

Paper

Professor Frank Pantridge – From beriberi to pre-hospital coronary care.

Patrick J Morrison

INTRODUCTION

It is a pleasure to be the guest editor of this special supplement on Frank Pantridge. It commemorates a man who made a significant contribution to Ulster medicine, and who is regarded as the father of emergency medicine in the USA. The papers in the supplement were presented during the historical section of an international symposium on Frank's legacy, held at Queens University Belfast, in June 2009. Professor Alun Evans, who is retiring later this year, coordinated the Symposium and our thanks go to him for the excellent international cast of speakers and session chairs that he assembled. The programme and further details are available online¹.

Beriberi: Etiological and Clinical Considerations

By J. F. PANTRIDGE, M.C., M.B.

FOR some time prior to the abrupt descent of the Rising Sun on 15th August, 1945, and for one month after that event, the writer had the opportunity of observing beriberi among British and Australian troops in various Japanese prison camps in Malaya, Slam, and Buzma. Sporadic beriberi was always with us, and two outbreaks were seen.

ETIOLOGY.

Beriberi was recognised by the Chinese 3000 B.C. The etiology, however, remained obscure till 1870. In that year Eijkman, working in Java, noted an epidemic of paralysis among fowls fed on polished rice. He found that this polyneuritis gallinarum could be cured if an extract of rice polishings were added to the diet. That polyneuritis gallinarum corresponded to human beriberi was shown by Frazer and Stanton in 1910. These investigators produced beriberi in convicts by feeding them a diet consisting solely of overmilled rice. They also succeeded in curing the disease by adding rice polishings to the diet. Frazer and Stanton concluded that the pericarp aleurone layers and the embryo of grain which are removed in the production of polished rice contained an anti-beriberi substance.

Fig 1. Front page of beriberi².

EARLY CARDIOLOGY IN NORTHERN IRELAND

Until the early part of the 20th century, general physicians or General Practitioners dealt with all medical treatments. There were no real medical specialists. In 1910, Dr John Elder MacIlwaine was appointed to the Royal Victoria Hospital as a physician. With the arrival of the (extremely large) ECG machine, he commandeered it and developed a sub-interest in 'cardiology'. Dr Robert (Bertie) Marshall was subsequently appointed in 1930. Bertie Marshall was one of the earliest physicians to specialise in pure cardiology, and he competed with his other cardiology colleague Dr Boyd Campbell - who by the time of Marshall's appointment - had succeeded John MacIlwaine, and had taken 'possession' of the ECG machine. Marshall was assigned to wards 5 and 6 and was perceived as the more intellectual of the two - in addition to his being cultured and widely read, he was also the editor of the *Ulster Medical Journal*, from 1943-1951. At that time the main diagnoses cardiologists saw were diseases affecting

the heart valves, (with rheumatic fever being top of the list of aetiologies), congenital cardiac anomalies, and angina. Any person who suffered a heart attack generally was dealt with by morphine and prolonged bed rest in the community, and usually did not ever make it to a hospital, let alone see a cardiologist. Pre-hospital coronary care at the time was confined to the home.



Fig 2. Professor Frank Pantridge in the early 1970's, holding one of the first light weight portable defibrillators. Picture courtesy of Dr N Campbell⁷.

DR J FRANCIS PANTRIDGE MC MB

So this was the environment that Frank Pantridge encountered when he returned from his war years. Having graduated earlier with MB in 1939, and having gained the military cross (MC) towards the end of the war, he got straight down to work. A study of his camp mates in prisoner of war camps in the east was the subject of his first publication (figure 1) - a seminal nine page account of beriberi². He graduated MD in 1946, and (presumably easily resisting doing an

MA to allow a really nice set of alphabetical letters after his name) having seen a case of giant follicular lymphoma, thereafter wrote an eleven-page account of Brill-Symmers' disease³ in 1947. He was appointed as consultant physician and cardiologist in 1951, a year after the first cardiac surgery operations in Belfast, as the cutting edge mitral valvotomy technique opened up valve disease to treatments. He published two large series of outcomes on mitral valvotomy, including an evaluation of the

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Fig 3. The cardiac ambulance in 1970. Picture courtesy of Dr N Campbell⁷.

operation^{4,5}. The latter paper was co-authored with another Dr Robert J Marshall, also known as 'Bertie' who was a registrar at the time. These papers demonstrated his tenacity and his ability to grasp an idea and run with it to completion – what we would now call 'evidence based medicine' probably combined with a demonstration of a complete audit cycle thrown in for good measure. Thus having 'sorted' valve disease, the foundation was laid for his future interests as he moved swiftly on to tackle coronary arterial disease⁶. The Belfast coronary care unit opened in 1963, and the rest is history. The Pantridge defibrillator (figure 2) and the cardiac ambulance (figure 3) became a normal part of medical care.

FRANK PANTRIDGE ANECDOTES

Everyone has their own anecdote to relate about Frank, such was his personality and impact on their lives. Some of these are of course unrepeatable, but even during the preparation of

this supplement, our sub editor Mary Crickard, when checking the references for each paper, volunteered hers:

'I remember when I first started in the Medical Library many moons ago, and was 'doing' my first Saturday morning alone! I needed to leave the library for ten minutes and asked this benign gentleman to look after the library. He looked up as if he didn't know where he was and smiled and told me that he would. When I came back, he was helping a reader! Yes, it was Frank Pantridge! I didn't know who he was until much later on - just another reader to me! However, after that he would give me a slight nod in passing.'

Mary Crickard.

In the end, he was a physician at heart as the title of his autobiography '*An Unquiet life: memoirs of a physician and cardiologist*' clearly stated. Patients today who are unfortunate enough to collapse with chest pain requiring either a defibrillator or a cardiac ambulance, will experience a vastly superior care and treatment throughout the world thanks to his far sighted vision.

ACKNOWLEDGEMENTS

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Paper

Frank Pantridge's Legacy: A Symposium

Alun E Evans

The Department of Epidemiology and Public Health, The Queen's University of Belfast, held a two day international conference from 10-12th June 2009, in Frank Pantridge's honour. It began with a review of the Department's cardiovascular disease research programme which was initiated when Frank Pantridge established Mobile Coronary Care in Belfast in 1966. It was Frank Pantridge's development of the portable defibrillator which had made Mobile Coronary Care feasible. Soon afterwards, a year-long study of all fatal heart attacks in Belfast was mounted by the Department. The study showed that heart attack patients admitted to hospital represented "...the survivors of a storm which has already taken its main toll."¹ The study was repeated in the early 1980s, and simultaneously, the Omagh / Ballymena Study was conducted which compared heart attack survival in two areas of the Province, only one of which was provided with Mobile Coronary Care². This Department's interest in community studies of cardiovascular disease made it a natural centre for the WHO MONICA Project which began in Belfast in 1983³. From this collaboration numerous other studies evolved, focusing on genetics, nutrition, alcohol and antioxidants, through, most notably, the ECTIM and PRIME Studies⁴, and more recently, the MORGAM Project⁵.

The latter part of Thursday 11th June was devoted to Frank Pantridge's memory. Frank was one of the 'Faces of Queen's' in the event to mark the Millennium. Queen's bestowed an honorary degree on him in 2001 and this was highlighted in the '2008' document 'Celebrating 100 Years as a Leading University.' The University did not possess a portrait of one of its most illustrious graduates who has become known as 'The Father of Emergency Medicine,' so in December 2008 a Committee, chaired by Professor John Morison, was established in the University to raise money, in conjunction with the Pantridge Trust, for commissioning an oil painting of Frank to hang in The Great Hall. The portrait, by the local artist Martin Wedge (figure 1), was unveiled by Jack Kyle, whose mother was treated by Frank. The portrait was accepted on behalf of the University by the Vice-Chancellor, Professor Peter Gregson⁶. This was followed by Memorial Lectures: Professor Richard Crampton of Charlottesville, Virginia, USA, who was the first to adopt the 'Pantridge Plan' in the USA, reviewed Frank's legacy from a North American perspective⁷; and Professor Desmond Julian of London, who had undertaken a WHO consultancy with Frank in the early 1970s, reviewed it from a European one⁸. The Lectures were chaired by Professor David Wood of Imperial College, London. These were followed by a Banquet held in Frank Pantridge's honour in The Great Hall.

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Fig 1. Martin Wedge: Portrait of Professor J Frank Pantridge, MC, CBE, MD, FRCP, FACC (1916-2004). Oil on canvas, 2009, The Queens University of Belfast.

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Paper

Frank's Legacy from a North American Perspective.

Richard S Crampton

PROFESSOR JAMES FRANK PANTRIDGE MC CBE MD FRCP FACC (1916-2004).

I am highly honoured to describe the monumental North American legacy of Frank Pantridge. Most emphatically Frank became a great life-changer for many in Europe and the Americas. I thank Alun Evans for this opportunity to focus upon our extraordinary Pantridge endowment.

Forty-three years ago one could not stand erect in a North American ambulance. Hearses, limousines and estate wagons transported the ill and injured. Undertakers had a conflict of interest. Little or no emergency care took place in these horizontal taxis. The driver sat at the steering wheel. The unattended patient rode strapped on a trolley in back.

Frank Pantridge changed that.

Feisty Frank revolutionised our emergency services in North America. He taught us to take care to the patient outside hospital. The Belfast system became the root and flower that crossed the Atlantic. It bloomed in and from North American casualty and emergency services. Frank made defibrillation and life saves from cardiac arrest a routine feature. He found autonomic distress a harbinger of sudden death in the acute coronary attack. He began treatment to thwart cardiac arrest and to save jeopardized heart muscle. He discovered that low energy electric shocks defibrillated. He introduced the miniature defibrillator that weighed only 3.2 kg.

Frank influenced North American emergency services from rural village general medical practices to sophisticated urban systems. Our independent hospital emergency or casualty departments did not exist until Frank ignited our North American firestorm in out-of-hospital care.

Bill Grace was Frank's first North American disciple. After he visited Belfast in 1968, Grace established mobile intensive care in New York City. Inspired by Frank and Bill, others followed suit. Five years after Frank began pre-hospital treatment of the acute coronary attack in Belfast, over 100 adaptations functioned in the USA and Canada. New York, Miami, Los Angeles, Seattle, Portland, Oregon, Columbus, Ohio and Central Virginia developed local, regional, pan-urban and suburban pre-hospital cardiac care systems under the impetus of Eugene Nagel, Michael Criley, Leonard Cobb, Leonard Rose, AJ Lewis, Richard Lewis, James Warren, Costas Lambrew, Richard Crampton and many others. Like Frank we overcame apathy and opposition to modernisation by our local emergency services, by our hospital administrators and, sad to say, by our medical colleagues. Despite this we managed to systematise pre-hospital care based on the Pantridge example.

Frank got us North Americans out of the ruts by pragmatic example linked to impeccable new exciting clinical data.

We adapted his brilliant concept of critical care for people outside hospital. We trained personnel called paramedics. We deployed unique electrical and communications equipment first used by American astronauts.

I read about Belfast mobile intensive care in *The Lancet*. In 1968 I wrote to Frank and asked to visit the mobile unit when I next came to Ireland to visit my wife's Kilkenny family. Frank welcomed me at the Royal Victoria. Eyes twinkling he observed that the best life-saving devices for intensive care came from the USA. "What we have done here is accomplished with your technology". Implicit loomed the question: why aren't you Americans providing such care outside hospital? I toured wards five and six and the mobile unit. I returned home to try mobile intensive care.

Pleas for funds fell on deaf ears. The Virginia and American Heart Associations and The US National Institutes of Health declined support. Thanks to the first Pantridge disciple, Bill Grace, the Frueauff Foundation paid for our battery powered portable defibrillator. Fortunately for us, Frank's work had provoked commercial manufacture of battery powered devices. The seminal 1966 Pantridge-Geddes-Mawhinney contraption ingeniously jury-rigged an American AC defibrillator, two car batteries and a DC to AC converter. This lifesaver weighed 45kg. Thus we were relieved that our 1971 store-bought instrument weighed 30kg less than the Belfast prototype.

Frank visited our Virginia system, a union of town and gown. Our first life-save came when a prominent horse trainer collapsed in a manure pile at a horse show. After removal of ventricular fibrillation eight times, he rode in the ambulance to hospital convalescence and later resumed work. We reported this happy event to Frank. He took our electrifying, to us, success in stride. He hoped that our man had not got tetanus.

We must put Frank's work into the context of forty-three years ago. He broke the very difficult trail to what we now take for granted. Neither Frank nor his fellow pioneers in Dundonald, Ballymena and Stillorgan, nor we North Americans who trod in the Pantridge footsteps, had an easy time. Cardiological, medical academic and health service establishments in the UK and USA blocked and often mocked the innovative idea of out-of-hospital care of the coronary attack. They ignored Frank's well shewn facts about prevention of prehospital death. Recall the naive Nottingham false economy of leave-them-at-home treatment during the vulnerable early phase of the coronary attack.

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Frank's revolutionary idea to take intensive care to the patient reverberated like a thunderclap in North America. It shook the stodgy medical establishment because when tried, it worked. The Belfast mobile unit showed that electric shock defibrillation outside hospital was a practicable proposition. Frank said it was futile not to address the acute coronary attack *in situ* outside hospital. He thrust this concept forward. He made it the reality we take for granted today.

Frank's Revolution was *vox populi*. People and ambulance personnel learnt about preventable cardiac death thanks to Frank's work. They forced politicians, health service administrators and physicians to appreciate expedited attention to the man or woman suffering a coronary event outside hospital.

Frank's message got broad publicity when a former US President, an incumbent mayor and the owner of an urban ambulance service benefitted by early treatment of their coronary attacks. In 1972 prehospital care burgeoned after former President Lyndon Johnson's coronary attack was treated in his daughter's house. Thanks to acute care by the Charlottesville-Albemarle Volunteer Rescue Squad and University of Virginia mobile intensive care unit, Frank's concept hit front pages in North America. The mayor of Portland, Oregon approved the private Buck ambulance paramedics for mobile intensive care. Then the mayor collapsed in City Hall. Later Buck, who developed and owned the ambulance fleet, collapsed. Both were defibrillated by Buck ambulance paramedics.

This publicity and the very popular Los Angeles paramedic television drama *Emergency!* popularised Frank's ideas. Today North American emergency services run with Pantridge-style prehospital treatment as the major component. The US standards for care of cardiac emergencies, updated frequently by the American Medical and Heart Associations and College of Cardiology, directly derive from the ingenious Frank Pantridge.

The dramatic reversal of cardiac arrest outside hospital was but the beginning. Shortly after Frank set the Belfast unit in action, came the realisation that the autonomic nervous system's early response to the coronary attack was often prefatal. Frank inspired the team he led. He and colleagues John Geddes, Dennis Boyle, Jennifer Adgey, Charles Wilson, Sam Webb, Norman Patton, Basil McNamee, Conor Mulholland, Michael Scott, Norman Campbell and many others cared for patients outside hospital with the mobile unit. They collected invaluable data on the spot. Frank flooded medical literature with new ways to prevent sudden cardiac death.

For us North Americans, the finest scientific justification of out-of-hospital cardiac care took place in Omagh and Ballymena. Alun Evans, whom we honour today with Frank, Charles Wilson and others hypothesized that "the true benefit of mobile coronary care can only be appreciated by recording its effect on the case fatality rate [of acute coronary attacks] within a defined community". Their investigation revealed that death rate fell only among patients who had prehospital intensive care.

Frank and his crew identified parasympathetic and

sympathetic disruptions early in the coronary attack. They medicated patients outside hospital. These early treatments prevented cardiac arrest. They reduced damage to heart muscle and thus moderated heart pump failure.

Frank's Belfast team next observed that prompt removal of ventricular fibrillation occurred with low energy electric shock. Fewer shocks with less electricity minimized injury of the heart. This success flew in the face of electric shock levels ossified in the US national standard for restarting arrested hearts. So we turn the page to the next chapter of the Pantridge Revolution in North American emergency care.

A most embarrassing question arose. Why were makers of defibrillators adding more electric power to give bigger shocks at greater cost of the larger device? Frank and biomedical engineer John Anderson had developed an inexpensive miniature 3.2 kg defibrillator. Its low energy electric shocks worked on both sides of the Atlantic. In Virginia we put the first Pantridge Portable Defibrillator that came to North America into front line clinical use. By serendipity, I staffed our mobile unit on a busy spring Saturday evening. I defibrillated my retired professor of orthopaedic surgery at his garden party with a low energy shock from Frank's device. I next used his instrument for a low energy shock at an Easter sunrise service at Monticello, Thomas Jefferson's mountaintop World Heritage House near Charlottesville. This news greatly pleased Frank. We savoured his pithy quip about our Deist resurrection service on Jefferson's doorstep.

Irrefutable data from Belfast and Virginia proved low energy shocks worked well. Yet bureaucrats in the medical device branch of the US Food and Drug Administration (FDA) shilly-shallied about standards. Perhaps there was undue regard for the FDA's gross misinterpretation of work that advocated bigger electric shocks by non-clinical electrical engineers at Purdue University. Or was it pressure from a multimillion dollar industry poised to enrich itself with larger more expensive devices to sell?

No matter however. Frank flew the Atlantic to our rescue. We slogged through eight inches of sticky new fallen snow to tell the FDA that low energy electric shocks worked in emergencies. Years later the FDA bureaucrats officially agreed. But Frank snuffed the manufacture of bigger costly electrical instruments. Representatives of the defibrillator industry came to that FDA meeting. They got an earful of Frank's full bore message that bigger shocks were not better. To make sure the US industry abided by Frank's message, I asked Jennifer Adgey, as a Pantridge-trained watch dog, to join our Defibrillator Committee of the American Association for the Advancement of Medical Instrumentation. She vigilantly helped us block further moves to make larger expensive harmful devices. Thanks to Frank the industry scratched making overpowered defibrillators.

The miniature 3.2 kg Pantridge defibrillator became the forefather of the automatic external defibrillators now used in emergency services. These devices are deployed like fire extinguishers in crowded venues like aircraft, airports, office buildings and stadia for use by and for the public.

To implement Frank's system in North America we had legally to extend the physician's supervision of the remote

paramedical worker by radio or mobile phone. Virginia law made this possible in 1972. Lewis Baird brought a man whom he had defibrillated at a cocktail party to our House of Burgesses. He had used the LifePak device in the boot of his car. Andrew Dickinson and I described our life-saves and our need for paramedical help in Virginia Beach and Charlottesville and in Princess Anne and Albemarle Counties. Then came the vote that amplified the Good Samaritan law. "Be it enacted by the General Assembly of Virginia as follows: Any person rendering emergency care is exempt from liability who in good faith renders emergency care or assistance without compensation". Our Virginia Board of Health required certified training in advanced life support, cardiac defibrillation, endotracheal intubation and life sustaining treatment with drugs. The Pantridge path was followed closely by Virginia paramedics. As in Seattle and Los Angeles, paramedics operated under remote supervision by physicians via radio voice contact and telemetry of the electrocardiogram. They used intravenous infusions, cardioactive medications, and defibrillators for electric shocks. Frank's concept of early care coupled to sophisticated communication made paramedics into intensive care astronauts.

In the consummate Pantridge heritage in North America, treatment prehospital upgraded yet again. Paramedics transmitted electrocardiograms to remote physicians who interpreted them. If they showed acute injury of the heart, paramedics gave the blood clot busters, streptokinase or tissue plasminogen activator, to start dissolving coronary clots before moving the patient to hospital.

We now declare the obvious. Frank became and remains the undisputed champion of the North American Revolution in emergency care. Our paramedics have Frank's Belfast brand on them. In the museum of the history of emergency care at the Charlottesville-Albemarle Rescue Squad, North America's first Pantridge Portable Defibrillator is prominently displayed.

Frank's honours in North America are too numerous to count. His legacy includes his Fellowship of the American College of Cardiology and his place in the Congressional Record of the United States.

At the 92nd US Congress, Stanley Sarnoff, founder of the Cardiovascular Research Laboratory of the US National Institutes of Health, commented: "If Professor J Frank Pantridge and his group at the Royal Victoria Hospital, Belfast, had not initiated the sequence of events they did in 1966, we might all still be largely ignorant of the all-important early minutes after the onset of an acute heart attack. Worse yet, we would probably still not know how little we knew".

General George Washington, commander-in-chief of our Revolutionary War Army and our first President, was dubbed "the father of his country". Leonard Cobb and I presented

Washington's portrait to Frank at his 1986 festschrift. Why? Because Frank was unequivocally the father of emergency medicine in North America.

Frank's vibrant legacy of early care of patients evolves in North America today. Thousands of community emergency services embody the Pantridge principles. Frank often remarked, as he raised his glass among us, "Good men are few". Today we toss that toast back to Frank. We remember an extraordinary medical graduate, teacher and investigator of the Queen's University Belfast. His portrait unveiled today makes Frank this well deserved place of honour in the history of Queen's University.

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Paper

Frank's Legacy from a European Perspective.

Desmond Julian

I am delighted to have the opportunity tonight to pay homage to the legacy of Frank Pantridge. I have to admit that I do not think he liked me very much at the beginning but I was not alone in this regard. But I do believe that we finished up as friends because I very much admired what he had achieved against all the odds and, in later years, I think he thought that I was OK. Before I discuss his remarkable contribution, I would like to describe the cardiological scene at the time he played his unique role.

Today, when coronary disease dominates the work of cardiologists, it is difficult to appreciate that in the 1950s, myocardial infarction was not seen to be a part of their remit. When I was training with Paul Wood at the National Heart Hospital in London in 1957 we scarcely ever saw patients with coronary disease, nor do I remember much discussion of its diagnosis and treatment. This is not at all surprising when the diagnosis of angina depended essentially on the history and its treatment was to administer nitroglycerine tablets. This was a richly rewarding condition for general physicians in private practice. Heart attacks were treated by what has been called benign neglect. The pain was relieved by morphine, and the patient was then kept strictly in bed for up to 6 weeks.

One evening in 1957, I was attending the annual dinner for the alumni of Middlesex Hospital when I found myself sitting next to the then Professor of Medicine. When I told him that I was a Registrar at the National Heart Hospital, he said "You're not planning to be a cardiologist are you?" I confessed that I did have that in mind. He replied: "I wouldn't do that if I were you. We've operated on all our mitrals" I am afraid that I did not take his advice.

I do not think many physicians then realised the seriousness of myocardial infarction. A colleague recently told me that when a nurse woke her up and told her that a patient had come in with a coronary during the night, she would sign a prescription for morphine and turn over in bed.

Just before I went to Australia in 1961, a survey was done of the medical staff of Sydney Hospital, asking them what they thought was the fatality of myocardial infarction in the hospital. The answers could be strongly correlated with the age of the doctor. The young doctors in the accident and emergency department thought it was 50%, the registrars thought (correctly) it was 30% and the senior physician could not remember any patient of his who had died.

The real breakthrough in managing heart attacks came with the development of closed chest cardiac resuscitation by Kouwenhoven and his colleagues at Johns Hopkins Hospital. It soon became obvious that those in the early stages of a myocardial infarction needed immediate care by those equipped and trained to undertake cardiopulmonary resuscitation (CPR) and defibrillation.

It is difficult now to imagine the controversy that the introduction of coronary care created. My first paper describing my experiences in 1963 was rejected by the BMJ on the grounds that it was irresponsible to suggest that all myocardial infarctions should be admitted to special units. Two notable figures in British medicine were vehemently opposed to coronary care. One was Geoffrey Rose, the leading British epidemiologist of the day and the other was Archie Cochrane, now even more famous posthumously as the arch guru of the randomised clinical trial. Rose complained that the introduction of coronary care had had no overall impact on the number of deaths in the community. He did not waver in his opposition even when it was pointed out that epidemiologists would not be able to detect it even if CCUs (Coronary Care Units) saved 10,000 lives a year. Cochrane put his faith in two extremely small trials that were hopelessly under powered. But these individuals had a strong voice in the Department of Health which discouraged developments in this area.

So this was the china shop into which a bull called Frank Pantridge charged. Based on the findings of Bainton and Peterson in Seattle and on a survey by the University Department of Social Medicine in Belfast, he became very aware of the high mortality of myocardial infarction before patients reached hospital. I have to say that those of us whose attention was focussed on the in-hospital care of myocardial infarction patients were aware of these out of hospital deaths but thought that nothing much could be done about it. Frank thought otherwise.

One must recognise that circumstances in Belfast at the time were in some ways propitious. The Professor of Medicine, Graham Bull, wanted to promote out of hospital care of heart failure patients and the success of John Geddes in resuscitating a patient outside hospital with the help of Pantridge certainly acted as a trigger. But as Pasteur said, 'chance favours the prepared mind' and Frank Pantridge had such a mind.

In September 1967, we held the first international meeting on coronary care in Edinburgh. This was attended by about 30 leading figures in the field. Three individuals stood out. These were Bernard Lown of Boston, Evgeny Chazov of Moscow and Frank Pantridge. Lown and Chazov went on to win the Nobel Peace Prize together but I don't think a Peace Prize would have been one of Frank's ambitions. Frank Pantridge told us of his first 20 months' experience with the mobile coronary care unit (MCCU). He had published his first paper on the subject the previous month. There was great interest in

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what he had to say. He opened our minds for the first time to the possibility that we could do something about those who were dying in the very early hours after onset of a myocardial infarction. We had thought that these deaths were very sudden and had not appreciated how many occurred during the often prolonged period between the onset and arrival in hospital. He described the creation of his unit and how he and his colleagues had developed a so-called portable defibrillator, albeit weighing 70Kg. He emphasised the importance of the autonomic disturbances that are frequent in the early hours of a heart attack. He firmly believed that the correction of these imbalances was at least as important as defibrillation in saving lives and he asserted that if one did this, the resulting infarction would be smaller than it otherwise would have been. I do not know whether he was the originator of the concept of infarct size limitation, as he believed himself to be, but it was an enormously important concept which was taken up enthusiastically in the succeeding years.

Evgeny Chazov described the mobile cardiac units they had in the Soviet Union. He also told us about how fibrinolytic drugs were life-saving and, I quote, "this therapy leads to the rapid control of pain, less cardiac failure, less rise in enzymes and rapid signs of ECG healing". Bernard Lown told us that we must identify warning arrhythmias and that if we treated these with lidocaine, ventricular fibrillation would not occur.

The reaction of the audience to these three speakers was interesting. Pantridge was challenged on several grounds. He had said that a quarter of all patients picked up by ambulances died in the ambulance. Several of those present, including myself, questioned this figure. A more widespread criticism related to what was considered to be the uneconomic use of scarce medical resources. My colleague Bobby Marquis quoted the famous remark of a French General about the disastrous Charge of the Light Brigade in the Crimea said 'C'est magnifique but ce n'est pas la guerre'. Frank wrote in his autobiography that he was hurt by this comment. Chazov's contribution was met with scepticism. I suspect that this related to the fact that he was the Soviet Minister of Health, a member of the Politburo, and Brezhnev's personal physician.

There is no doubt that Lown had the greatest impact on the meeting. He was and is a most charismatic person with a wonderful way with words. It was helped by the fact that he was American at a time that it was thought that anything that an American said must be true. At all events, lidocaine must have become the most widely used drug in the world.

Not long after this meeting, Frank and I were asked to have a discussion on the BBC about mobile coronary care. Unfortunately, as is often the case, the BBC wanted to polarise the discussion and so did Frank. Indeed, he completely ignored me throughout the programme. I gave a qualified approval to his work but this did not mollify him.

I had the good fortune to visit Lown, Chazov and Pantridge within the next three years and was able to form my own opinion about what they had said. It proved extremely educational. My first visit was to Lown and I attended his Rounds in the CCU at the Peter Bent Brigham Hospital in Boston. He was again making the point that if you identified warning arrhythmias, and you treated them with lidocaine, ventricular fibrillation did not occur. During the rounds, he

was called away. I remarked to the Head Nurse that I was very impressed that they did not see ventricular fibrillation any more whilst we continued to see it in spite of using lidocaine in our unit. She asked if I knew that patients destined for the Unit were kept in the emergency room until the enzymes were positive and that they had had several episodes of ventricular fibrillation recently down there. I wondered what Frank Pantridge would have said if he had heard this.

In February 1970, Frank and I travelled to Moscow together to attend a small conference on Mobile Coronary Care under the auspices of WHO Europe and chaired by Evgeny Chazov. On the plane, I told him that we were about to follow his example but with a different system. We had undertaken a survey in Edinburgh to find out the potential of such a service and to determine how often patients died on their way to hospital. Deaths in ambulances proved to be rare, but we recognised that with an efficient organisation covering the whole city, we should be able to save a significant number of lives, as he had done. With this, he mellowed and could talk about the kinds of problems that he had encountered.

At the Moscow meeting, everyone was keen to learn more of Frank's increasing experience. But there was a problem in that he spoke staccato in a strong Ulster accent with which few of those present were familiar. A woman interrupted him, saying 'Please slow down as I think you are saying something important and I want to understand'. However, even when he did, the audience still had difficulty in understanding what he said and I was asked to translate. Frank's especial message on this occasion was the necessity of medical staffing of the MCCU. He felt that, while paramedics might be capable of CPR and, even, defibrillation, they were not trained to correct the autonomic disturbances of early infarction. Opinion was divided on this issue, those who already had doctor-manned ambulances, like the Soviets, shared his view and the WHO report that emerged from the meeting stated unequivocally that mobile coronary care should be in the hands of doctors.

Representatives from other countries then recounted their experiences. Perhaps the most memorable was an intervention by a Dutch participant. He described the difficulties of getting ambulances down the narrow main streets of some Dutch cities and on some occasions they had to "circumcise the whole town in order to reach the patient". At this point, an Israeli physician jumped up and said that they had not had this problem in Jerusalem.

While we were in Moscow, we visited the ambulance base together. They had four designated cardiac ambulances but as Frank found out, none of them carried a defibrillator. He was not impressed.

After the Moscow meeting, I had the opportunity to spend three weeks in the Soviet Union to see how patients with heart disease were cared for outside hospital. I particularly wanted to go out in an ambulance to gain experience of this at first hand. In Moscow, Leningrad and Kiev, I was not allowed to do so. I do not know why. However, I was able to talk to the staff, saw the ambulance equipment and listened in to emergency calls. But when I went to Tbilisi in Georgia, the atmosphere was far more relaxed and my host, Prof Kipshidze, soon asked if I would like to go out on an emergency call. I eagerly accepted and went in the ambulance with the driver, a woman

doctor and a 'bare-foot' doctor. Kipshidze followed with three staff members and another car followed him, but its function was not revealed. It was probably the KGB.

I was asked to interview and then examine the patient. He seemed to have atrial fibrillation, so I asked for an ECG. While we were waiting for this to be done, Kipshidze and I were directed to the sitting room and plied with an orange and a glass of Cognac. After the second cognac, I enquired about the ECG and was told 'it was being developed'-they were using an old photographic ECG machine. Eventually after the third cognac, I was handed a long wet piece of paper with the tracing wandering all over the place, but there was just enough to confirm my diagnosis. Pantridge's reservations about the Soviet system appeared to be well founded.

In fact, I do not know whether any of those present at the Moscow meeting were aware of the successful introduction of paramedic-staffed mobile care in Dublin which had started there in 1967 - the year of Pantridge's original paper. Even when Gearty presented a paper on the subject to the British Cardiac Society in 1971 and published a paper on the subject in the same year, this lead was taken up by only a few places. Notable amongst these was Chamberlain's organisation in Brighton which became operational in 1971. In the same year in Edinburgh, we started a programme in which the doctor on duty, driving a minivan equipped with a defibrillator, met up with a normal ambulance. About the same time or within the next three or four years many different countries in Europe took up the concept, particularly the Netherlands and Sweden. Those countries whose emergency ambulances were already doctor-manned, such as France and Germany, naturally thought that this was the way to go and few followed the trend to paramedic pre-hospital care for myocardial infarction, unlike what happened in the United States.

My next meeting with Frank was in Portugal. I remember little of this meeting but he was friendly. Indeed after we had had an outstanding dinner hosted by the Professor of Medicine in Lisbon, who plied us with the very best vintage port, Frank asked me and others back to his hotel room for a glass of malt whisky. Although some of the others failed to get up the next morning, I just managed to do so but I had learned a valuable lesson - never mix vintage port with malt whisky. Frank was completely unaffected by this toxic mixture.

A year or two later, I was flattered to be asked by the Solicitor-General of Northern Ireland to act as an expert witness on a medico-legal case in Londonderry and I think Frank had been

responsible for the invitation. Apparently, a suspected terrorist had been taken to hospital with a head injury from a blow delivered by a policeman. He had died in hospital three days later from a coronary. The family were suing the Government because they thought that the blow had been responsible for his death from a heart attack.

Shortly before I went there, I was told that the case had been transferred to Belfast because of a bomb in the court in Londonderry. When I arrived at the Law Courts, I was annoyed to find that the case had been settled out of court. So I rang up Frank and he told me to come to the hospital. As before, I was immensely impressed by the organisation, and the enthusiasm and knowledge of the staff running the unit. He then said that he would take me to the airport but he would like to show me his Georgian house on the outskirts of Belfast first.

There was a soldier with a machine gun at the gate of the hospital. He failed to wave Frank through immediately, so Frank drove out rapidly, saying as he did so 'Stupid Bugger'. This made me rather uncomfortable, but in the car he told me I did not need to worry about the IRA or the soldiers.

When he arrived at his house, he told me about his marvellous housekeeper and how she had foiled four masked gunmen who had come to kidnap him. He then said that, since that time, he had kept a gun under his car seat. I did not find this reassuring. We were stopped by soldiers on the way to the airport but, fortunately, they did not look under the car seat and we arrived at the airport safely.

In later years, particularly after I had served on a Committee that recommended the widespread introduction of defibrillators in ambulances, he became very friendly. This led to him embroiling me in a nasty legal case in which he was being sued for \$8 million dollars by an American company because he had denigrated a product of theirs. I was never quite sure of the merits of the case, but I gave him what moral support I could.

He retired shortly afterwards and so we did not have any more opportunities to meet. But I retained a great affection and respect for him. The portrait reminds of my good fortune in being associated with a truly remarkable man. It is not often that one meets someone who really changes the world in which we live and work, but he was undoubtedly such a person.

Paper

Frank Pantridge portrait unveiling – a photo essay.

Patrick J Morrison, Alun E Evans.

FRANK PANTRIDGE – A RECEPTION AND PORTRAIT UNVEILING.

As part of the Frank Pantridge Legacy symposium at Queens University, the latter part of Thursday 11th June was devoted to Frank Pantridge's memory. A reception in the Canada room in the Lanyon building of the University took place followed by a formal unveiling of a commissioned oil painting of Frank.

The portrait, by the local artist Martin Wedge (figure 1), was unveiled by Dr Jack Kyle (figure 2). The portrait was accepted on behalf of the University by the Vice-Chancellor, Professor Peter Gregson (figure 3). Then followed two memorial lectures chaired by Professor David Wood of Imperial College, London. The first was delivered by Professor Richard Crampton of Charlottesville, Virginia, USA, and the second by Professor Desmond Julian of London.



Fig 1. From left to right, Prof. John Morison (Chair of The Pantridge Portrait Committee), Frank Pantridge Jr (Frank's nephew), Martin Wedge, Jack Kyle, and Prof. Peter Gregson.



Fig 2. Unveiling of the portrait of Frank Pantridge, by Dr Jack Kyle (left)

The symposium was organised and introduced by Professor Alun Evans (figure 4). The audience contained a varied range of people who were all associated with Frank Pantridge, some of whom are shown in the two montages of figures 5 and 6.

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We thank Martyn Boyd and media services, Queens University, for help with photography



Fig 3. Prof. Peter Gregson, vice chancellor, accepting the portrait on behalf of the university.



Fig. 4. Prof Alun Evans speaking during the unveiling ceremony.

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Fig 5. Montage 1

*Fig 6. Montage 2*