

IN THE CORONERS COURT
OF VICTORIA
AT MELBOURNE

Court Reference: 3399/06

FINDING INTO DEATH WITH INQUEST

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

Inquest into the Death of JUDITH ELIZABETH HEATH

Delivered On: 31 January 2012.

Delivered At: Coroners Court of Victoria
Level 11, 222 Exhibition Street
Melbourne 3000

Hearing Dates: 10, 11 and 12 May 2010

Findings of: JANE HENDTLASS

Representation: Leading Senior Constable King Taylor appeared to assist the Coroner
Ms Fiona Ellis appeared for The Alfred

I, JANE HENDTLASS, Coroner having investigated the death of JUDITH HEATH

AND having held an inquest in relation to this death on 10, 11 and 12 May, 2010
at Melbourne

find that the identity of the deceased was JUDITH ELIZABETH HEATH

and the death occurred on 7 September 2006

at The Alfred Hospital, Commercial Road, Prahran, Victoria 3181

from:

1a. COMPLICATIONS ARISING FROM ACUTE BLOOD LOSS

in the following circumstances:

1. Judith Elizabeth Heath was 68 years old when she died. She had lived in Rosebud with her husband, Edwin Heath. Mrs Heath was unable to drive and Mr Heath was elderly and required community assistance with everyday living. In 2000, they had moved from New South Wales to be closer to family supports.

2. Mrs Heath's medical history included appendicitis with peritonitis, diverticular disease, hypertension, depression, mood affective disorders and sleep disorder, polymyalgia rheumatoid arthritis, herpes simplex (shingles), hyperlipidaemia, constipation, obesity and fractures arising from a fall in 2005.

3. In 1994, Mrs Heath was also diagnosed with diabetes mellitus. For about six years, she was able to manage her diabetes using insulin, diet and urine glucose assessments twice a day. However, her condition gradually declined. She was subsequently diagnosed with diabetes-associated hyperkalaemia, renal bone disease, anaemia and chronic then end-stage renal failure.

4. On 23 January 2001, Mrs Heath consulted a general practitioner in Rosebud, Dr Martin Coffey. Dr Coffey remained her general practitioner until she died.

5. On 16 April 2004, Dr Coffey referred Mrs Heath to a nephrologist, Dr Greg Perry. Dr Perry managed the renal failure associated with her diabetes.

6. On 26 January 2006, Mrs Heath was admitted to Frankston Hospital with acute on end-stage renal failure and acute anaemia. On 19 February, she was transferred to The Alfred Urology Unit and required haemodialysis three times a week. On 24 February, Mrs Heath was placed on the waiting list for haemodialysis at Rosebud and Frankston Hospitals.

7. In the absence of available haemodialysis chairs near home, Mrs Heath attended out-patient appointments at The Alfred hospital three times a week from 6 March 2006. She relied on ambulance transport to and from The Alfred.

8. By 20 April 2006, Mr and Mrs Heath were reporting severe stress which they attributed to Mrs Heath having to be ready by 7.00am on three days a week for ambulance transfers that may not arrive until midday and to the lateness of her arrivals home. Mrs Heath was also admitted to The Alfred on three further occasions between March and September 2006 and was particularly susceptible to infection of the haemodialysis access points in her arms.

9. At about 2.30pm on 6 September 2006, Mrs Heath collapsed during haemodialysis at The Alfred when the line from the dialysis machine to Mrs Heath's arteriovenous catheter became disconnected. She lost a large volume of blood and went into cardiac arrest. Mrs Heath was resuscitated but her condition failed to improve.

10. At 4:45pm on 7 September 2006, active treatment was withdrawn and Judith Heath died.

11. The forensic pathologist who performed the autopsy formed the opinion that the cause of death was complications arising from acute blood loss. He also identified cardiac enlargement and triple vessel ischaemic coronary artery disease.

12. Accordingly, I find that Judith Heath died from complications arising from acute blood loss.

13. This Finding will review Mrs Heath's medical history with particular emphasis on:

- Management of her diabetes,
- Management of her end stage renal failure,
- Arrangements for transport to The Alfred for haemodialysis, and
- Malfunction of the dialysis equipment on 6 September 2006.

14. It will then comment and make recommendations intended to prevent other people dying for the reasons that Mrs Heath died.

Management of Mrs Heath's Diabetes

15. On 17 January 2001, Mrs Heath presented to the Rosebud Medical Clinic after she and Mr Heath moved to Rosebud from New South Wales. On 23 January, Dr Martin Coffey reviewed her medical history and established his relationship as Mrs Heath's general practitioner. Dr Coffey reviewed Mrs Heath regularly and prescribed her medication until 22 June 2006.

16. Mrs Heath had a complicated medical history which included chronic lower back pain, severe depression with associated prior suicidal ideation and hospitalisation, mood affective disorders and sleep disorder, diverticular disease, constipation, obesity and shingles. She was also using at least eight Panadiene Forte at night to enable sleep.

17. In 1994, Mrs Heath had been diagnosed with insulin dependent diabetes mellitus. She had learned to manage her diabetes using twice daily sugar tests and managing her diet. She injected her insulin with an insulin pen.

18. By 2004, Mrs Heath's diabetes had caused serious deterioration in her health and quality of life including sudden onset painful double vision attributed to acute left 6th nerve palsy and moderate background diabetic retinopathy associated with her diabetes. She also experienced right leg pain and profound weakness and required a walking frame to get around. This disability was attributed to a moderate neuropathic process affecting motor and sensory fibres in her legs consistent with her underlying diabetes.

Chronic renal failure

19. On 26 January 2004, Mrs Heath was admitted to Frankston Hospital with hyperkalaemia secondary to her diabetes. She was stabilised and discharged home.

20. On 16 April 2004, Dr Coffey sent Mrs Heath to an eye specialist because she was losing her sight. Mrs Heath underwent laser surgery but this was always considered a temporary reprieve from onset of severe blindness.

21. On 16 April 2004, Dr Coffey also referred Mrs Heath to a nephrologist, Dr Greg Perry, for opinion and management of her diabetes-related kidney disease. After this, Dr Perry regularly reviewed Mrs Heath until 22 June 2006.

22. When Dr Perry first assessed her, Mrs Heath's blood pressure was 180/95mmHg, her renal function was only 18% of normal and he confirmed she was suffering from diabetic nephropathy.

23. Mrs Heath's hyperkalaemia and hypertension persisted despite Dr Perry's attempts to manage her chronic renal failure. She also developed symptoms of depression and urinary tract infections.

24. On 8 April 2005, Mrs Heath fell and fractured her arm and leg. These injuries further complicated her capacity to move around.

25. On 1 July 2005, Dr Perry asked Dr Coffey to organise referral to a renal dietician under the Enhanced Primary Care program. Accordingly, on 25 August, a community nurse assessed Mrs Heath for a Care Plan including extra transport and domestic assistance but Mrs Heath did not want any change to her current level of support.

26. On 4 November 2005, Dr Perry added a diagnosis of renal bone disease based on her calcium and phosphate levels. Dr Perry again asked Dr Coffey to organise referral to a renal dietician under the Enhanced Primary Care program. Mrs Heath did not take advantage of this service. On 2 December, Dr Perry wrote to the dietician to say Mrs Heath was unable to go to Frankston to consult with her and asking for written information about potassium to be sent.

27. On 3 January 2006, Dr Coffey began to consider whether Mrs Heath's renal function was further deteriorating. On 11 January, he recorded that Mrs Heath looked and had been unwell. She had stopped taking her antihypertensive medication and her blood pressure was 100/100 mmHg. Dr Coffey reinstated Mrs Heath's anti-hypertensive medication.

28. On 23 January 2006, Mrs Heath presented to Dr Coffey with relapse of her shingles. He prescribed antiviral medication and referred her for a chest x-ray and renal ultrasound. This showed moderate cardiomegaly with ectasia of the thoracic aorta. The lungs were clear.

Management of Mrs Heath's end-stage renal failure

29. On 26 January 2006, Mrs Heath's behaviour became erratic at home. Mr Heath called an ambulance and she was transferred to the Frankston Hospital.

30. At 9.32am on 26 January 2006, Mrs Heath presented at Frankston Hospital with severe hyperkalaemia secondary to acute on chronic renal failure. Her haemoglobin level was 7.8 and she was transfused with four units packed blood cells. Her heart rate was 80 beats per minute. Her ECG showed a long QT.

31. Mrs Heath was admitted to Intensive Care Unit for haemodialysis and then returned to the General Medical Ward. She was diagnosed with end-stage renal failure requiring on-going dialysis.

32. On 19 February 2006, Mrs Heath was transferred from Frankston Hospital to the Renal Unit at The Alfred for management of her end-stage renal failure.

33. The Dialysis Coordinator at The Alfred, Dr Suzanne Douglas, assessed Mrs Heath and found her unsuitable for peritoneal dialysis because of her previous and current medical circumstances including her appendectomy, peritonitis, poor vision and decreased dexterity in her fingers. Therefore, she referred Mrs Heath for on-going haemodialysis.

34. Accordingly, on 24 February 2006, a fistula was created in Mrs Heath's left forearm to enable access for long-term haemodialysis. An arteriovenous permanent catheter (Permacath) was also inserted to enable immediate access. Mrs Heath continued to undergo inpatient haemodialysis three times a week at The Alfred and her name was placed on the waiting list for haemodialysis at the Dialysis Units at Rosebud and Frankston Hospitals.

35. On 4 March 2006, Mrs Heath was discharged home from The Alfred with out-patient appointments for haemodialysis at The Alfred Dialysis Unit three times a week. These appointments commenced on 6 March and, with one exception on 31 May, continued until she died.

36. Mrs Heath's blood was infected with *Vancomycin-resistant enterococci* so she was routinely prescribed antibiotics and her haemodialysis was always undertaken in one of three isolation rooms which open on to the main dialysis room at The Alfred Dialysis Unit. In 2006, these isolation rooms were not monitored by video cameras.

37. Mrs Heath's routine appointment for haemodialysis was booked for 2.30pm.¹ However, she usually commenced dialysing between about 12.30pm or 2.00pm unless she was an inpatient. The procedure took between 2½ hours and four hours. This means that Mrs Heath finished haemodialysis at between about 4.30pm and 6.00pm most days.

38. Before each procedure, 1000IU heparin was administered to Mrs Heath with a further 1000IU per hour. On 10 April, her heparin was increased to an initial bolus of 2000IU with a further 1000IU per hour.

39. On 10 March 2006, Mrs Heath presented to the Emergency Department at Rosebud Hospital with vomiting and diarrhoea and her permanent catheter site seemed red and tender. She was transferred to The Alfred for haemodialysis and surgery to create an arteriovenous fistula in her left forearm to enable haemodialysis which was routinely scheduled for 2.30pm. At 12.30pm, surgery was cancelled and Mrs Heath returned home that day.

40. On 29 March 2006, Mrs Heath was re-admitted to The Alfred for surgery to create the arteriovenous fistula in her left forearm. On 31 March, the fistula was created. On 3 April, a permanent catheter was installed in the fistula. On 5 April, she was discharged home.

41. On 20 April 2006, an Aged Care Nurse assessed Mr and Mrs Heath for home supports and respite care. The nurse reported that Mrs Heath told her she was finding the ongoing haemodialysis at The Alfred very tiring and very stressful particularly since the ambulance was unreliable. Mr Heath was also finding the situation stressful. The Aged Care Nurse formed the opinion that Mr and Mrs Heath required some advocacy support and monitoring by a case manager and provision of additional services such as meal preparation, transport and socialisation.

42. However, on 27 April 2006, Dr Coffey recorded that Mrs Heath looked and had been well.

43. On 3 May 2006, Mrs Heath was admitted to The Alfred overnight because of presumed staphylococcal infection and her left arm fistula was blocked. However, surgery was delayed because of a rash.

44. On 4 May 2006, the peritoneal dialysis educator, Belinda Simon, re-assessed and rejected Mrs Heath for transfer from haemodialysis to peritoneal dialysis because of her obesity, very poor vision, poor manual dexterity, borderline hygiene, impaired cognitive ability and previous abdominal surgery. She also had a current vaginal prolapse and incontinence of urine. Mrs Heath also told Ms Simon she would not want to transfer to peritoneal dialysis if she could have haemodialysis closer to home. Mrs Heath was discharged home with continuing out-patient appointments for haemodialysis at The Alfred.

¹ Mrs Heath's appointment time was changed on 13 occasions.

45. On 11 May 2006, Mrs Heath was reviewed by the Vascular Clinic at The Alfred. The permanent catheter in her left arm had blocked so she underwent an ultrasound of her right forearm arm in preparation for establishing an alternative access point for haemodialysis. The ultrasound showed that Mrs Heath's cephalic vein was not easily assessable so she was referred for surgery to establish an arteriovenous fistula in the right radio-cephalic arteriovenous system with the option of using the brachio-cephalic system if the forearm was inadequate.

46. On 23 May 2006, Mrs Heath was re-admitted to the renal unit at The Alfred with an infection secondary to her diabetes. On 24 May, she underwent surgery for formation of a right radio-cephalic arteriovenous fistula.

47. On 2 June 2006, Dr Perry saw Mrs Heath for a regular assessment. He was concerned about her infected permanent catheters and failed arteriovenous fistula as well as her eyesight and her urinary incontinence. Despite her earlier assessment which found she was unsuitable for peritoneal dialysis, Dr Perry said he would recommend a further evaluation for this dialysis process.

48. On 6 June 2006, Mrs Heath was accepted into the Southern Cross Care (Vic.) Community Aged Care Packages Program. This program provided Mrs Heath with domestic and travel assistance and some meals. Her case manager was Christine Walker.

49. Dr Perry last saw Mrs Heath on 16 June 2006. She was still dialysing at The Alfred and on a waiting list for Frankston or Rosebud Hospitals. In Dr Perry's opinion, Mrs Heath did not seem dangerously depressed:

"I did not think at that time that depression was a major issue. But depression was present, but it was consistent with what I had seen in other people in Mrs Heath's state".

50. Dr Coffey's records indicate that he last saw Mrs Heath on 22 June 2006. Dr Coffey was less concerned about Mrs Heath's mental health than he had been when dialysis commenced. She was coping well and was much more settled. Dr Coffey noted that Mrs Heath was being assessed for ambulatory peritoneal dialysis.

51. On 10 August 2006, the ophthalmologist assessed Mrs Heath's eyesight. Her vision seemed marginally better and he arranged to review again in six months.

52. On 22 August 2006, Mrs Heath was admitted to The Alfred for elective formation of a right brachiocephalic arteriovenous fistula to allow connection of the haemodialysis unit to her blood supply when the fistula in her right forearm was inoperative. However, the surgery was delayed and she was admitted to the renal unit.

53. During this period, Mr Heath spoke to Dr Perry in the corridor at The Alfred. Mr Heath told Dr Perry again that he was concerned about Mrs Heath's mental health. After this conversation, Dr Perry continued to be concerned that Mrs Heath was very depressed but he was not aware of any suicidal ideation.

54. On 24 August 2006, surgery proceeded to establish a right brachiocephalic arteriovenous fistula but Mrs Heath became hypotensive during surgery. She was diagnosed with an intraoperative acute myocardial infarction and underwent coronary artery angioplasty and stenting of 80% stenosis of her mid left anterior descending coronary artery. Mrs Heath's coronary condition stabilised and there were no problems with her fistula.

55. Although Mrs Heath experienced a series of further bradycardic episodes on 27 and 28 August 2006, the cardiologist attributed the collapse to medication and she spontaneously improved.

56. On 1 September 2006, the social worker at The Alfred spoke to Mrs Heath about the support available to ensure she coped with her on-going haemodialysis regime. The social worker also spoke to Ms Walker to ensure that Southern Cross Care was providing appropriate supports at home until Mrs Heath was able to access Rosebud dialysis services, hopefully in two months.

57. Ms Walker told the social worker that Mr Heath was very stressed by Mrs Heath's health but she was also providing Mrs Heath with support around this issue. Ms Walker also confirmed that she would be able to transport Mrs Heath to Rosebud when she transferred to their haemodialysis unit.

58. At 4.20pm on 1 September 2006, Mrs Heath was discharged home in an ambulance with continuing appointments for haemodialysis at The Alfred three times a week. Dr Ukor told Mr Heath that it was possible that a haemodialysis bed would be available for Mrs Heath at Rosebud in two months.

59. The commitment to transfer Mrs Heath to Rosebud for routine haemodialysis in about two months seems unlikely to have been realistic: Dr Douglas told the Court that Rosebud Hospital was unable to accept patients with permanent catheters at that time because there was only one nurse working. That person would be unable to look after both the Permacath patient and the other two patients. Also, if there was a problem with the permanent catheter, the patient would have to go to The Alfred to have the problem sorted out and to continue their haemodialysis.

Effect of travel between Rosebud and The Alfred for haemodialysis

60. Ambulances transporting Mrs Heath to and from The Alfred Dialysis Unit were usually authorised by The Alfred Dialysis Unit and booked by The Alfred transit lounge using telephone communication. These arrangements have now been computerised.

61. Mr Heath believed that Mrs Heath had to be ready by 7.00am to be picked up by the ambulance for transfer to The Alfred for dialysis. Sometimes, she did not get home until 10pm. In particular, Mr Heath told the Court:

"... she never got home before seven o'clock at night, that was the earliest you could get home. The latest was 11.15."

62. Mr Heath attributed the extended ambulance arrival times to ambulance personnel picking her up first and dropping her off last. However, he was unable to say how he formed this opinion. In evidence he explained:

"(Coroner)How do you know he liked to make Jude's drop-off the last one, who told you that?--(Mr Heath) I just took it for granted that he wanted to be home round the last call.

(Coroner) But you'd put two and two together, no-one actually told you that?---That's right, I put two and two together, that's correct.

(Coroner) So it might or might not have been right?---That's correct."

63. Dr Coffey did not notice any change in Mrs Heath's depression during 2006 when she was travelling to The Alfred for dialysis. He told the Court:

"... in the few months leading up to her death I would have said that I was not concerned about her mental state "

64. However, Mr Heath told the Court that these arrangements were taking their toll on both him and Mrs Heath. For example, Mr Heath wrote to The Alfred to complain about Mrs Heath's transport arrangements on 8 May 2006.

65. In particular, Mr Heath says that he asked The Alfred to reschedule Mrs Heath's pick up time because she had an appointment with Dr Perry at 12.30pm on 8 May 2006. He says they refused to change the pick up time so he contacted Dr Perry's office. Dr Perry's secretary rang Mr Heath back and told him that Mrs Heath should be ready to be picked up at 10.30am but the ambulance did not arrive until 12.30pm so Mrs Heath missed her appointment with Dr Perry.

66. Mr Heath also said he contacted the hospital when Mrs Heath was not home by 8.00-8.30pm on 8 May 2006. He explained the circumstances of Mrs Heath's delay to the Court:

" ... the time she got home I don't remember the date, at quarter past 11 at night, they'd forgotten her and I think it was because they'd forgotten to call the ambulance and it wasn't until I rang the hospital that they realised they'd had a patient sitting on a chair in the passageway."

67. However, Mr Heath's perception of what occurred on 8 May 2006 differs from that provided to me in the ambulance and medical records and explained to Mr Heath by the patient representative at The Alfred.

68. The ambulance and medical records confirm that, on 7 May 2006, Mrs Heath failed to keep an appointment with Dr Perry because she was unwell. The appointment was rescheduled to 12.30pm on 8 May at his rooms at The Alfred. There is no evidence that this re-scheduled appointment was discussed with The Alfred Dialysis Unit.

69. On 8 May 2006, an ambulance was despatched at 11.33am to take Mrs Heath to The Alfred but it did not arrive at her house until 12.20pm. She missed her appointment with Dr Perry. On the same

day, routine haemodialysis commenced at 2.00pm and was completed at 4.30pm. The return ambulance was booked for 6.30pm. It arrived at 9.38pm and Mrs Heath was delivered home at 10.54pm.

70. Further, the patient representative at The Alfred responded to Mr Heath's complaint in an email which explained the reasons for the difficulties experienced by Mrs Heath on 8 May 2006:

"Thank you for your email below. After investigating your complaint I can only advise that you will need to take up your complaint with the Metropolitan Ambulance Service as the arrangements for your wife to be transported from home to the Alfred were not organised by Alfred staff. For arrangements in future to see Dr Perry, the dialysis service advises that it's preferable for your wife to see Dr Perry on a non-dialysis day

If your wife was coming to see Dr Perry on the dialysis day your transport MUST be organised through the transit lounge at the Alfred as they will have to change the Metropolitan Ambulance service booking.

In regard to your wife's transport home, the dialysis service contacted the transit lounge at the Alfred at 3.20 to request an ambulance. The ambulance was booked with the Metropolitan Ambulance Service at 3.21 p.m. The ambulance was scheduled to arrive at 6.30 p.m. Unfortunately, the Metropolitan Ambulance Service did not dispatch the ambulance to come to the Alfred until 7.21 p.m. I do hope this explanation has clarified your concerns."

71. Therefore, the extended travel and waiting time which Mrs Heath experienced on 8 May 2006 were associated with ambulance delays and a one-off change in arrangements which was inconsistent with The Alfred Dialysis Unit routine arrangements for Mrs Heath. Despite the explanation provided by the patient representative at The Alfred, Mr Heath does not seem to have understood the way in which these routine arrangements worked.

72. Similarly, on 19 August 2006, Mr Heath wrote to Dr Perry because he was concerned about Mrs Heath's mental health which he attributed to the stress caused by the haemodialysis treatment at The Alfred and the times Mrs Heath was picked up and returned home on 18 August. Mr Heath said that she had to wait five hours for transport home. He said that the ambulance service told him that they were very busy and that, as she was a health card holder, all others came first in line.

73. In evidence, Mr Heath clarified the source of his information:

"I made a complaint to one of the ambulance men and he replied, "We've got to attend to the paying customers first."

74. Ambulance records indicate that an ambulance was despatched at 9.13am on 18 August 2006 to take Mrs Heath from home to The Alfred. At 9.15am, she was picked up and they arrived at The Alfred at 11.17am. Further, The Alfred ordered an ambulance for 3.30pm to take Mrs Heath home. At 6.17pm, an ambulance was despatched. At 8.36pm, it picked up Mrs Heath and she arrived home at 9.10pm. Again, the ambulance service attributed the delay in providing return transport to workload and resources. They indicated that 12 cases were delayed that day for longer than four hours.

75. Therefore, the extended transit and waiting time which Mrs Heath experienced on 18 August 2006 were associated with heavy ambulance work load and were not attributable to The Alfred Dialysis Unit's booking practices.

76. Dr Coffey and Dr Perry supported Mr Heath in his opinion that the ambulance transport arrangements was contributing to his and Mrs Heath's stress. Dr Coffey explained:

"In much the same as any older person who's chronically unwell. It's quite exhausting, it's a big undertaking and it's also of concern for the spouse because they're obviously worried about them and have to care for them when they come home tired and hungry."

77. Ambulance Victoria² was unable to identify any formal complaints to them about Mrs Heath's transport arrangements. Further, there is no evidence before me to suggest that anyone attempted to change Mrs Heath's routine ambulance transport arrangements to and from The Alfred Dialysis Unit.

Waiting lists at satellite haemodialysis units.

78. The availability of places at satellite haemodialysis units depends on the number of chairs and the number of shifts operating at each unit. In 2006, Frankston Hospital had nine dialysis chairs operating over four shifts with a total of 36 permanent patients. Rosebud Hospital had three dialysis chairs operating over four shifts so that they could dialyse 12 permanent patients.

79. In response to Mr and Mrs Heath's complaints, Dr Perry wrote to Dr Coffey on 2 June 2006. He expressed concern about Mrs Heath's reliance on ambulance transport to The Alfred for haemodialysis and said he would refer her to Ms Simon with a recommendation for transfer to peritoneal dialysis which could be managed at home by the Royal District Nursing Service. Dr Coffey referred this letter to the peritoneal dialysis educator at The Alfred, Belinda Simon.

80. On 29 August 2006, Dr Perry also wrote to Ms Simon directly. He told her that Mr and Mrs Heath were under immense stress due to the dialysis at The Alfred and requested assessment for peritoneal dialysis. He also included Mr Heath's complaint and noted on the letter: *"Belinda, What can we do to make this better?"*

81. On 31 August 2006, Ms Simon responded to Dr Perry. Again, she explained why Mrs Heath was unsuitable for peritoneal dialysis. As an alternative, Ms Simon suggested Dr Perry contact the Dialysis Coordinator to arrange a temporary spot at Frankston or Rosebud and indicated that hopefully Rosebud will open extra chairs later in 2006.

82. Therefore, it is clear that the renal unit at The Alfred was aware of and sensitive to the stress that the haemodialysis regime placed on Mr and Mrs Heath and the content of their complaints about the unreliability of ambulance transport to and from The Alfred.

²In 2006, the Metropolitan Ambulance Service was responsible for ambulance services in Melbourne. It is now integrated with the Rural Ambulance Service to become Ambulance Victoria. Ambulance Victoria provided the evidence I relied upon in this investigation.

83. The Dialysis Coordinator, Dr Suzanne Douglas, is responsible for allocating permanent chairs at The Alfred Dialysis Unit and at the satellite haemodialysis units. However, no one ever discussed Mrs Heath's particular circumstances with Dr Douglas and she does not remember her situation being discussed in the monthly multidisciplinary haemodialysis meetings.

84. Dr Douglas allocates permanent chairs strictly according to the length of time patients have been on the waiting list. In Court, Dr Douglas confirmed that no one is placed on a waiting list for haemodialysis at these centres until they have commenced dialysis at The Alfred.

85. On 8 March 2006, Mrs Heath was 6th on the waiting list for a permanent chair at Frankston Dialysis Unit and 8th on the waiting list at Rosebud Dialysis Unit.

86. Applying their policy for access to permanent haemodialysis beds in satellite units, The Alfred Renal Unit remained unable to permanently improve Mrs Heath's haemodialysis arrangements in September 2006:

- Frankston Hospital haemodialysis unit was also functioning at full capacity with nine chairs operating across four shifts and a total of 36 patients. Mrs Heath was second on the waiting list at Frankston Hospital when she died. Therefore she had proceeded four places in the period between March and September 2006.
- Rosebud Hospital haemodialysis unit had three haemodialysis chairs and could only accept 12 patients. Mrs Heath was sixth on the waiting list at Rosebud Hospital when she died. Therefore she had proceeded two places in the period between March and September 2006.
- Mrs Heath was unsuitable for peritoneal dialysis which may have overcome the need for haemodialysis at The Alfred.

87. In Court, Dr Perry raised concerns about the way in which criteria were applied to patients on the waiting lists for permanent beds at satellite haemodialysis units. In particular, he acknowledged that time on the waiting list was a factor because:

"... clearly the longer you've been waiting the more deserving you are for a permanent position."

88. However, Dr Perry was also of the opinion that other factors that should influence patients' access to beds closer to home include their multiple co-morbidities, psychological issues, age. He acknowledged that his opinion had not been accepted by the monthly clinical meetings he attended at The Alfred and that determining objective assessment of criteria other than waiting time is a real issue.

89. In 2010, Professor Thompson from The Alfred and the three physicians from the Mornington Peninsula, Dr Perry, Dr Solomon Meneham and Dr Robert Flank agreed that the waiting lists for permanent dialysis chairs would be assessed by reference to criteria other than time. They have agreed to jointly assess the patient and the patient would become a priority to go higher on the waiting list and

if they all agreed. No one has changed their position on the waiting list in response to these new arrangements.

90. Further, Dr Douglas told the Court that Rosebud Hospital Dialysis Unit was unable to accept patients with permanent catheters in 2006 for a number of reasons including:

- There was only be one nurse to look after the patient and the other two patients would be left unattended, and
- If there was a problem with the permanent catheter, the patient would have to go to The Alfred for dialysis or to have the issue sorted out.

91. Therefore, all efforts to place Mrs Heath at the Rosebud Hospital Dialysis Unit were unjustified while they remained a sole clinician unit and she remained reliant on a permanent catheter for access to her arteriovenous system. Accordingly, promises that a permanent chair would become available at Rosebud were unlikely to be fulfilled in the foreseeable future.

92. Dr Perry seems to have been unaware of this limitation on Mrs Heath's access to a chair at Rosebud Hospital Dialysis Unit. However, in 2006, he was actively involved in negotiations around increasing the chairs at Rosebud and Frankston. Dr Perry acknowledged that an alternative way of addressing the issue causing travel problems was creating more chairs in satellite haemodialysis units.

93. As an alternative to arrangements for allocating permanent chairs at in satellite haemodialysis units, temporary chairs become available from time to time, for example when patients go on holiday or are admitted to hospital. These temporary chairs are allocated directly by the unit without input from the Hub haemodialysis unit. The way in which this allocation occurs remains unclear.

94. Mr Heath told the Court that Mr Heath had received a phone call from Rosebud Hospital in mid August 2006 to say a chair would be available for Mrs Heath in two weeks time:

"she brightened up when we got a call from Rosebud Hospital saying there was a chair - a bed available for her in two weeks' time."

95. Mr Heath's daughter confirmed to the Court that Mrs Heath discussed the availability of a chair on 20 August 2006. She said this information was provided by Mrs Heath's case manager, Christine Walker from Southern Cross Family Care.

96. However, Dr Douglas had not allocated Mrs Heath to a permanent chair in a satellite haemodialysis unit and there is no evidence before me that a permanent chair was available. Although Mr Heath discussed it with his daughter and Dr Coffey, he did not know of any discussion about it with The Alfred staff. Further, we know Mrs Heath was unable to be accommodated at Rosebud.

97. Therefore, I presume this chair promised to Mrs Heath was a temporary chair at Frankston Hospital Dialysis Unit. Further, the timing suggests that it would have become available in four weeks from the date of notification or two weeks after Mrs Heath's death.

Arrangements for transport to The Alfred hospital for haemodialysis

98. From 4 March to 6 September 2006, Mrs Heath underwent haemodialysis at The Alfred hospital three times a week. Most of the time, her routine appointment was for 2.30pm but she usually commenced dialysing between about 12.30pm or 2.30pm on these days. Haemodialysis usually took between 2½ hours and four hours. This means that Mrs Heath finished dialysis at between about 4.30pm and 6.30pm most days.

99. Unless she was already in hospital, Mrs Heath was transferred between her home in Rosebud and The Alfred by non-emergency ambulance which was usually individually authorised by The Alfred Dialysis Unit and booked by their transit lounge. They used telephone communication to make these bookings.

100. All requests for non-emergency ambulance transport are received by the Non-Emergency Transport System through the Emergency Services Telecommunications Authority. These requests must be authorised by a health professional with advice as to acuity according to criteria established in the *Non-Emergency Patient Transport Regulations 2005*. Ambulance Victoria allocates the work to stretcher vehicles or clinic cars depending on this information.

101. Ambulance Victoria has contracts with three private agencies to deliver most of their non-emergency transport services. Their resources change from day to day depending on personnel and vehicle availability, their other contractual arrangements and the degree to which they cooperate with each other to cover the work load. And, where possible, transport is coordinated to pick up several patients during the same trip.

102. Despatch of stretcher vehicles and clinic cars is administered by two different agencies. Any booking for a patient not requiring a stretcher is routinely allocated to and managed by the Car Division. However, clinic cars usually stop operating at about 6.00pm so that they do not commence a trip to Rosebud after about 4.30pm.

103. When no non-emergency vehicle is available to transfer dialysis patients, the Emergency Services Telecommunications Authority is obligated to cover the gap. This work then competes with and is secondary to emergency ambulance requirements.

104. Therefore, because of availability, evening transfers are more likely to be allocated to stretcher vehicles even when this is not justified by the patient's acuity. The Emergency Services Telecommunications Authority routinely despatches stretcher vehicles bookings one hour before they are due for pick up.

Transport from Rosebud to The Alfred

105. Ambulance records indicate that Mrs Heath was transported from home to The Alfred 67 times between 4 March to 7 September 2006. A stretcher vehicle was used for 55 of these trips and a clinic car was used for 12 of these trips. On average, she spent 88 minutes in the vehicle being transported to The Alfred.

106. Rowena McLean was the Manager of Non-Emergency Transport for the Metropolitan Region of Ambulance Victoria. She interpreted the allocation of vehicles to transfer Mrs Heath to The Alfred to indicate that her condition was improving after 4 August 2006:

"It may have also been because of the concern raised in relation to wait time. There are number of reasons but ultimately she's been transferred to the Clinic Car agency and been assisted as what we call a wheelchair assistance."

107. Mrs Heath's appointment time for haemodialysis was changed on 13 occasions between 4 March to 7 September 2006. On six of these 13 trips from home to The Alfred, the Alfred Dialysis Unit ordered the ambulance for before 8.00am and Mrs Heath left home before 8.00am. Early appointments at The Alfred accounted for at least three of these early starts:

- On 29 March 2006, Mrs Heath was unaware that her appointment time had changed to 9.00am because of her planned admission for surgery so she was not ready when the ambulance arrived to pick her up at 6.22am. Haemodialysis commenced at 10.00am and was completed at 12.45pm.
- On 22 May 2006, Mrs Heath was not ready when they arrived to pick her up at 7.07am for an appointment at The Alfred at 9.00am. They left at 7.22am and arrived at The Alfred at 8.52am. Haemodialysis commenced at 1.50pm and was completed at 5.30pm.
- On 20 July 2006, Mrs Heath left home at 6.44am because her appointment had been changed to 8.00am. They arrived at The Alfred at 8.15am. Haemodialysis commenced at 8.35pm and was completed at 11.am.

108. Conversely, on 43 of Mrs Heath's 67 trips from home to The Alfred, the Alfred Dialysis Unit ordered the ambulance for after 10.00am. Further, on 30 of these trips, the ambulance picked up Mrs Heath after 11.00am. Five of these were after midday.

109. In summary, about two thirds of Mrs Heath's ambulance transfers to The Alfred occurred after 10.00am so there was usually no reason for Mrs Heath to be ready for transfer to The Alfred by 7.00am unless she had another appointment to keep at the Alfred or she was otherwise informed. Mr and Mrs Heath's concern about being ready for transfer to The Alfred by 7.00am seems to have arisen from their single experience on 29 March when there was a communication breakdown about her admission arrangements.

Arrangements for transport from The Alfred to Rosebud

110. Ambulance records indicate that Mrs Heath was transported 71 times from The Alfred to home between 6 March to 7 September 2006. A clinic car was used for 2 and a stretcher vehicle was used for 69 of these trips. On average, she spent 83 minutes in the vehicle on the way home.

111. On seven of these transfers from The Alfred to home in 2006, Mrs Heath arrived home before 6.00pm. Six of these early arrivals are consistent with her leaving home before 8.00am for earlier haemodialysis or other appointments.

112. On 53 other occasions or 83% of days when her haemodialysis commenced after 12.30pm, Mrs Heath was home between 6 and 9.00pm.

113. On 11 other occasions, Mrs Heath was home after 9.00pm:

- On 24 March, haemodialysis was completed at 4.30pm. The Alfred Dialysis Unit ordered an ambulance for 6.00pm. The ambulance picked Mrs Heath up at 7.43pm and they arrived home at 9.24pm. Ambulance Victoria was unable to explain this delay.
- On 1 May, haemodialysis was completed at 5.00pm. The Alfred Dialysis Unit ordered an ambulance for 5.30pm. The ambulance picked Mrs Heath up at 8.20pm and they arrived home at 9.50pm. Ambulance Victoria attributed this delay to resource management.³
- On 8 May, haemodialysis was completed at 4.30pm. The Alfred Dialysis Unit ordered an ambulance for 6.30pm. The ambulance picked Mrs Heath up at 9.38pm and they arrived home at 10.54pm. Ambulance Victoria attributed the delay in providing return transport to workload and resource and indicated that 13 cases were delayed that day for longer than four hours (see below for details).
- On 15 May, haemodialysis was completed at 6.10pm. The Alfred Dialysis Unit ordered an ambulance for 6.30pm. The ambulance picked Mrs Heath up at 7.56pm and they arrived home at 9.25pm. Ambulance Victoria was unable to explain this delay.
- On 17 May, haemodialysis was completed at 5.10pm. The Alfred Dialysis Unit ordered an ambulance for 5.45pm. The ambulance picked Mrs Heath up at 9.07pm and they arrived home at 10.36pm. Ambulance Victoria attributed this delay to high workload during the day.
- On 22 May, haemodialysis was completed at 5.30pm. The Alfred Dialysis Unit ordered an ambulance for 6.45pm. The ambulance picked Mrs Heath up at 7.37pm and they arrived home at 9.02pm. Ambulance Victoria was unable to explain this delay.
- On 19 June, haemodialysis was completed at 4.10pm. The Alfred Dialysis Unit ordered an ambulance for 6.15pm. The ambulance picked Mrs Heath up at 7.50pm and they arrived home at 9.20pm. Ambulance Victoria was unable to explain this delay.
- On 23 June, haemodialysis was completed at 4.30pm. The Alfred Dialysis Unit ordered an ambulance for 5.00pm. The ambulance picked Mrs Heath up at 7.34pm and they arrived home at 9.05pm. Ambulance Victoria attributed this delay to resource management.

³ From the information available, Ms McLean concluded there did not appear to be greater than average workload and there was not any apparent reason other than perhaps less than optimal utilisation of resources for the delay.

- On 17 July, haemodialysis was completed at 4.35pm. The Alfred Dialysis Unit ordered an ambulance for 5.00pm. The ambulance picked Mrs Heath up at 7.53pm and they arrived home at 9.30pm. Ambulance Victoria attributed this delay to high workload after 1.00pm
- On 9 August, haemodialysis was completed at 4.35pm. The Alfred Dialysis Unit ordered an ambulance for 5.15pm. The ambulance picked Mrs Heath up at 8.09pm and they arrived home at 9.20pm. Ambulance Victoria attributed this delay to above average afternoon workload.
- On 18 August, haemodialysis was completed at 2.40pm. The Alfred Dialysis Unit ordered an ambulance for 3.30pm. The ambulance picked Mrs Heath up at 8.30pm and they arrived home at 9.10pm. Ambulance Victoria attributed this delay to workload and resources (see below for further details)

114. Nurses or the ward clerks in The Alfred Dialysis Unit routinely book the patient's return ambulance as soon as they begin dialysis because they know the patient will finish in four hours.

115. On 19 June 2006, this practice caused a two hour delay between completion of haemodialysis and the time of the ambulance booking. On the ten other occasions, The Alfred Dialysis Unit had ordered the ambulance to pick Mrs Heath up within about 60 minutes of completing her haemodialysis.

116. On these ten other occasions, Ambulance Victoria was responsible for late arrival for a scheduled pickup which caused Mrs Heath to arrive home after 9.00pm. High workload accounted for at least five of these late trips and two were attributed to resource management. Ambulance Victoria was unable to explain their other late responses.

Malfunction of the dialysis equipment on 6 September 2006

117. On 4 September 2006, Mrs Heath returned to The Alfred for routine haemodialysis for the first time since her last admission and her acute myocardial infarction. To summarise the events on 4 September:

- The Alfred Dialysis Unit booked an ambulance to pick up Mrs Heath from home at 9.30am.
- The ambulance arrived at 9.43am and she arrived at The Alfred at 11.40am.
- Haemodialysis commenced at 12.50pm and completed at 4.00pm. Blood was also taken for routine monthly analysis and microbiology.
- Mrs Heath was nauseous during the procedure and her nose was bleeding. She was due for and given iron.
- The return ambulance was booked for 4.56pm and arrived at 5.37pm to pick up Mrs Heath.
- Mrs Heath was home at 7.02pm.

Therefore, there was nothing unusual about Mrs Heath's haemodialysis routine on 4 September 2006 that could be expected to influence Mrs Heath's state of mind.

118. On 6 September 2006, Mrs Heath told Mr Heath she did not want to go to The Alfred because she thought she could manage without haemodialysis for two weeks until her chair at Rosebud became available. Although she was fed up with it and he had to force her to get ready to go, Mr Heath believes Mrs Heath was in good spirits and not depressed.

119. At 9.30am on 6 September 2006, the ambulance was despatched to pick up Mrs Heath. At 9.43am, they left Mrs Heath's house. At 11.40am, they arrived at The Alfred.

120. At 1.45pm on 6 September 2006, Ianthie Kulatilleke admitted Mrs Heath to the Dialysis Unit at The Alfred and recorded her admission observations. Mrs Heath reported nausea and vomiting and feeling lethargic. She also said she felt tired after the long journey from home. Ms Kulatilleke said:

" ... she wasn't coping very well, but she knew she had to do dialysis, otherwise - you know, she would die, or she would have to withdraw with this - you know, was a very difficult position. So you know, she - you know, she kept coming, and you know, doing - doing the best, because she knew she had to have dialysis in order to live."

121. Blood cultures taken on 4 September 2006 confirmed Mrs Heath still had an infection so the renal resident doctor had to assess her before haemodialysis commenced. Accordingly, Dr Emem Akor assessed her as suitable to continue with routine dialysis in an isolation room and ordered further blood samples.

122. Louise Wah had been assigned to care for Mrs Heath during her dialysis. However, she was busy with another patient so another nurse, Cai Ting, accepted responsibility for connecting Mrs Heath to the dialysis machine. Ms Kulatilleke, Ms Ting and Ms Wah were all experienced dialysis nurses and they all had previously cared for Mrs Heath during her haemodialysis.

123. Ms Ting performed Mrs Heath's pre-dialysis review before her connection to the haemodialysis machine. Her blood pressure was 186/79mmHg, her pulse rate was 63bpm, her temperature was 36.6 degrees C, her blood sugar concentration was 10.3mM. Mrs Heath was administered 2000U heparin and the pump was set to deliver a further 1000U heparin hourly.

124. Ms Ting then prepared Mrs Heath for connection to the haemodialysis machine. Ms Kulatilleke assisted Ms Ting by preparing the connections arising from the haemodialysis machine and handing them to Ms Ting, one at a time. It is normal for two nurses to be involved in connecting a patient to the haemodialysis machine so that the nurse touching the patient's permanent catheter can maintain sterile conditions while the non-sterile nurse can manage the connection to the haemodialysis machine.

125. When she had handed the two connectors to Ms Ting, Ms Kulatilleke left the isolation room and went to the lunch room.

126. Ms Ting used aseptic techniques to connect the blue and red female Luer-Lok connectors on the venous and arterial lumens on the haemodialysis machine to the male Luer-Lok connectors attached to the blue and red tagged venous and arterial lumens on Mrs Heath's permanent catheter. As she

connected each Luer-Lok, Ms Ting also tightened the female connector on the screw provided. The Luer-Lok connections were achieved without any resistance or sign of misalignment. She then used scissor clamps to anchor the lines to Mrs Heath's cardigan to reduce tension and prevent the lines from falling or becoming tangled on the armrests.

127. Ms Ting then turned on the dialysis machine and recorded a further set of observations. She noted that these readings did not indicate any problem with the connection to the haemodialysis machine and there was no bleeding at the Luer-Lok.

128. Ms Ting has never experienced a situation where the connections between the permanent catheter and the dialysis machine failed. In her statement, she says:

"I am certain that the connections were properly and securely in place."

129. While Ms Ting was washing her hands after checking Mrs Heath's connections and recording her observations, she saw Mrs Heath lean with her left hand across her body to pick up her handbag. Mrs Heath told Ms Ting she was trying to get her phone to call Mr Heath. She said she would call him later.

130. This movement of Mrs Heath's arm was associated with an alarm going off in the haemodialysis machine indicating that the venous pressure in the machine was above the set limits for the alarm. Ms Ting searched for the cause of the alarm and could see that the lumen between the venous catheter and the dialysis machine had become kinked. Ms Ting told the Court that this type of alarm was not uncommon and did not usually require noting in the medical record. She corrected this kink and had to restart the haemodialysis machine after she had given Mrs Heath her handbag.

131. At about 2.00pm, Mr Heath says that Mrs Heath rang him on her mobile phone. I presume this was the phone call that Mrs Heath intended to make when the haemodialysis machine alarmed. Mr Heath told the Court:

"She said she was just going into dialysis and that she had an infection and they were putting her in the isolation ward and she'd "see me tonight as usual, sweetie." That was last word was "sweetie."

132. Therefore, there is no evidence that there was any disconnection of the vascular lumen when Ms Ting re-started the haemodialysis unit.

133. At 2.10pm, Ms Ting handed over responsibility for Mrs Heath to Ms Wah and went to the tea room. Ms Wah was unavailable to give evidence in the Inquest and did not make a statement for the coronial brief. Therefore, I rely on the retrospective notes she wrote in the medical record at about 6pm on 6 September 2006.

134. Ms Wah recorded in the medical notes that she responded to the nurse call bell at 2.20pm on 6 September 2006. Mrs Heath informed her that she had dropped her buzzer. Ms Wah says she picked

up the buzzer for Mrs Heath and told her she would be going on to Vancomycin today because of her positive blood tests. She does not record whether Mrs Heath responded to this information.

135. Ms Wah also noted that Mrs Heath's dialysis machine alarmed at 2.40pm on 6 September 2006. She walked into Mrs Heath's room and found Mrs Heath unresponsive with blood leaking on the floor. She called a Code Blue and called out to staff on the floor. Ms Wah does not record whether or not she turned off the haemodialysis machine.

136. Ms Kulatilleke told the Court that the alarms were loud and that anyone in the haemodialysis room outside the isolation rooms would have responded to the alarm if they had heard it. However, she and Ms Ting both told the Court they did not hear the alarm from Mrs Heath's haemodialysis machine on 6 September 2006 because they were in the lunch room and no one else had responded until after Ms Wah called out. Accordingly, no one other than Ms Wah is known to have heard the alarm from Mrs Heath's haemodialysis unit.

137. Ms Kulatilleke noted that she heard Ms Wah call out at 2.40pm and went to Mrs Heath's room. She was first in the room after Ms Wah. When she entered Mrs Heath's room, Ms Kulatilleke saw that Mrs Heath was unconscious and the blue female Luer-Lok connector on the lumen from the haemodialysis machine was lying beside but not connected to the male Luer-Lok connection attached to the blue-tabbed lumen of the permanent catheter in Mrs Heath's chest. Mrs Heath had a blanket around her but the Luer-Lok and the lumens connecting her permanent catheter to the haemodialysis machine remained exposed. There was a large amount of blood on the floor but Ms Kulatilleke cannot remember whether or not the pump was still running.

138. Therefore, the haemodialysis pump failed to stop automatically when the Luer-Lok connecting the haemodialysis machine to Mrs Heath's blood supply became disconnected. It is also unlikely that the alarm sounded when the Luer-Lok disconnection occurred or at all.

139. Ms Kulatilleke immediately re-connected the Luer-Lok and the resuscitation team used the permanent catheter to administer saline and six units of blood as the first step in re-establishing Mrs Heath's blood pressure. There was no problem with the Luer-Lok connection during these resuscitation procedures.

140. All the tubing connecting Mrs Heath's arteriovenous system to the haemodialysis machine was destroyed after her death so I am unable to further investigate the reasons for the failure of the Luer-Lok connection.

141. Further, these necessary emergency actions mean that the dialysis machine could not be interrogated to determine what settings Ms Ting had pre-set to trigger the alarms.

142. Mrs Heath was resuscitated but had irreversible brain damage.

143. A nursing note in The Alfred medical file states:

"Re patient - husband states that his wife (patient) who has recently been unwell stated that she wanted to end her life and did not want to attend dialysis today."

The nurse who made this notation was unable to be located to make a statement or give evidence.

144. In evidence, Mr Heath denied he told anyone that Mrs Heath wanted to end her life. On the contrary, Mr Heath believes that Mrs Heath's arthritis would have prevented her disconnecting the machine intentionally. Ms Douglas also thinks that Mrs Heath would not have been able to manipulate the Luer-Lok connectors to deliberately disconnect her from the haemodialysis machine.

Haemodialysis equipment

145. Haemodialysis compensates for end-stage kidney failure by taking blood from the patient's arterial supply and passing it through filters which mimic the operation of the kidney. The filtered blood is then returned to the patient's venous blood system.

146. Haemodialysis at The Alfred is performed by a haemodialysis machine marketed by Frensius Medical Care Australasia Pty Ltd. This haemodialysis equipment is designed to alarm and stop the pumps when the blood pressure in the arterial or venous line rises or declines outside pre-set parameters or there is air in the line.

147. Access to the patient's heparinised venous and arterial blood supplies is achieved by forming fistulae in the patient's central venous and arterial systems and then placing a permanent central venous catheter with two lumens, a red-tabbed lumen in the arterial fistula and a blue-tabbed lumen in the venous fistula. When not in use, each lumen in the permanent catheter is sealed using heparin and a lumen clamp to prevent air emboli entering the blood system.

148. After Mrs Heath died, staff from The Alfred Dialysis Unit expressed concern about how the haemodialysis machine could become disconnected without triggering an alarm and stopping the pump.

149. On 11 September 2006, the service division of Frensius Medical Care Australia Pty Ltd checked the haemodialysis machine used for Mrs Heath's dialysis on 6 September. They could find no problems with the machine. The alarms all alarmed as they should on dummy runs and all parameters were within normal limits.

150. In order to perform haemodialysis, the arterial and venous lumens of the central arterio-venous catheter must be aseptically connected to the haemodialysis machine before it commences operation. This connection is achieved using two Luer-Loks.

151. Luer-Lok is the commercial name for a patented connection system used to join narrow tubes which carry fluid under pressure. The connection is achieved using threaded male and female Luer-Lok connectors attached to the end of plastic tubing (lumen). Luer-Lok fittings are securely joined by means of a tabbed hub on the female fitting which screws into threads in a sleeve on the male fitting.

152. The tabs on the female fittings and the male fittings are either red or blue. These colours are intended to indicate whether they should be connected to the arterial or venous lines. However, Ms Kulatilleke said that the colours are not always matched because the size of the lumens can vary so that the rate of blood passage through them also varies. The most efficient lumen, rather than necessarily the lumen with a blue Luer-Lok connection, is connected to the blue-tagged venous line.

153. Ms Kulatilleke told the Court she had no other experience with a Luer-Lok connection failing but it would be obvious immediately the pump started if a Luer-Lok connection was not correctly established:

"Oh, you see blood - blood leaking from the - whatever the lumen is. You'll actually see blood immediately, because the blood is actually pumping 250 mils per minute."

154. Therefore, using the assumption that Mrs Heath had lost four litres of blood when she was found, the Luer-Lok connection failure had occurred about 16 minutes earlier. This time delay is inconsistent with the alarm operating and the pump stopping when Mrs Heath began haemorrhaging after the Luer-Lok connection failed.

155. Dr Joseph Sabto was Acting Director of the Renal Unit. In his opinion, it is possible that the pressure monitored by the alarm was artificially maintained above the pre-set levels because the outlet from the female arterial lumen was blocked by a kink or blanket or Mrs Heath's clothes or against her body.

COMMENTS:

Pursuant to section 67(3) of the **Coroners Act 2008**, I make the following comment(s) connected with the death:

1. Judith Heath was 68 years old when she died. She lived with her husband in Rosebud on the Mornington Peninsula. Mrs Heath's medical history included insulin dependent diabetes mellitus, appendicitis with peritonitis, diverticular disease, hypertension, depression, mood affective disorders and sleep disorder, polymyalgia rheumatoid arthritis, herpes simplex (shingles), hyperlipidaemia, constipation, obesity and fractures arising from a fall in 2005. Her general practitioner was Dr Martin Coffey.

2. In 2004, Mrs Heath was diagnosed with chronic renal failure associated with her diabetes. Her nephrologist was Dr Greg Perry. On 26 January 2006, she was also diagnosed with hypoglycaemia, hyperkalaemia and anaemia associated with end-stage renal failure. End-stage renal failure will result in death if the work of the kidneys is not replaced by mechanical dialysis. Therefore, Mrs Heath required haemodialysis three times a week at The Alfred hospital.

3. Haemodialysis is a process for removal of waste products from the blood by causing them to diffuse through a semi-permeable membrane in a haemodialysis machine. Blood is accessed through a catheter in an arterio-venous fistula in the patient's arterial system. After filtration, the blood is

returned to the patient's venous system through a second catheter which connects to the venous port of the fistula.

4. In Victoria, haemodialysis is performed at several so-called "Hub" renal units with a large number of haemodialysis chairs and at "satellite" dialysis units which undertake routine haemodialysis under referral from the relevant Hub renal unit. The haemodialysis units at the Frankston and Rosebud Hospitals are satellites of The Alfred Renal Unit and access to their permanent chairs is managed through the Dialysis Coordinator at The Alfred Renal Unit.

5. In February 2006, Mrs Heath was placed on waiting lists at Frankston and Rosebud Hospitals but no permanent haemodialysis chairs became available for her at these hospitals before she died. Mrs Heath was not suitable for the alternative procedure of peritoneal dialysis which could have been performed at home. Mrs Heath's renal physician, Dr Greg Perry, told the Court that there was only one other alternative treatment for end-stage renal failure:

"There is another option of course, and that is to withdraw from treatment. And some people do consider that, and it's particularly an issue in the geriatric population."

6. Mrs Heath's clinicians had a difficult time establishing her haemodialysis regime:

- On 29 March 2006, she underwent vascular surgery to establish a fistula in her left forearm arm to enable access for the haemodialysis equipment.
- On 3 May 2006, the fistula in her left arm became infected and blocked.
- On 24 May 2006, she required further surgery to establish an alternative access site in her right arm.
- On 24 August 2006, she had an acute myocardial infarction during surgery to establish a fistula in her brachial artery in her upper chest. She underwent coronary artery angioplasty and stenting of her mid left anterior descending coronary artery.
- On 1 September 2006, Mrs Heath was discharged home.

7. On 7 September 2006, Mrs Heath died after the Luer-Lok connection between her blood supply and the haemodialysis machine became disconnected. Mrs Heath's blood continued to pump out of her body at the rate of 250mls/minute. Using the assumption that Mrs Heath lost about four litres of blood, it seems that the pump continued to operate for about 16 minutes after the disconnection occurred.

8. The forensic pathologist who performed the autopsy formed the opinion and I accept that Mrs Heath died from complications arising from acute blood loss.

9. Therefore, I find that the disconnection between Mrs Heath's blood supply and the haemodialysis machine did not trigger the alarm or stop the pump in the haemodialysis machine and this failure caused her death.

10. Australian Bureau of Statistics projections indicate that the aged population in Australia is increasing dramatically and will continue to grow over the next few years. The Mornington Peninsula in Victoria already has a relatively high population of residents aged over 65 years.

11. Older people require more health services and have a greater incidence of chronic illness than younger people. This includes over-representation of patients with end-stage renal failure which is frequently associated with hypertension and diabetes.

12. Dr Joseph Sabto is the Deputy Director of Renal Medicine at The Alfred. He told the court:

"The Alfred Hospital in particular used to look after 25 patients back in the early 90s. We are now dealing with 260 - 270 patients."

13. Therefore, the lessons learned from Mrs Heath's death are important in planning for the future health needs of Victorians. Accordingly, this Finding has considered the following issues arising from Mrs Heath's death:

- Ambulance non-emergency transport of haemodialysis patients,
- Waiting lists at satellite haemodialysis units,
- Failure of the Luer-Lok connection, and
- Failure to activate the emergency response in the haemodialysis machine.

Ambulance non-emergency transport of haemodialysis patients

14. Mrs Heath relied on ambulance transport between her home and The Alfred for haemodialysis. Between 4 March to 7 September 2006, she was transferred to The Alfred on 67 occasions and from The Alfred on 71 occasions.

15. Mr Heath complained to Dr Coffey and Dr Perry about the early pick up times and late return times of Mrs Heath's ambulance transfers to and from The Alfred Dialysis Unit three times a week. He said these arrangements were creating extra stress for Mrs Heath and himself.

16. Mr Heath's concerns about ambulance non-emergency transport reflected the circumstances that occurred on 8 May and 18 June 2006:

- On 8 May 2006, Mr Heath sought an early pick up time because Mrs Heath had an appointment with Dr Perry at 12.30pm. He also says that Dr Perry's staff told Mrs Heath to be ready at 10.30am. The ambulance was despatched at 11.33am to take Mrs Heath to The Alfred but it did not arrive at her house until 12.20pm. She missed her appointment with Dr Perry. Haemodialysis

commenced at 2.00pm and completed at 4.30pm. The return ambulance was booked for 6.30pm. It arrived at 9.38pm and Mrs Heath was delivered home at 10.54pm.

Ambulance Victoria explained that the transfer to The Alfred was ordered by Dr Perry rather than The Alfred Dialysis Unit. Further, they attributed the delay in providing return transport to workload and resource and indicated that 13 cases were delayed that day for longer than four hours.

- On 18 August 2006, an ambulance was despatched at 9.13am to take Mrs Heath from home to The Alfred. At 9.15am, she was picked up and they arrived at The Alfred at 11.17am. Further, The Alfred ordered an ambulance for 3.30pm to take Mrs Heath home. At 6.17pm, an ambulance was despatched. At 8.36pm, it picked up Mrs Heath and she arrived home at 9.10pm. Again, the ambulance service attributed the delay in providing return transport to workload and resource and indicated that 12 cases were delayed that day for longer than four hours.

17. However, Mr Heath incorrectly attributed the overall stress that he and Mrs Heath experienced throughout 2006 to the early pick up times and late return times of Mrs Heath's ambulance transfers on other occasions because he misunderstood and/or misinterpreted the arrangements made by The Alfred Dialysis Unit and the frequency with which Ambulance Victoria failed to comply with these arrangements:

- Mr Heath believed that Mrs Heath had to be ready for pick up at 7.00am on dialysis days. However, analysis of the ambulance and hospital records indicates that the ambulance was ordered for before 8.00am and Mrs Heath left home before 8.00am on only six of her 67 trips from home to The Alfred. Early appointments at The Alfred accounted for at least three of these early starts.
- Mr Heath complained that Mrs Heath frequently came home after 9.00pm. However, analysis of ambulance and hospital records indicates that, on 53 occasions or 83% of days when her haemodialysis commenced after 12.30pm, Mrs Heath was home before 9.00pm.
- On seven of these transfers, Mrs Heath arrived home before 6.00pm. On six of these transfers, she had left home before 8.00am for earlier haemodialysis or other appointments.
- On 11 occasions, Mrs Heath was home after 9.00pm. On ten of these days, Ambulance Victoria was responsible for the late arrival for a scheduled pickup which caused Mrs Heath to arrive home after 9.00pm. High workload accounted for at least five of these late trips and two were attributed to resource management. Ambulance Victoria was unable to explain their other late responses.

18. Further, both Dr Perry and Dr Coffey say that transport is only one of the problems for patients who live in Rosebud and require haemodialysis at The Alfred. Dr Perry explained:

"... the difficulties related to the distance and the travelling, but also the practicalities of getting her established onto haemodialysis there were problems in going about the traditional way of doing it, and having what's called vascular access created in the arm. That was done, but it failed. And then she had to have it done again, and whilst this was going on she had temporary access placed

in the neck - a piece of plastic known as a permacath, and that gave us access for the dialysis machine. But obviously there was surgery, failed surgery; and these are not uncommon events for any patient."

19. Therefore, Mr and Mrs Heath's stress in relation to management of her end-stage renal failure could have been mitigated by better on-going communication with them about the stressors associated with the condition and with haemodialysis, including the likelihood and effect of medical complications with maintaining haemodialysis access, the way in which ambulance transfers were organised and the factors that contributed to variation from the usual arrangements.

20. Ambulance Victoria says that transport to and from haemodialysis represents approximately 9% of non-emergency stretcher workload and 65% of clinic car workload. The decision about whether to allocate a clinic car or a stretcher depends on the acuity of the patient and the operating hours of the Ambulance Victoria agency providing the service.

21. Rowena McLean was the Manager of Non-Emergency Transport for the Metropolitan Region of Ambulance Victoria. She told the Court that patients travelling long distances for routine treatment, particularly dialysis patients, cause difficulty for Ambulance Victoria:

"...there isn't I suppose a central coordination of who gets the treatment where because it depends on the referring patterns of the health network that they're under."

22. Therefore, in Ms McLean's opinion, patients sometimes travel unnecessarily long distances from home to the Hub dialysis unit while their haemodialysis regime is being established and/or they are waiting for chairs in satellite dialysis units. Transport of these patients after 4.30pm reduces availability of stretcher ambulance vehicles for higher acuity patient because clinic cars are unable to do that work in the evenings.

23. Better coordination between Dialysis Coordinators at Hub Dialysis Units and between Dialysis Coordinators and Ambulance Victoria would reduce the incidence of delayed ambulance response times and the length of ambulance trips.

Waiting lists at satellite haemodialysis units

24. Suzanne Douglas is the Dialysis Coordinator at The Alfred Hospital. Dr Douglas says that, in September 2006, the Rosebud Hospital had three dialysis chairs and could only accept 12 patients. Mrs Heath was sixth on the list.

25. Further, Frankston Hospital's dialysis unit was functioning at full capacity with nine chairs operating across four shifts and a total of 36 patients. At the time of her death, Mrs Heath was second on the waiting list at Frankston.

26. Dr Coffey also said Mrs Heath's experience with haemodialysis was not unusual:

"I'm afraid it's fairly consistent and I don't mean that as a huge criticism of the system

Because there's just not a huge ability to be able to slot people in quickly like there is at the Alfred. To the Alfred's credit, they're able to take the overflow so to speak but obviously when you're dealing with sick, often elderly patients it's much better to have them done in satellite centres."

27. Further, under 2006 conditions, Mrs Heath was unsuitable for placement at Rosebud Hospital Dialysis Unit because she had a permanent catheter and Rosebud operated with only one staff person.

28. In 2007, Rosebud Satellite Dialysis Unit increased its capacity to 24 patients and their current operating capacity is 36 patients. This increase in chairs was associated with increased staffing so that they now also accept haemodialysis patients with permanent catheters. As well, in March 2009, Frankston opened six twilight dialysis spots so that their capacity is now 42 patients.

29. Dr Perry says the availability of chairs on the Mornington Peninsula is no longer an issue. Ms McLean from Ambulance Victoria also says:

"I know that the issue in relation to the outpatients travelling from the Peninsula has improved given that they have additional chairs there."

Failure of the Luer-Lok connection

30. On 6 February 2006, Mrs Heath continued to be very depressed about her circumstances. Therefore, it is possible that Mrs Heath deliberately disconnected the Luer-Lok connection between her blood supply and the haemodialysis machine in order to stage her own death.

31. Further, an uncorroborated nursing note suggests that Mr Heath said that Mrs Heath wanted to end her life on 6 February 2006. Mr Heath denies making that statement.

32. However, the possibility of suicide reflects the circumstances of many haemodialysis patients who are facing decisions about their own life and death as well as having to manage a number of comorbidities and regularly travel long distances to access haemodialysis services. Dr Coffey explained:

"In much the same as any older person who's chronically unwell. It's quite exhausting, it's a big undertaking and it's also of concern for the spouse because they're obviously worried about them and have to care for them when they come home tired and hungry."

33. Therefore, it is important for policy makers and others to understand the enormous emotional and physical pressure placed on end-stage renal patients requiring haemodialysis.

34. However, I find that it is unlikely that Mrs Heath intentionally caused her own death because:

- She did not have the manual dexterity or the eyesight to be able to unscrew the Luer-Lok connection;
- She had recently been led to believe that a haemodialysis chair was available near home so she was more optimistic than she had been previously;
- There was nothing concerning noted during her admission to The Alfred from 22 August to 1 September 2006 or her previous outpatient haemodialysis on 4 September 2006;
- Her conversation with Mr Heath immediately before she died did not indicate any changed mental state or suicidal ideation.

35. Having discarded the likelihood that Mrs Heath deliberately disconnected the Luer-Lok connectors, how did the disconnection with the haemodialysis machine occur?

36. Louise Wah last saw Mrs Heath during her haemodialysis and Ms Wah found her unresponsive after the Luer-Lok disconnected. Ms Wah's record that Mrs Heath asked for her buzzer to be placed within reach seems inconsistent with her using it to call Ms Wah in the first place. One explanation could be that Mrs Heath was using the call button because she was aware of the leaking Luer-Lok and that Ms Wah did not notice the bleeding when she responded and spoke to Mrs Heath. In the absence of evidence from Ms Wah, I am unable to speculate further about what occurred during this encounter.

37. Luer-Lok connectors are routinely used in medical settings to connect tubes carrying fluid. They are manufactured and distributed by several different suppliers and there is little or no standardisation of their design and construction.⁴

38. Failure of a Luer-Lok connection in intravenous fluid delivery is well documented in the medical literature.⁵ A preliminary review suggests that the published failures include accidental mismatching of male and female LuerLoc connectors, failure to properly twist lock the connectors, and leaking, cracked, torn or broken connectors. The Food and Drug Administration in the United States of America is aware of adverse events related to these failures and has included Ms Zeigler's article on its web site.

39. Ianthie Kulatilleke is an experienced dialysis nurse who assisted in connecting Mrs Heath to the haemodialysis unit on 6 September 2006. She also told the Court that the size of the lumens can vary so she chooses the Luer-Lok connector which best fits the connection without necessarily using the one that colour matches the tagged lumen. This infers that Ms Kulatilleke also has experience of the Luer-Lok connectors failing to match.

40. Nursing journals also raise the frequency with which human error causes Luer-Lok connection failure:⁶

"Implications for nursing practice include the redesign of systems to accommodate human factors science and a change in health care's view of vigilance."

41. In the circumstances of Mrs Heath's death, Ms Wah noted that she responded to the nurse call bell when Mrs Heath had dropped the buzzer at 2.20pm on 6 September 2006. Ms Wah says she spoke to Mrs Heath and picked up her buzzer.

42. At 2.40pm, Ms Wah found Mrs Heath unresponsive, that is 20 minutes after she responded to the call button. This timing is consistent with the 16 minute window for when the connection failure occurred that can be calculated from the pump rate and the amount of blood lost.

43. Therefore, it is likely that the disconnection of the Luer-Lok occurred at or about the same time as Ms Wah was responding to Mrs Heath's call button. However, in the absence of evidence from Ms

⁴ For example, K. Holmes, D. Snow, M. H. Nathanson, "More problems with Luer Lock connections" (2006) *Anaesthesia* 61, 73.

⁵ See: Shirley Ziegler, "Prevent dangerous haemodialysis catheter disconnections" (2007) *Nursing* 37, 70.

⁶ For example, Debora Simmons & Krisanne Graves, "Tubing Misconnections - A Systems Failure With Human Factors: Lessons for Nursing Practice", (2008) *Urol. Nurs.* 28, 460-464.

Wah, I am unable to say why Ms Heath was looking for her buzzer or what efforts Mrs Heath had already made to retrieve the buzzer herself or whether Mrs Wah would have been in the position to notice a new bleed occurring, in particular, whether or not the Luer-Lok connection was covered by a blanket.

44. Dr Sabto says that the Alfred has made changes in haemodialysis procedures to reduce the risk of human error contributing to Luer-Lok disconnections. He includes revisions to their Policies and Procedures Manual including double checking of all connections and sign off on the dialysis run sheet by a different nurse prior to and during dialysis. Further, Luer-Lok connectors are to be visible at all times so that covering patients' Luer-Lok connectors with blankets and obscuring view of connection sites is discouraged.

45. Therefore, The Alfred has addressed the human factor issues that may contribute to unintended and undetected disconnection of a Luer-Lok connection.

Malfunction of the alarm and the pump on the haemodialysis equipment

46. Cai Ting was responsible for setting up the haemodialysis machine on 6 September 2006. After the process was complete, the alarm was triggered by a kink in the venous line caused by Mrs Heath attempting to reach her handbag. Ms Ting had to re-set the machine.

47. At 2.40pm, Ms Wah recorded that she was responding to the alarm on the haemodialysis unit when she found Ms Heath unresponsive and blood on the floor. However, there is no indication that any one else heard the alarm.

48. Therefore, I find that is unlikely that the alarm on the haemodialysis machine operated when the Luer-Lok connecting it to Mrs Heath's blood supply became disconnected at about 2.20pm on 6 September 2006.

49. In December 2007, The Alfred introduced a new protocol for management of patients undergoing haemodialysis. As relevant, this protocol includes:

" 3. *Avoid background noise to enable machine alarm to be heard.*

- *All patients to wear headphones for viewing TV to keep lower noise.*
- *Increase alarm volume on all machines to maximum audible level."*

50. These guidelines cannot influence detection of a failure in the haemodialysis system when no audible alarm is triggered.

51. Further, Ms Kulatilleke does not remember whether the pump was still operating when she entered Mrs Heath's room on 6 September 2006 and Ms Wah does not say whether she turned it off.

52. Therefore, I find that the the pump on the haemodialysis machine continued to operate for about 16 minutes after the Luer-Lok connecting it to Mrs Heath's blood supply became disconnected from her vein so that she sustained fatal blood loss.

53. The failure of the alarm system and the pump was not replicated when the dialysis machine was subsequently tested by the manufacturer's service operator in dummy runs.

54. Explanations consistent with these circumstances include the following:

- Ms Ting failed to re-set the alarm on the haemodialysis machine properly at 2.10pm on 6 September 2006, or
- The alarm system in the haemodialysis machine failed to respond to its own pre-set pressure monitor triggers when the Luer-Lok in the venous line disconnected, or
- The testing did not reproduce the conditions associated with the failure on 6 September 2006. For example, it could not mimic the circumstances of a blanket blocking the disconnected outlet.

55. All these explanations for this failure to trigger the alarm and stop the pump presume there is always a direct relationship between the patient's physiological responses to bleeding and the internal pressures in the haemodialysis machine which are pre-set to alert the alarm. In the circumstances of Mrs Heath's death, this relationship did not exist.

56. The haemodialysis machine had no independent capacity to detect or respond to changes in the patient's physiology which would occur when they begin losing blood at 250ml/minute. In particular, blood pressure would be expected to decline and heart rate would increase.

57. Difficulty in setting alarm limits to adequately ensure safety is also a recognised risk factor in setting up dialysis machines which rely on pressure monitoring to detect dislodgement of the venous line.⁷ In her advice to nurses, Shirley Zeigler also comments that;

⁷M. Segelmark, L. Mattsson, S Said, B. Olde & K. Solem, "Evaluation of a venous needle dislodgement method using heart pulses extracted from pressure sensors in the extracorporeal unit" (2011) Oxford Journals 4, Issue suppl 2.

*"When a catheter separates, the haemodialysis machine's alarm does not always go off. Its venous pressure monitor triggers an alarm when the venous blood line falls below the limit set by the user."*⁸

58. Fresenius Medical Care holds itself out as being the world's largest integrated provider of products and services for individuals undergoing dialysis because of chronic kidney failure, a condition that affects more than 2 million individuals worldwide.

59. In a letter dated 7 December 2010, the Director Clinical Marketing & Education-South Asia Pacific for Fresenius Medical Care, Peter Robertson, acknowledged that it is appropriate to look at an alarm which is independent of the dialysis process. He suggested a "wetness detector" that is placed around the connection to the blood lines and alarm if it reaches a preset saturation level. These detectors have been registered with the Therapeutic Goods Administration and cost about \$1500. They were not available in 2006.

60. Mr Robertson also suggested using a floor wetness detector and said that Geelong use floor leak detectors from Bunnings. These may be useful in other circumstances but the time taken for a leak to be detected by this method in dialysis patients where the pump is operating at 250ml per minute could be too long to ensure timely intervention.

61. As well as detecting failure after sufficient blood has escaped to activate a wetness detector, criteria for triggering the alarm which are independent of the haemodialysis machine's operation could be integrated into its design. For example, pulse and/or continuous blood pressure monitoring equipment is available and would be no more intrusive for the patient than the access systems required for the current equipment.

62. Fresenius Medical Care is well placed to assist in development of these detectors and their integration into haemodialysis equipment.

⁸Shirley Ziegler, "Prevent dangerous haemodialysis catheter disconnections" (2007) Nursing 37, 70.

RECOMMENDATIONS:

Pursuant to section 72(2) of the **Coroners Act 2008**, I make the following recommendation(s) connected with the death:

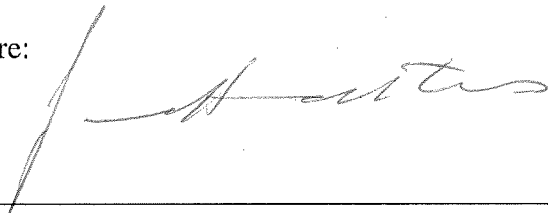
I recommend that:

1. The Alfred Dialysis Unit and Ambulance Victoria cooperate to develop an on-going communication strategy for elderly haemodialysis patients and their relatives to better inform them about the stressors associated with with haemodialysis, the way in which their ambulance transport arrangements are managed and the times they can expect to be picked up from and delivered home.
2. Dialysis Coordinators at Hub Dialysis Units in Melbourne cooperate with each other and with Ambulance Victoria to coordinate placement of patients in overlapping regional areas to reduce the incidence of delayed ambulance response times and the length of ambulance trips for haemodialysis patients.
3. The Therapeutic Goods Administration review the compatibility and standards of LuerLok connectors used in haemodialysis with a view to issuing a warning about the serious consequences of undetected failures.
4. The Alfred and other haemodialysis units use a wetness detector with their Luer-Lok connectors to prevent undetected leaks arising from failure or disconnections.
5. Fresenius Medical Care develop and integrate an emergency response system into their haemodialysis machines to independently detect decline in the patient's physiological condition, trigger an audible alarm and stop the pump.

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

Attorney-General
Minister for Health
Chief Executive Officer, Fresenius Medical Care
Chief Executive Officer, Ambulance Victoria
Chief Medical Officer, The Alfred
Australian and New Zealand Society of Nephrology
Therapeutic Goods Administration

Signature:



DR JANE HENDTLASS
CORONER

31 January 2012

