The History of Fetal Medicine With a Special Emphasis on Auckland

Transcript of a witness seminar held at Old Government House, University of Auckland, 19 February 2005

Edited by Linda Bryder and Derek A. Dow

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Front cover: Participants gathered before the witness seminar, 19 February 2005.
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Linda Bryder
Derek Dow
14 February 2006

Participants

Associate Professor Bruce Arroll
Dr David Becroft
Professor Virginia Berridge
Associate Professor Linda Bryder
Dr Pat Clarkson
Dr Derek Dow
Ms Penelope Dunkley
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Associate Professor Ross Howie
Dr David Knight
Associate Professor Paul Lancaster
Mr Ray Laurie
Dr Bruce Lewis
Dr Helen Liley
Dr Margaret Liley
Professor Colin Mantell
Dr Barton MacArthur
Dr Neil Pattison
Dr Susan Sayers
Sir John Scott
Dr John Stewart
Professor Peter Stone

Apologies for Absence: Professor Peter Gluckman, Professor Jane Harding, Sir Graham Liggins, Dr Anne Dezoete

Introduction

In 2004, I was invited to attend a Witness Seminar on the history of antenatal glucocorticoids, run by the Wellcome Trust Centre for the History of Medicine in London. I had no idea what a Witness Seminar was. But I learned, on that occasion, what exciting events they could be. Here were the people involved in making the history. Here was the perfect opportunity to ask them what happened and why, under what circumstances. Here we heard about how these people had made the discoveries and decisions that changed the practice of medicine, and the lives of thousands of babies and their families.

In February 2005, a similar seminar was held in Auckland on the history of fetal medicine, particularly as it applied to Auckland. I was sorry not to be able to attend this unique occasion. But once again, the very special nature of a Witness Seminar speaks loud and clear from the pages of this transcript. Here are the people and some of their stories. Here are the colleagues, friends, teachers and mentors who were involved in making the history of fetal medicine in Auckland, and indeed in the international arena. Readers will recognise some things that have changed utterly:-large randomized trials without grant funding, hospital administration support for funding fundamental research, the evolution of a postgraduate school, a hospital and eventually a university department. They will also recognise some things that remain unchanged today: clinical perinatal mortality meetings, the importance of multi-disciplinary interaction for successful research and clinical practice. In the transcript of this seminar is told the history of the development of fetal medicine at National Women's Hospital. The participants talk about fetal monitoring and fetal breathing, about treatment of Rhesus disease and the development of antenatal steroids as a treatment for the prevention of preterm lung disease. These were all remarkable innovations in the development of perinatal medicine. Repeated mention is made in these pages of National Women's Hospital as a prestigious institution with superb staff and a huge international reputation. It seems ironic, then, that at the time that this witness seminar was held, National Women's hospital had just closed, moving into the central site of the large general Auckland City Hospital. But then, this too is part of history as it moves on.

Linda Bryder and her team must be congratulated on putting together this seminar and the essential transcript, from which many more can learn. Congratulations are due, too, to the wonderful group of people who were assembled to talk about what happened and why and what it all meant. Their original work was peerless. Their contributions were essential to this very important documentation of events and times that are passing rapidly from individual memory. In these pages will be found the information sought by future generations of clinicians and historians about the 'Golden Age' of perinatal medicine in Auckland.

Jane Harding
November 2005

Transcript

Linda Bryder: Good afternoon everyone. My name is Linda Bryder and it's my great pleasure to be the chairperson for this afternoon's Witness Seminar. Now I know a lot of you are wondering what a Witness Seminar is and fortunately we have an expert amongst us. We have Professor Virginia Berridge who is visiting Auckland as a University of Auckland Distinguished Visitor for 2005 and she comes from the London School of Hygiene and Tropical Medicine and she is just going to tell us for a few minutes – she's had vast experience of Witness Seminars in London – and so she's going to talk for just a couple of minutes to give us an idea of the history of the Witness Seminar. I think you had better come to the front to do that.

Virginia Berridge: I wish I hadn't mentioned this to Linda. I was just saying about my memories of the coming of witness seminars and she asked me to tell you as well. In my recollection they were run first in London at somewhere called the Institute for Contemporary British History, not in the health field but run by historians like Anthony Seldon, Peter Henessey and Peter Cattrell. And they were then involved, Peter Cattrell in particular, with setting up witness seminars which were run by the Wellcome Institute. And originally we had something called the History of Twentieth Century Medicine Group which met at the Royal College of Physicians in London and aimed to bring together historians and clinicians and scientists, and from that developed a programme of witness seminars at the Wellcome Trust which is run by Tilly Tansey and her team, and they've run an enormous number and if you go into the Wellcome website you will find them all listed there.[1] There have been a number of volumes come out of those witness seminars. Other organisations and institutions also run them. We've run three at the London School of Hygiene and Tropical Medicine, one on the Black reports on health inequalities of the late 1970s, and I've recently done one with the Wellcome team on recent public health in the 1980s and the 1990s.[2] Sometimes people ask, and I think people have been asking here, 'What is a Witness Seminar?' and I also say it's like an historical focus group. It's like a sort of group exercise in oral history where it's more than the sum of the parts because you hope that people will interact with each other and one person's reminiscences and memories will stimulate other people as well. So I'm very glad to see it being introduced into New Zealand, and I will pass back to Linda now.

Linda Bryder: Thank you very much Virginia. Well, just by way of introduction, today in Auckland we have gathered together an impressive group of people to comment and discuss the subject at hand. We welcome your reminiscences and comments in response to questions like, 'What was it like at the time?', 'Why did things happen the way they did?' If you have different versions of the events, well, that's all good, don't be shy, just speak up. Having said that we also have a time limit on for each speaker, nothing definite, no rules at this stage, we'll

[1] http://www.ucl.ac.uk/histmed/witnesses.html. The Wellcome Institute for the History of Medicine is now known as the Wellcome Trust Centre for the History of Medicine at University College London.
[2] For an account of the witness seminar on the Black Report see http://www.sochealth.co.uk/history/interpreting.htm.

see how we go. But one thing I would like to say at this point is please could you identify yourself when you speak to make the recording of the event easier.

So, what is the subject at hand? We will be focusing on events in Auckland and specifically National Women's Hospital in the 1960s and 1970s, in the area of fetal and neonatal medicine. Sir William Liley is world renowned – following his ground-breaking research in Auckland in the 1960s he was dubbed the father of fetal medicine. [3] His name is still with us – two months ago New Zealand's Health Research Council announced a new prestigious award for medical research which it chose to call the Liley Award. A research centre at the University of Auckland, the Liggins Institute, took its name from another outstanding researcher at National Women's in this period, Sir Graham Liggins.[4] Sir Graham (or Mont) Liggins was hoping to be here this afternoon but sends his apologies owing to poor health. These great researchers could not of course accomplish what they did on their own. They had teams of support and inspiration and we are pleased that some of their co-workers are with us this afternoon.

The period we are addressing today was a crucial one in the history of childbirth. As Professor Dennis Bonham, head of the School of Obstetrics and Gynaecology at the University of Auckland, declared in 1967, 'The unborn baby is not just a passenger in the womb – it is the patient and is in charge of the case.'[5] He explained that new medical research at Auckland 'proved that all conditions associated with pregnancy were governed by the fetus from the beginning'. He said, 'the whole concept of obstetrics was now moving towards accepting the baby as an active member of the team and essentially as the patient in the case.' And this was definitely the view of Sir William Liley. A tribute to his work noted, 'For the first time ever children in the womb who were sick could be treated just like any other person'.[6] The social implications of viewing the fetus as a person led Liley to become founder-president of the

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[3] Sir [Albert] William Liley (1929-83) graduated MB ChB NZ 1954 and completed his PhD at ANU Canberra in 1956. He worked at National Women's Hospital from 1957-83 and was appointed Professor in Perinatal Physiology at the University of Auckland in 1968. He became FRCOG 1971 and was knighted in 1973. For a recent biography of Liley, see Barbara J. Hawgood, 'Professor Sir William Liley (1929-83): New Zealand perinatal physiologist', *Journal of Medical Biography*, 2005, vol. 13, pp. 82-8. His ground-breaking article was A.W. Liley, 'Intrauterine transfusion of foetus in haemolytic disease', *British Medical Journal*, 1963, vol. 2, pp. 1107-9.

[4] Sir Graham Collingwood Liggins (b. 1926) graduated MB ChB NZ 1949, FRCS Edinburgh 1958, FRACS 1959, MRCOG 1956, FRCOG 1970. His 1969 PhD was entitled 'The Physiology of the Fetal Adrenal'. He was appointed to National Women's Hospital in 1959 and was Professor of Obstetrics and Gynaecological Endocrinology at the University of Auckland 1971-87. He was elected FRS London in 1980 and was knighted in 1991.

[5] Cited in *The West Australian,* 28 November 1967. Dennis Geoffrey Bonham (1924-2005) qualified MA MB BChir Cantab 1948, FRCOG 1966, FRCS 1958, FRACS 1966, FRNZCOG 1976. He was Professor and Head of the Postgraduate School of Obstetrics and Gynaecology, University of Auckland, 1963-89. See tribute by Sir John Scott, in *The University of Auckland News*, June 2005, vol. 35.5, pp. 20-1.

[6] Marilyn Pryor and Des Dalgety, 'From New Zealand', in Foundation Genesis, *Sir William Liley: A Tribute,* 1984, p. 6.

Society for the Protection of the Unborn Child in 1970.[7] His obituary in the *New Zealand Medical Journal* claimed that he communicated directly with the fetus using light and sound, and also that it grieved him that others seemed to devote so little effort and expense to these most important of all patients in comparison with that spent elsewhere.[8] Describing the fetus, Liley listed this new individual's achievements. He wrote of the fetus, 'His own welfare is too important to permit leaving anything to the chance co-operation of others. And therefore he must organise his mother to make her body a suitable home…. No longer, he said, can we understand the physiology of pregnancy if we remain in ignorance of the physiology of the dominant partner in that relationship'. In short, in his view, the fetus was 'a young human, dynamic, plastic, resilient, in command of his own environment and destiny with a tenacious purpose'. [9]

The climate in which this conceptual change took place is one we will be discussing this afternoon. It signalled, and was related to, the new profession of neonatologists. In 1967, Stanley James, a visiting professor of paediatrics from Columbia University New York, and an Otago graduate, argued that ideally a paediatrician should be present at every birth. At that time, this was apparently very rare, though at Auckland, he said, it was being practiced and this was a leader in this respect. [10]

Today's agenda will consist of opening remarks about perinatal outcomes and epidemiology since the 1950s by Professor Peter Stone and Dr Paul Lancaster. Then we will move on to some specific themes, including fetal monitoring in history, Rhesus haemolytic disease in the newborn,[11] and corticosteroids for respiratory distress syndrome.[12] We will break for afternoon tea at 3.30 pm and I will be watching the clock generally for that. Thank you.

Peter Stone: Good afternoon, I'm Peter Stone and I'm currently the head of the department in obstetrics and gynaecology in the University of Auckland, and Linda, thank you for inviting

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[7] For the origins of SPUC see Marilyn Pryor, *The Right to Live. The Abortion Battle of New Zealand*, Auckland, 1986, and Allanah Ryan, 'Remoralising Politics', in Bruce Jesson, Allanah Ryan and Paul Spooney, *Revival of the Right: New Zealand Politics in the 1980s,* Auckland, 1988, pp. 56-85.
[8] Albert William Liley, Obituary, *New Zealand Medical Journal,* 1983, vol. 96, pp. 631-2.
[9] Sir William Liley, 'Development of Life', reprinted in Foundation Genesis, *Sir William Liley: A Tribute,* 1984, pp. 30, 32, 37.
[10] Cited in *New Zealand Herald*, 22 September 1967, Section 1, p.16. Leonard Stanley James (1924-94) graduated MB ChB Otago 1949 then worked in Canada and America from the early 1950s. He was Director of the Perinatal Medicine Division 1972- and Professor of Obstetrics and Gynecology1976-92, Columbia-Presbyterian Medical Centre, New York. As President of the Perinatal Research Society 1972-3, he is regarded as one of the founders of modern perinatology.
[11] Rhesus haemolytic disease occurs when there is an Rh-negative mother whose baby has inherited Rh-positive blood cells from the father. The mother builds up Rh-antibodies against the baby's blood cells. This does not affect the first pregnancy, but, unless treated, in subsequent pregnancies the mother's antibodies will attacks the baby's red blood cells, causing still-birth or severe jaundice following birth leading to cerebral palsy. About 20 per cent of women are Rh-negative.
[12] Respiratory distress syndrome is a common complication in premature births.

me. It's wonderful to see so many friends here this afternoon, people I didn't imagine would be coming. I'm going to talk very briefly about maternal and perinatal outcomes really dating back half a century, focused around Auckland and National Women's. But perhaps just by way of introduction to that, rather than mention individual names, because I hope other people in the audience will do that and contribute to the discussion, but rather set the scene by way of context. I think the great contribution that the university department made was not only in terms of the clinician-scientist relationship but also by accurate and assiduous description of perinatal outcomes which they did both in Auckland and then nationally, because without good data it's difficult to decide what are the problems and then move on and decide how those are to be addressed.

So perhaps to open, Linda, if we try and set the scene going back to the late 1940s, early '50s, you are probably aware that there had already been a lot of discussion in New Zealand at that time about the state of the maternity services and it was after the Second World War when the Auckland Hospital Board, as it then was, took over Cornwall Hospital and set up the maternity unit there.[13] So if we go back to that period of time and think about the expectations of my parents and, as I was born in the year that the Postgraduate School of Obstetrics and Gynaecology began, it's been wonderful to be able to look over that time and the very first report of that unit came out in '49, and one of the authors happened to be George Herbert Green. [14] And so very early on the university department, as it became, was interested in data collection and audit. In that time, you need to remember that DNA and the double helix had not been discovered, the endocrinology of the menstrual cycle had not been fully worked out, and mother had her pregnancy confirmed by what was called 'the frog test'. Pregnancy held considerable risks for the mother. In 1949 in the first annual report, there were nine maternal deaths related to obstetric factors. That was a rate of 74 per 10,000 which is really massive compared with 4-5 deaths in the whole country now from direct obstetric causes, a rate of 0.9 per 10,000. I'm sorry to say that just at the moment I can't give you better figures than that; since the late 1980s New Zealand has not seen fit to analyse its maternal deaths. Hopefully that will change again.

Well, assuming mother survived, what about the baby? First of all, I think we should consider some definitions. Gestation, which is the age of the pregnancy or the baby, and weight were

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[13] The 39th US Army General Hospital was erected in Cornwall Park in 1943 to house casualties from the war in the Pacific. The buildings were leased by the Auckland Hospital Board in 1945 and the first birth occurred in the `Obstetrical and Gynaecological Unit, Cornwall Hospital' on 9 June 1946. It was known as National Women's Hospital from 1954. See Gerald Wakely, *For the Women of New Zealand: The Story of National Women's Hospital*, Auckland, 1963.

[14] G.H. Green, *First clinical report for the year ended 31st March 1949 [of the] Obstetrical and Gynaecological Unit*, *Cornwall Hospital, Auckland NZ*, prepared by G.H. Green, Auckland Hospital Board, 1950. George Herbert Green (1916-2001) qualified MB ChB NZ in 1946 and became MRCOG in 1950. After postgraduate training in England during the early 1950s he was appointed assistant to the professor at the Postgraduate School of O&G in 1956, then Associate Professor of Obstetrics and Gynaecology from 1961 to 1982. He was a central figure in the cervical cancer clinical team at National Women's Hospital.

not clearly distinguished at that time, and doing so was a major conceptual leap – no pun intended there. So a full-term baby equalled a baby who was more than five pounds or more by 1951, and the third report, 5½ pounds or 2500 grams. A premature baby was defined as a baby weighing more than 2¾ pounds or 1250 grams and if you were less than that, you were categorized as non-viable and in 1949 you had a 94% mortality. So I'm glad I wasn't born at 28 weeks or 1250 grams. Nowadays viability is generally defined as 24 completed weeks or around 500 grams. Today at least 30% of 24-weekers will survive and 91% of 1250-grammers or 28-weekers will survive. Now there are other people in this room and others in this seminar who are going to talk about the outcomes of those babies in more detail.

Well, why did those babies die and what has happened over time? In 1949 and 1950, the leading cause of deaths of the baby was really related to all of the problems that both the pregnancy, the mother and the baby, were having related to what was called toxaemia or pre-eclampsia. Nowadays only 3% of our perinatal mortality relates to that as a direct cause and from being the top cause of death in this first report it's now the ninth cause. So-called obstetric difficulties, which was disproportion, difficult deliveries, obstetric trauma and so on, was the second cause, 17% of the babies, whereas now, apart from rare exceptions, that is not a cause at all. Obstetric trauma really should not and does not generally occur now. But one still figures as a major challenge and that is unexplained bleeding in pregnancy; this was the third leading cause of death then and remains the fifth, 12% of babies dying in those days and still nearly 6% now. And then going down the list, spontaneous prematurity, a major challenge in obstetrics still but in those days difficult to discuss because many of those babies were not salvaged, but of all our babies born beyond 24 weeks now, it constitutes 16% of our overall mortality. In the year 2000, when we had a report that I can show you, the leading cause of death was congenital abnormality, followed by spontaneous pre-term delivery and then a number of other factors.

Now if we look at the data that we have, and we are fortunate enough to have perinatal data going back in detail every year from 1959, then we see that the very little babies continue to do poorly really until the mid-1970s when there was a marked and increasing improvement in outcome. So from babies under 28 weeks or 1250 grams having about a 6% survival in the 1940s, by 1989 that was 65% and by 1999 over 80%. And if you were born greater than 1250 grams, then nowadays your chance of survival is well over 95%, and good survival without this ability would be around 95% of that 90%. And one of our major challenges wearing an obstetric hat is that for at least two decades now fetal deaths and intra-uterine deaths have exceeded neonatal deaths, so if babies are born alive then my neonatal colleagues are able to do a sterling job.

Well, how might I have been delivered? In 1949 the caesarean section rate nationally was 1.5% of all births. Currently nationally it's around 20%. At National Women's, or Cornwall Hospital in 1949 being the only hospital in the region effectively doing caesarean sections, the rate was 9.5% and was seen as a major problem and the rate in the whole of Auckland was 1.8%. In 2000 at National Women's the rate was 26.6%. Well, why were babies being delivered by caesarean section then and now? Well, some have similar problems. The leading

cause in 1949 was called disproportion – in other words the baby just would not come out, followed by toxaemia, then placenta praevia and diabetes. Nowadays the leading cause actually is repeat caesarean section for people having had a caesarean before, followed by what is loosely called 'failure to progress' and then 'fetal distress'.

Finally, how was I fed? In the 1950s we didn't really record how babies were fed, but in the baby-friendly hospital initiative era in the two thousands, we can record that 53% of babies at National Women's at discharge were exclusively breastfed, 24% were mostly being breastfed and only 7% were being totally artificially fed. And perhaps dear to some of the members of the audience is that in 1950 or '51 my mother and I would have had a six-week post-natal check funded by the Government.[15] In 2000 the puerperium ends at 4 weeks and the GPs were funded to check the baby only and not the mother.

So with those opening remarks, Linda, I willingly hand over to other experts in the audience.

Linda Bryder: Thank you Peter. I'm sure there's so many things there that we could talk about all afternoon and thank you very much for your introductory remarks. We have a few more introductory remarks to come and then we will try and open it more generally.

Paul Lancaster: Thanks very much Linda. I feel greatly honoured to take part in this witness seminar and I'll come to some reasons in a moment. My task was just to introduce some of the terminology perhaps for those of you who aren't familiar with childbirth and the newborn. Of course the term 'perinatal' just means around the time of birth. By the way, I didn't introduce myself as Linda requested. I'm a paediatrician originally trained at the University of Sydney, graduated there in 1966 and then spent two years in a research job at the Royal Hospital for Women in Sydney and then was director of newborn care there in the 1970s. And at the end of 1979, after a few years overseas learning some epidemiology and bio-statistics, I returned to the University of Sydney to set up what was called the National Perinatal Statistics Unit.

So that the term 'epidemiology', by that of course we are just referring to health and disease in human populations, and although the term 'perinatal epidemiology' has gained wide currency these days, in fact I think it's much more appropriate now to refer to the broader field of 'reproductive and perinatal epidemiology', particularly now as we've come to learn so much more about the very early stages of life from the research of our IVF colleagues.[16] So, if we look at this broader field of reproductive and perinatal epidemiology as well as history of course now becoming a key part of it, it includes fertility patterns and the demography of

[15] For maternity benefits introduced under the first Labour Government, see Elizabeth Hanson, *The Politics of Social Security: The 1938 Act and Some Later Developments,* Auckland University Press & Oxford University Press, 1980.

[16] The first successful IVF (in vitro fertilization) programme was conducted at Cambridge, England, by Dr Roberts Edwards, an embryologist, and Dr Patrick Steptoe, a gynaecologist. The first `test tube baby' was Louise Joy Brown, born on 25 July 1978. IVF is still the most commonly used procedure in ART (assisted reproductive technology).

populations and there's an expanding debate again about the population of both of our countries, Australia and New Zealand. It includes studies related to the mother and of course to the fetus and newborn but for a long time we didn't have much information about paternal influences. But again through the work of IVF particularly, some of those paternal influences in infertility have become more important. It includes sexual behaviour and sexual health and of course sexually-transmissible infections, pregnancy care and newborn care, which will of course be expanded on by other speakers and discussion during the afternoon, birth defects, pre-natal diagnosis and screening, and screening not only for anatomical birth defects but increasingly for genetic diseases and that's going to be a hugely expanding area, it already is, in the decades to come. It includes infertility and fertility drugs and of course assisted conception or IVF or ART, whatever term you use for that. It includes the follow-up studies of both the treated women and the newborn infants, and there's a rich history in both New Zealand and Australia of follow-up studies of the high-risk infants particularly. And then there's the whole new area of – although it's more than a decade now, it's several decades of work that's come to be known under the term 'the Barker hypothesis', [17] the fetal origins of adult disease and I'm sure some of my obstetric colleagues will expand on that, and even studies looking at sudden-infant death syndrome where people have linked the babies' birth records and then looked at the ones that die, less commonly fortunately these days, during infancy.

Since we're asked to talk about personal reminiscences – my first visit to New Zealand was over thirty year ago which was a bit late for somebody my age now I guess, but I spent ten days' study leave at the National Women's Hospital in about '74. And I arrived on a Sunday afternoon. I guess one of the key points to make is that the population data that Peter was quoting a moment ago, I mean that all depends on good information and good records in the places of birth, mainly hospital these days of course, but in that era still some at home and still occasionally today. I arrived at about four o'clock on a Sunday afternoon and Ross Howie and who, I'm delighted to say, is here this afternoon, picked me up at the airport and he said, 'Would you like to come to a perinatal mortality meeting?' And I was sort of a bit surprised, this was Sunday afternoon. In fact I thought we ran very good perinatal mortality meetings at the Royal Hospital for Women in Sydney but this ran at five o'clock that Sunday afternoon, ran from five o'clock till eight o'clock, chaired by Dennis Bonham and of course Bill Liley and Mont Liggins were there, as was Ross, an excellent perinatal pathologist David Becroft was there, Pat Clarkson may have been there, but I certainly met her and Jack Matthews[18] a lot

[17] David James Purslove Barker (b. 1938) graduated BSc, MB BS London 1961. He is Professor of Epidemiology, Southampton University, England, and a former Director of the Medical Research Council Environmental Epidemiology Unit. Barker developed the hypothesis that coronary heart disease has its origins in under-nutrition in the womb, arguing that the effects of this on the baby's structure, physiology and metabolism persist through life. He is the author of *Mothers, Babies and Health in Later Life* (1990). Barker was elected FRS London in 1998.

[18] Jack Dilworth Haslett Matthews (1917-2004) graduated MB ChB Otago 1940, Diploma in Child Health London 1947 FRCP 1950. He was a paediatrician at National Women's Hospital from 1950-82. See *New Zealand Medical Journal* obituary, 1 April 2005, vol. 118, no. 1212.

during those ten days, and Colin Mantell of course at the same time. So that was my first experience of meeting the New Zealand contingent who have been so prominent. And I think that just epitomized the quality of the work that was being done at the National Women's, not only the academic staff and the nursing staff, but the whole panoply of clinicians working at the National Women's were at that meeting. And just in passing I might mention that you exported a few of your key people in the perinatal area around that time. I worked under Les Stevens[19] from Otago University, he was associate professor at the University of New South Wales, Eric Burnard,[20] who some of you will know, also a graduate of the University of Otago, he was the doyen of neonatal research in Australia, and Harvey Carey,[21] he was the professor of obstetrics when I was looking after newborn babies, and Dick Climie, [22] an anaesthetist. So you lost quite a pool of talent at that particular time.

Just very briefly to reiterate, I mean the information obviously comes from the place of birth but the data source is for bringing these national or regional reports together on childbirth and outcomes. That started of course with registration of live births, fetal deaths and neonatal deaths. In Australia we started a perinatal data system in the early 1980s and, as Peter Stone just remarked, it's a pity that some of the collections that were started here a long time ago are no longer particularly active. That there are some particular collections to look at how women and babies have been treated. And I set up the first national register of in vitro fertilization pregnancies in 1983 and a couple of years afterwards Dennis Bonham just rang up and said, 'Do you think we could include New Zealand data?' And so from that time on it's been an Australia-New Zealand report on the assisted conception pregnancies. And also there's an Australia-New Zealand neonatal network that neonatal groups in both New Zealand and Australia contribute to.

Just finally on the issues of definitions that Peter referred to, it's extraordinarily difficult to in fact compare perinatal death rates around the world because there are so many different definitions used in different parts of the world. Fortunately in Australia we used a cut-off of 20 weeks gestation age from the late sixties and early seventies, depending on which state you

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[19] Lesley Herbert Stevens (b. 1927) graduated MB ChB NZ 1953. He worked as a paediatrician at the Prince of Wales Hospital, Sydney.

[20] Eric Dawson Burnard (1916-91) graduated MB ChB NZ 1940. He worked at the Children's Medical Research Foundation, Royal Alexandra Hospital for Children, Sydney. See obituary notice, *New Zealand Medical Journal*, 11 December 1991, p.524.

[21] Harvey McKay Carey (1917-89) graduated MB BS Sydney 1941, FRACS 1954, FROCG 1960. He was Postgraduate Professor of Obstetrics and Gynaecology and Medical Director at National Women's Hospital, 1953-62, then Foundation Professor of Obstetrics and Gynaecology and Head of School of Obstetrics and Gynaecology at the University of New South Wales, 1963-82.

[22] Colin Richmond ('Dick') Climie (b. 1923) graduated MB ChB NZ 1948. He worked as a specialist anaesthetist at National Women's from 1958-63, as Director of Anaesthesia at the Royal Hospital for Women, Sydney 1963-84, and as a visiting anaesthetist to various Auckland hospitals 1984-90. At National Women's in the early 60s he was responsible for resuscitation of the newborn as well as anaesthesia. See Hospital Medical Committee minutes: 16 October 1961, BAGC A 638 39a, Archives New Zealand, Auckland.

are talking about, but just in the last couple of weeks I've been at a viability workshop meeting organized by David Henderson-Smart[23] in the New South Wales perinatal group, and, as I'm sure you know, there are now survivors at 22 weeks and 23 weeks. Some would rather not see those infants getting active treatment but it seems absurd then to still see definitions, particularly in Europe and other parts of the world, that have a lower cut off of 28 weeks for fetal deaths and stillbirths. The live births are supposed to be registered at all stages, and I guess because of those variations in the lower definition of viability it increasingly is important when you are trying to compare the epidemiology in different countries of outcomes such as, well, just counting pre-term births and particularly for multiple births. Anyway, thank you Linda for inviting me and I'm delighted to take part.

Linda Bryder: Thank you very much Paul; that was great. And also now you've mentioned some individuals which will be picked up, I'm sure, by others as we discuss events and outcomes. I was just wondering, is David Becroft here? Oh he's right at the back, do you want to come forward a bit? It was suggested to me that if we are talking about epidemiology and mortality, you are the man.

David Becroft: Actually some warning of this might have been preferable. And I'm actually not going to speak about epidemiology. I'd come back from the United States where I had been working in a children's hospital. What nobody knew, including the pathology fraternity, was that I had not done any paediatric pathology. I was working clinically in paediatric oncology, so I had to learn about paediatric pathology very quickly, and part of that was the comment from the then director of Laboratory Services, 'I think you should go out to National Women's Hospital and look at the perinatal deaths.' I had a sinking feeling because that was probably the subject I knew least about, but continuing the bluff, I said, 'Okay,' and that then developed into one of the major interests in my career. Like all topics in medicine there have been enormous advances since then. At the time that I went out to National Women's there was a single textbook, now there are a multiplicity of books, and I did my best at the time, when I look back at those early reports, they were absolutely dreadful.

But one of the turning points of course was the introduction of the perinatal mortality meetings that have already been mentioned. And that was not only a stimulus to the level of care in the hospital, but certainly put great pressure on me to improve the quality of the information being provided from the postmortems. And I'm very grateful to Dennis Bonham for introducing those meetings. I'm not certain exactly when they began. I've got some records of the protocols for a meeting in 1968 and they were basically quite simple records. By the end of the year, though, they were more or less in the present format, so there's been very little

[23] David John Henderson-Smart graduated MB BS Sydney 1968 and completed his PhD 10 years later on `The regulation of breathing during sleep in newborn babies and animals'. He is the Foundation Professor of Perinatal Medicine, University of Sydney, Director of the NSW Perinatal Services Network and the Centre for Perinatal Health Services Research, and a past president of the Australian Perinatal Society and the Paediatric Research Society of Australia. He is also a co-ordinator for the Cochrane Neonatal Review Group.

change in the format of those monthly perinatal mortality meetings from the beginning of 1969 up to the present time and that's a very interesting point, isn't it, because not many things in medicine have stayed unchanged for that time and therefore they must be having a considerable benefit. I think I'd like to really pick up the individual topics, such as haemolytic disease as these come up.

Linda Bryder: Thank you very much. I think that Harvey Carey was running some form of perinatal mortality meetings in the fifties from looking at the medical minutes.[24] Does anyone else want to pick up on anything just now, or would you like to move on to one of our themes?

Colin Mantell: There's just one thing that I would like to say and that is this sort of audit of performance that was going on in the mid sixties and mid seventies was something that was in my view quite foreign to other parts and other branches of medicine at the time and was a sort of unique system of audit within medicine. It's now common, of course, everywhere, but we're now forty years on.

Linda Bryder: Thank you for that comment. Anyone else at this stage?

Penelope Dunkley: One of the things that I think was also important about this audit in the form of the perinatal mortality meetings was that it involved anybody who had been involved in the care of the mother during pregnancy-labour and post-natal, and this brought in the people who were in the community, particularly the general practitioner and everybody contributed to learning how they could do better next time. And I think it made an awful lot of difference to the standing of the hospital in the community.

Linda Bryder: Thank you. Anyone else? We'll go on then to some more specific themes that we are highlighting or focusing on during this seminar this afternoon. The first one that we have identified is fetal monitoring in history. I have a couple of people who might like to talk a little about it, and someone I was told who knew a lot about it was John Stewart.

John Stewart: What am I supposed to be talking about?

Linda Bryder: Ultrasound maybe, or x-rays, whatever you like.

John Stewart: Well, I was a little bit peripheral to most of what you have been hearing about recently this afternoon, but Bill Liley used to refer to me as his radar operator and that was about my status I think. We muddled along and managed to achieve what we set out to do without too many mishaps but it was very much teaching yourself at this period. My

[24] The meetings actually predated Carey's arrival. They were held from 1948 to discuss clinical problems and deaths occurring in the hospital – cases for discussion were recommended by the Hospital Medical Committee which reviewed all deaths monthly: HMC Minutes, 17 June 1948, Minute Book, YCB2 15492 1a, Archives New Zealand, Auckland.

introduction to perinatal mortality reviews probably started in 1963 when I was in England. I took a year off and I was over in England and I think I was actually in Oxford at the time when Dennis Bonham was appointed to the chair. And of course I had never heard of him and I wanted to know something about it and discovered that he was doing a nationwide perinatal mortality survey in England and Wales and I think it was subsequently done in Scotland and Ireland as well.[25] But I said, 'What's perinatal mortality all about?' and of course I got a definition and that was a help to start with and I'm sure you all know what the definition is, but perhaps Colin can tell us precisely the beginning and end of the perinatal period.

Colin Mantell: It's a long time.

John Stewart: But I understood it was from the onset of labour until about the second or third week of life of the fetus, is that correct? No, it must have been before the onset of labour if it was a stillbirth. Anyway, the point is that it included the lot. Now the other thing that I was going to mention and unfortunately, as you can see, I've been around awhile, and the memory is not too good so we might have that later.

Linda Bryder: We'll come back to you, don't worry. Colin, I think we're still on fetal monitoring in history, if you want to talk about fetal breathing.

Colin Mantell: Thank you. In terms of reminiscence, perhaps I would be permitted for two minutes to talk about this. I began at National Women's on July 3rd 1967, Monday – I know that because my wife went into labour that day with my first son, so that's easy to remember. But I want to tell a little story because it seems so foreign now. Peter Jennings[26] and I both started on the same day and we arrived at the hospital and we thought we would do the right thing and on the Saturday before we started work – hear that, Saturday before we started work! We arrived at the hospital and went to introduce ourselves to Dennis. We decided that we would wait until the end of his ward round on Ward 5, it was about 10.30. We were waiting outside by the lift, and Dennis and the entourage came out at the end of the round. We stepped forward, 'I'm Dr Mantell, this is Dr Jennings, we'd like to introduce ourselves.' And Dennis's response, which I think just reflects the kind of attitude at the time for getting on and learning and never missing an opportunity, was, Dennis said to us, 'You missed my ward round! What's more you will never catch up on all those things you didn't hear today!'

I also smile a little when people talk about the fetal origins of adult disease because I was born in '39 in Central Otago in October and my father and mother were farm labourers in Gimmerburn and during that year was the big snow in the South Island that froze everything for months, so from about July, end of June through to the end of September my mother lived

[25] Neville R. Butler & Dennis G. Bonham, *Perinatal Mortality: First Report of the 1958 British Perinatal Mortality Survey, Under the Auspices of the National Birthday Trust Fund,* Edinburgh, Livingstone, 1963; for a discussion of this see A. Susan Williams, *Women and Childbirth in the Twentieth Century: A History of the National Birthday Trust Fund 1928-93*, Stroud, 1997.
[26] Peter Nicol Jennings (b. 1939), graduated MB ChB Otago 1964, FRNZCOG 1982, FRCOG 1983.

on bacon and potatoes as the only thing that they had in the cupboard – so much for fetal origins of disease!

Picture 1967 in terms of fetal monitoring. The first we heard about fetal monitoring in Auckland was after the fetal (?) meeting in Sydney, in Australia, about '68 I think it was, where the two names of Ed Hon[27] from Los Angeles and Caldeyro Barcia[28] sparred at that meeting as to what constituted what in terms of indicating fetal distress. That was in '68. The first computers for the analysis of a fetal heart tracing I saw in '72. Now, you know if you are looking at fetal heart trace, a whole lot of records coming out, a whole lot of numbers coming out, one after the other, and all you are wanting to do is recognize patterns, it ought to have been ideal computer territory and it was recognized as such back in that time. But the first computer to monitor fetal hearts that I ever saw was in New York and it occupied about three-quarters of this room where there were stack upon stack of whatever they were that made up the computer.

The other thing I wanted to touch on, because it was something that I became particularly interested in, was the activity of the fetus and the activity obviously before birth. Remember that those quotes that Linda raised before about how people regarded the fetus in the mid-sixties as a sort of a blob that you couldn't do much about, that was changed by Bill Liley and Mont a little later.

But even the concept that a fetus breathed in utero, well it's foreign enough today, but it was certainly very foreign then, and there was a whole lot of emphasis, all our teaching was about this magical activity of the first breath of life after delivery. Geoffrey Dawes[29] in the - probably early sixties, might have been late fifties – had done a whole lot of work on the first breath and all the changes that took place and how hearts connected to lungs and how the first breath got the system going. But nobody had even considered what might be happening during the course of the pregnancy. And at the end of 1969 Mont had gone to Oxford and had worked with Geoffrey and had identified cyclical pressure changes and then subsequently actually flow changes in the tracheas of intra-uterine lambs, and that set about the direction and asking the question, 'Was that also happening in humans?' It would have been strange for that to be happening in sheep and not in humans, and that's about where I got involved in both the sheep studies in England and in human studies. One of the surprising things, a reminder

[27] Dr Edward Hon developed the electronic fetal monitor in the 1950s and was later Chief of Perinatal Research, University of Southern California Medical School, USA.
[28] Roberto Caldeyro Barcia (1921-96),Professor of Physiopathology at the Faculty of Medicine of Uruguay, was the founder and the Latin American Center of Perinatology. In 1998 he was one of three doctors to be commemorated in a series of Uruguyan postage stamps.
[29] Geoffrey Sharman Dawes (1918-96) qualified MB ChB Oxford 1943, FRCOG. He was Director of the Nuffield Institute for Medical Research, Oxford 1948-85, author of *Foetal and Neonatal Physiology* (1968), and founder of the Fetal and Neonatal Physiology Society in 1974. See Graham Liggins, 'Geoffrey Sharman Dawes, C. B. E. 21 January 1918-6 May 1996', *Biographical Memoirs of Fellows of the Royal Society*, November 1998, vol. 44, pp. 110-25.

that there's nothing new, was that some papers were unearthed, one written in 1888 and another in 1910 and 1911, that demonstrated the fetal activity called breathing when people looked at the abdomen of the mother under the right light and at the right time they could actually observe it happening. And I went to the Barcroft Symposium in Cambridge, celebrating Barcroft,[30] who was a great physiologist, it would have been his 100th birthday that year in '72, and Geoffrey Dawes talked about fetal breathing as the new activity and there was a lot of criticism at the time, saying that you are taking science back into the dark ages by using these terms and so on. Well, we returned from that meeting to Oxford and had one patient upon whom we looked at the abdomen and we could see this breathing movement just so clearly, it was as if it was a little baby lying under a piece of tissue paper and you could see the whole of the activity. An exciting day for us, remembering that ultrasound – real-time ultrasound -didn't come in to common existence until about 1978 or '79 so it was a long time before that. The problem for us, or the problem I think for fetal breathing, was that everybody tried to turn it from a physiological observation into a clinical tool and it was fine as a physiological observation, it told you a lot about what was happening, but why would anybody expect it to be particularly useful as a clinical tool? Thank you.

Linda Bryder: Great, thank you. Is there anyone who would like to follow up on anything that's been said there?

Helen Liley: But Colin, I think it was some very interesting comments but just to add another perspective, I think fetal monitoring had been something that was emphasized perhaps at National Women's for quite some time, and my limited recollection of this is that when I was thirteen, which would have been in 1969, my father employed me for a summer holiday job to sit down and analyse ten years' worth of fetal ECGs, recorded by Mona McLeod while he was doing intra-uterine transfusions.[31] It had been recognized that some babies died during intra-uterine transfusion and that perhaps there might be some things done to improve their outcome and so he had experimented with using atropine and other agents to try to maintain the fetal heart rate. And so I think the understanding that you could determine things about fetal wellbeing was something that was perhaps ante-dated even Hon and others' observations.

Colin Mantell: Thank you Helen, you've reminded me, I mean this is the wonderment actually of Bill Liley, that Bill could look at a wriggly line on a piece of paper and convince himself to 100% that these little wriggles were fetal ECGs and these little wriggles were maternal ECGs, and it was totally clear to Bill at the time, and I have no doubt that it was correct, but it was beyond what mere mortals could determine.

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[30] *Foetal and Neonatal Physiology: Proceedings of the Sir Joseph Barcroft Centenary Symposium Held at the Physiological Laboratory, Cambridge 25 to 27 July 1972*, Cambridge, 1973. Sir Joseph Barcroft (1872-1947) gave perinatal medicine a scientific foundation through his studies of fetal development in the 1930s in Britain. In 1947 he published *Researches in Prenatal Life. Part I*. See Peter M. Dunn, `Sir Joseph Barcroft of Cambridge (1872-1947) and prenatal research', *Archives of Disease in Childhood: Fetal and Neonatal Edition*, January 2000, vol. 82, F75-F76.

[31] Mona McLeod was an ECG technician at National Women's.

Linda Bryder: Well, since you're here we might as well start talking about haemolytic disease of the newborn and your father's work then. You would be the ideal person to introduce it.

Helen Liley: Oh Linda, that's a big ask. I think there are probably others in the audience far better qualified than I am.

Linda Bryder: Just a few opening remarks then.

Helen Liley: This is a little off the cuff, but I suppose it was one of the things, among many other important items of progress, that National Women's made, it was one of the things that put the place on the map and perhaps served to not only make a big impact clinically on the care of babies and to establish the reputation of the hospital, but also to help attract a group of people interested in improving perinatal mortality and maternal and infant well-being. And so, in that regard I suppose was a landmark that had effects far beyond the disease itself.

My understanding of the subject is that, although there had been huge steps forward made in the understanding of the cause of Rhesus haemolytic disease throughout previous decades, in the 1950s Rhesus haemolytic disease remained one of the most important causes of perinatal mortality, but also kernicterus due to jaundice in the newborn was a leading cause of intellectual disability and cerebral palsy in the newborn, and that people were really rather bereft of new ideas as to how to treat the disorder. It was, I think, in 1946 that exchange transfusions for newborns had first been developed in Boston, and I was explaining to Bruce Lewis previously that my reading on the subject is that the initial exchange transfusions in newborns were done by inserting a cannula in the baby's sagittal sinus, administering a fully anti-coagulant dose of heparin, slashing the baby's radial artery and exsanguinating the baby and transfusing it as fast as you could. This was followed about a decade later by the recognition that you could cannulate umbilical vessels. When I was working in Boston I had the opportunity to meet and talk with Will Cochran[32] who was one of the consultants at the Boston Lying-In Hospital when they first started doing umbilical cannulations. He described to me how he had been present at the first exchange transfusion using umbilical vessels and the whole procedure seemed to go very well – they drew the blood out of one vessel and injected it into the other and it all went very smoothly until they went to remove the cannulas. They didn't realize, as this baby had recovered a bit of a blood pressure and was feeling well and was looking pretty sprightly by this time, that when they removed the cannulas there suddenly seemed to be blood on the ceiling. They sort of realized after that that they had to place a cord-tie around the umbilical vessels, otherwise unfortunate consequences would result.

But really I think that the first step that my father made in this disorder is that he was invited by Harvey Carey to look at the whole question of Rh haemolytic disease and one of the things

[32] William D. Cochran, MD, Department of Pediatrics, Harvard Medical School.

that he recognized is that with new developments in neonatal paediatrics such that small babies could actually be supported and cared for if delivered in a timely fashion, that the first thing to do was to address the question of third trimester fetal deaths due to Rh haemolytic disease. And he took advantage of work that had been done previously identifying that when a baby is haemolyzing in utero, it excretes bilirubin into the amniotic fluid and that you can measure the bilirubin and it gives some index to the degree of haemolysis and so, using palpation rather than ultrasound, he localized the position of the fetus and made the first clinical utilization of the technique of amniocentesis to measure the state of the haemolytic disease in the fetus, and developed the concept that by defining the severity of illness in the fetus you could then choose the timing of the delivery such that the baby might have a chance of survival, ex utero under the care of people like Jack Matthews and his team.

After that it's my understanding that the technique of intra-uterine transfusion was an advantage taken of a clinical accident. I can't quite remember who it was that said that anybody can take advantage of their successes but it takes real genius to take advantage of your mistakes. And in my father's case he had heard about, that you could transfuse even children by intra-peritoneal injection and that this technique had been in use in Africa for treating children with severe anaemia due to sickle-cell disease and malaria, and I think with help from John Stewart he recognized that from time to time when he was doing these amniocenteses, instead of puncturing the amniotic space, he accidentally punctured the peritoneal space which was often quite enlarged with ascites in the fetus, and realized he could turn this to clinical advantage to transfuse the fetus in utero and the rest, as I think they say, is history.

But since then the techniques have largely been superseded by intra-uterine intravascular transfusion although perinatologists still need from time to time to resort to intraperitoneal transfusion. But it certainly was a huge leap forward, and I think Jerold Lucey[33] was the one who described it in terms of the fact that prior to this discovery NASA scientists had figured out how to monitor the wellbeing of animals and humans orbiting two hundred miles above the earth but that the fetus had remained inaccessible to treatment, and this represented the first exploitation of fetal treatment as Linda has described.

Linda Bryder: Thank you. We might come back to you later. Neil Pattison I believe is another expert in this area.

Neil Pattison: Hi, I'm Neil Pattison and I'm currently a private obstetrician in Auckland but I was an Auckland medical student started at the first intake, so my first experience of National Women's was as a student to Mont, and I did a fourth-year elective and then in my fifth year I

[33] Jerold Lucey (b. c. 1926) graduated MD New York in 1952. He began teaching at the University of Vermont College of Medicine in 1956 and was appointed lifetime incumbent of the endowed Harry Wallace Professorship of Neonatology in 1995. In 1974 he became the youngest-ever editor of the journal *Pediatrics.*

did an elective just for a week with Bill looking at transfusion. Then I've spent about 15 years at National Women's over the years apart from some time overseas.

I thought perhaps I would just talk a little bit initially about haemolytic disease to make sure we are all on target because there is a mixed audience. The problem was in 1950 that there were about 25 cases – there were only 1500 births at National Women's in 1950 – 25 women had haemolytic disease and of those ten babies died, so that was the problem. And that was the situation where the mother developed antibodies against her fetus. These antibodies would come across the placenta and they would destroy the fetal red cells, the baby would become anaemic. Now the problem was for the women that if it happened in the first pregnancy it was almost certainly going to happen in any subsequent pregnancy. And therefore that woman would know that she was going to grow a baby to 34 weeks, 32 weeks, seven or eight months, and then suddenly the baby would die. And of course people like Bill eventually had a collection of the system throughout New Zealand, patients were referred through to National Women's, as this became a recurrent problem. So the major thing when I look back at the impressions that I have of the individuals who I only really know as students, or when I was a student – and plenty of people in the audience worked closely with these individuals – was the power of sort of lateral thinking, and it was brought to my attention when Colin was speaking a few minutes ago, because this is 1950 when Bill was interested in maintaining – sorry 1965 – he had been doing fetal transfusions for about three or five years at that stage and decided to closely monitor the baby during the process because some of the babies died.

So, I'll tell you in a second how he did the transfusions, but what he did was develop this ECG machine which gave a direct record of the fetus. This was about 1965, 1966, but that must be the first fetal monitoring. I'm not sure if it is, but it must be pretty early in the day. So when you had a baby that had haemolytic disease, the two problems were to note when that baby was going to die in the womb, and in the early 1960s they didn't know that. They knew it might, it might not, they didn't know when. The only option they had was pre-term delivery. And if you delivered the baby too early in the 1960s – I don't know what gestation but less than 34 weeks – the baby probably didn't survive. So they would watch these babies who would eventually die in the womb. They could see it was going to happen and there was nothing anyone could do. So that's when the amniocentesis, that Helen talked about a few seconds ago, was the major step. Now I don't think Bill was the first person to do amniocentesis, in fact he wasn't, but what he did is refine the technique. So he did an amniocentesis on Monday, that's a needle into the fluid the baby is swimming in, the liquor, he took a measurement of that, he quantified it by measuring it on his spectrophotometer and then when the baby was delivered next day he had a haemoglobin measurement. So he started doing some correlations. So he was able to correlate the haemoglobin and the colour, the density of the yellowness of the liquor, so that was the first step, because then he could say, 'Look, this baby is very yellow, the amniotic fluid and therefore the haemoglobin is very low, therefore the baby is going to die soon and therefore we will deliver it tomorrow.' And that reduced the perinatal mortality rate from something like 45-50% for the condition down to about 20% – a major change quite quickly.

And then the next step was the fetal transfusion. And Helen introduced that very nicely – so thank you for that. But how it happened and what led to it etc. – I thought I would read to you from his initial paper in 1963, just exactly what happened and the most interesting part for most of us is the second thing I'm going to read but the first one is: Under local anaesthetic an 8-centimetre 16-gauge needle (which is what most people would put into your hand nowadays), 8-centimetre long 16-gauge was inserted into the amniotic cavity, the woman lying on the bed here. Prior to this, John Stewart has identified where the fetus is and where the fetal abdomen is. So if we can imagine a woman lying on the bed here, she's had a fair dose of some sedatives so that she and the baby are semi-drowsy. Then a syringe of sterile saline was attached to the end of the needle, so it's a long needle about eight or nine centimetres long, slight advance, free injection was again possible, and you continue advancing until you hit the fetal abdominal wall, then further advance until free injection with the syringe was possible which meant you were in a space, so you will be in the fetal abdomen. Then you aspirated the ascitic fluid and then what you inserted was a very thin epidural catheter (the same that are used nowadays into the epidural space for patients with pain relief and labour), and then you squirted a little bit of dye down the epidural catheter, and that would show you if the dye was in the correct place, and then you would thread this very thin aluminium probe down it, and you would be able to get an ECG reading directly from the fetus. So the first patient was in mid-1963 and that patient was Louise Brown who I'm sure most of us know.[34]

The first baby was born following a successful fetal transfusion – there were a couple of unsuccessful ones prior to this – so 34 weeks and 3 days surgical induction was commenced by inserting a 15-centimetre metal catheter through the cervix on a transverse line and then a polyethylene catheter, like an urinary catheter, was inserted through that. The cervix was firm, undilated, and the fetus was lying obliquely as a breech. Twenty-eight hours later, as there were no contractions and the fetal lie could not be corrected, eight hours of Syntocinon on nasal spray were provided, eight hours following this Oxytocin drip was provided, and a caesarean section was then performed forty hours later. Now that's absolutely nothing like medicine is carried out today. As I say, I only know the individuals we have been talking about primarily as a student or as a junior staff member working with them, but the most impressive thing for me was the lateral thinking. I mean if you look at Professor Liggins's major advance or major achievement it's the corticosteroids, that came as a side issue to his main direction, and I think the fetal monitoring is a side issue to fetal transfusion and it's the ability to work as a team, because they obviously work very well together, this large group. The first fetal transfusion was by Professor Liley; he was not an obstetrician so he was primarily the director of the programme presumably, others would know better, but the two clinicians looking after the patient were Mont Liggins and Herb Green. Thank you very much.

Linda Bryder: Thank you, that was a great introduction. Now we are going to follow this up with John Stewart – you can stay there if you want.

[34] The baby was in fact Grant Liley McLeod. Louise Brown, as previously noted, was the first 'test tube baby'.

John Stewart: I can now remember what it was that I couldn't, and of course what brought the memory back was Neil's reference to lateral thinking, and I may sound a little political here, but I make no apology. Looking back on my career at National Women's, the highlight of it was, I think, the contact that I had with these people we have been hearing about. Well, it obviously was. The way I experienced this I think could be of interest. At the old hospital in what had been the US Army 39th General, it was pretty rough, and so we all went to lunch in the typical American forces place for lunch and there were great long tables and we all sat at these, and so there was a lot of a mixture of the staff there. Well, when we moved to the new hospital with all the gleaming polished stuff and everything else, we missed that, but we still had lunch with the resident staff of the hospital in tables of four. And I usually sat at a table with Mont Liggins, Bill Liley and Herb Green, and I was the fourth, and the conversation round that table is something that I can remember today as being probably the highlight of my experience there. And of course these three got going and I would just listen, but that was a riot, I quite enjoyed listening. But the point I wanted to make was that this all came to an end when the administration decided that, as we were not resident, we were not entitled to have lunch there.

Linda Bryder: Thank you. That's how medical history is made. So we will continue with Sir William Liley. Did you want to say something Margaret?

Margaret Liley: Sorry no, I'm just going to contradict what you've said, John, because it was morning tea we all got together with. That was Harvey's idea, that we all got together at morning tea, and everybody discussed everything at morning tea, that was when we all got together.

Helen Liley: I understand that that's because everyone went home for lunch in those days.

Margaret Liley: Yes, their dad always came home for lunch. He was a very fine dad as far as children were concerned.

Linda Bryder: Anything else?

Helen Liley: I just wonder – a couple of other quick corrections. Louise Brown was the first IVF baby I think. It was Grant McLeod that was the first survivor of intra-uterine transfusion. He still survives I'm told. Grant Liley McLeod to be exact.[35] But the other thing is that my father was a trained obstetrician. I don't think he ever professed to be much of a gynaecologist, but had the fellowship of both the Australasian and British Colleges I believe, although the British one might have been honorary. But his background had been in neuro-physiology and his PhD was actually written on the fact that as acetylcholine is released at

[35] Grant Liley McLeod, the first baby to survive intra-uterine blood transfusion, was born at 34 weeks on 20 September 1963, to a mother who was pregnant for the fourth time, and had lost the previous three to haemolytic disease.

neuromotor endplates in small quanta, and he did that PhD working with Sir John Eccles, another impressive New Zealand graduate.[36] He graduated in Australia, beg your pardon, but anyway, and then made the change into obstetrics after that.[37]

Linda Bryder: Someone else I know who knew Bill Liley rather well.

John Scott: I don't really feel I should say too much here, I'm John Scott. I was part of a group based in the Endocrine Section, headed by Kaye Ibbertson[38] within the Department of Medicine, which met regularly as the Endocrine Journal Club. The group included National Women's staff and we shared a lot of these ideas in very early form. I was most profoundly ignorant, I had trained under a great man. I'd also done a degree in med. science under Sir John Eccles, who wasn't Sir John then, but I had that tremendous experience, and then worked with Medawar's successor. Sir Peter Medawar[39] was appointed at the age of 29 to a full chair in the University of Birmingham. When he went, his successor, also aged 29, John Squire, [40] was appointed, and was easily the best clinical investigator in Great Britain. But those men also did what happened at National Women's and what happened in Kaye Ibbertson's department, we met regularly and discussed journal ideas. I was allegedly an expert on some aspects of immunology, I learnt quite a bit of that from Mont when I came home, and I was allegedly an expert on aspects of lipids, and I wondered what prostaglandins were when I first came back and Mont Liggins knew all about them and I didn't. So the interchange between these groups was enormous. They may have learnt a thing or two from one or two of us, but

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[36] Sir John Carew Eccles (1903-97) graduated MB BS in his home town of Melbourne in 1925 then completed his Oxford DPhil under Sir Charles Sherrington. He was Professor of Physiology at the University of Otago 1944-51 before accepting the equivalent chair at the Australian National University. In 1963 he shared the Nobel Prize for Physiology or Medicine with A.L. Hodgkin and A.F. Huxley for his contributions to the understanding of synaptic transmission in the brain. See David R. Curtis and Per Andersen, 'John Carew Eccles 1903-1997', *AAS Biographical Memoirs*, Australian Academy of Science, 2001, http://www.science.org.au/academy/memoirs/eccles.htm

[37] Albert William Liley, 'Transmission at the Mammalian Neuromuscular Junction', PhD thesis, Australian National University, 1956.

[38] Henry Kaye Ibbertson (b. 1926) graduated MB ChB NZ 1951. He was appointed Foundation Professor of Endocrinology, University of Auckland in 1970 and established the Department of Endocrinology at Auckland Hospital, where he was responsible for training most of New Zealand's endocrinologists.

[39] Sir Peter Brian Medawar (1915-87) was the joint winner of the Nobel Prize with Sir MacFarlane Burnet in 1960 for their work on tissue grafting, which is basic to organ transplants. Medawar's interest in immunology was sparked by a discussion during World War Two with the New Zealand plastic surgeon, Sir Alexander Gillies, about the problem of rejection with skin grafts in burns' patients. See profile of Medawar in the *London Times*, 24 February 1975 and P.B. Medawar, *Memoirs of a Thinking Radish: An Autobiography*. Oxford University Press, Oxford, 1986.

[40] John Squire (1916-66) was Leith Professor of Experimental Pathology at Birmingham. In 1960 he was named as Director-Designate of the combined district general hospital and clinical research centre to be established in London, on the same day Medawar was named as the new Director of the National Institute for Medical Research. Squire died suddenly in January 1966 before the centre was completed. See *London Times*, 20 July 1960 and 26 February 1966.

the great spirit of science, and this was genuine humble enquiring science, nobody standing on their dignity, and people learning, set these institutions apart. And it was a tremendous strength and we were a very privileged group to be involved in this, and it's fun to see some of you here again today, as an outsider. Thank you.

David Becroft: David Becroft again. Just two or three points about intra-uterine transfusion. As Neil has said, from the time that amniocentesis was introduced, needles had accidentally hit many fetuses. But this was the first time from Bill's activities that needles had been introduced intentionally into the fetus, and so the question of how much harm, and whether there would be any harm, was unresolved, and of course the first person to ask is the pathologist in the considerable number of infants who subsequently died, and of course the remarkable thing is that after a couple of days there's virtually no evidence of the passage of needles. I can't remember one serious incident. And that must have given Bill considerable confidence. But no procedure is without harm or without consequences, even in the fetus, and subsequently we published a paper on the effects on the fetal thyroid gland of what we assume is of the iodine in the contrast media introduced into the peritoneal cavity. There's no evidence that it did any clinical harm, but you should always be looking for the unexpected.

The final point is something I've never quite known was the actual success rate initially of intra-peritoneal transfusion, so I thought I would look at the figures from postmortem, which I have in a very rough form still, and in the five years preceding the publication of Bill's paper in '64, there are on average fifteen perinatal deaths at National Women's per annum, in which haemolytic disease was at least involved and in most it caused the death. At first I was quite taken aback because in the three years subsequent to the publication of the paper, there were an average of 27 deaths from haemolytic disease, and of course this is the old trap in statistics isn't it? Because I presume that reflects the influx of patients, most with the severe form of the disease coming from all parts of the country. And the death rate didn't get back to baseline until, really towards the mid- or late seventies. Thank you.

Linda Bryder: Thank you. David Knight I think was wanting...

Sue Sayers: While David's going up I think I should say you mustn't forget the neonatologists...

David Knight: Yes, if it wasn't for the neonatologist that 34-week intra-uterine transfusion might not have done so well, although I think the pioneering work was done by Bill. First of all, a couple of comments: first about Jack Matthews who started the neonatal service at National Women's. He was appointed in 1950. He'd come back from training overseas having been a medical officer in the army during the war and then he went to the Hammersmith Hospital. He was the first paediatrician appointed to National Women's. At that time – the midwives might like this rule to be re-introduced now – the obstetrician at National Women's was forbidden from doing caesarean sections. He had to call the general surgeon, he was forbidden under threat of dismissal. Jack was told by the matron of National Women's that he

was not to see babies except by her invitation because she knew considerably more about babies than he did. He ignored that advice.

The other comment I'll just make about Mont Liggins, I first heard him at the Sir Joseph Barcroft symposium in Cambridge in 1972 which was a fetal physiology workshop, and it was full of very dry physiologists. And then Mont got up towards the end of the meeting and presented I think one of the first overseas presentations of the steroid trial which actually just blew me away, and that was one of the reasons I came to New Zealand, so maybe that was a downside of the steroid trial! A correction to Helen Liley, the first exchange transfusion was done in Toronto in 1924 and I think I'll just read – it was by Alfred Hart[41] and Bruce Robertson.[42] The account in 1925 is quite interesting because it puts haemolytic disease of the newborn into perspective. The paper was called 'Familial icterus gravis of the newborn and its treatment'.[43]

'The baby was a perfectly healthy looking fine specimen of male child weighing eight to nine pounds. The family history, however, was so remarkable that one prepared for trouble. As the father informed me, they had had six boys previously, born, apparently healthy and strong at birth as this baby. They all, however, developed jaundice within 24 hours and the condition became progressively worse until death occurred from 3 to 11 days. They had only one living child, a girl. She became jaundiced as the others and although it was felt that she was going the same road as they had gone, she had managed to live, although deeply jaundiced until one year old, and weighed at this age what she had weighed at birth. After a year of jaundice, the jaundice gradually disappeared and she grew very rapidly so that she is now, at 12 years, a very big girl but suffers from chorea which is a form of cerebral palsy. That transfusion was taking blood out of the anterior fontanelle and infusing it into the long saphenous to release some as yet unknown toxin.'

It was 21 years before that was repeated in New York and since then the neonatal treatment of haemolytic disease obviously it's become common to do exchange transfusions. In the mid 1960s Ross Howie kept figures and he had a couple of sisters, nursing sisters, who he had go through the records, and between 1956 and 1966 just over 1600 exchange transfusions were done at National Women's, and 69 of them died, 69 of the babies died but only sixteen related

[41] Alfred P. Hart practised at the Hospital for Sick Children Ontario where he published the first report, in 1925, of the use of exchange transfusion to treat severe neonatal jaundice ('erythroblastosis fetalis'). See Carl Pocheldy, `History of the Exchange Transfusion: Its Use in Treatment of Erythroblastosis Fetalis', *Bulletin of the History of Medicine*, 1970, vol. 44, p. 450 and P. M. Dunn, `Dr Alfred Hart (1888-1954) of Toronto and Exsanguination Transfusion of the newborn', *Archives of Disease in Childhood*, July 1993, vol. 69 (special number), pp. 95-6.
[42] Lawrence Bruce Robertson (1885-1923) graduated MB ChB Toronto 1909. He improved blood transfusion techniques during his time at a French casualty clearing station in World War I then developed exsanguination transfusion while working at the Toronto Hospital for Sick Children.
[43] A. P. Hart, `Familial Icterus Gravis of the Newborn and Its Treatment', *Canadian Medical Association Journal*, 1925, vol.15, p.1008.

to the exchange transfusion, which I think showed the skills in those days. Just to put it into perspective, in the last two years we've done five exchange transfusions. So from 230 to five.

So I was lucky enough to come to Auckland and to start my career in neonatology just at the end of the pioneering days. I was very lucky to work with the people over at Auckland who had been part of that pioneering stage with Mont and Bill obviously being giants in the perinatal area. But I think that those that have followed have sort of gone from when it was pioneering to when it almost had become routine. It's quite interesting being here because it's almost as if it was when I arrived in Auckland as a first year registrar in 1977, and I can just imagine Sue Sayers and Pat Clarkson and Keitha Farmer taking me on a ward round so it's nice to see them all here.

Linda Bryder: Thank you, thank you. We will go down and visit Sue Sayers and Pat Clarkson, would you like to say something?

Sue Sayers: I should introduce myself. I'm Sue Sayers and I came in 1975. I remember it well because I was late because I was the only paediatrician at the Darwin Hospital at the time of the cyclone,[44] so instead of arriving at my time, I arrived a couple of weeks late, to be a paediatric registrar. It was in 1976 that I was appointed as the first neonatal tutor specialist. I realized I was working in a remarkable set up, and it was Paul Lancaster who visited the place in '74 that came back to me and said, 'This is a terrific place, you need to go there.' And I went for what was six months and I stayed six years and had a remarkable experience.

I won't go into enormous detail but obviously the perinatal mortality meetings were the best I've ever been to and still remain that way. They were quite remarkable, but they did take place on a Monday afternoon, if I remember rightly, I don't know what was happening on a Sunday – maybe they were trying to show off to you Paul. The thing about the perinatal mortality meetings I think is that no one was game enough not to go because of Bonham, I think. He made it quite clear that you are expected to go. But having got there, it was a non-threatening environment, and so it was a healthy professional discussion that took place, and you were able to expose the deficits of what had happened without feeling truly threatened and I think that was a big advantage. I had been to other hospitals where there were attempts of cover-up because of the threatening environment, but that did not take place at National Women's, and it led to very healthy professional discussion that was a learning experience for everyone there. I could take the floor for a couple of hours but I won't.

Pat Clarkson: Pat Clarkson from Auckland. As Sue says, one could spend a couple of hours yackering, but I think the other interesting thing that struck me as one looks at haemolytic disease is that there were quite a large number of patients who had this problem, and as one encountered them after several pregnancies, more than one lady would comment they really felt that as time had gone by, the management of their obstetric and neonatal care had

[44] Cyclone Tracey struck Darwin on Christmas Eve 1974. Wind speeds in excess of 200 kpm killed 65 people and caused serious structural damage to 70% of the city's dwellings.

improved over a period of years, and they were always very grateful for this and pleased that doctors seemed to be making progress.

Linda Bryder: Pass it to Keitha.

Keitha Farmer: I haven't anything revolving around haemolytic disease in particular. I was a student, final year student in 1950, I was Jack Matthews' house surgeon about '52 and then went back to National Women's in '64 where I was on the staff until '94 I think it was. My only contribution to this seminar is not on haemolytic disease other than I had a death exchanging transfusion as a house surgeon, because the obstetric registrar preferred to do a Caesar and I don't know what was wrong but I remember Jack coming in and trying to resolve the situation.

If I may mention my interest was infection when I was on it, and there were numerous epidemics in the late sixties and seventies. There has been an improvement in the management. Group B strep is treated in at-risk women prophylactically; listeria we haven't done much. But may I make one remark about improvements, everyone was willing to have a test for syphilis years ago, but now I gather they do not test for HIV where it would reduce fetal mortality from 30% to 2%. It's just a bit of advice that if they think the woman is at risk, they should offer it to her. One remark on the preceding discussion, I remember in '65, as a patient, they thought I might have twins. They excluded it by fetal ECG, the thing is they would have had two fast hearts as well as my slow one if there had been twins.

Linda Bryder: Thank you very much. That was great. Now true to my time-keeping, I think I said we were going to have a cup of tea at 3.30 so we will just have a break and then we will come back when we've had our cup of tea and carry on. Thank you.

Linda Bryder: Thank you for regathering. I know that lots of interesting anecdotes and conversations happened over tea which you are now going to share with the rest of the room, hopefully. We are going to move on to talking about the steroid thing in a minute, but from my own afternoon tea conversation I just wanted Sue Sayers to make one or two more general comments about, I think team work, international status of National Women's and Jack Matthews.

Sue Sayers: Team work: I really wanted to emphasize that it was a team – team work that was very impressive. There were noticeable obstetricians that came regularly to the neonatal unit, Liley, Liggins, Ron Jones,[45] Colin Mantell, to name just a few and it was obvious they were very interested and they followed their babies, and in turn the obstetricians had us neonatologists on side. There was a lot of discussion: when it was an appropriate time to deliver a baby. They didn't always listen to us, mind you, and I remember getting six babies of

[45] Ronald William Jones (b. 1939) graduated MB ChB Otago 1964. After spending 6½ years in the UK he returned to NZ in 1973, as a tutor specialist at National Women's Hospital. He is currently Professor of Gynaecology at National Women's Hospital and in private practice.

diabetic mothers on one day and let the obstetrician know that that wasn't quite the right way. But the fact of the matter is that it was a team and I went on regular obstetric ward rounds. I had the honour to go with Liggins on a regular ward round with him, so that I think should be emphasized.

Linda Bryder: That was quite unusual.

Sue Sayers: It was unusual in those days. When I came back from America in 1972 and said I wanted to be a neonatologist, my colleagues in Australia wanted to know what I was talking about, a lot of them. My friends didn't know what a neonatologist was. The other thing I wanted to emphasize, or share, is that National Women's had an international reputation. In 1977, the first American boards in perinatology and neonatology were conducted and I had my American boards in paediatrics but I wanted to do the perinatal thing, and I was allowed to do it from National Women's, which was absolutely unheard of, and it was because National Women's had an international reputation at that time and because of the connection with Stan James that it was a recognition that I in fact could go to America even although I had done my training in National Women's. And I have my fellow colleagues, particularly Pat Clarkson who once she knew I was doing this exam I had an unending stream of references to read.[46]

The last thing I wanted to say was that I wanted to emphasize that although Jack Matthews looked rather grandpa-ish he was like a terrier and if he got something in his sights he never let it go and with a regular ending to the ward round was a trip down to Dr Warren's[47] office, the medical superintendent, when Jack would beaver away at something that he had. He would come in smiling but he had an agenda that he intended to fulfil.

Linda Bryder: Thank you. And we had another outstanding matter that Peter wanted to quickly sum up on the haemolytic disease outcomes.

Peter Stone: Just on Jack, for those of you that weren't involved, the whole haemolytic disease Rhesus work was innovative but extremely time-consuming and we shouldn't for a minute underestimate the work that people like, not only Bill Liley, but John Stewart and others did in actually imaging the baby in the days before ultrasound and the work, and in the neonatal unit, the physical labour that went into doing the transfusions and just how hard and how long it took. And I remember one night being on call in that unit and needing Jack Matthews, and we phoned and he said he would come because he always did and even as a senior specialist he would always be available and come in. And he didn't arrive, and he didn't arrive which was very atypical for Jack, and in the end we rang again and his wife said, 'Oh

[46] Having passed the American Board of Pediatrics Neonatal-Perinatal Sub-Boards examinations, Sue can be regarded as the first-ever trained neonatologist in Auckland, in New Zealand, and possibly in Australasia

[47] Robert Algar Warren graduated MB ChB NZ 1944, FRCOG 1968. He was Medical Superintendent of National Women's Hospital 1960-77.

no, he's definitely left,' and eventually we found him asleep in the carpark. So he had made it to the hospital! So we worked him very hard.

But what I do think, one of the most important international contributions that Bill Liley made, and it's due to his approach to the clinical problem and he saw Rhesus disease as a clinical problem in its entirety, was that round about the time that he was working on this problem, it had been proposed, particularly in North America, that this be managed by an open fetal approach, and if you think about that even now just really how ridiculous or challenging that would have been, and because Bill took a medical, or if you like, a medical/invasive approach, he not only was able to solve the problem but I cannot imagine how in the 1960s it would have been possible to open the human uterus, try and exteriorize a baby, do a transfusion and put the baby back again. Even now that's largely still insoluble or very difficult to do. So I think he really needs to take credit because he is the person that changed the whole direction of fetal surgery by taking really a medical approach, and it's really only now, in North America, that open fetal surgery is done and the NIH actually insists that the current work being done on neural tube – fetal surgery for neural tube – be done only within the context of a trial, and there's a randomized trial going on. So I think Bill needs to take enormous credit for that and it was really his approach to the problem that led to that.

Linda Bryder: Thanks. And Helen would like to contribute to that.

Helen Liley: Peter, it's my understanding that hysterotomy transfusion was actually clinically attempted in the United States and I can't quote letter and verse for this but I believe it was tried on something like four or five women and among them there was one maternal death which put the end to that procedure.

Margaret Liley: I remember it quite well. Bill used to come home and tell me that he'd told the obstetrician or the paediatrician who was doing it, taunted him with, 'Is this the final solution to the haemolytic disease problem?'

Paul Lancaster: Could I just make a comment about the fetal monitoring because there was reference made to fetal heart rate monitoring and fetal breathing but at that time certainly the Royal Hospital for Women in Sydney, the Octoson ultrasound was being developed and that was from the late fifties, early sixties with George Kossoff from the Ultrasonics Institute,[48]

[48] George Kossoff BSc 1957, BE 1959, ME 1965, DSc Eng 1981 (all Sydney) was Director of the Ultrasonics Institute in Sydney from its foundation in 1959 as a branch of the Commonwealth Health Department. The Institute, which was later transferred to CSIRO, pioneered the use of ultrasound in medical diagnosis and made a technical breakthrough called 'grey scale ultrasound' which allowed much greater clarity and detail. See Kaye A. Griffiths, `An historical look at ultrasound as an Australian innovation on the occasion of the ultrasound stamp issued by Australia Post – 18 May 2004', *ASUM Ultrasound Bulletin*, August 2004, vol. 7, no. 3, pp. 22–26.

and of course Stuart Campbell[49] and Ian Donald[50] in the UK had started that, and we should also remember that it had never really caught on in our part of the world, I'm not sure at the National Women's Hospital, but the fetal scalp monitoring for pH and gases and so on and urinary oestriol is, dare I mention, one way of screening for fetal growth retardation. They are all in the sort of early to mid-sixties.

Linda Bryder: Thanks Paul. John Stewart.

John Stewart: I really wanted to make a point about the importance of having somebody with a prepared mind, and you will recall from the description of the early history of the intra-uterine transfusions how we had been doing amniotic taps and we'd been putting contrast in and, as David Becroft reminded us, it wasn't always in the baby's best interest but we persisted with that. The history of the amniotic business, as far as I'm concerned, went back to the time when I was working at a hospital in England, before I came home, and we had a visitor from Scandinavia and he said to the head of my department there that, 'I think we ought to have another look at amniography.' Now amniography is a term which was coined to describe an x-ray procedure whereby x-ray contrast medium was put into the amniotic fluid and a film was taken. Now there were several things: one was of course, to x-ray a pregnant uterus was considered a pretty risky and highly undesirable thing anyway, and you had to have a pretty good reason before you would do that, and we had the feeling afterwards that if we put in a bit of contrast medium, and this had been done by some Italians way back in the 1920s – that's why the Swedish chap wanted to have another look at it, he'd just dug that up. Anyway, by adding the contrast medium we could get more information with one film, which was always what we wanted to do, just to keep down the number of films. Well, of course, inevitably on one occasion, I'm not sure whether I did it or somebody else, but the needle went into the peritoneum with the baby which probably had more fluid in it than the amnion did at that time and we got this remarkable picture of the peritoneum with the baby and all the viscera inside it outlined. And the point I wanted to make was the prepared mind, because I just regarded this as an unfortunate accident. Bill saw it as an opportunity.

Linda Bryder: Thanks very much. I think we'll move on now to respiratory distress syndrome and Ross Howie has very kindly agreed to open this discussion.

Ross Howie: Thanks Linda. Can I sit down? Can I add another story about Sue, Paul Lancaster and Bruce Lewis. Sue was our first ever full-time specialist paediatrician at

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[49] Stuart Campbell graduated MB ChB Glasgow 1961 then worked with Ian Donald. Campbell's *An Improved Method of Fetal Cephalometry by Ultrasound* (1968) was a landmark publication.

[50] Ian Donald (1910-87) graduated MB BS London 1937, FRCOG. He was Regius Professor of Midwifery, University of Glasgow 1954-76. Donald invented the first practical ultrasound scanner and was the author of *Practical Obstetric Problems* (1955). See James Willocks, `Medical Ultrasound: A Glasgow Development which Swept the World', University of Glasgow *Avenue*, 19, January 1996, and James Willocks and Wallace Barr, *Ian Donald: A Memoir*, London, 2004.

National Women's Hospital and Bruce was her successor.[51] We're ever-lastingly grateful to Paul for suggesting them both. New Zealanders simply weren't interested at that time in positions but I was particularly glad to see Sue in 1975. There was a bit of a story. We were wanting this post established for years and years but I remember once, I think it was in 1974 or it may have been earlier than that, I was overseas for two weeks, I think at the World Health Organization in Geneva. I was the only person at the time who could ventilate babies at National Women's and in my absence two relatively large pre-term babies died of uncomplicated respiratory distress syndrome, it came up at the next perinatal mortality meeting. I hit the roof, I sent in my resignation and for some reason people thought it necessary to talk me out of it, but we finally did get the post, and we were delighted to see Sue in January 1975. She was very shook up as I remember after the Cyclone Tracey (was it Sue?), having lived through that, but thank you all for the important contribution you made to the development of the newborn service at that time.

Now I'm sorry that Mont Liggins is unable to be here and Jane Harding is unable to be either.[52] Jane knows more about the steroid work overall and particularly the recent work, it only leaves me, but I think the story is very well known and I don't need to say much. But first I'd like to thank Linda for inviting me here this afternoon and for undertaking the history of National Women's. I think she is very brave. I think there are plenty of people on all sides who will be looking at it very critically and one thing she can be sure of is she won't please everyone. But she's doing her best and I like to tease her for example by quoting Voltaire to the effect I think that history is no more than accepted fiction. Of course it doesn't apply to all history and I have to admire people like Linda who work so hard to try to ensure that it doesn't.

All the themes this afternoon could easily have been the subjects of seminars of their own and this one in fact has. In June last year, in London, at the Wellcome Trust Centre for Medical History, there was a witness seminar on this topic. It's due to be published at the end of this year although it could easily be later if all contributors are as slow as I am in sending comments back. And neither Mont nor I were able to be present, I think it's very fortunate indeed that Jane Harding was there to keep up Auckland's side or the transcript might have ended up a good illustration at least in part of some truth in Voltaire's remark.[53]

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[51] Sayers was in fact the first neonatal tutor specialist – see footnote 46.

[52] Jane Elizabeth Harding (b. 1955) graduated MB ChB Auckland 1978 then completed her DPhil Oxford as a Rhodes Scholar in 1982. She is currently Professor of Neonatology, University of Auckland and Associate Director (Academic) at the Liggins Institute. Her major research interests concerns the regulation of growth before and after birth, and particularly the interaction between nutrition, hormones and growth. In 2003 she was named joint New Zealander of the Year by *North and South* magazine.

[53] L. A. Reynolds and E. M. Tansey (eds), *Prenatal Corticosteroids for Reducing Morbidity and Mortality in Preterm Birth*: *Wellcome Witnesses to Twentieth Century Medicine,* Vol. 25, London, 2005, www.ucl.ac.uk/histmed/witnesses.html.

Now Mont in sending his apologies gave me a one-page outline of the origins of the work which perhaps I can read as he gave it. This is Mont:

'When I returned to an academic appointment at the Postgraduate School of Obstetrics and Gynaecology at National Women's Hospital in 1959 after six years' specialist training in the UK, I looked for a field of research that I could begin. I sought the advice of my friend and colleague Bill Liley of fetal transfusion fame. He advised me to look for a major problem in obstetrics that is potentially solvable. There was no difficulty in identifying the major problem which was premature birth then and still is. I naively thought that if I could discover the mechanism controlling the time of birth at term the cause of premature birth would be revealed. The current view was that the mother was in charge but there was some circumstantial evidence from congenital anomalies in fetal sheep in which the pituitary was malformed that the fetus might be important. So I developed a method in which I could destroy the fetal pituitary in sheep without disturbing the pregnancy. To my great satisfaction pregnancy continued weeks past term. It was then a matter of finding out which pituitary hormone was the key. I guessed that it was ACTH and tested this by infusing ACTH or cortisol into the fetus and found that I had guessed correctly because premature delivery occurred after 48 hours of infusion, even many weeks before term. So the question of mother or fetus was solved. But what was unexpected was the fetuses were born alive and able to breathe at an age when the lungs should have been solid-like liver and quite unable to expand with air. Clearly the treatment with ACTH or cortisol had accelerated the maturation of the lungs by inducing the vital enzymes. Since it seemed likely that these enzymes were not unique to sheep but present also in the human fetus, it seemed worthwhile to find out whether cortisol was effective also in human babies about to be born prematurely. We already knew that a potent cortisol analogue crossed the placenta so it was possible to treat the fetus by giving the hormone to the mother. Fortunately we knew also that cortisol does not cause premature labour as in sheep.'

So he ends by saying that he discussed the idea of a clinical trial in women who showed signs of imminent premature labour with me, and that I would tell you about the design of the trial and the results. As there isn't a lot of time and I've long ago forgotten most of it anyway, I won't, but I thought we would leave the time for discussion. Mont's words are typically understated, but I have to say that I felt that it was a highlight of my career actually to be given by Mont the lungs of twin fetal lambs, one of whom had been infused with cortisol, the other not. The infused lamb, the lungs were pink, they floated in water, in total contrast to the uninfused one where they sank. I might say that the lambs had been delivered at a stage when there was no possibility of any lung maturation under ordinary conditions. And as someone who felt he had spent far too much time up at nights trying to ventilate babies with respiratory problems, this was very exciting, not to mention of course the possible benefits to babies in sparing them the tender mercies of intensive care. For the London seminar I wrote originally thirteen pages which I cut down to six. I haven't time to read them now. I thought I might leave it there, just open for discussion.

Linda Bryder: Thank you very much. Who would like to pick up on that?

Bruce Lewis: I'm Bruce Lewis, a paediatrician, and first of all I'd like to outline how I came to be in Auckland from 1977. It was late in 1976, or the latter part of it, that Ross Howie came to Sydney to a seminar – I think it was just a one-day seminar at one of the women's hospitals in Sydney – anyway, I was fortunate to be introduced to him, I think by Paul Lancaster. The concept of being able to work as a paediatrician in the intensive care of babies and actually be the hands-on person in looking after babies requiring assisted ventilation was to me very tempting, and I was fortunate to be offered a position to come to work at National Women's in 1977. Now to us today that may seem rather strange that, well, isn't that what paediatricians do? But no, it wasn't. In Sydney in the first half of the 1970s, the assisted ventilation of babies was not conducted by paediatricians, it was by anaesthetists, that was Sydney. It may have been peculiar to Sydney but that certainly was the pattern in Australia. In other parts of Australia, neonatal care was even further behind, and I'm sure that John Thearle[54] here who was working in Brisbane at that time would be able to comment on the levels of assisted ventilation.

So National Women's as a magnet and Ross Howie as a magnet of people with enthusiasm to come and work here in the support of newborns, again I think underlines this international draw-card that National Women's was at that time. It's very easy for us to forget at this stage with the rapidity of technological development that's occurred. There's been a number of illusions made to imaging and including from – Paul mentioned the Octoson ultrasound imager, this was a huge machine on which women lay belly down and to get the images for us today with the dinky little ultra-sound probes that can be put into, not just into orifices but lots of holes made in the body if people so wish, perhaps not so much in obstetrics. But that sort of changed and if we could bring it back, if I could just again draw us back to Bill Liley's – how extraordinary some of these advances that he conceived were, that these were done without the imaging techniques that we had then. The amniography that John Stewart referred to, the concept, even the realization that by putting an iodine-based dye into the amniotic cavity, that some of that iodine would actually adhere to the vernix in the baby. This is how you got your image, that iodine sticks to vernix, and so you got this ghost-like image of the fetus and then of course if you put some dye into the amniotic cavity you could have a two-dimensional concept of inside and outside. These were extraordinary things, and enabled those catheters and needles to be put where they could be. So I really wanted to pay tribute to Ross and the neonatal service at that time which was really ground-breaking in those days.

Linda Bryder: Thank you. David Knight.

David Knight: I just want to make some comments about the steroid trial. The steroid trial was one of the greatest pieces of clinical investigation in the history of medicine. It's been

[54] Michael John Thearle graduated MB BS Queensland 1964 and has worked in the Department of Child Health at the University of Queensland since 1973.

used by the McMaster Epidemiology Unit[55] in teaching, I don't know whether it still is, but certainly through the '90s it was, as the example as to how to introduce a treatment into clinical medicine, with careful observations in experimental animals, followed by a large randomized controlled trial and then long-term follow-up. And Ross led this long-term follow-up where they looked at the children up to 7 years of age, looking at all sorts of parameters of development, not just neural development but immune function, respiratory function, a whole lot of things, and in fact the steroid trial lives on now. Jane Harding and a medical student and I looked back through the original data and I think answered the question about the relevance of steroids with ruptured membranes and I think that now has answered a question that the Americans have had for 30 years and the original steroid trial answered that question with Ross's data which of course is meticulously kept. And then Jane and Stuart Dalziel and the research group at the Liggins have just done a 30-year follow-up of the steroid trial which will be published soon.[56]

It's interesting that it's the research team that did the trial with big grants. In Ross's day there was no research team and there were certainly no grants. There were just probably the two of them and I think that shows the enormous contribution. One of the problems with that, Ross and Mont are both very quiet and humble and self-effacing people and I think that it probably takes someone like me to get up and say just what an incredible contribution they made, just as Bill was the father of fetal medicine. I remember when I was in Oxford in 1990 and Iain Chalmers[57] who started the Nuffield Perinatal Epidemiology Unit which became the Cochrane Collaboration,[58] described Mont as the greatest living obstetrician.

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[55] The Health Information Research Unit (HIRU) in the Department of Clinical Epidemiology and Biostatistics at McMaster University was established in 1987. It has played a leading role in promoting evidence-based medicine.

[56] Stuart R. Dalziel, Natalie K. Walker, Varsha Parag, Colin Mantell, Harold H. Rea, Anthony Rodgers and Jane E. Harding, `Cardiovascular Risk Factors After Antenatal Exposure to Betamethasone: 30-year Follow-up of a Randomised Controlled Trial', *The Lancet*, 28 May 2005-3 June 2005, vol. 365, pp. 1856-62.

[57] Sir Iain Geoffrey De Cormelie Chalmers (b. 1943) graduated MRCS LRCP MB BS London 1966. He was Director of the National Perinatal Epidemiology Unit, Oxford 1978-92, and played a key role in the evolution of the Cochrane Collaboration, as Director of the first Cochrane Centre 1992-2003. He then became Editor of the James Lind Library, which documents the evolution of fair tests of medical treatments.

[58] Archibald Leman Cochrane (1909-88) graduated MB BS London 1938**.** He was David Davies Professor of Tuberculosis and Chest Diseases, Welsh National School of Medicine, Cardiff, Wales, 1960-9 then Director of the Medical Research Council Epidemiology Research Unit, Cardiff, Wales, 1960-74. Cochrane is best known for his influential book, *Effectiveness and Efficiency: Random Reflections on Health Services* (1972), and his challenge led to the establishment during the 1980s of an international collaboration to develop the Oxford Database of Perinatal Trials. His encouragement, and the endorsement of his views by others, led to the opening of the first Cochrane centre in Oxford, England, in 1992 and the founding of The Cochrane Collaboration in 1993. Cochrane was made a CBE in 1968.

Linda Bryder: Thank you David. Helen.

Helen Liley: Thanks Linda. I just wondered if I could ask some questions. Ross, I wondered whether there had been any prior randomized controlled trials done at National Women's? I wondered whether John Scott could answer how many there had been previously in Auckland, and Bruce might be able to give us an indication of how many had been done in the world at that time?

John Scott: Certainly some had been done. They mostly had imperfections and I agree with everything that's been said about that National Women's trial. Derek North's[59] unit which was set up concurrently with units in Christchurch and Wellington, set out to begin the sort of controlled trial and Robin Norris,[60] working from Greenlane, took part in controlled trials. They were financed by ICI in those days and they were some of the very early ones, so there were some but there is no doubt that this National Women's was a model to be emulated. Bruce – have you got...?

Bruce Arroll: I'm from the Department of General Practice at the University of Auckland here. I'm not sure how many randomized trials had been done at that point, probably just a few thousand, now there's quarter of a million on the Cochrane database, but what I was going to say, to you Ross, and to Mont, is that the logo of the Cochrane Collaboration which is summarizing all the randomized trials that have ever been done, on their logo, the Liggins and Howie study is the top line and it makes me very proud as a New Zealander to be associated with the Cochrane Collaboration, seeing that little line there at the top, so it's a great thrill every time I see it.

Linda Bryder: Thank you. Is Barton MacArthur here?

Barton MacArthur: All I would like to say is that coming as an outsider into the study with Ross and Mont and others, I was made very welcome from the outset, and it was exciting to work in an area with all those developments and the interesting design that we worked on. And just to finish with one point, is that it opened up for me so many other areas overseas, because wherever you went this was known, and doors opened and it made life a lot easier when you were travelling. But all I can say really is that how privileged I was as an outsider to come and work on this study which, when I arrived, was so well designed and went so well. And I've got nothing but praise and thanks for all the people I worked with at National Women's.

Linda Bryder: Could you tell us your role?

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[59] John Derek Kingsley North (b. 1927) graduated MB ChB NZ 1950. He was appointed Professor of Medicine, University of Auckland in 1968 and was Dean of the Auckland School of Medicine 1989-91.
[60] Robin Mackenzie Norris (b. 1931) graduated MB ChB NZ 1955. He was Cardiologist-in-charge, Coronary Care Unit, Greenlane Hospital, Auckland 1971-92 and Honorary Professor of Cardiovascular Therapeutics, University of Auckland 1987-92.

Barton MacArthur: Well, I was involved with the cognitive follow-up of the children, before they went to school and when they arrived at school, and this was quite an extensive study and I don't think anything else quite like it had been done. Ross will expand on this a little bit, but it was interesting that when we wrote the two articles for *Pediatrics*, they were both accepted immediately and went in.[61] It was an interesting study and people were keen to find out what actually happened.

Linda Bryder: Looks like David's got a burning thing to say.

David Knight: Just on publication, it being accepted by *Pediatrics*, Mont told me that the original steroid trial was submitted to the *Lancet* and was rejected as not being of general interest!

Linda Bryder:
That's great. It's probably about time we had a nursing perspective.

Penelope Dunkley: I'm Penelope Dunkley and I worked in the neonatal unit at National Women's Hospital from '64 for the next twenty years, and worked with all the dramatis personae that have been mentioned today. And I don't propose to tell anecdotes about all of them.

One of the things I would like to add from a nursing perspective was that a lot of the things that have been mentioned were often in the one individual baby. The baby may have been premature, it may have had congenital malformations, respiratory distress and haemolytic disease, so we all had to work together to sort it out. Haemolytic disease, you heard about exchange transfusions, what did it look like? Last year National Women's moved to a new site, and they had a farewell and I published this book which includes 150 photographs.[62] Below is a doctor on the left and a nurse on the right conducting an exchange transfusion, the blood went in from the top and came out at the bottom. One of the things that was invented to make that easier was a three-way tap. Before that, the umbilical catheter had a syringe attached to the end, you pulled the blood out, disconnected the syringe, filled it up with something else and put it in again, so the three-way tap was one miracle. It was metal and then the plastic ones came in and then they were disposable. The other thing was that those exchange transfusions took a long time, at least three hours. One weekend we did nine. Where did the blood come from? The blood bank. We made incredible demands on the blood bank,

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[61] B. A. MacArthur, R. N. Howie, J. A. Dezoete & J. Elkins, `Cognitive and Psychosocial Development of Four-year-old Children Whose Mothers Were Treated Antenatally with Betamethasone', *Pediatrics*, 1981, Vol. 78, pp.638-43; B. A. MacArthur, R. N. Howie, J. A. Dezoete & J. Elkins, ` School Progress and Cognitive Development of 6-year-old Children Whose Mothers Were Treated Antenatally with Betamethasone', *Pediatrics*, 1982, vol. 70, pp. 99-105.

[62] Penelope A. Dunkley, *Genesis: Neonatal Nursing 1964-1990. National Women's Hospital Auckland New Zealand,* The Albatross Press, Rotorua, 2004.

and when the next development in the treatment of haemolytic disease which was to prevent it, [that was] the anti-D protection scheme, that meant that all that work didn't need to be done so much, so that was really important.

Respiratory distress syndrome, for those of you who have not seen a baby with respiratory distress, and we saw them before these steroids were invented, when a baby drew their breath in, the chest was drawn in and it looked as though the sternum was hitting the backbone. And one of the things that was thought, quite logically, was if you could stop the sternum hitting the backbone, then that would lessen the problem. So a nylon thread was put through the sternum to hold it up and a pulley put on the end of a bit of string and you held it up, but that didn't really work in the end. So that was another example of trying to see if we could make it work.

Associated with this was the change in the management of the thermal environment for the baby, because the one thing that kills babies very quickly is if the temperature is wrong – if they are too hot or too cold. And so incubators in 1964 consisted of a perspex box with a large top. When you opened it, the box would become the same temperature as the environment. And one of the developments was to develop boxes with portholes and then have two layers, and all the time we as nurses were expected to clean those incubators and keep them operational. And the secret in the end was to have one variety of incubator that everybody knew how to operate. So we worked through all those things.[63]

And the other thing was that all this equipment meant that we got to have more cupboards and more spaces and more trolleys for it, because in the sixties we had an incubator in a room, and a nurse went in with a trolley and fed the baby. Then we got intravenous fluids. And I want to pay tribute to electricians, engineers and carpenters in National Women's Hospital. For those of you who know him, Ian Annabell designed and built the first resuscitation trolley. He is to retire from Auckland Hospital in two weeks' time. Without those individuals we couldn't have operated, and Sue Sayers used that first trolley. I don't know if it was replicated in other parts of the world but it served our purposes. And accompanying this I wish to pay tribute to the Auckland Hospital Board for allowing me to run the first neonatal nursing training course in the country from 1964 to which nurses came from the Pacific Islands and from Australia. It was the first Australasian course and in 9 years we put 100 nurses through that. And those nurses continued to work in that specialty and I was fortunate to do that. And that's enough!

Linda Bryder: Thank you Penelope. We should also acknowledge the pharmacy contribution to the steroid trial. Ray Laurie?

Ray Laurie: Yes, I'm Ray Laurie, I was at National Women's prior to it moving to Greenlane and then until 1992 at Greenlane. I think we appreciated the staff at National Women's Hospital, particularly Professor Liggins because he would always come down to see us and

[63] For the history of incubators see Jeffrey P. Baker, *The Machine in the Nursery: Incubator Technology and the Origins of Newborn Intensive Care,* Baltimore and London, c. 1996.

explain what he would want and of course Ross Howie did the same. And our role was principally, in latter years, to do the randomizations and the labeling and coding of the trial material. It certainly extended over many years, it was absolutely massive, and I wonder, 'Did the trial material ever get recovered after I left?' I believe Jane Harding was looking for the codes a few years back. I left in 1992 but I wondered did the trial codes ever turned up again. It was my impression that Dr Howie had more or less finished the trial just before I left and all the codes had been resolved.

Linda Bryder: Thank you Ray. I think David Becroft was involved with this.

David Becroft: One could hardly not be involved because the problem of lung disease in the immature infant was initially, when I went to National Women's, an absolutely overwhelming problem. I mean the numbers of cases dying in a year were very very large indeed, and one can really make very few comments. And actually I could just observe the changes that were taking place with admiration and all I'm going to do is take the opportunity of asking Ross Howie a question. What were you doing, Ross, all those years ago, well beyond any ethical recall, with those little pieces of lung tissue in which you were looking at bubbles? And once talking about your work I illustrated this with that Millais painting – you know 'Bubbles' that used to advertise Pears' soap?[64] Ross, you squished pieces of lung and you looked at bubbles – own up!

Ross Howie: It was just one of these minor projects, David, that never ever got written up, but it was related to surfactants[65] of course, and people had complicated ways of measuring this on lung extracts. I remember the Wilhemy balance for example.[66] We didn't go to that sort of thing, but it occurred to me, reminded probably by fourth form physics, that fluid rises up a capillary tube a certain distance depending on a number of factors, including surface tension. We used simple capillary tubes used for measuring the packed cell volume of blood. I got bits of lung from David, very kindly, and squeezed fluid out after injecting them with saline. We could clearly differentiate lungs with abnormally high surface tension, the fluid rising a long way up the capillary tube, and more normal lungs with low surface tension. This gave an initial insight into what was going on.

There are a number of other issues raised – the matter of support, it's quite true, we didn't have a grant for the main steroid trial, but in that time I was myself supported by the Medical Research Council and they are due acknowledgement. We could only have done this with the most superb support from everyone else, and you've heard of David and Ray Laurie and the

[64] Sir John Everett Millais's painting (originally titled 'A Child's World' and modeled on his grandson Willie) was completed in 1886 and purchased soon afterwards on behalf of Pears by Thomas Barratt, regarded by many as the father of modern advertising.
[65] A surfactant is a material that can greatly reduce the surface tension of water when used in very low concentrations.
[66] The Wilhemy balance is a devise for making dynamic measurements of tension on a fluid surface (dynamic meaning measurement in both compression and stretching).

nurses. The whole system was keen on it and it worked very well. The Hospital Board itself was very good. It certainly had its problems and we had problems with them later, but that was a time when the Medical School had just been started in 1968, I think – our trials started in '69 – and the Auckland Medical Research Foundation had been started a few years before[67] and Harcourt Caughey, [68] who was chairman of the Auckland Hospital Board, was a strong supporter of that. And we had Wilton Henley as superintendent-in-chief of the Board and probably haven't had a better one ever.[69] He was keen to get that job so he could help the university get along and help everything the university was for. Nowadays you have to get grants for your postage I think, as well as everything else, but it happily wasn't so in those days.

The matter of randomized controlled trials, Bruce may be able to answer that one, but John Scott mentioned Derek North. I was, as I remember, Derek's second-ever registrar, 1959-60. I think he had started that Unit in '59. The story of the first registrar is very entertaining but I won't go into it here. It was Slim Williams[70] of Williams's Syndrome fame, and I don't think we had any controlled trials there, but the critical way of looking at things and the emphasis on physiology, on science, really stood me in very good stead ever since. And so the concept of randomized controlled trials was not strange to me at that time, even though I hadn't taken any part in any.

The follow-up – and Barton was very modest, we were very lucky indeed to have the services of Barton at the hospital. I seem to remember late 1960s he'd come to me as I think senior lecturer in education at the university, I suspect in some fear and trembling of National Women's Hospital, asking if he could follow up on small babies for us and we basically said, 'Yes please.' And he did a very good study of groups of small babies and the steroid trial was

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[67] The Auckland Medical Research Foundation was first mooted by Dr (later Sir) Douglas Robb in a 1953 address to the Auckland Hospital medical staff and came into being three years later under the leadership of John Grierson, who later chaired the Auckland Hospital Board for twelve years. According to Robb this was partly a response to Auckland dissatisfaction with the Medical Research Council's Otago bias. See Douglas Robb, *Medical Odyssey: An autobiography*, Auckland, 1967, pp. 6, 56-7, 119-20 and E. H. Roche, *Continuing Medical Education in Auckland: The First 25 Years of the Auckland Postgraduate Medical Committee* , Auckland, 1978, p. 10.

[68] Sir Thomas Harcourt Clarke Caughey (1911-93), managing director of Smith & Caughey and a rugby All Black from 1932-7, was a member of the Auckland Hospital Board 1953-74 and chairman 1959-74.

[69] Wilton Ernest Henley (1907-81) qualified MB BCh Oxford 1935, FRACP 1951, FRCP London 1960. He was visiting senior physician, Auckland Hospital 1948-61 and Superintendent-in-Chief, Auckland Hospital Board 1961-73.

[70] John Cyprian Phipps Williams graduated MB ChB NZ 1953. He was the first author on a paper from Greenlane Hospital describing the association of an uncommon congenital cardiac anomaly – supravalvular stenosis – with an unusual facies and abnormal behavioural characteristics; this was named 'Williams's Syndrome' in 1961. See also M. King, `Something Nobody Counted On,' *New Zealand Listener*; 28 April 2001, pp. 22-4 and U. Bellugi, P. Wang and J. R. Korenberg, ` Williams Syndrome: From Cognition to Brain to Gene', in http://www1.elsevier.com/homepage/sah/ens/contents.html#W.

really a godsend, because I remember after our trial had first been published, the World Health Organization tried to interest us in a international multi-centre controlled trial of steroids, including places – my papers are all in storage I can't remember them all – but they included Bangkok and Leningrad and we recall absolute horror. We'd found the trial difficult enough to run properly in Auckland but a trial like that, if you get some of the essential data wrong, say a baby did not have RDS[71] when the baby did or the baby was treated and it wasn't, then the net effect of this is to eliminate differences between the treated and control groups, and we didn't relish the prospect of WHO disproving our work. But we did say, 'Would you please fund us to do a follow-up study, we've got Barton who's New Zealand's leading authority on tests of cognitive development in small children?' And I'm pretty sure he still is because that field is out of political favour at the moment, and I think that's a great shame. Barton brought in Anne Dezoete who did her PhD on the work.[72] And we were able to build on the steroid trial follow-up to say to the Hospital Board, for years before it happened, that we needed a follow-up of all the smallest babies managed in the unit, to find out how they were doing in the longer term. In 1986 the Hospital Board finally funded it.

Linda Bryder: About publishing the results of the trial and the obvious benefits of the steroids, it wasn't picked up in America for many years. Does Ross, or anyone else have any views on that?

Bruce Lewis: As I mentioned earlier, I came to National Women's at the beginning of 1977 and in the middle of 1981, as a result of having worked at such a prestigious place, was given the opportunity to go to work at the children's hospital in Denver Colorado. So that's mid '81, remembering that the steroid trial was published in 1972. It was quite an extraordinary experience. A famous hospital, the children's hospital, Denver, at that stage it had a huge neonatal retrieval service that covered thirteen states around Colorado that flew babies in to be looked after, mainly in the department of that hospital. The intensive care unit at the children's hospital had 32 ventilator spaces in 1981, and they were often full, but what was being ventilated were big babies that I hadn't seen since the early 1970s in Sydney, who were sick with hyaline membrane disease,[73] and basically the use of betamethazone for fetal unmaturation was essentially not being used in this – certainly not to the extent that it could have been.

But coming back to the importance of follow-up studies here, I think this is what is so important. One of the things that was stopping many North American obstetricians at that time

[71] Respiratory Distress Syndrome.
[72] Dr Anne Dezoete *née* Clapham (b. 1943) is a developmental psychologist at National Women's. Formerly a general nurse and midwife, her research interests have been in the field of the long-term outcome of children at special risk. See J. A. Dezoete, Development of a Group of Infants After Neonatal Intensive Care, University of Auckland, PhD thesis, 1986, and B. MacArthur and A. Dezoete, *Early Beginnings: Development in Children Born Preterm*, Auckland, 1992.
[73] Hyaline Membrane Disease is a disease of the lungs usually found in premature babies. It is caused by the immaturity of the lungs and the inability of the air sacs to expand properly.

from using steroids was, Ross would know the exact reference, but there's a study that has tended to become known usually disparagingly as the collaborative perinatal study which from memory I think and this is how poor research, which Ross referred to there, can negate the positive results. This study I think had shown that only if you were a 34-week gestation black American fetus did you benefit from the steroids, and as a result of this there was widespread non-use, and it took quite some time after that before the realization that a huge fetal benefit was not being taken advantage of started to be recognized.

Linda Bryder: I think Helen Liley has something to add to that.

Helen Liley: I followed Bruce to the United States – although to Boston, a couple of years later, and actually I think there were a couple of other phenomena in the United States that made a big difference. I agree with Bruce about the somewhat lukewarm results of the collaborative perinatal trial but the other issues involved in the United States at the time – well, first of all that Lou Gluck[74] had taken the technique of amniocentesis and had used it extensively to determine the state of fetal maturation of fetal lungs by doing a variety of – he developed the technique of lecithin-sphingomyelin ratios in amniotic fluid but others had developed a variety of other amniotic tests which allowed greater precision in the timing of delivery to allow a baby to be born at much lower risk, and so there had been a lot more emphasis on that in the United States.

The second issue was that the United States, as I recall it in 1982 when I started there, was a place that was still reeling under the realization that the use of diethylstilbestrol which had been introduced in the 1950s there as a method of purportedly preventing miscarriage, had resulted not only in no benefits to the prolongation of pregnancy in the women who were treated, but also in the daughters of those pregnancies in a very high rate of various gynaecological malignancies including carcinoma of the cervix and also in a lot of cervical incompetence.[75] And so my recollection of North American obstetricians at the time was that they were saying they wanted to see not just years of follow-up of the progeny of these steroid-treated infants which National Women's was obviously under the leadership of Barton and Ross and others producing, but at least a generation of follow-up before they would be convinced that it was a safe treatment. And I'm not sure in retrospect that their caution was – I think it was possibly appropriate, and also it's been a great tribute or a great benefit of the National Women's study that that long-term follow-up was in fact undertaken.

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[74] Louis Gluck (d.1997), graduated from Rutgers College, USA, in 1948. Following a paediatric residency at the Babies Hospital, Columbia-Presbyterian Medical Center, New York City, he specialized in infectious diseases in premature infants. Gluck engineered a test which analyzed a sample of amniotic fluid to predict lung maturity in unborn fetuses. His role in creating one of the first neonatal intensive care units earned him the title `father of neonatology'.

[75] Diethylstilbestrol (DES) was first prescribed in America in 1938 and by 1971, when the Food and Drug Administration advised physicians to stop prescribing DES for pregnant women, an estimated 5-10 million individuals had been exposed to the drug. See http://en.wikipedia.org/wiki/Diethylstilbestrol.

Linda Bryder: Thank you. I think Paul is also dying to say something.

Paul Lancaster: I remember at the time that Ross and Mont's study was published, talking to obstetricians and maybe even to Harvey Carey at the Royal Hospital for Women in Sydney, and nobody was interested in doing it. But if they'd taken the example of the randomized controlled trial here at the National Women's we might have avoided a few of the problems that we had. I mean Harvey Carey in fact was trying his mini pills and was using fertility drugs and we were unfortunate enough to have nontuplets at the Royal Hospital for Women in 1971 and that was a disastrous clinical experience I must say. But also then if the message had got through to the people who were starting IVF, particularly in Australia at the time, we might have avoided a lot of the problems of the multiple births with IVF. And I think one of the key reasons, and perhaps Ross or others could comment on this, but one of the key reasons that there wasn't good obstetric research in our part of the world at the time was at that time 75% of women had private health insurance. And so I was fortunate to work in a hospital where the neonatologists were able to examine all babies whether they were mothers who were admitted as public patients or under private care. But other hospitals in Sydney at the time, particularly King George V, I mean the staff specialist newborn care doctors couldn't get anywhere near the private babies to look at them and that, I am sure, had an impact on their attitudes to something like the sort of trial that Ross so successfully undertook.

John Scott: Just a couple of points: firstly to Ross, it was after you left that the model trial on gout involved the use of allopurinal and produced a strongly positive result, that was designed in London but largely modified in Auckland, so that's what I was referring to. For the medical historians present, what we've just been hearing over the last few minutes is a universal phenomenon. What happens in one big country, be it Europe, the United States or England, arouses antithetical jealousy and there are analyses of this. For instance, a man called Herrick in Boston published the first modern description of what a coronary attack or a heart attack is. He wasn't actually the first, he was the first to understand it, he was the first to publish, that was in 1911.[76] In about 1925 or '26 the top cardiologist in Great Britain, Sir James Mackenzie, [77] top cardiac physiologist died from his second mycardial infarction, not knowing what he was dying of, so there's some history lessons in that.

Linda Bryder: In the remaining time, I think also that my colleagues from London want to know about the epidemiology, what difference did it all make? All this wonderful work that happened at National Women's Hospital, Auckland, New Zealand, world-breaking stuff. I think maybe we should let Peter Stone tell us.

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[76] J. B. Herrick, `Clinical Features of Sudden Obstruction of the Coronary Arteries', *Journal of the American Medical Association*, 1912, vol. 59, pp. 2016-20. James Bryan Herrick (1861-1954), graduated from Rush Medical College in 1888, was also the first to describe sickle-cell anaemia.

[77] Sir James Mackenzie (1853-1925) was a Scottish cardiologist and a pioneer in the study of cardiac arrhythmias. He was first to make simultaneous records of the arterial and venous pulses to evaluate the condition of the heart, a procedure that laid the foundation for much future research. See R. McNair Wilson, *The Beloved Physician, Sir James Mackenzie*, London, 1926.

Peter Stone: Well, thank you Linda. I believe it has made a difference, continues to make a difference and will make a difference. But just before we do that, Linda, I think for the record, the postgraduate school was actually begun in the early 1950s and actually in its official original form closed in 2001 or shortly thereafter, after its 50th anniversary. And in fact the last official employee of the postgraduate school was Associate Professor John France who actually discovered placental sulphatase deficiency, so that's another discovery from National Women's that we haven't discussed this afternoon.[78] The second professor, the second head of department there who actually I believe is responsible for a lot of the initiation of the teaching programmes and which had an impact nationally and also I believe was in fact a very important mentor for both Bill Liley and Mont Liggins, was Harvey Carey. And I'd like John Scott to say something about Harvey because he, for various reasons, sadly left and went back to Australia, so for the younger people in the room we never had an opportunity to meet or know about him. So John, I think it would be worth saying something I think.

John Scott: Thank you Peter. I've been looking around the room and asked one or two people, I think I am one of the few here, unless David Becroft was one, that came up from Dunedin, and experienced the sudden shock, the onslaught of Harvey Carey for the first time, apart from in our undergraduate course in basic science, where we had a man called Edson,[79] a modern biochemist, and John Eccles whom the students loathed because he was a dreadful lecturer, but to a few of us was a marvellous man, but to most of the class he wasn't. Prescriptions were still partly written in Latin, we had two or three antibiotics, we had teachers who pontificated, and if you had done a thing like a B.Med.Science you knew perfectly well that a lot of what we were being taught was absolute rubbish, but they did it with great aplomb. And then we suddenly came up to the old American Army hospital, met Harvey Carey and it hit us like a sledge hammer. Suddenly there were words like 'evidence', the questions, hypotheses were put to us. He was a wonderful man but he fell foul of the old general Auckland establishment.

Now to tell you what it was like, just before I came up, and I came up in 1954 from Otago, just before that the chairman of the Auckland Hospital Board had changed and no longer did the chair of the Auckland Hospital Board communicate with the superintendent of Auckland

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[78] John T. France, 'A Placental Steroid Sulphatase Defect in Human Pregnancy', PhD Thesis, University of Auckland, 1969; J.T. France and C.G. Liggins, G.C., `Placental Sulphatase Deficiency', *Journal of Clinical Endocrinology and Metabolism*, 1969, vol. 29, pp. 138-41. John France (b.) graduated BSc Auckland 1961 then trained at the Worcester Foundation of Experimental Biology, USA, from 1962-4. He returned to the University of Auckland in 1969, was appointed Associate Professor of Steroid Biochemistry, Department of Obstetrics and Gynaecology, and later became HOD of the Postgraduate School.

[79] Norman Lowther Edson graduated MB ChB NZ 1931, then completed a PhD in biochemistry at Cambridge University before returning to the University of Otago as a lecturer in biochemistry in 1937. He became an Associate Professor in 1944 and Professor of Biochemistry from 1949-68. See C. Hercus & F. Bell, *The Otago Medical School Under the First Three Deans*, Edinburgh & London, 1964, pp. 238-9.

Hospital through the head orderly at the mortuary. Shortly before that, Dr Charles Burns,[80] later Sir Charles Burns, one of the great New Zealand physicians of the twentieth century, a big tall fellow called Mr Douglas Robb,[81] later Sir Douglas Robb (Greenlane), and Marcus Clarke,[82] later head of surgery at Middlemore in its development phase, were all sacked by the Auckland Hospital Board under pressure from the other consultants because they had the temerity to suggest that treatment should be monitored, there should be audits of treatment. Not only were they sacked, they were told they could not practice medicine anywhere within 50 miles of the central Auckland post office.[83] That judgment case was overturned by Mr Justice, later Sir Alfred,[84] North, Derek North's and Ken North's[85] father, but that was the environment. Now Harvey Carey took that head on and suffered. I think I've said enough too.

Peter Stone: But anyway, Harvey was responsible for setting up a lot of the teaching programmes because prior to that, the maternity services in New Zealand had been rather fragmented, and apart from the Cornwall Hospital in Auckland, there were a number of nursing homes all around Auckland that delivered babies. But as someone mentioned earlier on, obstetricians by and large weren't involved with the operative delivery for caesarean sections and so on. So in fact if you go back to pre-war then the maternity services in New Zealand were fragmented and Harvey was responsible amongst others, supported by people like Doris Gordon[86] and so on which we haven't time to discuss today, in setting up a very important postgraduate training programme diploma of obstetrics for general practice training

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[80] Sir Charles Ritchie Burns (1898-1985) graduated MB ChB NZ 1922, FRACP 1938, FRCP 1932. He was Director of Medicine, Auckland Hospital 1938-40 and later practiced as a physician and cardiologist in Wellington.

[81] George Douglas Robb (1899-1975) graduated MB ChB NZ 1922. An accomplished surgeon, who headed the cardiothoracic surgical centre at Auckland's Greenlane Hospital from the late 1940s, Robb was better known in the 1930s and 1940s as a prolific writer on social medicine and the New Zealand health system. He was also one of the leading figures in the prolonged struggle to establish New Zealand's second medical school, which opened in Auckland in 1968. Robb was knighted in 1960. See D. A. Dow, `Sir Douglas Robb', in N. Tarling (ed.), *Auckland Minds & Matters*, Auckland, 2004, pp. 28-46.

[82] John Maxwell (`Marcus') Clarke (1899-1971) graduated MB ChB NZ 1920. He was Director of Surgery, Auckland Hospital in 1938. See obituary notice, *New Zealand Medical Journal,* 1971, vol. 73, pp. 372-4.

[83] Robb and his colleagues, who also included Dr Cyril Tewsley, were dismissed by the Auckland Hospital Board in 1935. See Robb, *Medical Odyssey*, pp. 50-3.

[84] Sir Alfred Kingsley North (1900-81) was an Auckland lawyer.

[85] Kenneth Alfred Kingsley North (b. 1930) graduated MB ChB NZ 1954.

[86] Doris Gordon (1890-1956) graduated MB ChB Otago in 1916. She was the leading figure in the 1927 formation of the New Zealand Obstetrical Society and was instrumental in raising funds for the chair of obstetrics at the University of Otago in 1930, and for the later postgraduate chair at National Women's Hospital. In 1954 she was the first female medical practitioner to be elected an honorary fellow of the Royal College of Obstetricians and Gynaecologists. See Linda Bryder, 'Gordon, Doris Clifton 1890-1956'. *Dictionary of New Zealand Biography*, updated 7 July 2005, URL: http://www.dnzb.govt.nz/. The original version of this biography was published in the *Dictionary of New Zealand Biography* Volume Four (1921-1940), 1998.

of obstetrics in New Zealand. The programme still runs but I've been involved in actually having to change that both in terms of its teaching format, but now of course it's pitched not only at GPs but also midwives because of the changes in maternity in New Zealand.

So very briefly, what is happening now and in the future? Well, the whole environment in New Zealand has changed, you're probably aware that the last women's hospital in New Zealand, Christchurch Women's Hospital, will shortly close and shift on to the Christchurch Hospital campus,[87] and National Women's has already done so and moved into the Auckland Hospital site. And I think this is a national trend, a social trend, an interesting one because it's not necessarily being followed by all countries in the Western world and it will be interesting to see how that change evolves.

But in terms of the academic unit and the future there, well, many of the challenges still remain, but the era of physiology and steroid biochemistry has really largely gone and we are really in an era now of molecular biology, molecular genetics. And as I was preparing for this we are either looking at the major problems in obstetrics, staring them in the face and failing to see, or in fact there's not an easy answer and in fact we are going to have to do the hard yards and try and come up with new ways of looking at things and I believe that we can do that. We're going to need to do that though by recruiting good people and to do that we are going to need to maintain the achievements that we have had in the past, and I think we do have to try our hardest to maintain the links between the clinician, the hospital and the lab. I think we could mull over whether the clinician scientist, the people like Mont Liggins and Bill Liley, whether that kind of person can exist. The fact of being required to be highly trained in clinical medicine and be highly trained in laboratory medicine and whether that's possible in the current environment. I suspect there are some exceptional people where that is possible, but by and large that may be less easy now than it was a generation ago.

And finally what I think that we could perhaps learn, and perhaps could learn from Mont, is that we need to be careful that we don't put a lot of impediments in the way of research. Mont used to be able to run some of his sheep in Cornwall Park[88], grant applications didn't have to be 35 pages long and 15 copies and go through various iterations and then even highly-rated grants have a hit rate of say 20 or 30% in getting funded. When we are in that kind of environment it is very difficult for researchers to get funding and to keep projects going. Nevertheless, I think there are notable examples, including in Auckland where people have been successful, and one example is within the Liggins Institute and the work that they are doing within Auckland. So I am optimistic but I think the environment has changed and the way we think and work is different from the days of National Women's but we need to rise to the challenges if we are going to keep up the excellence that we've had. Thanks, Linda.

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[87] See K. D. Drayton, *Christchurch Women's Hospital – the first fifteen years*, Christchurch, c.1990.
[88] Cornwall Park was gifted to the people of Auckland by Sir John Logan Campbell in 1901. See John Stacpoole, *Cornwall Park: A Handbook*, Auckland, 1985. Campbell, who graduated MD Edinburgh in 1839, is acknowledged as the `Father of Auckland'.

Linda Bryder: Thanks, Peter. One of the features of a witness seminar that I'd forgotten about was that historians were supposed to be allowed the opportunity to ask questions of witnesses and we've just about come to a close because we haven't got a lot of time but I have an historian here who wants to ask a question.

Derek Dow: The token historian obviously. This actually links directly to what you were saying at the end there, Peter, but it's something that's been nagging away at the back of my mind all afternoon. Twenty years ago I wrote a history of the Royal Maternity Hospital in Glasgow, [89] and at that stage the trend was that you wrote the history then you spoke to the people who had been involved, just to clarify things, and I met Ian Donald. After the book was published he came up for one of the anniversary events, and I was chatting to him about the introduction of ultrasound and he said that he'd managed to scrape together the first machine with help from a commercial company. But then he had the problem of how to actually get it near the patient, and the hospital board didn't want to know, the university didn't want to know. So he went into the hospital late at night when the catering officer had gone home, stole one of the trolleys that they wheeled over to the bed, cut it out and, I suspect, painted it to disguise it, and that was how he managed to get his equipment to the patient. And the question for you is, did you have the same trouble in Auckland trying to get funding for very basic things? Did you have the same Heath Robinson[90] approach in the 1960s for doing it?
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Linda Bryder: Who would like to answer that one? I think we've already heard about Jack Matthews's attempts to get things.

Penelope Dunkley: The secret was to make friends with everybody, particularly the person who had the signature for supplies. I mentioned the first resuscitation table. When we were developing the transportation of newborn babies we needed a box to put all the things in – fishing tackle box – I found the model, the lady signed the chit, I got the box and then I got a rocket – that's the way to do it (laughter).

Linda Bryder: We can see where the real power lay at National Women's Hospital. But on that happy note I'm afraid I'll have to – I'm not going to try and make any conclusions because the discussion has been wide-ranging, most informative and very, very interesting, and thank you everyone who contributed this afternoon. It was just a wonderful event and thank you for coming. I hope you got something out of it, and, if nothing else, I'm sure you've met some of your old mates which is always a good thing to do. Thank you very much.

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[89] Derek A. Dow, *The Rottenrow: The History of the Glasgow Royal Maternity Hospital 1834-1984,* Carnforth, Lancs, 1984.
[90] William Heath Robinson (1872-1944), an artist and illustrator, caricatured the machine age with his cartoons of bizarre inventions. The phrase `Heath-Robinson contraption' entered the English language before the First World War.

Biographical Notes on Participants

Arroll, Bruce (b. 1952), MB ChB Auckland 1979, PhD Auckland 1993, FRNZCGP, FAFPHM. Associate Professor and Head of Department, Department of General Practice and Primary Health Care, University of Auckland

Becroft, David Maxwell O'Neill (b. 1928), MB ChB NZ 1952, MD NZ 1962, FRCPA 1967, FRCPath 1978, hon FRANZCOC 1986, ONMZ 2001. Paediatric pathologist, National Women's Hospital 1959-92; World President of the International Paediatric Pathology Association 1998-2000

Berridge, Virginia , Professor of History and Head of the History Group, Health Promotion Research Unit, Department of Public Health and Policy at the London School of Hygiene and Tropical Medicine since 1998.

Bryder, Linda (b. 1956). Associate Professor, Department of History, University of Auckland. Currently writing a history of National Women's Hospital.

Clarkson, Patricia Mary (b. 1934), MB ChB NZ 1957, FRACP 1974. Paediatrician at National Women's Hospital 1971-99, clinical teacher University of Auckland School of Medicine 1974-99; research interests include growth and development in infants with congenital heart disease.

Dow, Derek (b. 1950). Medical historian, honorary senior lecturer, Department of General Practice, University of Auckland

Dunkley, Penelope (b. 1935). Trained in nursing at St George's and Middlesex Hospitals, London Came to NZ in 1964; supervisor of the Neonatal Unit and tutor sister, National Women's Hospital 1970-84, Assistant principal nurse paediatrics, Auckland Hospital 1984-5, nurse tutor, Waiariki Polytechnic, Rotorua 1986-95..

Farmer, Keitha (b. 1928), MB ChB NZ 1950, DCH Eng 1956, PhD London 1963, FRACP 1972, FRCP Edinburgh 1972. Paediatric tutor 1960 then paediatrician 1964-70, Princess Mary Hospital for Children, Auckland 1960. Paediatrician for neonatal research, National Women's Hospital 1970-93.

Howie, Ross Nisbet (b. 1936), MB ChB NZ 1956, FRACP 1978. Associate Professor of Neonatal Paediatrics, University of Auckland, 1977-95; worked at National Women's Hospital 1962-95.

Knight, David Bower (b. 1949) MB ChB Oxford 1973, MRCP 1975, FRACP 1982. Trained in paediatrics in the UK, arrived in NZ 1977 then worked in Australia 1983-4. Replaced Jack

Matthews as full-time neonatal paediatrician, National Women's Hospital 1984. Later Clinical Director Newborn 1989-2000 and Clinical Leader 2002-

Lancaster, Paul Angus Llewellyn (b. 1941), MB BS Syd 1966. Consultant in Reproductive Health and Birth Defects, Conjoint Associate Professor, School of Women's and Children's Health, University of New South Wales. First director of National Perinatal Statistics Unit, University of Sydney, 1979-97.

Laurie, Ray (b. 1934) MB ChB NZ 1956. Worked at National Women's Hospital 1955-61 then Green Lane Hospital 1964-92

Lewis, Bruce, MB BS Queensland 1970.

Liley, Helen Gwendolin, MB ChB Auckland 1979, American Boards Certification in Pediatrics and Neonatal/Perinatal Medicine 1987, FRACP 1998. Consultant appointment, Joint Program in Neonatology, Boston, USA 1991-5, Medical Director (Neonatology), Christchurch Women's Hospital 1995-8, Senior Staff Specialist Neonatal Paediatrician, Mater Health Services Brisbane Ltd, 1998-date. Daughter of Sir William Liley.

Liley, Helen Margaret Irwin *née* Hunt (b. 1928), MB ChB NZ 1953. Resident neonatal paediatrics officer 1954, then physician for prenatal and postnatal instruction of parents, National Women's Hospital 1957-84. Assistant Director of Medical Services, Plunket Society, 1966-. Wife of Sir William Liley.

Mantell, Colin David (b. 1939), MB ChB NZ 1964, MROG 1970. Appointed to National Women's Hospital 1967, studied in Oxford 1970-2 then returned to National Women's Hospital 1973; Senior Lecturer in O&G University of Auckland 1973-7 then Professor of O&G 1977-2005, and HOD 1989-93; Clinical Director Child Mother and Family, South Auckland Health, Middlemore Hospital 1994-.

MacArthur, Barton (b. 1929), PhD 1977. Senior Lecturer, Department of Education, University of Auckland, 1968-. Involved with Child Development Unit, National Women's Hospital 1985-2003. Principal investigator for research into cognitive development for the steroid trial.

Pattison, Neil Spencer (b. 1950), MB ChB Auckland 1974, MD Auckland 1990, FRCOG 1991, MMedSc 1996. Private Obstetrician. Associate Professor in O&G, National Women's Hospital.

Sayers, Susan Mary, MB BS Sydney 1968, DCH RCPSG 1970, American Boards in Pediatrics 1974 , FRACP 1975, American Sub-Boards in Perinatology and Neonatology 1977, PhD 1999. Founder and Chief Investigator, Aboriginal Birth Cohort Study 1987-, Menzies School of Health Research, Darwin, Australia.

Scott, Sir (Philip) John (b. 1931), BMedSci NZ 1942, MB ChB NZ 1955, MD Birmingham 1962, FRACP 1966, FRCP Lond 1975, FRS NZ 1987. Professor of Medicine, University of Auckland 1975-96. HOD, Department of Medicine 1979-87 then Head, Academic Unit, Middlemore Hospital 1988-97. President Royal Society of New Zealand 1998-2000. KBE 1987.

Stewart, John Hamlyn (b. 1922), MB ChB NZ 1946, FRCR 1957, FRACR 1968. Radiologist, National Women's Hospital, 1955-87.

Stone, Peter Richard (b. 1951), MB ChB Auckland 1976, MRCOG 1982. Professor (since 1998) and Head of Department, Department of Obstetrics and Gynaecology, University of Auckland. President New Zealand Perinatal Society.

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