IN THE CORONERS COURT
OF VICTORIA
AT MELBOURNE

Court Reference: COR 2008 001481

FINDING INTO DEATH WITH INQUEST

Form 37 Rule 60(1)
Section 67 of the ***Coroners Act 2008***

Inquest into the death of EDDIE TECK CHUAN LEE

Delivered on:	21 January 2014
Delivered at:	Coroners Court of Victoria Level 11, 222 Exhibition Street Melbourne, Victoria
Hearing dates:	1 and 2 October 2012
Findings of:	Coroner Paresa Antoniadis SPANOS
Police Coronial Support Unit Assisting the Coroner:	Leading Senior Constable Nadine Harrison.

I, PARESA ANTONIADIS SPANOS, Coroner,
having investigated the death of EDDIE TECK CHUAN LEE
and having held an inquest in relation to this death on 1 and 2 October 2012
in MELBOURNE
find that the identity of the deceased was EDDIE TECK CHUAN LEE
born on 4 August 1941, aged 66
and that the death occurred on 12 April 2008
at the Dandenong Hospital, 135 David Street, Dandenong Victoria 3175

from:

1 (a) INTRACEREBRAL HAEMORRHAGE.

in the following circumstances:

BACKGROUND AND PERSONAL CIRCUMSTANCES

1. Mr Lee was a 66-year-old man who lived with his wife, Ms Siok Eng Song, in Lyndhurst. He had a history of significant cerebrovascular disease, previously intracerebral haemorrhages, hypertension, hypercholesterolemia and had been a smoker.
2. On 24 March 2008, he presented at the Dandenong Hospital with a headache, confusion and right-sided weakness. He was transferred to the Emergency Department, where a CT brain scan performed in the early hours of 25 March 2008 revealed a large left parietal haemorrhage with surrounding oedema and sulcal effacement.
3. Mr Lee was initially treated by stroke services at the hospital. A second CT scan on 26 March 2008 and third CT scan on 27 March showed no changes in the initial size of the haemorrhage, but an extension of the haemorrhage in to the intraventricular region which had not initially been seen.
4. Mr Lee was then transferred to the Monash Medical Centre on 26 March 2008 following review by a neurosurgeon on 1 April 2008 who considered that surgical intervention by way of drainage of the haematoma was not appropriate in the circumstances. A CT scan on 31 March 2008 continued to demonstrate no marked change.
5. It was noted that Mr Lee had developed a swollen right leg on around 1 April 2008. A leg ultrasound performed on 2 April revealed extensive thrombosis within the deep venous system of the right leg, and an inferior vena cava filter was implanted.

6. On 4 April 2008, Mr Lee was transferred back to the Dandenong Hospital for ongoing conservative management of his condition. Neurosurgical opinion remained that surgical decompression of the haematoma was not indicated.

7. Following discussion between the Monash and Dandenong medical units, a decision was made to commence Mr Lee on intravenous heparin[1] to keep an APTT[2] of approximately 40-60 seconds.

8. On 7 April 2008, Mr Lee was given an unintentional overdose of heparin. A bolus dose of 20,000 units of heparin was given instead of the prescribed 2,000 units due to nursing staff misreading a heparin vial. The nursing staff believed that the vial contained 2,500 units and gave 4mL of the 5mL solution. In fact, the vial contained 25,000 units.

9. As soon as the nursing staff discovered the error, they suspended the heparin infusion. An urgent CT scan of the brain showed progression of the intracerebral bleed and Mr Lee was intubated and transferred to intensive care as his conscious state was deteriorating.

10. Attempts to control the bleed over the subsequent three days were unsuccessful and, on 10 April 2008 it was determined that Mr Lee would not recover. After consultation with Mr Lee's family he was extubated and palliative care was commenced. Mr Lee died on 11 April 2008.

CORONIAL INVESTIGATION AND DECISION TO HOLD AN INQUEST

11. There is a power to hold an inquest as part of the coronial investigation of any reportable death.[3] The decision to hold an inquest was largely to investigate the circumstances in which Mr Lee died, specifically, how it was that Mr Lee was mistakenly given an overdose of heparin, whether there was a causal connection between the quantity of the heparin dose accidentally administered and Mr Lee's death and to explore opportunities for prevention of similar cases in the future.

12. This finding draws on the totality of the material the product of the coronial investigation of Mr Lee's death. That is, the investigation and inquest brief compiled by Sergeant Greig McFarlane, the statements, reports and testimony of those witnesses who testified at inquest and any documents tendered through them. All this material, together with the inquest transcript, will remain on the coronial file. In writing this finding, I do not purport to

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[1] Heparin acts as an anticoagulant, preventing the formation of clots and extension of existing clots within the blood.

[2] APTT (Activated Partial Thromboplastin Time) is a measure of part of the blood-clotting pathway.

[3] As to the requirement and discretionary power to hold an inquest, see section 52 of the *Coroners Act 2008*.

summarise all the material and evidence, but will refer to it only in such detail as appears to me to be warranted by its forensic significance and the interests of narrative clarity.

PURPOSE OF A CORONIAL INVESTIGATION

13. The purpose of a coronial investigation of a *reportable death*[4] is to ascertain, if possible, the identity of the deceased person, the cause of death and the circumstances in which death occurred.[5] The *cause* of death refers to the *medical* cause of death, incorporating where possible the *mode* or *mechanism* of death. For coronial purposes, the *circumstances* in which death occurred refers to the context or background and surrounding circumstances, but is confined to those circumstances sufficiently proximate and causally relevant to the death, and not merely all circumstances which might form part of a narrative culminating in death.6

14. The broader purpose of any coronial investigations is to contribute to the reduction of the number of preventable deaths through the findings of the investigation and the making of recommendations by coroners, generally referred to as the prevention role.7 Coroners are also empowered to report to the Attorney-General in relation to a death; to comment on any matter connected with the death they have investigated, including matters of public health or safety and the administration of justice; and to make recommendations to any Minister or public statutory authority on any matter connected with the death, including public health or safety or the administration of justice.[8] These are effectively the vehicles by which the prevention role may be advanced.[9]

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[4] The *Coroners Act 2008,* like its predecessor the *Coroners Act 1985*, requires certain deaths to be reported to the coroner for investigation. Apart from a jurisdictional nexus with the State of Victoria, the definition of a reportable death in section 4 includes deaths that appear *"to have been unexpected, unnatural or violent or to have resulted, directly or indirectly, from accident or injury"* and the *death of a person who immediately before death was a patient within the meaning of the Mental Health Act 1986"*. It is clear that Mr Lee's death falls within this definition.

[5] Section 67(1) of the *Coroners Act 2008*. All references which follow are to the provisions of this Act, unless otherwise stipulated.

[6] This is the effect of the authorities – see for example Harmsworth v The State Coroner [1989] VR 989; Clancy v West (Unreported 17/08/1994, Supreme Court of Victoria, Harper J.)

[7] The 'prevention' role is now explicitly articulated in the Preamble and purposes of the Act, cf: the *Coroners Act 1985* where this role was generally accepted as 'implicit'.

[8] See sections 72(1), 67(3) and 72(2) regarding reports, comments and recommendations respectively.

[9] See also sections 73(1) and 72(5) which requires publication of coronial findings, comments and recommendations and responses respectively; section 72(3) and (4) which oblige the recipient of a coronial recommendation to respond within three months, specifying a statement of action which has or will be taken in relation to the recommendation.

FINDINGS AS TO UNCONTENTIOUS MATTERS

15. In relation to Mr Lee's death, most of the matters I am required to ascertain, if possible, were uncontentious from the outset. His identity, the date, place and medical cause of death were never at issue. I find, as a matter of formality, that Eddie Teck Chuan Lee born on 4 August 1941, aged 66, late of 125 Aylmer Road, Lyndhurst Victoria 3975 died at the Dandenong Hospital, 135 David Street, Dandenong Victoria 3175 in the early hours of 12 April 2008.

MEDICAL CAUSE OF DEATH

16. An autopsy of Mr Lee's body was not conducted as an objection to autopsy under section 29 of the *Coroners Act 2008* was lodged by the family of Mr Lee and was upheld. Senior Forensic Pathologist Dr Matthew J Lynch from the Victorian Institute of Forensic Medicine (VIFM) conducted an external examination of Mr Lee's body, reviewed his medical records, police report of death and medical deposition and provided a written report of his findings.
17. On the basis of the available medical history and other information, and in the absence of a full post mortem examination given the family's objection, Dr Lynch stated that it would be reasonable in the circumstances to attribute Mr Lee's death to *intracerebral haemorrhage*, and recommended that the Court's Clinical Liaison Service (now the Coroners Prevention Unit)[10] review Mr Lee's medical management. Dr Lynch was not prepared to make any more than a temporal connection between the accidental overdose and Mr Lee's death upon external examination, and noted that his APTT immediately after the administration of the overdose was normal.

CLINICAL MANAGEMENT AND CARE

18. An overview of the clinical management and care provided to Mr Lee was given by Mr Michael Pullar, consultant neurosurgeon at Monash Medical Centre.
19. Mr Pullar explained that on 1 April 2008 Mr Lee became systemically unwell including fever, dehydration, was tachopnoeic and tachycardic and developed a swollen right leg, and a clinical diagnosis of deep vein thrombosis (DVT) with possible pulmonary embolism was made. An ultrasound confirmed the presence of extensive DVT in the right lower leg.
20. Considering Mr Lee's risk of increased intracerebral bleeding with therapeutic anticoagulation for treatment of the DVT, Mr Pullar stated that it was decided to insert an inferior vena cava

[10] The Coroners Prevention Unit is a specialist service comprising a team of investigators and health clinicians, which assists coroners fulfil their prevention role and contribute to a reduction in preventable deaths.

(IVC) intravascular filter to prevent pulmonary embolism and avoid therapeutic anticoagulation. Mr Lee was then transferred back to Dandenong Hospital on 4 April 2008.

21. Mr Damian Burns, Nurse Unit Manager, SouthWest Four Dandenong Hospital, provided an overview of the clinical care provided to Mr Lee upon his return to Dandenong Hospital on 4 April 2008.

22. Mr Burns stated that a standard heparin infusion of 2,000 units was commenced in the early hours of 5 April 2008 using a pre-prepared flask from the pharmacy at half the usual protocol prescribed rate (5,000 units). Mr Lee developed a fever which was treated with paracetamol, reviewed by the treating medical team and continuation of the current management was ordered.

23. At 2.00pm on 5 April, Mr Lee was transferred to a stroke bed. His heparin infusion was maintained. At 5.45pm on 6 April 2008, Mr Lee's heparin infusion rate was increased to and a bolus of 2,000 units of heparin was given. Mr Burns stated that just after midnight on 7 April 2008, Mr Lee's APTT was 25 seconds. The heparin infusion rate was increased to 10.5mL/hour and a bolus of 2,000 units was ordered.

24. Registered Nurse Ms Rochelle Bunn was caring for Mr Lee at the time and was responsible for administering his medications and those of eleven other patients. Ms Fiona Wong was the Assistant Nursing Unit Manager on the morning of 7 April 2008. Ms Bunn and Ms Wong both stated that their shift was a particularly busy one.

25. At 2.20am, Ms Bunn was ordered to administer 2,000 units of heparin intravenously. She collected an ampoule of heparin, which she read as being 2,500 units in 5mL, and drew 4mL into a syringe based on a concentration which she believed to be 500 units per mL, or 2,000 units. Ms Bunn had in fact collected a 25,000-unit ampoule of heparin and, in drawing 4mL, had drawn 20,000 units.

26. The two 5mL heparin ampoules available for use on the ward at the time of Mr Lee's death were in 5,000 unit and 25,000 unit measurements. The two ampoules are the same size and shape, but have different coloured text printed on them. To the knowledge of Mr Burns, a 2,500-unit ampoule was never available for use on the ward.[11]

27. Ms Wong was on the telephone at the time making staffing arrangements for the next morning's shift, this being part of her duties as Assistant Nursing Unit Manager. Ms Bunn brought the medication order and the syringe in a kidney dish to Ms Wong to have her check

[11] Even if Ms Bunn had selected the correct 5,000-unit ampoule, she should have only drawn 2mL into the syringe, not 4mL. It is possible that Ms Bunn's statement that she believed she had collected a 2,500 unit ampoule might therefore have been due to her attempting to reconcile in her mind, in hindsight, the reason for the mistake occurring.

the dosage. Ms Bunn states that Ms Wong pointed at the order whilst she was on the phone and Ms Bunn understood her to be confirming that it was for 2,000 units of heparin. Ms Bunn acknowledged this, left Ms Wong and administered the medication to Mr Lee.

28. Ms Wong stated that when Ms Bunn presented the syringe to her, she noticed that something was wrong as there appeared to be a large quantity of heparin in the syringe, or more than the order for 2,000 units. Ms Bunn did not show Ms Wong the ampoule from which she had drawn the heparin. Ms Wong pointed at the medication order whilst she was on the telephone to alert Ms Bunn to this, and stated that Ms Bunn acknowledged and then walked away. Ms Wong stated that she then finished on the telephone and quickly ran to follow Ms Bunn to Mr Lee's bed, but that she had already administered the heparin.

29. Ms Bunn stated that she immediately realised her error upon administering the heparin when she realised that there was 4mL of liquid in the syringe instead of 2mL. She turned off the heparin infusion and, given Mr Lee's haemorrhage, elevated his head by winding up the hospital bed. Ms Bunn then immediately called the nursing coordinator and the night medical officer, who consulted the medical registrar who was involved in the medical management of Mr Lee.

30. Ms Bunn explained in her statement that it was hospital protocol for two Division 1 Nurses to take an intravenous drug to the patient's bedside to administer it together and for both nurses to check the patient at the same time. However, Ms Bunn stated that this does not always occur in practice due to the nurses' workloads during night shifts and that common practice was for two nurses to check the drug and the medication order and then for one nurse to administer the medication to the patient alone. In her testimony, Ms Bunn stated that she asked Ms Wong to check the heparin dose she had prepared for Mr Lee, but acknowledged that she should have waited for Ms Wong to accompany her whilst she administered it.

ALLOCATION OF NURSES TO PATIENTS

31. Ms Wong stated that she worked a permanent, full time night duty shift from 9.00pm to 7.30am, and that there were usually five nurses – four Division 1 nurses and one Division 2 nurse – per shift. Ms Wong was responsible for allocating nurses to patients, answering telephone calls, replacing any staff shortages for the next shift and arranging staff break times.

32. On 6 April 2008, Ms Wong states that she allocated eight patients each to herself and two other Division 1 nurses, and that Ms Bunn and the Division 2 nurse were allocated 12 patients between them. The Division 2 Nurse was providing patient care and carrying out patient observations, but was not qualified to administer medication.

33. Mr Burns stated that Ms Bunn was a nurse of eight years experience, and that Ms Wong was a nurse of greater than 20 years experience. He said that both nurses were regular staff with intimate knowledge of the ward environment and routine policies.

SOUTHERN HEALTH RESPONSE

34. Southern Health accepts that Mr Lee was administered 20,000 units of heparin in error, and that the correct dose ordered was 2,000 units.

35. Mr Burns stated that 25,000-unit ampoules of heparin were immediately removed from the ward's drug room as they are not routinely required. Where they are required, they can be ordered through the Southern Health pharmacy.

36. In his testimony, Mr Burns acknowledged that Mr Lee's two conditions, being the haemorrhage and DVT, were extremely difficult to treat together and that the administration of anticoagulants to a patient with a bleed carries some risk. Mr Burns further stated that he expected that a nurse working in the stroke ward in which Mr Lee was admitted should have an understanding of this clinical complexity. Further, Mr Lee was being prescribed less than the protocol dose of anticoagulants for patients with a 'normal' risk of DVT because of his increased risk of bleeding.

37. Significant changes have been made to the way that heparin is made available on the ward following Mr Lee's death. Heparin is now only available in pre-prepared bags with saline.

38. At the time of Mr Lee's death, nurses would administer heparin by obtaining a regular saline bag and injecting a dose of prepared heparin into the bag. Mr Burns stated that this technique left room for errors and also relied on a sterile technique being employed by nursing staff.

39. On 5 April 2008, a 'pre-prepared heparin infusion' was administered to Mr Lee. Mr Burns stated that this was not the same as the pre-prepared bags that were introduced as part of the change to hospital protocol, but were bags that were prepared by the hospital pharmacy in the same way that the nurses were required to prepare the medication.

40. One of the limitations of the change in protocol is that doctors are no longer able to order their own concentrations of heparin as they could in the past, but must use the standard concentrations available.

41. Southern Health also made changes to the protocol in relation to nurses crosschecking the administration of medication on the ward, with the introduction of a protocol for the single administration of medication. Certain drugs are deemed single-check medications and do not need to be double-checked by a second Division 1 nurse before being administered. Mr Burns opined that the current protocol is safer because it addresses a tendency to rely on the double-

checking process under the protocol that was in place on 7 April 2008, and because it became evident that nurses were so busy overnight that they were unable to comply with the protocols that were in place at the time of Mr Lee's admission.

42. Other drugs, including heparin, must still be double-checked, in order to signify that such drugs are high risk and require careful checking by a second nurse.

43. The investigation also considered that the complexity of Mr Lee's condition could have been better communicated to nursing staff who ultimately administer medication, in order to alert them to the need to exercise extreme care. Dr Li acknowledged that this was a valid comment as Mr Lee's condition was verbally communicated to medical staff and to his family, but might not have been so clearly articulated to nursing staff.

44. Mr Burns stated that the hospital's medication administration protocol has been reinforced with all staff to follow without exception, and staff have also received further education in performing consistent and reliable Glasgow Coma Scores.[12]

INDPENDENT OPINION

45. Mr Brendan O'Brien, consultant neurosurgeon at St Vincent's hospital, provided an independent clinical opinion on the care provided to Mr Lee. Mr O'Brien reviewed Mr Lee's medical records, Southern Health clinicians' statements, family letters of concern and the medical examination report prepared by Dr Lynch.

46. Mr O'Brien was asked to consider the decision to commence intravenous heparin, and whether the increased heparin dose led to Mr Lee's death.

47. Mr O'Brien stated that it appeared that further haemorrhage occurred on Mr Lee's subsequent CT following the administration of the increased dose of heparin. Mr O'Brien noted that Mr Lee initially presented with a well-documented history of cerebrovascular disease and three previous intracerebral events from which he had largely recovered.

48. Regarding the initial decision to commence intravenous heparin, Mr O'Brien commented that this was a risky one in the setting of such a large intracerebral haematoma, and that even a small additional haemorrhage around this lesion could have been predicted to cause intolerable mass effect and secondary irretrievable raised intracranial pressure. Mr O'Brien

[12] Glasgow Coma Scale is a standardised system for assessing response to stimuli in a neurologically impaired patient; reactions are given a numerical value in three categories (eye opening, verbal responsiveness, and motor responsiveness), and the three scores are then added together. The lowest values are the worst clinical scores. (Source: Dorland's Illustrated Medical Dictionary, 30th Edition).

indicated a preference for subcutaneous injection rather than intravenous infusion of heparin[13] and noted that it did not appear that Mr Lee's APTT was kept within the normal range. He noted that the decision to insert the IVC filter to prevent a pulmonary embolus in the setting of a very significant DVT was an important one, and endorsed the decision.

49. Regarding the risks of intracerebral haemorrhages increasing in size in patients also being treated with anticoagulants, Mr O'Brien stated that the major risk is in the first 24 hours and the risk of extension of the haemorrhage without anticoagulation is ten to 15 per cent and that the risk falls to approximately one per cent after the first few days. Mr O'Brien attributed this information to several studies, and at inquest he explained that there was up to date published observational data on this issue, which was available in February 2012, but not at the time of Mr Lee's death.[14] However, Mr O'Brien stated that many of the studies that were reviewed in the publication were conducted pre-2008.

50. Mr O'Brien recognised the possibility that Mr Lee's deterioration could have occurred regardless of the increased heparin dosage and that in the presence of a large haematoma, as increasing mass effect would have been occurring over the first seven to ten days with increasing oedema in and around the area. At inquest, Mr O'Brien was asked whether he thought it was possible that Mr Lee's second haemorrhage, revealed on the CT scan performed after the heparin overdose, could have already been occurring prior to the overdose. He testified that, in the absence of any interval CT scans, this possibility could not be excluded, but that it was less likely, because there had been a period of stability and no clear clinical indication of a deterioration in Mr Lee's condition, before the heparin overdose.

51. Mr O'Brien concluded that the inadvertent increased heparin dosage led to the secondary haemorrhagic event, which acted as a catalyst for further raised intracranial pressure and Mr Lee's clinical deterioration. He agreed with the medical advice that neurosurgical evacuation of the extended intracerebral haemorrhage at that time, given Mr Lee's Glasgow Coma Score of five, was extremely unlikely to lead to an improved prognosis. At inquest, he concluded that there was greater than merely a temporal link and a likelihood of a causal link, but that there was no clear objective evidence by way of APTT. Mr O'Brien agreed that the protocol at

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[13] Dr Qiang Li, who attended Mr Lee in the capacity of medical registrar on the evening of 4 April 2008, stated at inquest that he believed the matter to be less clear-cut as, in his opinion, intravenous heparin administration was more easily monitored and reversible than subcutaneous injection, as the drug remains active for eight to twelve hours when administered subcutaneously.

[14] Eelco FM Wijdicks, 'Anticoagulant and antiplatelet therapy in patients with an acute or prior intracerebral haemorrhage' (2012).

Southern Health to test a patient's APTT every six hours once they were within the therapeutic range was appropriate.

52. Regarding actions taken after it was known that the heparin dose was administered, Mr O'Brien stated that protamine sulphate, an antidote for heparin, could have been administered and expressed some bewilderment that it was not administered to Mr Lee following the heparin overdose. Dr Darren Mansfield, Head of General Medicine at Dandenong Hospital, stated at inquest that this was a fair consideration and that the decision not to do so was unclear.

53. It appears that a decision was instead made to retest Mr Lee's APTT after the heparin overdose. Dr Mansfield commented that, given that it remained within the target range, this might have been the reason for the decision not to administer the antidote. He also stated that in the event that an excessive dose of heparin is administered, there is a time delay in then conducting a blood test in order to determine the patient's APTT. Dr Mansfield stated that in this respect, there might have been a time critical error in Mr Lee's medical management as an alternative option would have been for medical staff to order the administration of protamine sulphate immediately after recognition of the inadvertent overdose. Dr Mansfield was of the view that both clinical courses were appropriate in the circumstances.

CONCLUSION

54. The standard of proof for coronial findings of fact is the civil standard of proof, on the balance of probabilities, with the *Briginshaw* gloss or explication.[15] The effect of the authorities is that coroners should not make adverse findings against or comments about individuals or institutions involved in the clinical management or care of the deceased, unless the evidence provides a comfortable level of satisfaction that their negligence and/or departure from the generally accepted standards of their profession caused or contributed to the death.[16]

55. I do not make findings regarding the decision to prescribe or administer heparin to Mr Lee in the first place, as I am satisfied on the evidence that this was a complex clinical decision given

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[15] *Briginshaw v Briginshaw (1938) 60 C.L.R. 336 esp at 362-363.* "The seriousness of an allegation made, the inherent unlikelihood of an occurrence of a given description, or the gravity of the consequences flowing from a particular finding, are considerations which must affect the answer to the question whether the issues had been proved to the reasonable satisfaction of the tribunal. In such matters "reasonable satisfaction" should not be produced by inexact proofs, indefinite testimony, or indirect inferences..."

[16] *Anderson v Blashki [1993] 2 VR 89 at 95; Secretary to the Department of Health & Community Service v Gurvich [1995] 2 VR 69 at 73-74; Re State Coroner; ex parte Minister for Health (2009) 261 ALR 152 at [21].*

his medical history, haemorrhage and DVT. However, the focus of the investigation is the circumstances under which the increased quantity of heparin was administered.

56. I am satisfied, based on the evidence before me, that the increased heparin dose administered to Mr Lee was due to a human error in the settings of systems failure, and that the similarity between the two heparin ampoules significantly contributed to the error. I do not imply any lack of care on the part of the individual nurses involved, and accept that they were doing their best in the circumstances which included a busy shift, whether busier or as busy as usual.

57. I appreciate that Ms Bunn admitted the error as soon as she realised it, and commend her for doing so. I understand that this incident has had a tremendous effect on her personally. I also acknowledge that Ms Bunn and Ms Wong took immediate action but, unfortunately, it appears that it was too late.

58. However, it has to be noted that Ms Bunn's statement that the error occurred due to her misreading the ampoule as containing 2,500 units of heparin, sits uncomfortably with the fact that heparin was only available in 5,000-unit and 25,000-unit ampoules on the ward, as she should have been aware. It is therefore remains unclear precisely how the mistake occurred, but this case serves as an example of the risk inherent whenever nursing staff are expected to perform quick mental arithmetic in the setting of a busy hospital ward.

59. I have also considered the evidence of systems improvements presented by Southern Health, and note that the introduction of pre-prepared heparin is a clear solution to the problem in question. I acknowledge the actions of Southern Health in this regard.

60. Southern Health also presented evidence of changes made to the protocol for checking medication before administration to patients, and changes in the allocation of nurses to patients on the ward. Whilst heparin is one of the medications that must still be checked by two nurses on the ward, I accept that the change in protocol for checking medications assists by communicating clearly to staff that certain medications do require special attention and assists to reduce the risk of accidental administration of incorrect doses when double-checking.

61. Whilst I do not make adverse findings against the individuals involved, it is clear that that Mr Lee was administered an increased dose of heparin, being 20,000 instead of the required 2,000 units. I am satisfied that the weight of the evidence before me supports a finding of a causal and not merely temporal connection between this administration error and Mr Lee's death. Moreoever, through its counsel, Southern Health accepts Mr O'Brien's opinion in its entirety, and accepts that on the evidence there is a causal, and not merely temporal link.

I direct that a copy of this finding be provided to the following:

The family of Mr Lee

Southern Health

Mr Brendan O'Brien

Sergeant Greig McFarlane, Police Coronial Support Unit.

Signature:

PARESA ANTONIADIS SPANOS
CORONER
Date: 21 January 2014

cc: Manager, Health and Medical Investigation Team, Coroners Prevention Unit.