IN THE CORONERS COURT
OF VICTORIA
AT MELBOURNE

Court Reference: COR 2012 4181

FINDING INTO DEATH WITH INQUEST

Form 37 Rule 60(1)

Section 67 of the Coroners Act 2008

Deceased:	Roy Irvin DORNER
Delivered on:	29 March 2018
Delivered at:	Coroners Court of Victoria, 65 Kavanagh Street, Southbank
Hearing dates:	22 and 23 February 2017
Findings of:	Coroner Paresa Antoniadis SPANOS
Counsel assisting the Coroner:	Leading Senior Constable King TAYLOR from the Police Coronial Support Unit
Representation	Mr John GOETZ of Counsel appeared on behalf of the family of the deceased Mr Paul HALLEY of Counsel appeared on behalf of Mr Gilbert Colin SHARDEY
Catchwords	Significant cardiac disease, re-do thoracotomy, aortic valve replacement, permanent pacemaker, past history of Hodgkin's lymphoma, incision of right ventricle, death following surgery, use of pre-operative CT in cardiac surgery, cardiac bypass.

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I, PARESA ANTONIADIS SPANOS, Coroner,

having investigated the death of ROY IRVIN DORNER

and having held an inquest in relation to this death at Southbank on 22 and 23 February 2017:

find that the identity of the deceased was ROY IRVIN DORNER

born on 7 August 1948, aged 64

and that the death occurred on 3 October 2012

at St Francis Xavier Cabrini Private Hospital, Wattletree Road, Malvern, Victoria 3143

from:

I (a) COMPLICATIONS OF RE-DO THORACOTOMY/AORTIC VALVE REPLACEMENT IN A MAN WITH ISCHAEMIC HEART DISEASE

in the following circumstances:

INTRODUCTION

1. Dr Dorner was a 64 year old medical practitioner who resided in Hampton with his partner of some 35 years, Peter George Lynch. Dr Dorner had worked as a general practitioner, in the travel health advisory service of the Department of Health and finally in medical insurance. According to his own GP Dr Andrew Harris, Dr Dorner was a careful, meticulous and intelligent man who demonstrated a comprehensive understanding of medical issues and always took an involved and collaborative approach to any medical decision making concerning his health.[1]

PAST MEDICAL HISTORY

2. Dr Dorner had a significant past medical history that included Hodgkin's lymphoma treated with radiotherapy (1970), coronary artery bypass grafts (1998), paroxysmal atrial fibrillation with pacemaker insertion for sick sinus syndrome (2006), congestive cardiac failure (2009), transient ischaemic attacks (2011) and aortic stenosis (2012).[2]

3. Since 2009, Dr Dorner had been experiencing symptoms of congestive cardiac failure with reduced exercise tolerance which was being managed medically. His regular medications were diuretics, warfarin, sotalol, Lipitor and Micardis. Dr Dorner's medication regime was set by Cardiologist Dr Simon Jakovits in 2010 with improvement in his functional capacity

[1] Statement of Dr Andrew Harris, Sandringham Medical Centre, dated 29 January 2016, page 14 coronial brief [CB]. Transcript pages 13-14.

[2] Ibid and Exhibit F, statement of Dr Jack Federman, Consultant Cardiologist, dated 19 December 2015, page 21 CB.

such that, for example, he was able to take a one hour walk. However, towards the end of 2012, Dr Dorner felt his malaise and shortness of breath increasing and investigations indicated a degree of aortic valve stenosis that required aortic replacement.[3]

ADMISSION TO CABRINI HOSPITAL FOR RE-DO THORACOTOMY

4. The indications for surgery, the operation itself and its sequelae were the primary focus of the coronial investigation of Dr Dorner's death and will be discussed in some detail below. Suffice for present purposes to say that Dr Dorner was admitted to St Francis Xavier Cabrini Hospital [Cabrini] on 3 September 2012 ahead of the surgery scheduled for 4 September 2012. During the operation, Dr Dorner's right ventricle was incised. He required extensive blood transfusion and was placed on extracorporeal membrane oxygenation. Once stable, the aortic valve was replaced as had been planned. After surgery, Dr Dorner was admitted to the intensive care unit [ICU] where he remained intubated and required respiratory support and nitric oxide for right ventricular dysfunction.

5. However, Dr Dorner's clinical condition continued to deteriorate with multi-organ failure and signs of severe neurological damage. On 3 October 2012, at about 9.15pm, treating clinicians discussed Dr Dorner's poor prognosis with his family and the decision taken to withdraw active treatment and move to a palliative pathway. Dr Dorner was kept comfortable and passed away shortly afterwards.

INVESTIGATION AND SOURCES OF EVIDENCE

6. This finding is based on the totality of the material the product of the coronial investigation of Dr Dorner's death. That is, the brief of evidence compiled by my assistant Leading Senior Constable King Taylor, from the Police Coronial Support Unit, the statements, reports and testimony of those witnesses who testified at inquest and any documents tendered through them, and the final submissions of Counsel.

7. All of this material, together with the inquest transcript, will remain on the coronial file.[4] In writing this finding, I do not purport to summarise all the material and evidence, but will refer to it only in such detail as is warranted by its forensic significance and in the interests of narrative clarity.

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[3] Statement of Dr Harris, page 15 CB. I note that Dr Dorner last consulted Dr Harris on 16 November 2011 and the latter was therefore not involved in the decision to proceed to surgery or any discussions about the risks involved. Also see Exhibit F, page 21 CB.

[4] From the commencement of the ***Coroners Act 2008*** (the Act), that is 1 November 2009, access to documents held by the Coroners Court of Victoria is governed by section 115 of the Act. Unless otherwise stipulated, all references to legislation that follow are to provisions of the Act.

PURPOSE OF A CORONIAL INVESTIGATION

8. The purpose of a coronial investigation of a *reportable death*[5] is to ascertain, if possible, the identity of the deceased person, the cause of death and the circumstances in which death occurred.[6] It is self-evident that Dr Dorner's death falls within the definition of a reportable death, specifically section 4(2)(b) of the Act which includes deaths that occur during or following a medical procedure where the death is or may be causally related to the medical procedure and a registered medical practitioner would not, immediately before the procedure, have reasonably expected the death.

9. The *cause* of death refers to the *medical* cause of death, incorporating where possible the *mode* or *mechanism* of death. For coronial purposes, the *circumstances* in which death occurred refers to the context or background and surrounding circumstances, but is confined to those circumstances sufficiently proximate and causally relevant to the death, and not all those circumstances which might form part of a narrative culminating in death.[7]

10. The broader purpose of any coronial investigations is to contribute to the reduction of the number of preventable deaths through the findings of the investigation and the making of recommendations by coroners, generally referred to as the *prevention* role.[8] Coroners are empowered to report to the Attorney-General in relation to a death; to comment on any matter connected with the death they have investigated, including matters of public health or safety and the administration of justice; and to make recommendations to any Minister or public statutory authority on any matter connected with the death, including public health or safety or the administration of justice.[9] These are effectively the vehicles by which the coroner's prevention role can be advanced.[10]

11. It is important to stress that coroners are not empowered to determine the civil or criminal liability arising from the investigation of a reportable death, and are specifically prohibited

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[5] The term is exhaustively defined in section 4 of the ***Coroners Act 2008*** [the Act]. Apart from a jurisdictional nexus with the State of Victoria a reportable death includes deaths that appear to have been unexpected, unnatural or violent or to have resulted, directly or indirectly, from an accident or injury; and, deaths that occur during or following a medical procedure where the death is or may be causally related to the medical procedure and a registered medical practitioner would not, immediately before the procedure, have reasonably expected the death (section 4(2)(a) and (b) of the Act).

[6] Section 67(1).

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

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

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

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

from including in a finding or comment any statement that a person is, or may be, guilty of an offence.[11]

FINDINGS AS TO UNCONTENTIOUS MATTERS

12. There were no contentious issues surrounding Dr Dorner's identity, nor about the date and place of his death. I accordingly find, as a matter of formality, that Roy Irvin Dorner, born on 7 August 1948 and aged 64, late of 36B Highett Road, Hampton, died at Cabrini Hospital, Wattletree Road, Malvern, on 3 October 2012.

MEDICAL CAUSE OF DEATH

13. Nor was the medical of death contentious. Forensic pathologist Dr Jacqueline Anita Lee from the Victorian Institute of Forensic Medicine [VIFM] reviewed the circumstances of death as reported by the police to the coroner, the medical deposition and medical records from Cabrini Hospital and post-mortem CT scanning of the whole body undertaken at VIFM [PMCT] and performed an external examination of Dr Dorner's body. Having done so Dr Lee provided a written report of her findings and opinion as to the cause of death.[12]

14. Dr Lee advised that PMCT confirmed the presence of sternal wires and showed pulmonary infiltrates bilaterally (indicative of pneumonia) and left pleural effusions (indicative of congestive cardiac failure) but no acute changes within the head. In the absence of a full post-mortem examination of autopsy, Dr Lee advised that it would be reasonable to attribute Dr Dorner's death to *complications of redo thoracotomy/aortic valve replacement in a man with ischaemic heart disease.*

15. The available evidence therefore supports a finding that Dr Dorner died as a result of the complications of re-do thoracotomy/aortic valve replacement in a man with ischaemic heart disease.

THE FOCUS OF THE CORONIAL INVESTIGATION AND INQUEST

16. The focus of the coronial investigation and inquest into Dr Dorner's death was on the adequacy of the clinical management and care provided to him in relation to his last episode of care encompassing the threshold need for the surgery, the adequacy of the advice given to

[11] Section 69(1). However, a coroner may include a statement relating to a notification to the Director of Public Prosecutions if they believe an indictable offence may have been committed in connection with the death. See sections 69 (2) and 49(1).
[12] Dr Lee's report includes details of formal qualifications and experience, pages 2-7 CB.

Dr Dorner about the surgery, in particular, the explanation of the risks involved, and the manner in which the surgery was performed.[13]

17. Consultant cardiologist Dr Jack Federman was Dr Dorner's treating cardiologist from March 2009 when he was referred for a second opinion regarding right heart failure at the time. He reviewed him regularly thereafter. Dr Federman felt that Dr Dorner's major problem was left ventricular diastolic dysfunction that responded well to medical management. Even as at March 2009, Dr Dorner had evidence of mild aortic stenosis.[14]

18. In August 2012, Dr Dorner presented to Dr Federman with a six month history of deteriorating exercise tolerance, increasing shortness of breath and recurrent atrial arrhythmias. On review he had evidence of cardiac failure with clinical signs of significant aortic stenosis. Dr Dorner had been having regular echocardiograms that showed gradually increasing severity of aortic stenosis. An echocardiogram in August 2012 confirmed that he had severe aortic stenosis and that this represented an unusually quick deterioration for someone of his age.[15] He then underwent a coronary angiogram that showed that all of his coronary grafts were widely patent but also showed extensive native coronary artery disease beyond the grafts. Dr Federman referred Dr Dorner to Mr Gil Shardey for consideration of an aortic valve replacement.[16]

19. Dr Federman had a prolonged discussion with Dr Dorner and Mr Lynch about Dr Dorner's deteriorating clinical state that was of a severity that warranted consideration of surgery. He advised that there were increased risks with re-do cardiac surgery but that without surgery Dr Dorner's condition would continue to deteriorate with a poor prognosis over the next two years or so and a high risk of death. If successful, surgery would significantly improve his long term prognosis.[17]

20. At inquest, Dr Federman expanded on the need for surgery and the associated risks. He testified that there was no doubt in his mind that Dr Dorner needed the surgery. By reference to all the data for patients with severe aortic stenosis and cardiac failure, Dr Dorner's life expectancy was about two years without surgery.[18] He testified that he always tells patients that a second or re-do surgery involves adhesions, is more difficult and always carries a

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[13] These issues were a distillation of issues raised by Mr Lynch in correspondence initially in response to a letter advising of my intention to finalise the investigation 'on the papers' without an inquest. Mr Lynch's letters dated 7 February, 26 February, 9 April and 9 July 2014 are at pages 8-13 of the coronial brief.
[14] Exhibit F, statement of Dr Jack Federman dated 19 December 2015, page 21 CB. Transcript pages 101, 105.
[15] Ibid. The echocardiogram showed a mean aortic gradient of 41mmHg a calculated valve area of 0.7cm^2 and a dimensionless index of 0.19. Transcript pages 100, 105, 113.
[16] Ibid.
[17] Ibid, page 22 CB. Transcript pages 111, 112
[18] Transcript page 111.

higher risk, including the risk of damage to a major organ and death. Whereas Dr Federman testified that the risk involved in a first surgery is of the order of one to two per cent, he put the risk of re-do surgery at more than two to three times that, but still less than ten per cent. In terms of what he would have told Dr Dorner, Dr Federman's evidence was that he would have spoken of an increased but not prohibitive risk.[19]

21. Mr Gilbert Colin Shardey was the surgeon who performed sextuplet coronary artery graft surgery on Dr Dorner in 1998[20] and to whom Dr Federman referred Dr Dorner in August 2012. Mr Shardey provided a statement outlining pre-operative investigations of Dr Dorner, the complications during the surgery and Dr Dorner's clinical course thereafter.[21]

22. Mr Shardey was aware of the trans-thoracic echocardiogram [TTE] performed on Dr Dorner on 6 August 2012 which reported severe aortic stenosis and a *sightly dilated* right ventricle. On review of the TTE, Mr Shardey considered that it in fact demonstrated *a dilated hypokinetic* right ventricle. He noted that an angiogram performed on 23 August 2012 demonstrated that all coronary grafts were patent. Overall, Mr Shardey was of the view that Dr Dorner's clinical presentation was suggestive of right heart failure and ascites, which he considered a sinister presentation in a patient with predominantly aortic valve stenosis. A pre-operative chest x-ray demonstrated cardiomegaly and a lateral view showed that the right ventricle was closely applied to the posterior table of the sternum, as expected.

23. Nevertheless, Mr Shardey recommended surgery to replace the aortic valve, specifically by way of re-do thoracotomy and did not consider the alternative transarterial aortic/apical valve replacement [TAVI] as suitable for Dr Dorner.[22]

24. In his statement, Mr Shardey explained that he performed the sternotomy cautiously, using an oscillating saw, mindful that this was a re-do procedure and that chest x-ray showed the right ventricle closely applied to the sternum.[23] However, on entering the mediastinum, the right ventricle was damaged and required repair. Thereafter, it proved difficult to establish Dr Dorner on cardiopulmonary bypass. Mr Shardey and another surgeon unsuccessfully attempted access via the femoral route. While femoral artery cannulation was achieved, perfusion line pressure was prohibitive and adequate perfusion flows could not be achieved.

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[19] Transcript pages 112-113. See also Mr Lynch's evidence in this regard at transcript pages 14-15.
[20] At the time, Mr Shardey noted in his operation note that the pericardium was "loosely approximated". Exhibit H, statement of Mr Gilbert Colin Shardey, dated 12 September (?) 2013, page 16 CB. Mr Shardey noted that Dr Dorner had undergone dual chamber pacemaker insertion for sick sinus syndrome in 2006.
[21] Ibid.
[22] Ibid.
[23] Transcript pages 133 and following.

Eventually, the hugely dilated right ventricle was mobilised off the aorta, cardiopulmonary bypass was established and the aortic valve replaced.[24]

25. At inquest, Mr Shardey was cross-examined about the use of CT scanning chest to enhance pre-operative assessment and inform surgical technique or approach, and about pre-emptive or electively cardiopulmonary bypass, neither of which undertaken in Dr Dorner's case.

26. Mr Shardey maintained that CT scanning would not have given him any additional information about the adhesions, in terms of their depth or density. Put another way, he said that 'he did not trust CT scans, that he was sort of a pessimist' who assumed the worst case scenario and that the adhesions would be there.[25] When he did use pre-operative CT scanning it was to identify pathological anatomy as opposed to routine anatomy as in Dr Dorner's case. The right ventricle was where it should be and was roughly the size expected in aortic stenosis and there were adhesions as he would expect in any re-do procedure. A CT scan might show a line of separation between the sternum and underlying structures which he would not necessarily trust in terms of modifying his surgical approach. Mr Shardey maintained that his approach was always cautious and risk averse and additional information able to be gleaned from CT scanning would not have changed this approach. Having undertaken some 800 re-do thoracotomies, he was happy to say this this was the first and last incidence of incision of the right ventricle.[26]

27. Mr Shardey also testified that the use of pre-operative CT scanning in re-do thoracotomies such as Dr Dorner's was not routine practice in Melbourne in 2012, and although he did not personally believe CT scanning would add much, he would not argue against a practice of increasing use of CT scanning in this setting.[27]

28. In terms of the failure to establish peripheral bypass at the commencement of the procedure, Mr Shardey adopted the reasoning of both expert witnesses as to why one might not do so but also explained that in Dr Dorner's case there was an additional reason in that he was an atheromatous patient with premature coronary artery disease from the age of 50. This

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[24] Exhibit H, page 17 CB. See also Mr Shardey's evidence expanding on this aspect of the procedure at transcript pages 138 and following.

[25] Transcript pages 133 and following, and 152.

[26] Transcript pages 134-137, 140-144, 146-147. Note Mr Shardey's evidence at page 144 about the extent of the adhesions in Dr Dorner's case – *"But I don't think that a CT would have told me that little thing...There were adhesions before the tear and there were adhesions above the tear. So there were adhesions all the way along. And the only part of the ventricle that was opened was about a centimetre and a half, or a centimetre of that little bit. And I doubt – there's no way I could have predicted that little bit as distinct from the adhesions all the way along the um, the ventricle..."*

[27] Transcript pages 148-150.

complicating feature was confirmed when there were intraoperative emergent attempts to cannulate the femoral artery after the right ventricle was incised.[28]

29. Anaesthetist Dr Lee Tan provided a statement and attended the inquest. When she saw Dr Dorner alone on 3 September, the day before the surgery, she discussed the usual topics she would discuss with a patient about to undergo cardiac surgery and provided him with a patient information sheet. Dr Tan performed a physical examination and ordered temazepam as premedication the next morning and to assist with sleep that night if required.[29] Dr Dorner did not ask any questions and, in Dr Tan's assessment, understood exactly what he was having done.[30]

30. Dr Tan saw Dr Dorner in the operating theatre at 7.30am on 4 September 2012 and prepared him for surgery. Preparations included intravenous cannulation, arterial line insertion and, after induction of general anaesthetic and intubation, the insertion of a pulmonary floatation catheter and transoesophageal ultrasound probe.[31]

31. Dr Tan described the start of the surgery as uneventful until, during the attempt to open the sternum, Dr Dorner's blood pressure dropped from normal to very low all of a sudden and he looked over and saw torrential bleeding and the right ventricle empty. Dr Tan noted that the right ventricle had been damaged despite use of a special re-do or oscillating saw and great care by the surgeons to elevate the sternum from both sides. [32]

32. Thereafter, Dr Tan was fully occupied trying to keep the patient alive by transfusing him with blood and blood products, trying to maintain his blood pressure so as to ensure perfusion to the brain and organs until cardiopulmonary bypass was achieved. In total, Dr Tan gave ten units of platelets, eight units of cryoprecipitate and twelve units of fresh frozen plasma while Mr Shardey and his assistant tried to control the bleeding and establish peripheral cannulation and cardiac bypass.[33]

33. Mr Shardey then proceeded to repair the damaged right ventricle and to replace the stenotic aortic valve. The surgery took around nine hours in total and Dr Dorner proved difficult to wean off cardiopulmonary bypass. Dr Tan attempted to do so with maximal levels of

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[28] Transcript pages 137-139, 154-155.
[29] Exhibit E, statement of Dr Lee Tan dated 5 January 2016 and annexed information sheet, pages 23-25 CB.
[30] Transcript pages 87-88. Dr Tan graduated MBBS from the University of Melbourne, was a Fellow of the College of Anaesthetists and had over twenty years' experience as a cardiac anaesthetist.
[31] Op cit.
[32] Ibid and transcript page 88
[33] Transcript pages 88-90. Exhibit E. That is not to say that all the blood and blood products were given prior to establishment of cardiopulmonary bypass. Also, Dr Tan stated that the surgeons finally obtained cannulation of the femoral artery and the patient was put on cardiopulmonary bypass and that further attempts were made to cannulate the descending aorta before satisfactory cardiopulmonary bypass was established. This is consistent with Mr Shardey's evidence.

pharmacological supports including high doses of adrenaline noradrenaline, milronone and nitric oxide. At the conclusion of the surgery, Dr Dorner was transferred from the operating theatre to the Intensive Care Unit [ICU] on extracorporeal membrane oxygenation [ECMO] with his chest packed but left open.[34]

34. Also present during the surgery was Mr Gil Giovinazzo, a perfusionist, currently based in Lausanne Switzerland who was practiced in Melbourne from June 2011 to November 2012 at a number of hospitals including Cabrini. Mr Giovinazzo provided a statement explaining the role of a perfusionist in cardiac surgery generally and verifying that as far as he remembered he followed the relevant protocols during the aortic valve replacement that Dr Dorner underwent. He noted that the right ventricle was breached during sternotomy and that Dr Dorner was massively transfused through the distal ascending aorta until full establishment of cardiopulmonary bypass. Mr Giovinazzo also noted that after attempts to wean Dr Dorner from cardiopulmonary bypass at the end of the surgery, he was established on ECMO with the assistance of Mr Michael McDonald, a senior perfusionist who had been called in to assist.[35]

INDEPENDENT EXPERT EVIDENCE

35. Clinical Professor Mark A. J. Newman [Prof Newman] provided an initial independent expert assessment at my request and a second report when additional information became available.[36] Prof Newman agreed that Dr Dorner had developed severe aortic stenosis, had become symptomatic with heart failure and would have a very poor quality of life, and death within a few years, without surgical intervention. He also agreed that surgical approach through the previous sternotomy was the only safe approach for a relatively young patient, in the setting of previous coronary grafts and a previously documented short aorta.[37]

36. In terms of potential criticism of Mr Shardey's surgical approach, Prof Newman raised the possibility that pre-operative CT scanning of the chest may have warned of the severe risk posed by the proximity of the right ventricle to the sternum and was of the view that peripheral bypass should have been established before sternal re-entry. He also opined that use of more profound systemic and topical hypothermia of the right ventricle may have better protected the right ventricle during the ischaemic period of the operation.[38]

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[34] Exhibit E.

[35] Statement of Mr Michael McDonald dated 17 December 2015, page 26 of the CB. According to Mr McDonald's account, he was called at about 11.30am to assist with "a cannulation problem", arriving at about 12.00pm which he understood was some 15 minutes after cardiopulmonary bypass had been established.

[36] Exhibit B, Professor Newman's report dated 4 February 2015 at pages 30-34 CB. Exhibit C, Professor Newman's later but undated report at pages 35-37 CB.

[37] Exhibit B, page 31 CB.

[38] Exhibit B, page 34 CB. See also Exhibit C, page 37 CB where as part of his summary, Prof Newman states that *"It is my conclusion that Dr Shardey [sic] underestimated the complexity of this case. The safest techniques when*

37. Professor James Tatoulis provided a medico-legal on behalf of Mr Shardey.[39] He advised that severe symptomatic aortic stenosis is lethal and average survival is two years, and by inference, characterised Dr Dorner as just such a patient. In his report, Prof Tatoulis stated that aortic valve replacement was appropriate providing there were no significant contraindications such as disseminated neoplasm, severe advanced dementia or any other major physical or medical disability which would mean the patient would not benefit once through the perioperative period. Dr Dorner did not have any of these contraindications.[40]

38. Prof Tatoulis also expressed that view that there was nothing in Dr Dorner's clinical presentation, nor in the pre-operative investigations that were undertaken, to indicate that this case was different from any routine cardiac re-operation by sternal re-entry and advised that the approach undertaken by Mr Shardey would have been common and reasonable practice by a cardiac surgeon both in 2012 and currently.[41]

39. Prof Newman and Prof Tatoulis gave evidence at inquest concurrently using a "hot-tub" process, whereby after they were sworn in, they were given a series of questions and allowed time out of court to consult with each other in conclave and to consider their answers to those questions before returning to court.[42] Once court resumed, LSC Taylor elicited their answers to the questions and all parties had an opportunity to cross-examine.

40. Both experts agreed that available data from 28 cardiothoracic units around Australia[43] indicates that about 140 aortic valve replacement surgeries performed each year are second or re-do surgeries and these amount to only seven per cent of all aortic valve replacements performed each year. However, as aortic valve replacements comprise only about 20 per cent of the work of a cardiothoracic surgeon, each surgeon might perform only two or three per

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performing re-operation cardiac surgery were not used. These include a preoperative CT scan to assess the anatomy, elective peripheral bypass and significant hypothermia when myocardial protection is difficult."

[39] Exhibit D, Professor Tatoulis' report dated 23 January 2017 was not included in the CB as it was provided to the court on 31 January 2017, after the brief had been finalised.

[40] Exhibit D, page 5.

[41] Exhibit D, page 12.

[42] For completeness, the questions are reproduced here in their entirety but I will only refer to selective questions and answers in the finding proper. *"1. How common is re-do aortic valve replacement surgery? 2. Is this procedure considered a complex procedure? 3. Was this procedure required and was it the correct procedure to undertake having regard to the circumstances? 4. What are the risks involved in undertaking such a procedure? 5. What investigations should be undertaken to mitigate the risks in relation to this procedure? 6. What other surgical methods are used to undertake Re Do Aortic Valve Replacement? 7. Why wasn't one of these methods used? 8. Are adhesions expected to be found behind the sternum when performing this procedure? 9. Was it reasonable to rely on the CXR to get an understanding of the extent and nature of the adhesions? 10. Would it have been reasonable to undertake a pre-operative CT scan to get a better understanding of the extent of the adhesions? 11. What was the usual practice in 2012 undertaken to assess the extent of the adhesions behind the sternum and what is considered usual practice now? 12. What might be considered best practice in the future? 13. Under what circumstances would elective peripheral cardiopulmonary bypass be an option? 14. Given all the circumstances of Dr Dorner's case should elective peripheral cardiopulmonary bypass have been undertaken?*

[43] Professor Tatoulis noted that the data only covers about half the cardiothoracic units in Australia. Transcript page 23.

year (or seven per cent). On this basis, re-do aortic valve replacement remains a relatively uncommon procedure, although older more experienced surgeons generally performing more than average as they often re-operate on past patients and have a greater referral base.[44]

41. It was common ground among the experts that re-do sternotomy aortic valve replacement is a complex procedure as it requires a reoperation sternotomy with its associated problems of require mobilising the right ventricle from the back of the sternum, mobilising the rest of the heart structures, identifying and protecting coronary bypass grafts, the challenges of myocardial protection,[45] and because of all these added complications in a re-do, the surgery takes longer and is more taxing on the patient.[46] Another way of looking at the complexity, is from the perspective of the risk of mortality which the experts put at between two and three times than for primary surgery.[47]

42. For all its complexity, both experts agreed that re-do thoracotomy/sternotomy was the correct procedure in Dr Dorner's case and that the other available techniques were inappropriate. Transcatheter aortic valve implantation [TAVI] which is performed through the groin and has been used in Australia for the past five years, is reserved for elderly patients who are at high risk or otherwise inoperable. It does not require the chest to be opened or the patient to be placed on cardiac bypass and is a shorter procedure, however, the evolving data suggests that the valves used in TAVI start deteriorating within an eight year timeframe (some as early as two years) and so are not suitable for patients in their fifties or sixties. Both Prof Newman and Prof Tatoulis testified that none of the TAVI centres in Australia would accept a patient such as Dr Dorner for the procedure.[48]

43. The second alternative procedure is a right thoracotomy which involves an incision in the fourth intercostal space and approaching the heart laterally. This technique affords only limited exposure of vital structures (even in a de novo procedure) and is a difficult procedure even in experienced hands. Both experts agreed that the fact that Dr Dorner had bypass grafts made this approach unsuitable.[49]

44. Prof Newman and Prof Tatoulis agreed about the three standard pre-operative investigations that are routinely undertaken to mitigate the risks inherent in re-do thoracotomies. The first

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[44] Transcript pages 23-25. See also transcript page 46 where Prof Newman extrapolates further on the data – *"Q...a surgeon would perhaps carry out a reop of this nature perhaps two or three times a year...A That's an estimate, and it would vary from surgeon to surgeon. Some would perform none and some would perform 15 maybe...Well, it's – approximately there's 110 surgeons in Australia and 140 cases."*

[45] Transcript page XX.

[46] Transcript pages 25-27.

[47] Transcript page 31.

[48] Transcript pages 27-30.

[49] Transcript page 30 – *"...the fact that there were bypass grafts – crossing the aorta and coming off the aorta would – would make this virtually an impossible approach and, you know, doomed – doomed to failure."*

investigation is an angiogram to ascertain the location of previous grafts and whether they are intact or require revision. The second is an echocardiogram which confirms the actual pathology that is to be addressed by the procedure and is usually accurate to within a millimetre or two in terms of the structures, their functionality and some of the pressures within the heart. The third investigation is a lateral chest x-ray which gives a view of the structures in relation to the back of the sternum (breast bone).[50]

45. Prof Newman and Prof Tatoulis also agreed that adhesions are always to be expected in re-do thoracotomies and that pre-operative CT scanning of the chest, the fourth potential investigation, would not assist a surgeon's assessment of the density or extent of adhesions.[51]

46. The experts parted company, however, in relation to the broader utility of pre-operative CT scanning. Prof Tatoulis testified that, in his own practice, he would use CT scanning selectively to further define things in those patients thought to be unusual, particularly if he had not performed the earlier surgery himself. For example, if there were patent but diseased grafts he would like to know where they were; if the new problem involved the aorta; or, if there had been infection or some other significant event following the previous procedure.[52]

47. Prof Tatoulis testified that his practice was consistent with and indicative of the practice of cardiac surgeons generally in 2012, and while he conceded that there may now be increasing use of pre-operative CT scanning in re-do procedures, he maintained that there was still no evidence base for more than selective use. Moreover, he was sceptical about whether CT scanning would actually inform or alter a cardiac surgeon's approach to a re-do procedure.[53]

48. Prof Newman professed a greater preparedness to use pre-operative CT scanning. His evidence was that he would use this modality in all re-do thoracotomies, on a pre-warned is pre-armed basis, as they were among the most difficult surgical procedures performed by cardiac surgeons, (still) relatively uncommon, and CT scanning can assist assessment of the patient's anatomy and further alert the surgeon to potential dangers.

49. Prof Newman gave evidence that there is increasing literature supporting the use of CT findings to inform the way such procedures are performed. In terms of the contraindications, Prof Newman conceded that CT scanning is costly, requires administration of a contrast medium which can be problematic for some patients, particularly those with renal

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[50] Transcript page 32.
[51] Transcript pages 37-38.
[52] Transcript page33.
[53] Transcript pages 36 and following.

impairment, and that it carries an increased risk of cancer from the exposure to radiation, albeit generally in an older cohort of patients in which this risk was quantifiable.[54]

50. At inquest, both experts testified about the practice of preparing for and/or pre-emptively establishing peripheral cardiac bypass in re-do procedures and, again there was some difference between their views as regards the need for this in Dr Dorner's case. They agreed that in re-do procedures, all cardiac surgeons would have one or both groins exposed, prepped and available for cardiopulmonary bypass. In some circumstances, they would actually have the groin vessels actually exposed so that they are visible, that is surgically exposed, and under very exceptional circumstances some patients would be placed on cardiopulmonary bypass before the sternotomy was commenced.[55]

51. Prof Tatoulis testified that he, in common with most cardiac surgeons in Australia, would rarely establish pre-emptive peripheral bypass prior to starting a sternotomy. He did not think that there was anything unusual in Dr Dorner's case to point to the need for pre-emptive peripheral bypass. He weighed 80 kg or so and was a young patient. The echocardiogram showed a mildly dilated not grossly dilated right ventricle, the pressures in the right side of the heart were not elevated and the chest x-ray and angiogram did not show anything particularly concerning so as to warrant surgical exposure of the groin vessels or pre-emptive bypass which was not without its own complications.[56]

52. Prof Newman took a different view. He thought Dr Dorner's lateral chest x-ray was particularly worrying with a pacing wire which is in the apex of the right ventricle virtually touching the sternum indicating how closely it was applied to the back of the sternum, a compressed chest and lots of patent arterial grafts crossing the midline. All these factors in combination, in the setting of right heart failure, would have led him to seek further information and perhaps a CT scan which might have shown how problematic the anatomy was (actually found when the chest was re-opened) and might in turn have led him to at least expose the groin vessels if not establish elective bypass. Prof Newman was challenged about hindsight bias, conceded it is difficult to disregard the possibility but maintained that there were aspects of Dr Dorner's presentation that heightened his risk.[57]

53. Dr Christopher James O'Donnell is a consultant radiologist employed at the Victorian Institute of Forensic Medicine. He was asked to provide an independent expert opinion about Dr Dorner's chest x-ray and to advise as to the utility and practice around the use of pre-

[54] Transcript pages 33-35, 40.
[55] Transcript page 42.
[56] Transcript page 43.
[57] Transcript pages 43-44.

operative CT scanning in re-do thoracotomies. In his written report, Dr O'Donnell expressed the opinion that apart from pacemaker leads and moderate cardiomegaly, there was no substantial abnormality on the lateral chest x-ray, that the x-ray would have been performed primarily for assessment of the lungs and not specifically to assess the proximity of the right ventricle to the back of the sternum or adhesions and that the x-ray report was accurate.[58]

54. In terms of CT scanning in this context, Dr O'Donnell advised that he did not believe that it was standard practice at the time of Dr Dorner's procedure, despite some pre-dating medical literature advocating such a procedure, and indicated that he would defer to an expert cardiothoracic surgeon with specific experience on this point.[59] In his opinion, CT scanning was without question more accurate that chest x-ray and its utility was that, depending on the degree of adhesions present, it might show distortion to the contour of the right ventricle and increased soft tissue (representing scar) in the fat sitting between the ventricle and sternum.[60]

55. At inquest, Dr O'Donnell expanded on the advantages of CT scanning over x-ray and, by means of a demonstration in court, demonstrated the difficulty of interpreting a lateral chest x-ray which is essentially a two dimensional picture of a three dimensional subject and the superior resolution provided by a CT scan.[61] Dr O'Donnell testified that, despite the literature, in his practice as a radiologist in 2012, CT scanning was unusual in this setting but was an evolving practice currently. He felt this was in part due the increasing incidence for re-do procedures in an aging population and a desire by cardiac surgeons to improve mortality rates and inform decision-making about surgery.[62]

CONCLUSIONS

56. The standard of proof for coronial findings of fact is the civil standard of proof on the balance of probabilities, with the *Briginshaw* gloss or explications.[63]

57. Adverse findings or comments against individuals or institutions are not to be made with the benefit of hindsight but only on the basis of what was known or should reasonably have been known or done at the time, and only where the evidence supports a finding that they departed

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[58] Exhibit G, radiology report of Dr Christopher James O'Donnell, pages 37.1-37.4 CB. The report includes Dr O'Donnell's formal qualifications and experience and a caveat to the effect that
[59] Ibid.
[60] Ibid.
[61] Transcript pages 117 and following.
[62] Transcript pages 120 and following.
[63] *Briginshaw v Briginshaw (1938) 60 C.L.R. 336 esp at 362-363. "The seriousness of an allegation made, the inherent unlikelihood of an occurrence of a given description, or the gravity of the consequences flowing from a particular finding, are considerations which must affect the answer to the question whether the issues had been proved to the reasonable satisfaction of the tribunal. In such matters "reasonable satisfaction" should not be produced by inexact proofs, indefinite testimony, or indirect inferences..."*

materially from the standards of their profession and in so doing caused or contributed to the death under investigation.

58. Having applied the applicable standard of proof to the available evidence, I find that:

    a. By August 2012, Dr Dorner had developed heart failure and severe aortic stenosis confirmed both clinically and by investigations.

    b. Dr Dorner's clinical picture at this time was such that his reasonable life expectancy without aortic valve replacement was of the order of two years.

    c. Mr Shardey reviewed Dr Dorner, including reviewing of a recent angiogram, transthoracic echocardiogram and chest x-ray and advised surgical replacement of the aortic valve.

    d. The three pre-operative investigations undertaken were in accordance with the prevailing standards of cardiac surgery in Melbourne in 2012.

    e. Mr Shardey's choice of re-do thoracotomy/sternotomy rather than a transarterial/apical aortic valve replacement or a right lateral thoracotomy was appropriate and also in accordance with prevailing standards.

    f. Dr Dorner understood the need for surgery and the risks involved and was in a position to give, and gave, informed consent.

    g. Pre-operative CT scanning of the chest was not done and, in Melbourne in 2012, was not required to be done to accord with prevailing standards.

    h. While pre-operative CT scanning may potentially have provided a clearer view of Dr Dorner's anatomy and the proximity the right ventricle to the sternum posteriorly, there was nothing in his pre-operative presentation to indicate the need for CT scanning.

    i. The clinical management and care provided to Dr Dorner after incision of the right ventricle intraoperatively and post-operatively was reasonable and appropriate.

    j. Dr Dorner died from a known but uncommon complication of a re-do thoracotomy/sternotomy to replace his severely stenotic aortic valve.

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

The family of Dr Dorner

Mr Gilbert Colin Shardey c/o Avant Law

Cabrini Health c/o Ms Jennifer Radnell

Professor Mark A. J. Newman

Leading Senior Constable King Taylor, Police Coronial Support Unit

Signature:

PARESA ANTONIADIS SPANOS
Coroner
Date: 29 March 2018

Cc: Manager, Coroners Prevention Unit/Health and Medical Investigation Team