need, and not on political objectives. We must request and encourage our politicians to absolve themselves from their parochial responsibilities, and instead to join with us in meeting the greater challenge of an acute hospital plan for Northern Ireland, a Regional Specialty plan, and a research and development plan.

I therefore have sympathy with the constraints placed upon the McKenna Committee and I certainly hope that the McKenna report,[16] which will undoubtedly be a stimulus for discussion, will not necessarily be the final word on a framework for specialty rationalisation. If we continue to use a King Solomon approach to the baby of acute medicine in Belfast, then we will certainly lose that baby. Much more thought needs to go into the development of the City and Royal Hospitals sites, perhaps not in a complementary style, but rather in a unified style, from primary through to tertiary care. Such an approach will take much time and further debate, but if we use the guiding principles of service needs and of the fully-costed needs of teaching and research, then the rewards will benefit us all. So back to you students. Your opportunities too are enormous and you can look to a most rewarding future. You can imagine it is January 1st, 2004. You may well be working in this hospital, getting your wake-up call, a bit groggy because last night it was a good party, but encouraged by your surroundings in the luxury of the new Royal, and further encouraged by the dulcet tones of your Chief Executive reminding you that it's 6.30 am, and please remember the Mission Statement. It's New Year's day, but in this, the 21st century, all the wards and operating theatres are open 365 days a year, so you dash off, perhaps to the Gene Therapy Clinic or the Cognitive Therapy Workshop. Perhaps you look at patients, not just from Northern Ireland but from further afield, for world medicine will have to maximise use of expensive resources.

So to all medical students I would say, take heart, you will have a wonderful time in medicine. Do not be too concerned about health care reforms – they are predictable and happen about every 20 years; do not worry about curriculum reforms – the intelligent teach themselves; honour your teachers – they may have many deficiencies but they are probably doing their best; and above all – honour your patients – because they are your scientific partners.

Finally, I would direct your attention to something attributed to that great internationalist and Christian humanist, Erasmus, born to an unmarried mother and orphaned when both his parents died of the plague when he was 13. "Live as if you are to die tomorrow, study as if you were to live forever".

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