Reflections on a career in Wound Healing

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My interest in wound healing started when I was a Medical Student at the University of Birmingham, England looking for a project to undertake as part of my final year course where I was expected to undertake a research project. The Professor of Surgery at the University and other senior academic surgeons were concerned that low-dose Heparin which had recently been developed as a prophylaxis for thromboembolic disease may have had an impact on healing of their surgical wounds. I therefore spent three months doing colonic anastomoses and skin wounds in rats to prove that low-dose Heparin did not have an adverse effect on healing of wounds and help dispel the anxiety that senior surgeons working at that time had around this new innovation in clinical practice.

Following graduation and undertaking junior training posts in Birmingham I returned to Wales where I fell under the wing of my real inspiration and hero, Professor Les Hughes, who was, at that time, the Professor of Surgery at the University of Wales College of Medicine in Cardiff. Professor Hughes was a giant in the field of General Surgery and had a global reputation as a world leading Academic Surgeon in diverse areas including breast cancer, inflammatory bowel disease, malignant melanoma and wound healing. Professor Hughes had developed and patented the use of a new dressing material for the treatment of post-surgical wounds.

Unlike many of his colleagues at that time, he was concerned that gauze packing, which was the standard treatment for post-surgical wounds healing by secondary intention, may have been cheap and easy to access but it was not necessarily the most convenient and comfortable for individual patients. His invention was based on dental impression moulding materials which allowed constituent liquids to be mixed together, poured into a wound and these were then set to a spongy consistency and formed an exact stent of the wound in to which the material had been poured. This was one of the few modern dressings that was developed by a clinician to meet a clinical need. This allowed post-surgical wounds to be treated in a far less painful manner and was therefore more acceptable to many patients. The wounds that this was used on were mainly surgical wounds healing by secondary intention and led to the creation of a Wound Clinic at the University Hospital of Wales in 1972 that allowed patients who had undergone surgical procedures, and whose wounds were healing by secondary intention, to attend a weekly Wound Clinic where new stents would be made for the wound as it decreased in size.

This clinic continued to operate on a part-time basis for a number of years with minimal funding. One of the great assets that was available to the staff in the clinic in the early years was the presence of Dr Joseph Marks, a retired Head of the Public Health Laboratory Service in Wales and a World Health Organization Reference Expert in Tuberculosis. He had retired from his professional role but was keen to have an academic interest and work part-time for ten years, completely unpaid, and undertook a series of studies that led to a very detailed understanding of microbiological factors associated with healing of surgical wounds. In addition to Dr Marks, Sue Bale was the original Research Nurse that was part of the group and undertook a number of interesting and novel clinical studies in the early years of our work in this area. Again, she showed great loyalty to the group in that she was prepared to accept very short term contracts as we attempted to provide an income stream that allowed staff to be employed in this group.

I became part of the group in its early years and provided a free service whilst I was continuing my role as a Primary Care Physician in the city.

This continued for around ten years and by which time we had an ever increasingly busy clinic to service. We attempted to provide education as and when requested and tried to obtain funding for research studies that helped improve the understanding of wound healing in patients and raise the standards of care provision to such patients.

By 1991 I had reached the point where, in addition to a busy general practice, I was also giving up a significant amount of my holiday entitlement to speak at wound healing conferences. This was in addition to developing an interest, and having various roles, in the provision of Continuing Medical Education for clinicians, initially in Cardiff and subsequently in Wales. This led to me undertaking a six month sabbatical in North America looking at wound healing and medical education initiatives that were being developed there. This trip made me realise that, unlike many of the academic teams working on wound healing in North America where they have

significant funding to undertake laboratory studies, they struggle to access patients. We, however, had access to patients but did not have sufficient and stable funding to undertake basic research and we were trying to deal with an ever increasing demand to see patients with wound healing difficulties. As a consequence to the six month travel fellowship I, in discussion with Professor Hughes, realised that we had an interesting opportunity to develop wound healing as an academic aspect of surgery. This led to the creation of the Wound Healing Research Unit in 1991 which was initially part of the Academic Department of Surgery and over the years, and following multiple reorganisations of the Medical School in the University, then became part of the Department of Dermatology and also at one stage was a separate Department of Wound Healing within the Medical School. This led to a number of developments that helped increase our legitimacy to claim that wound healing was an important clinical problem and also a problem that had an academic basis which merited further development to ensure its appropriate place in current day clinical practice. The challenge that I was presented by the University was that they were prepared to support the creation of an academic group in wound healing provided it could be self-funded. This led to the development of a plan that suggested sources of income to enable us to be independent and sustainable. These included long-term sources of funding which was mainly academic grants but had to build a reputation before we were able to obtain academic grants in the United Kingdom at that time. This was to be supplemented in the medium term by funding from the National Health Service. The challenge here was the budgeting system operating at that time that was focused very much on the question of why would the hospital we are based in pay for a wound healing service when no other hospital in the country did so. This was not because these other hospitals did not have wound healing problems; they were just not being funded from a single budget which you could impact by creation of a new service. This problem resolved itself when, in partnership with other members of the senior management team in the hospital, I was able to work with them to develop what was the largest managed bed contract in Europe and show we could improve outcomes in reducing the number of patients with pressure ulceration and save money based on projected expenditure. An immediate source of funding that was identified when we created this new group, was partnership with industry. It is accepted and recognised that taking funding from industry can compromise professional integrity and independence but it was felt that, provided we could work with multiple companies at any moment in time and we would provide honest and professional advice to them, we could maintain the ability to sustain the group. This model was successful and led to us working with multiple companies of varying size over many years to help improve the standard of education and research studies that helped clarify where, when and how to use specific treatments for patients with wound healing difficulties.

At the same time as trying to create a model that allowed an academic group to be set up and flourish, we were faced with an ever increasing number of patients with increasingly diverse challenges in terms of wound healing. As a result we gradually became a General Wound Healing Clinic and seeing patients with all wounds apart from burn injury. This was only because the Regional Burn Unit was based in a hospital 40 miles away from the Medical School and it was felt that the practical difficulties of trying to undertake meaningful clinical practice and research in a facility that was a distance from our base would prove to be very difficult.

The staffing of the Wound Healing Research Unit over the years enabled us to identify, appoint and grow a number of key individuals in many academic and clinical aspects of wound healing. Our position within an established academic department in the Medical School allowed us to have influence on medical undergraduate courses, ensuring patients with wounds were seen in clinical final examinations and enabled us to identify a unique selling point for the Medical School and University in which we were based. In addition to creating a cohort of experienced nurses and therapists we also had a long series of surgical registrars who would undertake a two to three year period of full-time work with us where they would pursue an academic project that led to the award of a Doctoral Degree that helped their future career as surgeons in and around Wales. The success of this programme has led to us being involved in the supervision and support of over 50 students who have obtained doctoral degrees. Their research work was diverse and of a high standard and resulted in a number of publications in high quality journals.

In addition to the research work that was undertaken, another aspect of creating credibility of the subject was to develop professional courses in wound healing. Work in this area resulted in the creation of a Certificate, Diploma and Masters Course in Wound Healing and Tissue Repair which was the first in the world and, as a consequence of this, we now have graduates from all corners of the world who have successfully undertaken the Cardiff Masters Course in Wound Healing. In addition to educational activities, we have developed and validated the first disease-specific quality of life tool in chronic leg wounds – Cardiff Wound Impact Schedule (CWIS). This has now been translated into multiple languages and has been used as a quality of life tool in many studies around the world.

In recent years in the United Kingdom, partly driven by the Research Excellence Framework exercise that universities undertake at regular intervals, and an increasing recognition of support from government agencies that universities need to translate their research into developments that have an impact for patients and society, there has been an increased interest in and support for translational research, or what could also be labelled as clinical innovation. During the years that the Wound Healing Research Unit was growing, I undertook a range of senior management roles within the University focused on commercial strategy, innovation and engagement and translation of discovery research findings into practice. This had the further benefit of us being able to demonstrate that the initiatives that we had undertaken in wound healing had a direct benefit for patients locally and even further afield. At the same time as this was occurring members of the group from Cardiff were involved in supporting a number of initiatives that are seen as important in this area. This includes the creation of the European Wound Management Association which emerged from an international conference that we held in Cardiff in 1991, the European Pressure Ulcer Advisory Panel, of which I had the honour of being the First President and was

created as the result of four individuals having a breakfast meeting in Amsterdam, the European Tissue Repair Society which I had the privilege of being President of in 2001, and the World Union of Wound Healing Societies which emerged from a meeting that was held in Australia in the year 2000.

While all these developments were taking place and raising the profile of the subject and the contribution of members of the wound healing group in Cardiff, we were faced with the daily, weekly, monthly challenge of being self-funded. As a consequence of hard work, a brilliant team of colleagues and some good fortune, we were able to obtain more the £50 million GBP of funding over a period of around 15–20 years. This enabled us to be self-sustaining and ensured that we were able to employ appropriate staff with the requisite skills to further develop our academic aspirations. This ability to obtain funding and allow the group to grow diminished in more recent years, and it was felt this was due to the inability to grow the group any further from a single university and medical school and a major teaching hospital. This was one of the many factors that led to the desire to create a National Wound Innovation Centre in Wales.

This Wound Innovation Centre was opened at the end of 2014 after seven years of planning and lobbying with Government and other agencies within Wales. This has now been operating for five years and, again, is self-funding after receiving pump priming funding from the Government in its initial years to give us an opportunity of creating sustainability in what is a novel and well-supported initiative in the area of clinical innovation within Wales. The basic premise of this National Wound Innovation Centre is that we would coordinate academic, clinical and economic aspects of wound healing in Wales from this innovation centre. The academic development had made significant progress over the years that the Wound Healing Research Unit was in operation but we are now keen to involve other universities within the country to join as part of a collaborative to further develop and coordinate academic activity across the country. This was then supported by the development, evaluation and support of clinical service development and delivery across the country with support from the Chief Executive of NHS Wales to raise standards and ensure that a clinical problem that was receiving little attention in many parts of the Health Service was raised in importance and the clinical service provision was raised across the country. A major catalyst for this support was a scandal into deaths in nursing homes where pressure ulceration developed potentially as a result of neglect. This has resulted in Government support to create a National Wound Registry across Wales which will go live in the very near future. The economic aspects of wound healing in Wales provided us with a unique and serendipitous opportunity. In the Life Sciences Sector in Wales, wound healing companies are the biggest employers in Wales with over 2,000 jobs in existence. Our ability to coordinate the academic and clinical service provision for patients with wounds in Wales and help protect those jobs and even act as a magnet for further inward investment in Wales resulted in significant support from the political bodies within the country.

The model on which the Welsh Wound Innovation Centre (WWIC) is based is now seen as a success, not only in Wales but across the United Kingdom and, indeed, the same model has been used to develop a Respiratory Disease Innovation Centre and is being looked at to develop a number of other clinically focused innovation centres. The Innovation Centre model is now seen as a living lab of clinical innovation in Wales and is part of a bigger initiative that has resulted in the award of significant funding from the European Union Regional Development Fund to create a clinical innovation system across the whole of South Wales.

Also, in addition to support within Wales, the model is being looked at in various other countries around the world including Australia, Singapore, Holland and Finland. This has resulted in the successful award of over $20 million SGD to an academic group based in A Star led by Professor Zee Upton that is focused on developing and delivering improvements in wound healing services for Singapore and South East Asia. As a consequence of this I now spend a proportion of my time in Singapore working with colleagues based there to raise the standards of wound healing across that region.

The journey that we have undertaken in Cardiff over the last 40 years has been interesting, exciting and scary. I am confident that as a result of the efforts of a large number of people who were interested in, focused on and passionate about the subject of wound healing, we have, in a small way, helped establish a legitimacy for the subject of wound healing in modern day academic and clinical practice. We are not perfect, never have been and probably never will be and the model that we have created has been developed to enable us to sustain and flourish within our society and healthcare system. This experience is shared with you, not to say "aren't we marvellous," but really to demonstrate that much can be achieved if the right personalities with the passion and focus for a particular topic can come together and work in a collegiate and collaborative manner.

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