IN THE CORONERS COURT
OF VICTORIA
AT MELBOURNE

Court Reference: COR 2006 2298

FINDING INTO DEATH WITH INQUEST

Form 37 Rule 60(1)

*Section 67 of the **Coroners Act 2008***

Inquest into the Death of: TREVOR McDONALD

Delivered On:	1 October 2012
Delivered At:	Coroners Court of Victoria Level 11, 222 Exhibition Street Melbourne 3000
Hearing Dates:	10 November 2008 27 to 29 September 2010
Findings of:	JANE HENDTLASS, CORONER
Representation:	Dr Halley appeared for Mr McDonald's family Mr Murdoch appeared for Peninsula Health
Police Coronial Support Unit	Leading Senior Constable Greig McFarlane

I, JANE HENDTLASS, Coroner having investigated the death of TREVOR McDONALD

AND having held an inquest in relation to this death on 10 November 2008, 27 to 29 September 2010

at MELBOURNE

find that the identity of the deceased was TREVOR RONALD McDONALD

born on 6 July 1962

and the death occurred on 25 June 2006

at Frankston Hospital, Hastings Road, Frankston 3199

from:

1 (a) HYPOXIC BRAIN INJURY

1 (b) HAEMOPERICARDIUM AND TAMPONADE

1 (c) RUPTURED RIGHT CORONARY ARTERY COMPLICATING CORONARY ANGIOPLASTY FOR CORONARD ARTERY ATHEROSCLEROSIS

in the following circumstances:

Background

1. Trevor McDonald was 43 years old when he died. He lived with his long-term partner, Karen Turvey, at 11 Horsfield Street in Cranbourne. Mr McDonald worked as a roof tiler.

2. Mr McDonald's medical history included reflux, heartburn, hypertension, three months of exertional angina, high cholesterol levels and coronary artery disease. Mr McDonald's family history also included premature coronary artery disease and elevated cholesterol levels. His general practitioner was Dr Pradeep Chhabra.

3. On 16 June 2006, Dr Chhabra referred Mr McDonald to a private consultant cardiologist, Dr Gregory Yu Foo Szto, for an echocardiogram stress test. The echocardiogram stress test was very abnormal with marked ST depression which took some time to recover.

2. On 19 June 2006, Dr Szto reviewed Mr McDonald and organised for him to undergo coronary angiography at Frankston Hospital. Mr McDonald was aware that the coronary angiography would help Dr Szto diagnose the cause of his abnormal echocardiogram stress test. He was also aware that he may have to undergo subsequent surgery if the angiography showed it was required to correct any blockage in his coronary blood vessels.

3. At 7.00am on 22 June 2006, Mr McDonald presented to the Percutaneous Coronary Angiography Suite at Frankston Hospital for elective, day-case angiography performed by Dr Szto under local anaesthetic.

4. The angiogram proceeded without incident. It showed that Mr McDonald's mid right coronary artery was 100% occluded with a blood clot. The mid left circumflex coronary artery was also 99% occluded with a diagonal branch harbouring ostial moderate stenosis.

5. At 12.30pm on 22 June 2006, Mr Szto decided to perform immediate balloon angioplasty to stent the occlusion that had been identified. Accordingly, he admitted Mr McDonald to the Coronary Care Unit at Frankston Hospital for Percutaneous Cardiac Intervention ("PCI").

6. At about 3.00pm on 22 June 2006, Dr Szto commenced balloon angioplasty of the right coronary artery and two bypass grafts under local anaesthetic. He encountered significant difficulty in passing the guide wire past the occlusion in Mr McDonald's right coronary artery. However, he managed to place and inflate the balloon which allowed him to satisfactorily place the stent in the artery.

7. However, when Dr Szto began to deflate the balloon after the procedure was complete, he noticed that the contrast dye he used to visualise Mr McDonald's arteries was escaping from the blood vessel at the site of the procedure. This leak indicated that he had perforated the right coronary artery during the angioplasty procedure and blood was leaking into Mr McDonald's pericardial sac.

8. Dr Szto tried to re-inflate the balloon to stop the bleeding but Mr McDonald was already hypotensive.

9. As the balloon re-inflated in his right coronary artery, Mr McDonald sustained a cardiac arrest and respiratory difficulties. He was stabilised but subsequently his condition further deteriorated. An emergency echocardiogram confirmed the presence of pericardial effusion with cardiac tamponade. Dr Carrillo de Albornoz arranged for Mr McDonald's transfer to The Alfred hospital for cardiac surgery to identify and manage the source of the blood causing the cardiac tamponade.

10. At 5.00pm on 22 June 2006, Mr McDonald was discharged from Frankston Hospital for emergency ambulance transfer to The Alfred hospital. He was accompanied by Dr Szto and

two medical registrars as well as two mobile intensive care ambulance officers. The doctors applied continuous external heart massage and administered intravenous adrenaline throughout the transfer. The MICA officers did not provide patient care.

11. At 5.40pm on 22 June 2006, Mr McDonald presented at The Alfred Hospital. He was taken directly to the operating theatre.

12. Dr Silvana Marasco is a cardiothoracic surgeon and, at that time, she was Deputy Director of The Alfred Cardiothoracic Unit. At 5.50pm on 22 June 2006, she commenced a sternotomy to enable access to Mr McDonald's heart for pericardial catheterisation, evacuation of pericardial blood and management of his bleeding, including reinstatement of his lacerated right coronary artery.

13. When Dr Marasco opened Mr McDonald's pericardium, she noted that there was some blood in the pericardial sac and there was a lot of haematoma around the right coronary artery but no active bleeding at this site.

14. Dr Marasco also noted that the right ventricular outflow tract branch of the right coronary artery (the "RVOT") was severed and actively bleeding. She sutured the RVOT and performed coronary bypass surgery to correct other atherosclerotic blockages in Mr McDonald's cardiac circulation that Dr Szto had identified in his angiogram earlier that day.

15. At 12.04am on 23 June 2006, Mr McDonald was admitted directly to the Intensive Care Unit at The Alfred Hospital with continuing sedation.

16. On 23 June 2006, Mr McDonald showed minimal brain function when his sedation was withdrawn.

17. At 10.00pm on 25 June 2006, Mr McDonald died.

18. The Coroner accepted the recommendation of the forensic pathologist that no autopsy was required. The forensic pathologist who inspected the body and the medical records formed the opinion that a reasonable cause of death in the circumstances was hypoxic brain injury, haemopericardium and tamponade and ruptured right coronary artery complicating angioplasty for coronary artery atherosclerosis.

19. This Finding will review in more detail the events on 22 June 2006 including:

- Mr McDonald's Angiogram and Angioplasty at Frankston;
- Resuscitation Measures at Frankston Hospital;
- Transfer to The Alfred hospital.

20. It will then comment and make recommendations intended to prevent other deaths occurring for the same reasons that Mr McDonald died.

Mr McDonald's Angiogram on 22 June 2006

21. At 7.00am on 22 June 2006, Mr McDonald presented to the Frankston Hospital Angiography Unit at Frankston Hospital for elective day case angiography.

22. At 10.26am, Mr McDonald was sedated with diazepam and promethazine. Dr Szto successfully performed a coronary angiogram via the right femoral artery. Dr Szto does not remember the particular procedure but there is no reason to believe that there were any complications.

23. The angiogram identified an 100% occluded mid right coronary artery and a 99% occluded mid left circumflex coronary artery with a diagonal branch harbouring ostial moderate stenosis. The occlusion of the mid right coronary artery appeared to result from a recent clot.

24. Accordingly, Dr Szto decided that Mr McDonald required balloon angioplasty of the mid right coronary artery and bypass grafts on the mid right coronary and mid left circumflex coronary arteries so that blood flow to the heart could be maintained and his heart muscle would not deteriorate.

25. In evidence, Dr Szto admitted that 100% occlusion of an artery makes performance of an angioplasty technically more difficult than it would be for less severe obstruction. Complete obstruction increases the risk of complications including bleeding arising from puncture of the artery he was attempting to recanalise.

26. However, Dr Szto also said that, consistent with Mr McDonald's recent escalation of symptoms, the blood clot appeared to be recent because of the appearance of contrast flowing around a rounded shape structure just before the blockage. After a few days or a week it would solidify and become very hard and scarred tissue.

27. Therefore, the current obstruction in Mr McDonald's mid right coronary artery should lend itself to easier passage of the guide wire through the occlusion to enable access for the balloon which he used to dilate the blocked artery and placement of the stent. Dr Szto told the Court:

"I thought it was urgent because he was a young man with quite a severe blockage, with what I thought on the angiogram to be clot present, and that usually indicated a recent heart attack."

28. Further, Dr Szto considered trying cardiac bypass surgery or medications to see if they would help. However, he was concerned that leaving Mr McDonald with on-going symptoms of severe occlusion of two of his major cardiac arteries for another day or two could result in more damage to the heart. He was also concerned about submitting Mr McDonald to major open heart surgery if angioplasty could re-establish the cardiac circulation.

29. Accordingly, Dr Szto decided to offer Mr McDonald immediate balloon angioplasty of the mid right coronary artery and bypass grafts on the mid right coronary and mid left circumflex coronary arteries if a bed was immediately available. Nursing staff maintained Mr McDonald's catheter in anticipation of angioplasty later that day.

Mr McDonald's Angioplasty on 22 June 2006

30. There was no overnight bed available in the Cardiac Unit at Frankston Hospital on 22 June 2006. However, Dr Szto was able to secure Mr McDonald's admission to an urgent coronary care bed.

31. Accordingly, at 12.30pm on 22 June 2006, Mr McDonald was transferred to the Coronary Care Unit and Dr Szto ordered aspirin and clopidigrel anticoagulants to reduce the risk of clotting following introduction of the stents in his cardiac arteries.

32. At 12.46pm on 22 June 2006, Frankston Hospital admitted Mr McDonald to the Coronary Care Unit. Mr McDonald was not asked to sign the admission documents because nursing staff were concerned that he had already taken pre-medication for his angioplasty.

33. However, Mr McDonald's failure to sign the documents seems to reflect nursing policy rather that an inability to consent. Dr Szto remembers Mr McDonald seemed quite lucid and retained capacity to consent to emergency angioplasty. Ms Turvey says that he was quite

capable of deciding what bets to place on the horse races. She also says that Mr McDonald knew in advance that his angiography may indicate that he needed angioplasty.

34. Therefore, I have formed the view that Mr McDonald was capable of understanding and providing consent for urgent angioplasty on 22 June 2006.

35. Ms Turvey was present when Dr Szto spoke to Mr McDonald. She told the Court that Dr Szto did not warn Mr McDonald of the extra risks associated with emergency angioplasty when the cardiac arteries are severely occluded. Dr Szto was unable to remember the conversation and agreed that it is possible he did not tell Mr McDonald that the severity of occlusion of his arteries increased the risks associated with angioplasty.

36. Therefore, I am unable to say whether or not Mr McDonald also specifically consented to the extra risks of angioplasty associated with his particular condition. However, I have no reason to believe that he would have refused consent even if he had known of these risks.

37. At 3.00pm on 22 June 2006, Mr McDonald was administered a further 8000 units of heparin as well as 9.9ul Reopro which also acts as an anticoagulant. Mr McDonald was also given midazolam to sedate him during the procedure. Further, at 3.10pm, infusion of a further 4.5ul Reopro commenced.

38. Dr Szto agreed that Mr McDonald was more at risk of bleeding than he would be without the anticoagulants. However, they are routinely used to prevent the platelets sticking together and complicating placement of the stents in the arteries.

39. As soon as Mr McDonald was sedated, Dr Szto began balloon angioplasty of Mr McDonald's right coronary artery and two bypass grafts under local anaesthetic under ultrasound guidance. Normally he would be assisted by a registrar or training cardiologist. However, on this occasion, Dr Szto was assisted by nursing staff and technicians without other medical assistance.

40. Dr Szto encountered significant difficulty in passing the guide wire through the occlusion in Mr McDonald's right coronary artery so he inflated the balloon towards the end of the wire to give it additional support. He told the Court that there was no extra force involved in passing the wire through the blockage. Rather, he was able to probe the blockage until he could find

another channel that yielded to the wire and allowed him to place the stent in an appropriate position.

41. At 3.35pm on 22 June 2006, Dr Szto deflated the balloon after the stent was in position. When this occurred, contrast leaking from the cardiac circulation at the procedure site indicated bleeding into Mr McDonald's pericardial sac. Dr Szto arranged for administration of aramine and tried re-inflating the balloon to stop the bleed.

42. At 3.36pm on 22 June 2006, Mr McDonald's blood pressure was already 55/44mmHg but his blood oxygen level remained 97% saturation.

43. At 3.46pm on 22 June 2006, Mr McDonald sustained a cardiac arrest and respiratory difficulties. Dr Szto immediately resuscitated him with atropine, protamine and more aramine, commenced external cardiac massage and applied a positive pressure oxygen face mask to support his breathing.

44. Almost immediately[1], Mr McDonald's cardiac function returned and his blood pressure was 130/90mmHg. External cardiac massage ceased but oxygen continued using the positive pressure oxygen face mask.

Resuscitation at Frankston Hospital

45. At 3.46pm on 22 June 2006, Dr Szto called a Cardiac Arrest ("Code Blue") requesting an emergency echocardiogram technician in the angiography suite. He told the Court he did this because he thought it was possible that Mr McDonald's condition would deteriorate.

46. Mr McDonald's resuscitation team included the anaesthetic registrar, Dr Andrew Green, and the intensive care registrar, Dr Michael Patterson. Dr Patterson recalls that Mr McDonald's blood pressure was stable when he and Dr Green arrived in the PCI Suite.

47. The Director of Anaesthesia, Dr Terry Loughnan, and another Intensivist, Dr Ian Carney, also responded. These medical officers were not part of any allocated Code Blue response team. Rather they heard the request for emergency echocardiogram assistance and went to the PCI Suite because they were aware that a cardiac arrest during angioplasty was a serious and rare event.

---

[1] The medical record says 1946 but this is out of sequence with the previous time of 1545 and the next time of 1546 on the next page. Therefore, I presume the time was 1546.

48. There is no record of Mr McDonald's resuscitation in his medical records and Peninsula Health has been unable to find any of the records of the Code Blue response. Further, Dr Szto told the Court he could not recollect the sequence of events relating to his emergency response to Mr McDonald's condition. Therefore, I have relied on evidence presented to the coronial investigation to put together what seems to have happened next.

49. There is no evidence before me to suggest that either of the two other interventional cardiologists who, together with Dr Szto, comprised the Frankston Hospital interventional cardiology team played any role in Mr McDonald's resuscitation.

50. However, the Head of Cardiology, Dr Carrillo de Albornoz, responded to the emergency call. He assisted in arranging and transporting the emergency echocardiogram machine downstairs. He also assisted in confirming Dr Szto's preliminary diagnosis of a cardiac tamponade.

51. Echocardiography showed a moderate circumferential pericardial fusion with evidence of right ventricular compression and echo dense appearance of pericardial fluid consistent with blood. The echocardiogram did not identify the site/s of the bleeding. These results of the echocardiogram were communicated to Dr Szto to confirm the need for pericardiocentesis to enable draining of the pericardial fluid.

52. The echocardiogram record was not available to the Court but the radiology report was tendered. This report does not refer to and I accept that there was no a percardiocentesis needle within the pericardial sac when the echocardiogram was performed.

53. At 3.46pm on 22 June 2006, Dr Loughnan intubated and anaesthesised Mr McDonald. He told the Court that Mr McDonald's movements were already consistent with onset of cerebral hypoxia when he arrived at his bedside. He also said this was evidence of significant hypoxia which would probably have seriously affected Mr McDonald's brain. However, he could not say whether it was already irreversible.

54. After the cardiac tamponade had been confirmed, Dr Szto commenced an urgent pericardial aspiration (pericardiocentesis) from the subcostal approach. Dr Szto said he had performed this procedure 30-40 times during his professional career.

55. The pericardiocentesis procedure involved four distinct processes:

- First, Dr Szto inserted a 12.5cm long, wide bore needle through the skin into Mr McDonald's chest about one to two inches below the sternum. He then pushed the needle under the ribcage until the tip of the needle entered the blood or other fluid in the pericardial sac and fluid began to flow back out of the needle.

- As I understand Dr Szto's evidence and Mr McDonald's medical record, Dr Szto withdrew about 150mls blood from Mr McDonald's cardiac tamponade using this needle and a 50ml syringe. He reinfused about 100mls of this blood into Mr McDonald's circulation.

- In the second stage, Dr Szto pushed a blunt flexible wire up the inside of the needle he had placed in Mr McDonald's chest. When that wire entered the pericardial fluid, the needle was withdrawn back down the wire.

- After this, Dr Szto pushed a hollow tube over the wire into the pericardial fluid and a pigtail on the pericardiocentesis line secured its position in the pericardial sac. He then withdrew the wire to allow the fluid to flow.

- Dr Szto says he collected about 900 ml frank blood from this pericardial drain and re-infused most of this blood into Mr McDonald's circulation.

56. There is conflicting evidence about whether and/or when Dr Szto used the echocardiogram to assist him in placing the pericardiocentesis needle and drain:

- Dr Szto cannot remember whether or not he was guided by echocardiogram in performing the pericardiocentesis.

- In his first statement, Dr Carrillo de Albornoz told the Court that he accompanied the Cardiac Technologist to the Coronary Angiography Suite. An emergency echocardiogram was performed and it confirmed the presence of a pericardial effusion with tamponade. He subsequently left the Coronary Angiography Suite to organise emergency transfer of the patient to a cardiac surgical centre.

- In his further statement, Dr Carrillo de Albornoz told the Court that he believes that he provided guidance for Dr Szto using the echocardiogram machine about the best placement of a pericardiocentesis needle. He also says he left after the pericardial drain was inserted to organise Mr McDonald's intra-hospital transfer.

- In response to my question about whether he assisted Dr Szto to place the pericardiocentesis needle on 22 June 2009, Dr Carrillo de Albornoz told the Court:

  "I didn't do (that)*, I left to make the phone calls and the usual thing would be that the sonographer would stay and provide the images because the sonographer is actually more skilled at acquiring the images."*

- Dr Carrillo de Albornoz also told the Court that the echocardiogram equipment and the sonographer remained in the room. The sonographer participated in reviews of Mr McDonald's death at Frankston Hospital but she did not raise the role of the electrocardiograph machine in these reviews. However, there is no direct evidence before me as to whether or not the sonagrapher assisted Dr Szto in placing the drain.

57. Therefore, I find that Dr Szto probably did not use echocardiogram assistance to position the pericardiocentesis needle and the pericardial drain in Mr McDonald's cardiac effusion and relieve the tamponade.

58. Further, there is conflicting evidence about when or at what stage of the pericardiocentesis procedure Dr Loughnan anaesthesised Mr McDonald:

- The medical record indicates that Dr Loughnan intubated Mr McDonald at 3.46pm on 22 June 2006. This record follows the indication that Dr Szto had drained 150ml out of the pericardial drain.

- Dr Andrew Green was an anaesthetics registrar at Peninsula Health. He told the Court he arrived in the PCI Suite when Dr Szto was experiencing difficulty in inserting the drain because Mr McDonald could not lie still.

- Dr Patterson told the Court that Mr McDonald was moving around when he entered the PCI Suite but he can not remember whether the pericardial drain was in place.

- Dr Loughnan also told the Court that:

  - Dr Szto had already diagnosed a cardiac tamponade when he arrived and:

  "they were taking blood off from the catheter efficiently... It was being done through the catheter through a three-way tap."

- He clearly recalled an echocardiogram was brought in to the room from radiology, that is after he arrived.

- He continued to give Mr McDonald oxygen by oxygen mask and face mask to support his breathing and improve his oxygenation for his lungs, whilst they were waiting for the equipment to come to allow intubation and anaesthesia.

- He had to organise a spare anaesthetic machine and equipment required to intubate and anaesthetise Mr McDonald appropriately.

- He was present when the pericardial drain was placed.

- He also said that the wire exchange was done under anaesthetic. However, in response to my question about whether the pericardiocentesis was performed under anaesthetic, he replied:

"The one that I saw was - was done after he was anaesthetised."

59. Therefore, I have formed the opinion that Dr Szto probably placed the pericardiocentesis needle in Mr McDonald's pericardial effusion and drained about 150mls pericardial fluid after the cardiac tamponade was confirmed using an echocardiogram but before he was intubated and anaesthetised.

60. After Mr McDonald was anaesthetised, Dr Szto established the pericardial drain and drained a further 900ml from the pericardial effusion. Mr McDonald's blood pressure then rose from 55/44mmHg at 3.30pm to 164/98mmHg at 3.50pm on 22 June 2006. Associate Professor Chard told the Court that this improvement in Mr McDonald's condition tended to indicate that the drain was appropriately placed in the pericardium.

61. However, after five to ten minutes, Dr Green had to administer more adrenaline because Mr McDonald's blood pressure declined again. In the absence of cardiac surgery facilities at Frankston Hospital, Dr Carrillo de Albornoz and Dr Szto initiated arrangements to transfer Mr McDonald to a tertiary hospital with appropriate cardiothoracic surgeons and facilities to open his chest and operate on his heart.

62. By 4.15pm, Mr McDonald's blood pressure further deteriorated to 90/65mmHg and his pulse was 64 beats per minute.

Transfer to The Alfred Hospital

63. At 4.03pm on 22 June 2006, Ambulance Victoria received a call from Frankston Hospital Angiography Unit requesting an urgent transfer to The Alfred Hospital theatre.

64. Dr Carrillo de Albornoz also contacted Monash Medical Centre, The Alfred Hospital and St Vincent's Hospital but they did not have appropriate theatre facilities available. When he re-contacted The Alfred, an operating theatre had become available but there was still no post-operative intensive care ("ICU") bed. In the end, Dr Carney was able to organise an ICU bed at The Alfred.

65. At 4.33pm on 22 June 2006, the ambulance was despatched. There is no evidence before me about the reasons for this delay. At 4.36pm, ambulance officers Adrian Canning and Judith Hessey arrived at Mr McDonald's bedside. They transferred Mr McDonald to their trolley and returned with him to their vehicle in the Frankston Hospital car park.

66. Drs Szto, Green and Patterson also accompanied them. Dr Patterson remembers that the blood pressure equipment established during the emergency response accompanied Mr McDonald to the car park and that Mr McDonald's blood pressure remained stable on the way to the car park but the pericardial drain had stopped draining blood by the time they reached the ambulance.

67. Mr McDonald collapsed with a further cardiac arrest in the car park at Frankston Hospital. After discussion about whether to keep him at Frankston Hospital in order to stabilise his condition, external cardiac compressions commenced and adrenaline was administered through an intravenous line. Drs Szto, Green and Patterson were able to re-establish blood pressure for a short time.

68. Dr Szto also contacted the only thoracic surgeon at Frankston Hospital, Mr Peter Cole, on the telephone to ask him to help with emergency thoracic surgery. Mr Cole was at his consulting rooms in Berwick and unable to assist. Therefore, the plan to transfer Mr McDonald to The Alfred continued.

69. Dr Szto told the Court it would not have been appropriate to seek Mr Cole's help earlier because, in the vast majority of cases, a percutaneous pericardiocentesis will solve the problem.

70. Mr McDonald's family told the Court that they also saw one of the doctors plunge a needle straight into Mr McDonald's chest. They said the needle and syringe were much bigger than normal. However, Drs Green and Patterson and Mr Canning all say that no such event occurred and at no time was Mr McDonald given an intracardiac injection. Dr Szto also said in evidence:

"We attempted aspiration and external heart massage but we never opened the chest."

71. The ambulance record indicates Mr McDonald was loaded at 5.00pm[2] or 24 minutes after their arrival at the hospital. They departed using lights and sirens. Mr McDonald's transfer from the Frankston Hospital car park to The Alfred hospital took 40 minutes.

72. Drs Szto and Green performed continuous external cardiac massage throughout Mr McDonald's transfer in an attempt to maintain his blood pressure. Ongoing aspiration of blood from the pericardial sac was performed alternately by Dr Szto and Dr Green. Dr Patterson maintained Mr McDonald's airway and monitored his blood pressure using the ambulance blood pressure monitors.

73. Dr Green also recalls that, just prior to arrival at The Alfred Hospital, he was aspirating significant amounts of blood. Associate Professor Chard suggests this may have been associated with breaking up of the coagulated blood during cardiopulmonary resuscitation and may have minimised the residual tamponade. This would have increased Mr McDonald's blood pressure. Variations in the rate of aspiration were attributed to blockages in the pericardial drain.

74. The three doctors also administered adrenaline through the venous line. Ambulance officers provided the doctors with ten 1mg in 1 ml ampoules of adrenaline when their stock ran out.

---

[2] The ambulance record states the ambulance was despatched at 1633 hours and arrived at Frankston Hospital at 1734hours and ambulance officers were at the patient at 1736 hours. It also says they departed location at 1700 hours. Therefore, I interpret the recorded times to be a mistake and to mean that the ambulance was despatched at 1633 hours and arrived at 1634 hours and ambulance officers were at the patient at 1636 hours.

75. There were no oxygen saturations taken en route and Dr Szto told the Court that Mr McDonald remained hypotensive during his transfer to The Alfred hospital. However, reports of his systolic blood pressure during transfer are inconsistent:

- Dr Szto says it remained about 70mmHg using the pressure transducer in the femoral artery registered a systolic blood pressure.
- Drs Green and Patterson say it remained about 50mmHg using the ambulance blood pressure equipment.
- The ambulance report says that his blood pressure was 100mmHg with cardiopulmonary resuscitation when they left Frankston.

76. Dr Szto also told the Court that he remembered that Mr McDonald's systolic blood pressure was 200mmHg when he was first connected to the equipment in the operating theatre at the Alfred Hospital. Dr Patterson also saw this reading but he is unable to remember whether it was before or during the sternotomy.

77. Dr Szto's observation is inconsistent with all the other evidence of Mr McDonald's blood pressure during transfer to The Alfred Hospital. Therefore, I can only assume it was an anomaly that occurred during establishment of The Alfred blood pressure monitors or that it occurred after surgery commenced.

The Alfred

78. At 5.40pm on 22 June 2006, Mr McDonald presented at the Emergency Department at The Alfred hospital. He was taken directly to the operating theatre with resuscitation efforts continuing.

79. At 5.45pm, Mr McDonald's blood pressure in the operating theatre at The Alfred was 130/80mmHg. His pulse was 96 beats per minute.

80. At 5.50pm, Mr McDonald was on the table in the operating theatre. Cardiopulmonary resuscitation continued. His oxygen level was 88% saturation. His coagulation rates were abnormal and he was acidotic.

81. Dr Silvana Marasco is a cardiac surgeon and a Fellow of the Royal Australian College of Surgeons. In 2010, she was Deputy Director of the Cardiothoracic Unit at the Alfred Hospital.

82. At 5.52pm, Dr Marasco commenced an urgent sternotomy for pericardial catheterisation, evacuation of pericardial blood and suture of the lacerated right coronary artery. This procedure involved splitting of the pericardium and it was noted that there was some blood in the pericardial sac. Dr Marasco and Dr Szto observed little residual blood in the pericardial sac.

83. Dr Marasco noted a great deal of haematoma in the epicardial fat around the right coronary artery consistent with its prior laceration but no site of bleeding into the pericardium. Therefore, she did not need to repair the artery immediately and she was unable to attribute any of frank blood she encountered to injury of the right coronary artery.

84. However, Dr Marasco also noted a laceration of the RVOT which was bleeding profusely. This bleeding ceased when Dr Marasco sutured the site.

85. Although the RVOT is a relatively small blood vessel, Dr Szto said he would have expected the pericardial sac to be full of blood if that artery had been bleeding during transfer at the rate that he saw it when Dr Marasco opened Mr McDonald's chest.

86. However, Dr Loughnan explained that the high levels of adrenaline administered to Mr McDonald during transfer would have increased his blood pressure and the rate of bleeding from the injured RVOT as soon the cardiac tamponade was released.

87. At 6.24pm on 22 June 2006, Mr McDonald's blood pressure stabilised at 180/100mmHg with inotropic support before placing him on cardiopulmonary bypass for a total of 136 minutes.

88. Dr Marasco harvested the long saphenous vein and used it to construct a vein graft to the posterior descending artery and a composite vein graft to the second obtuse marginal artery (OM2). Mr McDonald's heart remained on bypass to allow 40 minutes reperfusion prior to a prolonged period of haemostasis and closing his pericardium and chest.

89. By completion of surgery at 9.35pm on 22 June 2006, Dr Maresco was encouraged that Mr McDonald continued to make urine and all his biochemical derangements had been corrected. In a letter to Dr Szto dated 22 June, Dr Marasco says that, from a cardiac point of view, Mr

McDonald seemed to have done quite well. He came off bypass relatively easily with a very low level of inotropic support.

90. At 11.40pm on 22 June 2006, Mr McDonald was admitted directly to the Intensive Care Unit at The Alfred hospital sedated but in a stable condition. Platelets and protamine were administered to assist in correction of his coagulation. However, his blood pressure was 90/55mmHg and he continued to require adrenaline and noradrenaline infusions. His oxygen saturation was 99-100%.

91. At 10.00am on 23 June 2006, Mr McDonald's sedation was withdrawn. By 2.30pm, he showed minimal brain function. A subsequent echocardiogram showed trivial pericardial effusion with no signs of tamponade.

92. On 24 June 2006, a CT brain showed perfuse hypoxic brain injury and he still had a GCS of 3/15.

93. At 8.30pm on 25 June 2006, no neurological function had been detected for two days and life support was withdrawn.

94. At 10.00pm on 25 June 2006, Trevor McDonald died.

COMMENTS

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

1. Trevor McDonald was 43 years old when he died. His medical history included reflux, heart burn, hypertension, high cholesterol levels and coronary artery disease. His general practitioner was concerned about a three-month history of exertional angina and referred him to the interventional cardiologist, Dr Gregory Yu Foo Szto.

2. On 16 June 2006, Dr Szto diagnosed Mr McDonald with very abnormal cardiac function often attributable to severe coronary artery atherosclerosis and risk of severe myocardial infarction. Dr Szto referred him for an elective diagnostic angiogram at the Frankston Hospital Percutaneous Coronary Angiography Unit.

3. On 22 June 2006, Mr McDonald's angiogram showed he had a 100% occluded mid right coronary artery and a 99% occluded mid left circumflex coronary artery with a diagonal branch harbouring ostial moderate stenosis. Accordingly Dr Szto arranged for his transfer to the Frankston Hospital Percutaneous Intervention ("PCI") Suite.

4. At about 3.00pm on 22 June 2006, Dr Szto performed an urgent balloon angioplasty of Mr McDonald's right coronary artery and created two bypass grafts at Frankston Hospital. The balloon angioplasty was difficult but Dr Szto was able to achieve his goal without apparent complication.

5. However, when he deflated the balloon used to dilate and support the artery, Dr Szto noted bleeding into Mr McDonald's pericardial sac and his blood pressure was declining. Therefore, he re-inflated the balloon in an attempt to stop the bleeding. During this procedure, Mr McDonald collapsed with cardiac arrest.

6. Dr Szto formed the preliminary opinion that Mr McDonald was developing a cardiac tamponade.

7. Accordingly, Dr Szto commenced resuscitation efforts including external cardiac massage and oxygen delivery through a positive pressure facemask. Dr Szto also drained about 150ml fluid from Mr McDonald's pericardial space.

8. Dr Szto also called for emergency assistance. An emergency echocardiogram subsequently confirmed the presence of pericardial effusion with tamponade. He then performed an urgent pericardiocentesis and aspirated a further 900mls fluid. Mr McDonald's bleeding declined and his condition improved temporarily.

9. After about 15 minutes, Mr McDonald's blood pressure deteriorated again. Resuscitation efforts continued as other cardiology and intensive care staff arranged to transfer Mr McDonald to The Alfred Cardiothoracic Unit for surgery to find and treat the cause of his pericardial bleeding.

10. While he was waiting to be loaded into the ambulance for transfer, Mr McDonald's condition deteriorated again in the car park of the Frankston Hospital. External cardiac massage re-commenced and adrenaline was infused through the intravenous line. However, Dr Szto decided to continue with his transfer to The Alfred hospital.

11. Three doctors accompanied Mr McDonald to The Alfred hospital in an emergency ambulance transfer. He was intubated, anaesthetised and maintained on positive pressure oxygen while the doctors continued to perform external cardiac massage and administer adrenaline in an attempt to maintain his oxygen levels and blood pressure.

12. At The Alfred hospital, a cardiac surgeon, Dr Silvana Marasco, performed an emergency sternotomy to enable pericardial catheterisation and evacuation of pericardial blood.

13. Dr Marasco noted that bleeding from Mr McDonald's right coronary artery was clotted and there was no active bleeding into the pericardium from that site. However, she also found that the ventricular outflow tract of the branch of Mr McDonald's right coronary artery ("RVOT") was lacerated and actively bleeding. Accordingly, Dr Marasco sutured the RVOT injury. Mr McDonald's physiological condition immediately improved.

14. Dr Marasco then performed cardiac bypass surgery to successfully construct a vein graft to the posterior descending artery and a composite vein graft to the second obtuse marginal artery. After surgery was completed, Mr McDonald remained intubated and anaesthetised. His biochemical assessments had been corrected and she hoped that the resuscitation had been adequate to protect his brain.

15. However, Mr McDonald did not recover consciousness after his anaesthesia and sedation were withdrawn on 23 June 2006.

16. On 25 June 2006, Mr McDonald died at The Alfred hospital from hypoxic brain injury, haemopericardium and tamponade and ruptured right coronary artery complicating angioplasty for coronary artery atherosclerosis.

17. To place Mr McDonald's pre-existing condition and Dr Szto's decision to perform urgent angioplasty on 22 June 2006 in context, it is worth considering the importance of cardiovascular disease and PCI procedures in the Victorian community.

18. I will then discuss and make recommendations about the following issues:

- Factors influencing Mr McDonald's fatal hypoxic brain injury
- On-going effect of puncture of Mr McDonald's right coronary artery

- Effect of transection of ventricular outflow tract of the branch of Mr McDonald's right coronary artery
- Stand Alone Percutaneous Coronary Intervention Laboratories
- Department of Human Services (now Department of Health)
- The Cardiac Society of Australia and New Zealand
- Cross accreditation
- Patient selection.

Cardiovascular disease and PCI procedures in Victoria

19. Cardiovascular disease is:

    i. Victoria's biggest killer accounting for 11,600 deaths (33% of all deaths) in 2008. It is marginally second (16%) to cancer (19%) as Victoria's leading cause of the burden of disease.

    ii. A leading cause of avoidable mortality.

    iii. Our most expensive disease group, accounting for 11% of all health expenditure.

    iv. Projected to increase by 28% by 2033.[3]

20. For patients experiencing or at immediate risk of a heart attack, quick medical treatment saves lives and reduces the risk of long-term damage to the heart muscle. Reperfusion through thrombolysis or percutaneous coronary intervention restores blood flow to the heart within one to two hours of symptom onset reduces mortality by half and may completely stop a cardiac event.[4]

21. Over the past decade, percutaneous coronary intervention (PCI) has replaced coronary artery bypass graft surgery as the most common coronary revascularisation strategy for treating

[3] Heart Foundation Victoria 2011-12 State Budget Submission

[4] Heart Foundation Victoria 2011-12 State Budget Submission, p. 6.

coronary artery disease in Australia.[5] Stent implantation has significantly improved the short-term and long-term outcomes of patients undergoing PCI for obstructive coronary artery disease.[6]

22. Between 2001-02 and 2005-06, there was a 9.2% increase in the number of patients undergoing interventional cardiology procedures in Victoria. Since that time, Ballarat Hospital has also opened a PCI Suite.

23. Frankston Hospital PCI Suite performed 5% of these procedures including 760 cases in 2005-06.[7] In contrast, St Vincent's and the Alfred Hospitals and Monash Medical Centre with on-site cardiothoracic surgery each performed about two times this number of procedures that year.

24. About one person in 1000 (0.11%) undergoing PCI in the Frankston Hospital PCI Suite suffers a coronary perforation during their procedure. When uncontrolled, a coronary perforation can lead to major bleeding. Major bleeding is a known adverse consequence of percutaneous coronary intervention in 2.3% of cases.[8]

25. A cardiothoracic surgeon engaged by solicitors for Mr McDonald's family, Associate Professor Richard Chard, also expressed the expert opinion that coronary artery perforation and major bleeding are known potential complications of percutaneous cardiac artery angioplasty.

26. Cardiac tamponade occurs when fluid collects in the pericardial space between the heart and the pericardium. Pressure from the fluid interferes with the heart's capacity to expand and refill after each beat. This also compresses the right ventricle to limit the amount of blood it can send to the lungs for re-oxygenation.

---

[5] Davies J. Coronary revascularisation in Australia, 2000. AIHW bulletin no. 7. Canberra: Australian Institute of Health and Welfare, 2003. (AIHW Cat. No. AUS 35.)

[6] Fischman DL, Leon MB, Baim DS, et al. A randomized comparison of coronary-stent placement and balloon angioplasty in the treatment of coronary artery disease, *N Engl J Med* (1994) 331: 496-501 cited in Yan BP, Ajani AR, Duffy SJ, New G, Horrigan M, Szto G, Walton A, Eccleston D, Lefkovits J, Black A, Sebastian M, Brennan AL, Reid CM and Clark DJ on behalf of the Melbourne Interventional Group investigators, "Use of drug-eluting stents in Victorian public hospitals" *MJA* (2006) 185: 363–367.

[7] Price Waterhouse Coopers, "A Cardiac Framework for Victoria, A Report prepared for the Department of Human Services", April 2008 (the "Review").

[8] Major bleeding complication is defined as bleeding that occurred during or after the procedure until discharge, that required transfusion and/or prolonged hospital stay and/or caused a drop in haemoglobin level > 3.0 g/dL.

27. Accordingly, a cardiac tamponade reduces the volume and oxygen level of blood servicing the brain. The usual first indication of this effect is lowering of the blood pressure and the oxygen saturation level.

28. Hypoxic brain injury occurs when the oxygen supply to the brain is insufficient to maintain neurological functioning because the oxygen levels in the blood are low and/or the blood flow to the brain is restricted. Three minutes complete absence of oxygen causes irreversible brain damage.

29. This time is extended when oxygen delivery to the brain is not completely extinguished. Hypoxic brain injury can also occur incrementally. As the Director of Anaesthetics at Frankston Hospital, Dr Terry Loughnan, told the Court:

> *"...it may be a situation when multiple events add up in an accumulative way to irreversible hypoxic damage."*

30. In order to minimise the period of inadequate oxygen supply to the brain, the appropriate response to cardiac tamponade is percutaneous drainage of the fluid in the pericardium and physical or pharmacological interventions aimed at maintaining blood pressure and cardiac output. In circumstances where major bleeding does not respond to local strategies, cardiac surgery is required to find and remedy the source of the bleeding before hypoxic brain injury occurs.

31. In Court and in interpersonal communications, professional witnesses have consistently expressed the opinion that Mr McDonald would have been more likely to survive the consequences of his cardiac tamponade if Dr Szto had performed his angioplasty in a PCI Suite associated with a tertiary hospital with surgical capacity to perform cardiothoracic surgery or, at least, undertake a sternotomy so that the bleeding site can be identified and controlled prior to transfer for cardiac surgery.

32. For example, on 28 June 2006, Dr Marasco from the Cardiothoracic Surgical Department at The Alfred wrote to Dr Szto. In her letter she stated:

> *"As we discussed by telephone this is obviously a significant issue when angioplasty is performed in a remote hospital. Perhaps we should discuss some further options on how we could provide you with faster retrieval service if it becomes necessary."*

33. In Court, Dr Marasco also said:

> *"I think low risk angioplasty lesions can be safely tackled in a more remote hospital but I suspect that more high risk lesions should be performed in a hospital where there is cardiac surgery on site. I think to say that no angioplasty should be performed in peripheral hospitals means there's an enormous number of patients who can't be serviced locally who would have to go onto a waiting list at a sort of major city hospital, and I think that means the servicing of those patients is reduced. So I think it is appropriate to tackle low risk lesions in a peripheral hospital."*

34. Similarly, Associate Professor Chard told the Court:

> *"...if you are undertaking the types of procedures that are listed in this case, you will have the occasional, very rare situation like this and that type of situation is eminently fixable by a surgeon on site and ends up with a situation like this if there isn't. It's as simple as that. The Cardiac Society guidelines do allow for no surgical backup but I guess that's accepting that the risk of this type of thing can happen, because it can."*

35. As an alternative strategy, Mr Peter Cole was the Head of Thoracic Surgery at Frankston Hospital. Accordingly, he had the capacity to perform an emergency thoracotomy and relieve the tamponade prior to Mr McDonald's transfer to a cardiothoracic unit for cardiac surgery.

36. Therefore, these opinions about the timeliness and characteristics of advanced surgical responses required to respond to emergencies that arise in the PCI Suite carry important policy and practical implications for the operation of PCI Suites without on-site cardiothoracic surgery facilities.

37. I will now attempt to identify the factors that influenced the development of Mr McDonald's hypoxic brain injury to the stage where it became irreversible. I will then consider the current conditions governing continuing operation of regional, stand-alone PCI facilities in an attempt to reduce the risk of other people dying for the reasons that Mr McDonald died.

Factors influencing Mr McDonald's fatal hypoxic brain injury

38. Retrospective determination of the factors contributing to Mr McDonald's irreversible hypoxic brain injury is complicated because symptoms of cardiac effusion with associated tamponade, such as declining blood pressure and lowered oxygen saturation levels, reflect its primary effect on cardiac function and, accordingly, follow the event.

39. Anaesthesia also masks physiological indicators of changes in cerebral function so that, other than a CT brain scan, direct assessment of brain damage is impossible in an anaesthesised patient. Therefore, particularly in circumstances where the patient is anaesthetised, it is difficult to determine when or if hypoxic brain damage is continuing or has become fatal.

40. However, as a preliminary issue, I find that Mr McDonald's brain had not suffered fatal hypoxic cerebral injury before his blood pressure declined during his angioplasty procedure on 22 June 2006.

41. My reasons for making this finding include:

- Mr McDonald was well with no suggestion of impaired mental state before he was sedated for his angioplasty;
- The angioplasty proceeded without known incident;
- His blood pressure did not deteriorate until the balloon in his right coronary artery was deflated and the bleed had been identified; and
- His first cardiac arrest followed deterioration in his blood pressure.

42. Dr Szto and Dr Loughnan expressed the opinion that cerebral hypoxia would have commenced in the period of time between when Mr McDonald sustained cardiac failure in the PCI Suite and when he was intubated, anaesthetised, respirated with oxygen and his tamponade was relieved.

43. However, the initial drop in Mr McDonald's blood pressure when Dr Szto released the balloon in his right coronary artery and preceding his cardiac failure was already attributable to cardiac tamponade and consequent reduction in the heart's capacity to refill. Accordingly, I find that cerebral hypoxia probably commenced at the time Mr McDonald's blood pressure dropped, that is at 3.35pm on 22 June 2006.

44. Mr McDonald's cardiac failure at 3.45pm on 22 June 2006 is evidence of on-going effusion and the cardiac tamponade's continuing effect on his heart's capacity to refill and re-distribute the oxygen being provided to his lungs. Further, despite giving Mr McDonald oxygen by positive pressure facemask, his cardiac failure would have increased the hypoxic effect of already reduced blood flow to the brain.

45. Dr Loughnan and Dr Green say that Mr McDonald's movements when they arrived in the PCI laboratory interfered with Dr Szto's ability to place the pericardial drain and release the pressure on his heart. Despite a suggestion that these movements were caused by withdrawal from midazolam sedation used during the angioplasty, I accept the evidence of the anaesthetists at the scene that Mr McDonald's movements prior to his anaesthesia were consistent with onset of cerebral hypoxia prior to his intubation.

46. Therefore, I accept that Mr McDonald was already suffering from severe cerebral hypoxia when formal resuscitation efforts commenced in the PCI Suite at Frankston Hospital.

47. Dr Szto drained 900mls of frank blood from Mr McDonald's cardiac tamponade in the PCI Suite after he was anaesthetised. This volume of fluid in the cardiac sac would have continued to severely compromise his heart's ability to pump blood effectively to the brain until the bleeding stopped and the tamponade was relieved.

48. As evidence of the effect on on-going bleeding and tamponade, Mr McDonald suffered a second cardiac arrest in the car park at Frankston Hospital prior to loading in the ambulance at about 5.00pm on 22 June 2006.

49. Therefore, after reviewing all the evidence, I am confident that Mr McDonald suffered further hypoxic brain damage arising from his on-going cardiac effusion and tamponade and consequent decline in blood pressure over a period of at least 30 minutes between 3.45pm when he was anaesthetised and about 5.00pm on 22 June 2006 when he suffered a second cardiac arrest in the Frankston Hospital car park.

50. This period of significant cerebral hypoxia means that Mr McDonald's brain was probably already irreversibly compromised before his transfer commenced.

51. In Dr Szto's opinion, Mr McDonald's cerebral hypoxia became irreversible in the ambulance. Further, Dr Szto told the Court that the transfer is the main factor differentiating between

emergency response to an uncontrolled cardiac tamponade that occurs in a PCI Suite in a tertiary hospital and an uncontrolled cardiac tamponade that occurs at a remote site.

52. During Mr McDonald's transfer to The Alfred hospital, he was intubated and ventilated with oxygen, administered large amounts of intravenous adrenalin and underwent continuous external cardiac massage. However, there were still no oxygen saturation measurements taken en route.

53. Assessment of Mr McDonald's systolic blood pressure during transfer to The Alfred hospital ranged from 50mmHg to 100mmHg. Some of these measurements may have been influenced by blockages in the arterial line and do not necessarily reflect the amount of blood available to his brain.

54. I accept that the most reliable assessment of Mr McDonald's peripheral venous blood pressure was determined by the ambulance equipment. Therefore, it was probably about 50mmHg during most of the transfer.

55. I also accept that even these low levels would not be effectively translated into cerebral oxygenation because his on-going cardiac tamponade limited the capacity of external cardiac massage, adrenaline and oxygen ventilation to deliver blood to the lungs for re-oxygenation.

56. Further, at 5.50pm on 22 June 2006, Mr McDonald's oxygen saturation was 88% prior to surgery commencing at The Alfred hospital. His coagulation rates were abnormal and he was acidotic. This suggests his metabolism was compensating for serious on-going oxygen depletion.

57. Accordingly, I accept Dr Szto's opinion that Mr McDonald would have further deteriorated during his ambulance transfer to The Alfred hospital. That is, even if he was retrievable when he left the car park at Frankston Hospital, his brain will have been further influenced by the incremental effect of the following 40 minutes of limited oxygen availability.

58. However, in the context of his pre-existing cerebral hypoxia, I am unable to say that this period was crucial to his capacity to recover.

On-going Effect of Puncture of Mr McDonald's Right Coronary Artery

59. The amount of blood drained from Mr McDonald's cardiac tamponade varied during the trip to The Alfred hospital and probably also reflected clotting around the drainage tube. Further, although drainage increased as the ambulance approached The Alfred, Dr Marasco and Dr Szto observed that there was substantial haematoma around the right cardiac artery but no active bleeding from that site when the pericardium was opened in surgery.

60. Therefore, I have formed the opinion that the penetration of Mr McDonald's right coronary artery that occurred when Dr Szto was performing balloon angioplasty on 22 June 2006 probably did not continue to bleed heavily or at all during his transfer to The Alfred hospital. However, the clot arising from the right coronary artery injury will have continued to compromise the heart's capacity to refill.

61. Further, it is unlikely that all of the 900mls frank blood drained from Mr McDonald's cardiac perfusion at the Frankston Hospital after his anaesthetic was administered and further blood drained during transfer to The Alfred came from perforation of his right coronary artery because:

- Mr McDonald's cardiac function was restored prior to drainage of the 150mls from the initial effusion. However, he suffered a second cardiac arrest in the car park indicating he was still bleeding into his pericardium and this was influencing cardiac performance.

- Dr Marasco and Dr Szto confirmed that the blood around the coronary artery perforation was clotted when the cardiac sac was opened despite the ongoing effects of anticoagulants.

- Mr McDonald's pericardial effusion continued to drain sporadically during his ambulance transfer and increased as they approached The Alfred Hospital. This is inconsistent with the clot that Dr Marasco found around the right coronary artery.

- Dr Loughnan further explained that the pericardium is quite inflexible so that, as the pressure in the pericardial sac rose and the pressure gradient reduced, the blood loss from the injured cardiac blood vessels would reduce. If the pressure in the pericardial sac is so high that it is retarding blood flow out of the coronary arteries, that is a huge reduction in cardiac output.

Effect of transection of ventricular outflow tract of the branch of Mr McDonald's right coronary artery ("RVOT")

62. In an alternative explanation of the source of Mr McDonald's cardiac effusion and tamponade, Dr Marasco and Dr Szto agree that the RVOT was severed and actively bleeding with no mention of a clot at that site when they commenced surgery at The Alfred hospital. Dr Marasco sutured this injury and Mr McDonald's physiological condition immediately improved.

63. Bleeding from this injury is important because, if the RVOT transection occurred before cardiac surgery, this blood would have increased the cardiac effusion and tamponade to the extent that it created the extra oxygen deficiency for the period required to critically compromise Mr McDonald's hypoxic brain damage.

64. The Court heard five explanations for the way in which transection of Mr McDonald's RVOT could have occurred before or during his transfer to The Alfred hospital.

65. Firstly, laceration of the RVOT could have occurred during angioplasty. However:

- Associate Professor Chard told the Court that it would be difficult to access the RVOT during the left heart approach used by Dr Szto to access the right coronary artery during Mr McDonald's angioplasty.

- Dr Marasco also told the Court:

  "I think it was very unlikely, I think the laceration was too far removed from the right coronary artery, so just anatomically I don't see how that could have been possible."

- Further, Dr Szto agreed that the nature of the transection of the RVOT suggested that the vessel was cut from outside the vessel rather than punctured from inside. That is the injury was inconsistent with an injury caused during angioplasty.

- Therefore, I find it unlikely that Mr McDonald's RVOT was transected during his angioplasty. Accordingly, it is unlikely that it contributed to his original cardiac effusion and tamponade at 3.35pm on 22 June 2006.

66. Secondly, laceration of the RVOT could have occurred during pericardiocentesis.

- Dr Szto says that he performed the pericardiocentesis from the subcostal approach. That is the pericardiocentesis needle entered Mr McDonald's chest about 1-2 inches below the sternum and under the rib cage.

- Dr Marasco confirmed that, when she commenced surgery, Mr McDonald's pericardial drain was positioned in the pericardium in the subxiphoid position and in the pericardium it was sitting over the diaphragmatic surface. This is consistent with Dr Szto's evidence about the way in which he performed the pericardiocentesis.

- Dr Loughnan and other professional witnesses confirmed that they saw Dr Szto perform the pericardial aspiration from the subcostal approach after Mr McDonald was anaesthetised. That is, they saw the pericardial drain exit Mr McDonald's chest about 2.5 to 5cm (1-2 inches) below the sternum and under the rib cage.

- Dr Marasco confirmed that she found the pericardiocentesis drain in a position consistent with Dr Szto having used the subcostal approach in its placement.

- Although Dr Szto says it is possible that laceration of the RVOT could have occurred during pericardiocentesis, he does not accept that the needle he used to insert the pericardiocentesis drain ruptured the RVOT because this explanation is inconsistent with the anatomy of the heart and Mr McDonald's stabilisation for 15 minutes after drainage of his tamponade at 3.45pm on 22 June 2006 prior to further deterioration.

- In her letter to Dr Szto on the day of the surgery and in cross examination, Dr Marasco said that, in the absence of any other intervention, the RVOT laceration must have occurred during pericardiocentesis. The artery that was lacerated was on the epicardial surface of the heart in line with the direction that the pericardial needle would have been inserted. Therefore, it could have been lacerated without any injury to the heart muscle if the needle was long enough to reach the site, that is four or five inches (about 10-13 cm) long.

- After hearing the evidence in relation to Dr Szto's performance of the pericardiocentesis, Associate Professor Chard also said it would be difficult to lacerate the RVOT vessel during pericardiocentesis from the subcostal approach. In explanation of his opinion, Associate Professor Chard also said that the needle must have advanced a long way from the subcostal approach to lacerate the artery on the outflow tract.

- Dr Carillo de Albornoz said that the pericardiocentesis needle would have to traverse the anterior pericardial space in a perpendicular direction to reach the right ventricular outflow tract. The anterior pericardium is essentially hard up against the sternum and it would be difficult to angle the needle to pass between the pericardium and the sternum to reach the RVOT. Further, when the space was entered, the operator would see blood coming from the syringe so there would be no reason to further advance the needle.

67. Therefore, I accept that transection of the RVOT is not a known or likely adverse consequence of pericardiocentesis from the subcostal approach.

68. The role of the real time electrocardiography in assisting Dr Szto to place the needle during pericardiocentesis is important in identifying whether the breach of the RVOT occurred during this procedure:

- The electrocardiogram machine allows the operator to see images of the heart and the fluid and the equipment he is operating.

- It also provides reaction if the pericardiocentesis needle comes in contact with the heart.

- Dr Szto said he usually relied on the electrocardiogram machine to assist him in pericardiocenteses. However, he cannot remember whether or not he used it on this occasion.

69. I do not accept the submission made by Counsel for Frankston Hospital that the evidence indicates that Dr Szto performed the percardiocentesis using echocardiogram visualisation. On the contrary, I find that, on this occasion, Dr Szto probably did not use echocardiogram visualisation because:

- Dr Szto would remember using the echocardiogram because he has performed pericardiocentesis from the subcostal approach 30- 40 times successfully.

- If he had used echocardiogram he would have been able to visualise the procedure and have more memory of its performance.

- Dr Green and Dr Loughnan remember seeing the echocardiogram used for diagnosis of the pericardial effusion and cardiac tamponade but they do not remember its use during the pericardiocentesis procedure.

70. I also remain uncertain as to whether or to what degree the pericardiocentesis was performed with assistance from Dr Carillo de Albornoz because he gave three versions of his role during Dr Szto's placement of the periocentesis drain:

- In his first statement, Dr Carrillo de Albornoz told the Court that he accompanied the cardiac technologist to the Coronary Angiography Suite. An emergency echocardiogram was performed and it confirmed the presence of a pericardial effusion with tamponade. He subsequently left the Coronary Angiography Suite to organise emergency transfer of the patient to a cardiac surgical centre.

- In his further statement, Dr Carrillo de Albornoz told the Court that he believes that he provided guidance for Dr Szto using the echocardiogram machine about the best placement of a pericardiocentesis needle. He also says he left after the pericardial drain was inserted to organise Mr McDonald's intra-hospital transfer.

- In response to my question about whether he assisted Dr Szto to place the pericardiocentesis needle on 22 June 2009, Dr Carrillo de Albornoz told the Court:

  *"I didn't do (*that*), I left to make the phone calls and the usual thing would be that the sonographer would stay and provide the images because the sonographer is actually more skilled at acquiring the images."*

71. Therefore, I doubt that Dr Carrillo de Albornoz visualised the pericardiocentesis using the echocardiogram and transferred that information to Dr Szto to assist him in placing the pericardiocentesis drain.

72. Dr Carrillo de Albornoz also told the Court that the echocardiogram equipment and the sonographer remained in the room. The sonographer participated in reviews of Mr McDonald's death at Frankston Hospital but she did not raise the role of the electrocardiograph machine in these reviews. However, the sonographer did not give evidence and there is no other evidence before me as to whether or not the sonographer assisted Dr Szto in placing the drain.

73. Therefore, I find that Dr Szto performed the pericardiocentesis without echocardiogram assistance.

74. Further, for the reasons already stated, it is unlikely that all of the 900mls frank blood drained from Mr McDonald's cardiac perfusion and tamponade in the Frankston Hospital PCI Suite and the blood drained during his ambulance transfer came from the coronary artery perforation. The only other source of blood was the lacerated RVOT.

75. Looking at the issue from another perspective, Mr McDonald was restless prior to his anaesthetic. Dr Loughnan attributed this to onset of cerebral hypoxia. Therefore any attempt to introduce the pericardiocentesis needle prior to anaesthetic would have been complicated and risky:

- Dr Andrew Green told the Court that, when he arrived, Dr Szto was experiencing difficulty in inserting the drain because Mr McDonald did not lie still.
- After discussion on 22 June 2006, Dr Marasco and Dr Szto agreed that the most likely explanation for the RVOT injury was misplacement of the pericardiocentesis needle.
- The RVOT injury was on the epicardial surface of the heart in line with the direction that Dr Szto would have inserted the pericardiocentesis needle.
- The pericardiocentesis needle was 12.5cm long. That was long enough to reach the site which is four or five inches (about 10-13 cm) from the access site below the ribs.
- In evidence, Dr Szto underestimated the length of the pericardiocentesis needle by about two centimetres. Therefore, in the absence of echocardiogram guidance, he would not have been aware of the risk of advancing the needle too far.

76. Accordingly, I have formed the opinion that Dr Szto probably attempted to place the pericardiocentesis needle in Mr McDonald's pericardial perfusion and release his tamponade before he was intubated and anaesthesised. He withdrew 150mls fluid in this attempt.

77. Dr Szto responded to Mr McDonald's deteriorating condition in unfamiliar and difficult circumstances:

- He had only performed this procedure once before in an emergency situation during his training period.

- He significantly underestimated the length of the pericardiocentesis needle he was inserting.
- He was operating without the usual medical assistance of a cardiology registrar or trainee.
- Mr McDonald was already restless from onset of cerebral hypoxia.

78. As a consequence of all these issues, I have formed the opinion that Dr Szto probably unwittingly severed Mr McDonald's RVOT during his attempt to place the pericardiocentesis needle to relieve the cardiac tamponade associated with pericardial effusion caused by his puncture of the right coronary artery on 22 June 2006.

79. As an alternative, Dr Carrillo de Albornoz also said that the pigtail on the pericardiocentesis line would have been sharp enough to lacerate the RVOT. However, it remained in place during resuscitation and transfer. Therefore, the injuries it caused would have been repetitive as the heart beat moved against the pigtail. There was no evidence of repetitive injury to the RVOT.

80. A third explanation tendered in Court to explain laceration of the RVOT was that it arose when adrenaline was injected directly into Mr McDonald's chest while he was in the car park at Frankston Hospital waiting for transfer to The Alfred hospital.

81. Dr Marasco did not inspect the pericardium over the area of the RVOT. However, all adrenaline administered to Mr McDonald during his resuscitation was introduced through an intravenous line. Further, all professional witnesses deny that anyone administered adrenaline directly through the chest to the heart.

82. Therefore, I have formed the opinion that Mr McDonald's family was mistaken in their interpretation of their observations of the large syringe used for Mr McDonald's ongoing aspiration of fluid from the pericardial drain. This procedure did not cause laceration of the RVOT.

83. As a fourth possibility, Dr Szto speculated that Mr McDonald's RVOT injury could have occurred during external cardiac massage after Mr McDonald collapsed in the car park at Frankston Hospital. However, the injury is consistent with a cut rather than a bursting or puncture injury. Further, there are no chest injuries consistent with splintering that could

cause this type of injury. Therefore, it is unlikely that cardiac compressions caused laceration of Mr McDonald's RVOT.

84. A fifth explanation for laceration of Mr McDonald's RVOT was that it occurred at The Alfred hospital during surgery. In particular, Dr Carillo de Albornoz told the Court:

> *"...my understanding from reading the information and from the sequence of events was that there was not much blood in the pericardium at the time the chest was opened, and there was a description of a spurting blood vessel in the end, in the right ventricular outflow tract and I would argue that if the blood vessel had been spurting for two hours then the pericardium would not be empty. This is what I don't understand, is if the pericardium was dry, if there was no pericardial fluid or no significant pericardial fluid release when the chest was opened and yet there is a blood vessel spurting, then where has that blood been going all that time."*

85. On the other hand, Dr Marasco told the Court she did not believe laceration of the RVOT occurred during surgery:

> *"...because usually we open the pericardium with a longitudinal incision in the line of the sternotomy and the right ventricular outflow tract isn't directly below that line, it's more lateral. So I can't see how it could have been caused on opening."*

86. Dr Szto was present when Dr Marasco split Mr McDonald's pericardial sac. Therefore, he would have noticed if she had cut the RVOT and, at the time, Dr Szto and Dr Marasco agreed that that the most likely explanation for the severed RVOT was that it occurred during placement of the pericardiocentesis needle.

87. Further, Mr McDonald's blood pressure stabilised at 180/100mmHg with inotropic support when Dr Marasco split the pericardium and sutured the RVOT before placing him on cardiopulmonary bypass. This evidence confirms that his cardiac function remained compromised until he underwent surgery.

88. Associate Professor Chard also told the Court that it was very unlikely that the RVOT laceration identified by Dr Marasco occurred during cardiac surgery at The Alfred hospital. He said a median sternotomy on a person who has not had previous surgery the pericardium would be intact. In these circumstances, he said it would be:

"almost unheard of that an experienced surgeon would have lacerated an artery inadvertently in that manner."

89. Therefore, I find that it is unlikely that the RVOT laceration identified by Dr Marasco occurred during cardiac surgery at The Alfred hospital.

90. Further, Mr McDonald's recovered well after bypass was withdrawn. Therefore, I am confident that cardiac bypass surgery at The Alfred did not further contribute to Mr McDonald's hypoxic brain damage.

91. After careful analysis of the alternative explanations for the RVOT injury and the evidence before me, I have formed the opinion that the RVOT transection was probably caused by the pericardiocentesis needle used to place the pericardial drain and not later when the drain was in place.

92. Accordingly, I find that Dr Szto lacerated Mr McDonald's RVOT during insertion of the pericardiocentesis needle into Mr McDonald's pericardial effusion using the subcostal approach after the pericardial fluid collection and cardiac tamponade had been confirmed and prior to intubation and anaesthesia.

93. I also find that the RVOT injury contributed to Mr McDonald's on-going pericardial effusion, cardiac tamponade, cerebral hypoxia and death.

94. On that analysis, the 900mls of the frank blood drained at Frankston Hospital and the extra blood drained during transfer must have arisen from a combination of two injuries: perforation of his right coronary artery during angioplasty and laceration of the RVOT which must have occurred before leaving the PCI Suite, that is during pericardiocentesis.

95. This means that Mr McDonald's hypoxic brain damage probably became irreversible before his transfer between the Frankston and The Alfred hospitals. It may have become further compromised during his transfer.

96. I am unable to say that it would have been prevented if his PCI had been performed at a tertiary hospital with cardio-thoracic facilities or if a thoracic surgeon had been available to perform a thoracotomy after his second cardiac arrest in the car park at Frankston Hospital.[9]

Stand Alone Percutaneous Coronary Intervention Laboratories

97. Over the past decade, percutaneous coronary intervention (PCI) has replaced coronary artery bypass graft surgery as the most common coronary revascularisation strategy for treating coronary artery disease in Australia.[10] Stent implantation has significantly improved the short-term and long-term outcomes of patients undergoing PCI for obstructive coronary artery disease compared with balloon angioplasty alone.[11]

98. The Frankston Hospital PCI Suite is one of five stand-alone regional PCI Suites now operating in Victoria. These units are not based in hospitals with a capacity to perform cardio-thoracic surgery.

99. The *Health Services Act* 1988 devolves responsibility for public hospital operations to the Board of Directors of each health service. These Directors are appointed by the Minister for Health and their funding is derived from the Government of Victoria through the Minister for Health.

100. Accordingly, the Board of Directors of each host hospital requires approval from the Department of Health to establish the unit. Then, once a stand alone regional PCI Suite is in operation, the Board of Directors is responsible for managing the associated risks.

101. The PCI Suite at Frankston Hospital was established in 2000. Since 2003, it has been administered as part of the Cardiology Department. In 2006, Dr Phillip Carrillo de Albornoz was the Director of Cardiology and, accordingly, responsible for managing the PCI Suite.

---

[9] Mr Cole had no formal relationship with the PCI Suite and was unable to assist Dr Szto in a timely manner on 22 June 2006 because he was off-campus when Mr McDonald's emergency arose.

[10] Davies J. Coronary revascularisation in Australia, 2000. AIHW bulletin no. 7. Canberra: Australian Institute of Health and Welfare, 2003. (AIHW Cat. No. AUS 35.)

[11] Fischman. DL, Leon MB, Baim DS, et al. A randomized comparison of coronary-stent placement and balloon angioplasty in the treatment of coronary artery disease, *N Engl J Med* (1994) 331: 496-501 cited in Yan BP, Ajani AR, Duffy SJ, New G, Horrigan M, Szto G, Walton A, Eccleston D, Lefkovits J, Black A, Sebastian M, Brennan AL, Reid CM and Clark DJ on behalf of the Melbourne Interventional Group investigators, "Use of drug-eluting stents in Victorian public hospitals" *MJA* (2006) 185: 363–367.

102. Dr Carrillo de Albornoz had no experience in interventional cardiology and, accordingly, did not perform procedures in the Frankston Hospital PCI Suite. He was allocated two hours a week for its administration. Therefore, in my opinion, the Board of Directors of Peninsula Health could not be confident that he had the expertise or time to advise them about risk minimisation in the PCI Unit. **Recommendation 1**

Department of Human Services (now Department of Health)

103. Decisions about the distribution and the location of PCI services involve a two-stage process. First, the Health Service must propose creation of a PCI service. Second, the Department of Health approves and, in public health services, funds the PCI service.

104. In 2008, the Department of Human Services Victoria Quality and Safety Branch authorised a review of acute and sub-acute cardiac services in Victorian public health services (the "Review").[12] Dr Carrillo de Albornoz had no contact at all with the then Department of Human Services about the standards that applied to the PCI Suite and there is no record that anyone else from Frankston Hospital PCI was consulted. Therefore, I presume he was not consulted in this review.

105. The Review recommendations included:

- *The following planning principles for the future development of Victorian cardiac services system:*
  - *Quality and safety of care are the overriding considerations in planning and delivering cardiac services in Victoria.*
  - *Cardiac services are time critical - better outcomes are achieved with quicker treatment: thus access to cardiac services must be timely equitable for the residents of Victoria.*
  - *The system should be developed to meet volume requirements necessary to maintain quality standards.*

[12] Price Waterhouse Coopers, "A Cardiac Framework for Victoria, A Report prepared for the Department of Human Services", April 2008 (the "Review").

- *Service delivery will define the system structure – teaching and research will follow services.*

➢ *That the Department of Human Services (now the Department of Health) support the appointment of specialist cardiac care coordinators in each metropolitan health service that provides acute cardiac services and in each rural region.*

➢ *That the Department of Human Services (now the Department of Health) establishes a clinical network for cardiac services in Victoria to provide clinical leadership, define standards for infrastructure and leadership, promote quality care, improve the coordination and efficient use of clinical resources and monitor and report on the quality of cardiac care in Victoria.*

➢ *That the proposed cardiac clinical network develop guidelines for angiography and PCI services without on-site surgical back-up in Victoria for endorsement by the Department of Human Services (now the Department of Health) and incorporation into conditions of finding if necessary and that the guidelines are consistent with the Cardiac Society of Australian and New Zealand 2008 "Guidelines on Support Facilities for Coronary Angiography and Putcutaneous Coronary Intervention (PCI) including Guidelines of the Performance of Procedures at Rural Sites....*

➢ *That the Department of Human Services (now the Department of Health) ensures that new angiography and PCI services are developed under the supervision of a highly experienced operator and in compliance with recommended patient selection criteria and that outcomes are monitored by the supervising operator to ensure appropriate quality standards are achieved."*

106. The Review also recommended that the Department of Health request its Intensive Care Advisory Committee to consider the issue of access to intensive care beds for cardiac surgical patients in the context of the overall supply of intensive care beds in the State. The coronial investigation has not sought further information about implementation of this recommendation. However, in circumstances like those facing Mr McDonald's treating team at Frankston, it was another important factor influencing the extra time required for his transfer to a tertiary hospital with cardiothoracic surgery capability.

107. Therefore, I endorse the Review's recommendation that the Department of Health request the

Intensive Care Advisory Committee to consider the access to intensive care beds for cardiac surgical patients in the context of the overall supply of intensive care beds in the State. **Recommendation 2.**

108. In making policy decisions about the placement and practice of PCIs, the Department of Health now accepts advice from the Cardiac Clinical Network. The Cardiac Clinical Network is a consultative group established in 2009 to provide independent expert clinical advice to the Department and to work with other clinicians in the sector.

109. The Department of Health also facilitates Adult Retrieval Victoria which is part of Ambulance Victoria. This state wide service is available 24 hours, 365 days a year. Adult Retrieval Victoria has overall responsibility for providing advice, referral and transport for critically ill patients like Mr McDonald where the clinical management is beyond the resource or clinical capacity of a health service. Where definitive management of a patient's condition is likely to be achieved by urgent transfer to another hospital, Adult Retrieval Victoria will coordinate transport of a critically ill patient and facilitate access to critical care beds.

110. The coronial investigation did not hear any evidence that Adult Retrieval Victoria was involved in attempting to find cardio-thoracic surgical facilities for Mr McDonald. Accordingly, the investigation has not further considered the role of Adult Retrieval Victoria in the context of emergencies at regional, stand-alone PCI Suites.

111. However, the circumstances surrounding Mr McDonald's emergency transfer from Frankston Hospital PCI to The Alfred cardiothoracic unit have highlighted the overlapping roles of the Cardiac Clinical Network, the Intensive Care Advisory Committee and Adult Retrieval Victoria within the Department of Health.

112. Therefore, the Department of Health should seek advice from the Cardiac Clinical Network about whether it can better facilitate emergency inter-hospital transfer of emergency PCI patients by integrating its role in relation to emergency transfer of PCI patients to tertiary cardiothoracic units with the services offered by the Intensive Care Advisory Committee and Adult Retrieval Victoria. **Recommendation 3.**

The Cardiac Society of Australia and New Zealand ("The Cardiac Society")

113. The Cardiac Society has established guidelines for the services required to support percutaneous coronary intervention procedures.[13] These include specific requirements for stand alone regional facilities including cardiac surgical support, cross accreditation of senior operators with cardiac surgery units and patient selection.

114. Although these guidelines are advisory, the Department of Health also requires stand alone regional PCI Suites to comply with guidelines set down by the Cardiac Society.

115. The Cardiac Society guidelines state:

> *"The Cardiac Society believes that diagnostic coronary angiography and percutaneous coronary interventions (PCI) should only be performed where there are:*
>
> - *Proper hospital infrastructure and facilities;*
> - *Critical mass of appropriately trained workforce;*
> - *On site cardiac surgery or formalised links with a cardiac surgical unit."*

116. Further, the Cardiac Society guidelines relevant to stand-alone regional PCI Suites contemplate specific written inter-hospital arrangements for procuring this inter-hospital support:

> *"For centres without on site cardiac surgery the laboratory director or his nominee should establish a formal relationship with a cardiac surgical unit."*

117. The Cardiac Society guidelines require these agreements to be reviewed annually. These reviews did not occur at Frankston Hospital PCI Suite between 2000 and 2006. They are now occurring each year. Further, since 2009, they have included specific contact arrangements to facilitate rapid recovery of emergency patients.

118. Dr Carrillo de Albornoz told the Court he was not aware that it was his role to ensure the Frankston Hospital PCI Suite complied with the Cardiac Society guidelines or, in particular, to routinely review all the protocols that had already been put in place. Accordingly, although

---

[13] The Cardiac Society of Australia and New Zealand, "Guidelines on Support Facilities for Coronary Angiography and Percutaneous Intervention (PCI) including Guidelines of the Performance of Procedures in Rural Sites".

he had constant communication with The Alfred Hospital, St Vincent's Hospital and Monash Medical Centre, he did not review the written transfer and support protocols on a regular basis.

119. In 2009, these protocols were reviewed and there is continuing consultation between the Frankston Hospital PCI and St Vincent's Hospital, The Alfred Hospital and Monash Medical Centre.

120. However, the 2009 commitments made by St Vincent's Hospital, The Alfred hospital and Monash Medical Centre to offer the assistance of their cardiac surgeons to the Frankston Hospital PCI Suite specifically depend on the availability of an operating theatre and an appropriate post operative bed in the receiving tertiary hospital. They do not refer to allocation of beds or transfer arrangements made through Adult Retrieval Victoria.

121. On the contrary, in her role as Deputy Director, Cardiothoracic Department at The Alfred, Dr Marasco suggested a streamlined process to minimise the number of phone calls that are required to send a patient to the Alfred. She suggests that in the first instance the Consultant Cardiothoracic Surgeon should be contacted by the Cardiologist at Frankston with a second phone call made by the Frankston registrar to the Admitting Officer at The Alfred.

122. Similarly, Adam Horsburgh, General Manager, Monash Medical Centre Clayton & Acute Patient Access/Flow, Southern Health, has offered a flow chart to enable access to PCI patients who require emergency transfer to a tertiary site from the PCI laboratory at Frankston Hospital. This flow chart involves direct contact with the Head of or the Consultant-on-Call for the Cardiothoracic Unit at Monash Medical Centre. It does not integrate Adult Retrieval Victoria into the process.

123. These individual arrangements for emergency transfer of patients from Frankston PCI Suite to St Vincent's Hospital, The Alfred Hospital and Monash Medical Centre comply with the requirements imposed by the Cardiac Society Guidelines. However, they duplicate the responsibilities of Adult Retrieval Victoria.

124. Further, Dr Carrillo de Albornoz's efforts to find an appropriate receiving hospital for Mr McDonald suggest to me that the formal arrangements between Frankston Hospital and St Vincent's Hospital, The Alfred Hospital and Monash Medical Centre do not integrate with the service offered by Adult Retrieval Victoria. Execution of these arrangements contributed to

the time taken to transfer Mr McDonald from the PCI at Frankston to the cardiothoracic unit at The Alfred hospital.

125. Therefore, given the Department of Health relies on the Cardiac Society to provide standards for regional stand alone PCI facilities, the Cardiac Society, the Department of Health and the Cardiac Consultative Council should cooperate to ensure mutual compatibility and minimise the time taken to arrange emergency transfers to a tertiary cardiothoracic unit. **Recommendation 4.**

126. The Cardiac Society also advises that stand-alone facilities are placed within one hour of tertiary hospital. Accordingly, the Cardiac Society recommends that patient consent to a percutaneous cardiac intervention in a facility without on-site surgical backup specifically includes accepting the increased risk associated with recovery from complications in the context of the potential delay in obtaining cardiac surgery when complications occur. However, Cardiac Society guidelines do not specify the composition of the one hour.

127. In the circumstances of Mr McDonald's emergency transfer, Dr Szto and Dr Carrillo de Albornoz decided to transfer Mr McDonald to a tertiary hospital a t 4.00pm on 22 June 2006. At 6.45pm, Mr McDonald's anaesthetic was induced in the operating theatre at The Alfred hospital so that Dr Marasco could commence surgery.

128. Therefore, two hours and 45 minutes elapsed between the decision to transfer Mr McDonald and commencement of cardiothoracic surgery.

129. In considering the effect of this delay on Mr McDonald's outcome, I am aware that, even in a tertiary hospital, the delay between diagnosis and commencing surgery can be influenced by theatre and surgical availability and transfer and preparation times within the organisation.

130. However, the time between decision and surgery also included time arising from difficulty in finding an appropriate receiving hospital for Mr McDonald and 40 minutes travel time in his inter-hospital transfer. Both of these factors distinguish between PCI at a tertiary hospital with cardiothoracic surgery facilities and PCI in a remote facility.

131. These delays are inherent in establishing stand-alone, regional PCI Suites within one hour of a tertiary cardiothoracic unit. Therefore, to the extent that it takes into account ambulance

response and transfer times, the Cardiac Society recommendation that requires PCI Suites one hour for transfer is probably reasonable.

132. However, on 22 June 2006, Dr Carillo de Albornoz took a further 33 minutes to find an available operating theatre and post-operative intensive care bed for Mr McDonald at The Alfred hospital. There were no available facilities at Monash Medical Centre or St Vincent's Hospital.

133. Dr Szto does not believe this was an unusual delay. Further, the receiving hospitals have indicated that it is impractical to notify them when angioplasty is commenced in Frankston because they cannot change their bed availability for the small frequency of cases that will be transferred.

134. However, this time may have been crucial in determining the outcome for Mr McDonald because he was already showing clear symptoms of brain hypoxia but the pericardiocentesis was draining minimal fluid.

135. In addition, the ambulance crew took 27 minutes to respond and load Mr McDonald. This time was extended by his cardiac collapse in the car park at Frankston Hospital and discussions about whether or not to continue the transfer. On the other hand, the collapse was further evidence that Mr McDonald's cardiac tamponade was continuing to influence his cardiac function and consequent cerebral hypoxia.

136. Therefore, this time required to arrange reception in an appropriate facility must be factored into the time required for transfer of a patient from a stand-alone regional PCI Suite to a tertiary hospital with cardiothoracic surgery facilities and an agreement to accept patients. **Recommendation 5.**

137. The Cardiac Society guidelines do not require or otherwise advise stand-alone regional PCI laboratories to have on-call thoracic surgery capability. There is only one thoracic surgeon at Frankston Hospital and he also runs a private practice. I make no recommendation with respect to thoracic surgery capabilities available to stand-alone regional PCI Suites.

Cross accreditation

138. The Cardiac Society guidelines provide:

"For rural and regional centres without cardiac surgery ideally the Director should be cross accredited at this referral hospital and perform procedures at this hospital on a regular basis."

139. Dr Szto was also the Director of the Frankston Hospital Percutaneous Coronary Intervention Suite from 2000 to 2003. During that time, he was not cross-credentialled to St Vincent's Hospital, The Alfred hospital, Monash Medical Centre or any other tertiary hospital with cardiothoracic surgery capability.

140. Further, in 2006, Dr Carrillo de Albornoz was Director of Cardiology and, through that position, Director of the PCI Suite. However, he had no experience in performing PCI procedures. Therefore, his collateral credentials are not relevant to his capacity to manage a PCI emergency.

141. Therefore, in practical terms, the Frankston Hospital PCI Suite did not comply with the Cardiac Society guidelines in 2006.

142. All three interventional cardiologists at Frankston have at least two years overseas dedicated Interventional Cardiology Training and comply with the Cardiac Society Guidelines on maintenance of competency in coronary intervention.

143. Dr Szto had undertaken over 2000 coronary angioplasty procedures in 12 years prior to operating on Mr McDonald. In that period, his complication rate was about 2-3.5%. Therefore, Dr Szto was and remains a very experienced and effective interventional cardiologist.

144. However, Mr Chard also said that any cardiologist performing angioplasty should be able to deal with tamponade using percutaneous drainage of the pericardial space and fluid or pharmacological interventions aimed at maintaining blood pressure and cardiac output until surgical help is available.

145. Dr Szto had only perforated a coronary artery in two or three cases in his entire career. He had performed two emergency pericardiocenteses and about four other pericardiocenteses in elective situations. The incident he experienced on 22 June 2006 had never happened before in the six and a half years that he and his colleagues had performed PCI procedures at

Frankston Hospital. Dr Szto had only one prior experience of being unable to control a tamponade using pericardiocentesis. This occurred during his training in the United States.

146. Dr Szto's inexperience in the specific skills required to resuscitate Mr McDonald during a cardiac tamponade is the unintended consequence of his high success rate with performing PCI angiography and with managing cardiac tamponade. It would have been overcome if he had continuing experience performing PCI procedures in a higher volume unit associated with a tertiary cardiothoracic unit where he would have seen and assisted with complications arising during other operators' procedures.

147. The same issue arises for Dr Szto's two interventional cardiology colleagues in the Frankston Hospital PCI Suite. There is no evidence before me to suggest that either of Dr Szto's colleagues was on site on 22 June 2006 to assist him when the emergency occurred or to learn from his experience.

148. Therefore, I have formed the view that all interventional cardiologists performing angioplasties in regional stand-alone PCI suites should be cross-credentialled to perform PCI procedures in a tertiary high volume cardiothoracic unit and should be required to work in that unit for, say, one month a year to maintain their exposure to emergency responses.

149. Accordingly, the Cardiac Society should extend its advice for cross-credentialling of the Director to include all cardiologists working in a regional stand-alone PCI Suite. **Recommendation 5.**

Patient selection

150. The Cardiac Society believes that careful selection of cases is important and patients with a stable clinical condition but high-risk anatomy may be better served by performing the procedure in a facility with on-site surgical back up.

151. In particular, the Cardiac Society advises that high risk PCIs involving target lesions with chronic total occlusion should not be undertaken at peripheral PCI Suites.

152. Dr Marasco also expressed the view that the stand-alone regional PCI Suites should be placed near the population they serve with the understanding that high risk lesions would travel to a tertiary centre that can offer cardiac surgery if required.

153. There is some dispute as to whether Mr McDonald's angiography was in the high risk category defined by the Cardiac Society:

- Dr Szto admitted that 100% occlusion of an artery makes performance of an angioplasty technically more difficult than it would be for less severe obstruction. Complete obstruction increases the risk of complications including bleeding arising from puncture of the artery he was attempting to recanalise.

- However, the clot appeared to be recent rather than chronic and therefore should lend itself to easier passage of the guide wire through the occlusion to enable access for the balloon which he used to dilate the blocked artery and placement of the stent.

154. For these reasons, Dr Szto decided that he should proceed directly to follow-on angioplasty on 22 June 2006.

155. Although Dr Szto acknowledged that Mr McDonald was high risk because of total occlusion of his right coronary artery and his presenting symptoms, Mr McDonald did not fit the guidelines' requirement for chronic total occlusion. Therefore, Dr Szto did not breach the guidelines when he decided to operate immediately on Mr McDonald.

156. After a review of the circumstances of Mr McDonald's death, Frankston Hospital PCI Suite has instituted weekly review meetings which include cardiothoracic surgeons from Monash Medical Centre and St Vincent's Hospital. Further, the Cardiology Unit at Frankston has decided there would be no follow-on angioplasty if it has not been discussed at the weekly meeting unless there are critical lesions and a cardiology bed is available at Frankston before the surgery commences.

157. Mr McDonald was in the category that, since the changes in Frankston policy arising from review of this incident, would not now undergo follow-on angioplasty without prior consultation at a case conference.

158. Dr Szto told the Court that there were several reasons for these changes. One is to allow Frankston interventional cardiologists time to reflect on the kind of cases that were appropriately dealt with at Frankston Hospital PCI. Secondly, the changes allow input from the cardiothoracic surgeons. Thirdly, they emphasise alternative channels of investigation or alternative facilities for treatment of the patient.

159. However, the circumstances that faced Dr Szto on 22 June 2006 are very rare:

- He seriously considered the risks associated with delay in performing Mr McDonald's angioplasty.
- His complication rate for similar procedures is low.
- He drained the original cardiac tamponade caused by injury to the right coronary artery.
- He was not aware that he had injured the RVOT until it was exposed by Dr Marasco.
- There is no evidence that that earlier intervention after his second cardiac arrest would have changed the outcome for Mr McDonald.
- Everyone involved in Mr McDonald's resuscitation and retrieval has learned from the event.

160. Accordingly, I make no recommendations with respect to selection of patients for angioplasty in regional stand-alone PCI Suites.

RECOMMENDATIONS

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

1. That Peninsula Health ensure that the Director of the Frankston Hospital PCI Unit is an experienced interventional cardiologist who is cross accredited to at least one tertiary cardiothoracic unit performing interventional cardiology and practices interventional cardiology in the Frankston Hospital PCI Unit.

2. That the Department of Health request the Intensive Care Advisory Committee to consider access to intensive care beds for emergency cardiac surgical patients in the context of the overall supply of intensive care beds in the State.

3. That the Department of Health seek advice from the Cardiac Clinical Network in relation to integrating its role in emergency transfer of patients from stand-alone regional PCI Units to a tertiary cardiothoracic unit with the services offered by the Intensive Care Advisory

Committee and Adult Retrieval Victoria.

4. That the Cardiac Society of Australia and New Zealand consult with the Department of Health and the Cardiac Clinical Network in Victoria to ensure that the Cardiac Society Guidelines relating to stand-alone regional PCI Units take into account local arrangements which may reduce the time required to organise emergency transfer to a tertiary cardiothoracic unit.

5. The Cardiac Society of Australia and New Zealand reconsider their advice about the time required for emergency transfer of patients from stand-alone regional PCI Units to a tertiary hospital with cardiothoracic surgery capability to include the time required to find a bed in a receiving hospital and the time required to arrange emergency transfer.

6. The Cardiac Society of Australia and New Zealand review its guidelines to require all interventional cardiologists performing angioplasties in regional stand-alone PCI Suites to be cross-credentialled to perform PCI procedures in a tertiary high volume cardiothoracic unit and to work in that unit for sufficient time to maintain their exposure to emergency responses.

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

Minister for Health
The Chair, Cardiac Society of Australia and New Zealand
Professor Richard Harper and Dr Jeffrey Lefkovits Joint Chairs, Cardiac Clinical Network, Victoria
Adult Retrieval Victoria, Ambulance Victoria
Australasian Society of Cardiac and Thoracic Surgeons

Signature:

DR JANE HENDTLASS
CORONER
Date: **1 October 2012**

Coroners Court of Victoria