CORONERS ACT, 2003

SOUTH *AUSTRALIA*

FINDING OF INQUEST

An Inquest taken on behalf of our Sovereign Lady the Queen at Adelaide in the State of South Australia, on the 2nd, 7th, 8th, 9th, 10th, 14th, 15th and 17th days of June and the 27th day of October 2022, by the Coroner's Court of the said State, constituted of Naomi Mary Kereru, Coroner, into the death of Dimitrios Rentoulis.

The said Court finds that Dimitrios Rentoulis aged 79 years, late of 10 Rozells Avenue, Colonel Light Gardens, South Australia died at the Royal Adelaide Hospital, Port Road, South Australia on the 19th day of February 2018 as a result of iatrogenic right ventricular injury complicating drainage of pericardial collection following coronary artery bypass grafting for ischaemic heart disease. The said Court finds that the circumstances of his death were as follows:

1. Introduction and cause of death

1.1. Dimitrios Rentoulis was 79 years of age when he died on 19 February 2018 at the Royal Adelaide Hospital (RAH). Mr Rentoulis was a father of two and a grandfather of three who, prior to his death, had lived at home in Colonel Light Gardens, with his wife of 53 years.

1.2. Following Mr Rentoulis' death, a post-mortem examination was conducted on 1 March 2018 by Dr John Gilbert who is a forensic pathologist at Forensic Science South Australia. As part of the post-mortem process, Mr Rentoulis' heart was retained and examined by specialist cardiac pathologist, Professor Anthony Thomas of SA Pathology. Professor Thomas prepared an anatomical pathology report.[1]

[1] Exhibit C3a

1.3. Professor Thomas' findings relating to Mr Rentoulis' heart were detailed in Dr Gilbert's post-mortem report.[2] Dr Gilbert cited Mr Rentoulis' cause of death as:

> 'Iatrogenic right ventricular injury complicating drainage of pericardial collection following coronary artery bypass grafting for ischaemic heart disease.' [3]

1.4. For reasons that will appear below, I have accepted Dr Gilbert's cause of death. As the cause of death has several elements, I pause here to provide a brief explanation. Firstly, '*iatrogenic*' means a disease or symptom induced in a patient by treatment of a physician. The iatrogenic injury in the context of Mr Rentoulis' surgery was damage or tearing caused to the right ventricle of his heart by surgical intervention. Secondly, this occurred during the process of attempting surgical '*drainage of the pericardial collection*', a build-up of fluid in the pericardial sac which is a serous membrane that encloses and protects the heart. Thirdly, the build-up of fluid around the heart was a complication of the '*coronary artery bypass grafting*' (CABG) surgery. The CABG surgery involved the grafting of arteries to bypass the blocked arteries to maintain blood flow to Mr Rentoulis' heart, which was necessary because Mr Rentoulis suffered from '*ischaemic heart disease*'. Ischaemic heart disease is a condition whereby the heart is starved of oxygen due to a reduced blood supply. The blood supply is compromised from a build-up of plaque or fatty materials in one or more of the coronary arteries.

1.5. Returning to the evidence as to the cause of death, there was some suggestion made during the course of the Inquest that the level of heart disease found at post-mortem by Professor Thomas was a contributing factor in Mr Rentoulis' death. Leaving aside the dilatation of the right ventricle, which I will address later in the Finding, Professor Thomas told the Court that there was severe narrowing of Mr Rentoulis' coronary arteries, irregular areas of scarring in the heart[4], left ventricular hypertrophy and aortic regurgitation.[5] This severe narrowing and scarring theoretically put Mr Rentoulis at risk of sudden cardiac death in addition to the aortic regurgitation which may have impeded the ventricle from contracting after the injury was sustained.[6] When cross-examined, Professor Thomas agreed with a suggestion that the level of disease generally and the aortic regurgitation was a contributing factor in Mr Rentoulis' death.[7]

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[2] Exhibit C2a
[3] Exhibit C2a
[4] Transcript, page 92
[5] Transcript, pages 46 and 81
[6] Transcript, page 92
[7] Transcript, pages 95-96

1.6. Professor Thomas was asked to clarify his evidence on this topic, noting that he had agreed with the cause of death cited by Dr Gilbert.[8] He explained that his comments about the condition of Mr Rentoulis' heart were more by way of background than contribution.[9] He told the Court that the left ventricular hypertrophy and the aortic regurgitation were a feature of Mr Rentoulis' baseline prior to the sub-xiphoid procedure undertaken by Dr Worthington on 19 February 2018. Had the injury to Mr Rentoulis' right ventricle not occurred and the pericardial fluid drained as planned, Mr Rentoulis would have been discharged home, with possibly some improvement in this baseline,[10] but with existing scarring and coronary artery disease.

1.7. There can be no doubt that Mr Rentoulis suffered from both coronary artery disease and myocardial scarring. Mr Rentoulis had suffered a non-ST elevation myocardial infarction (NSTEMI) and required CABG surgery in January 2018. This in turn is likely to have caused the pericardial effusion which ultimately needed to be surgically drained. This history provided the reason for Mr Rentoulis' re-admission to the RAH in February 2018. The level of scarring and disease may very well have put Mr Rentoulis at risk of sudden death, had he survived the procedure performed by Dr Worthington.

1.8. However, expert cardiothoracic surgeon, Dr Jacob Goldstein, whose expertise is outlined below, reviewed the clinical notes and several echocardiograms, including the intra-operative transoesophageal echocardiogram. He told the Court that his reading of these investigations revealed mild to no evidence of aortic regurgitation.[11] He opined that Professor Thomas had overstated the assessment of the role of aortic leakage in Mr Rentoulis' death. He said:

> '…I don't think that mild regurgitation is significant enough to be a major contributor to Mr Rentoulis' heart not contracting adequately post-surgery. Firstly, because most of the difficulty, maybe all of it in Mr Rentoulis' case, was his right ventricle and not his left ventricle. And, secondly, there are other reports of echocardiograms that call the degree of regurgitation in the trivial or don't mention any regurgitation at all, so it's not a significant amount. And if Mr Rentoulis had been investigated for aortic valve disease and that was the answer of what his aortic valve was doing, there would be no indication whatsoever of treating that aortic valve.' [12]

[8] Transcript, page 79
[9] Transcript page 97
[10] Transcript, page 97
[11] Transcript, page 332
[12] Transcript, page 332

1.9. What is clear is that Mr Rentoulis died on 19 February 2018 as a result of an injury and repair to his right ventricle. I therefore accept the evidence of Professor Thomas in relation to the level of disease and scarring to Mr Rentoulis' heart (and possible future implications of the same) but find no basis upon which the cause of death should be changed or expanded upon.

1.10. As indicated above, I find the cause of Mr Rentoulis' death to be:

> 'Iatrogenic right ventricular injury complicating drainage of pericardial collection following coronary artery bypass grafting for ischaemic heart disease.' [13]

2. Events leading to Mr Rentoulis' death

2.1. It is convenient here to describe in general terms the sequence of events leading up to Mr Rentoulis' death, including the CABG surgery in January 2018. I will deal with the salient features in greater detail later in these Findings.

2.2. Mr Rentoulis had a past medical history of type II diabetes, hypertension, hypercholesterolaemia, chronic renal impairment, obstructive sleep apnoea (on CPAP), a right nephrectomy for renal cell carcinoma in 2015, benign prostatic hypertrophy and ischaemic heart disease.

2.3. On 14 January 2018, Mr Rentoulis was conveyed to the RAH by ambulance with a complaint of chest pain. Tests revealed that he was suffering a NSTEMI. He was admitted to the RAH where he underwent CABG surgery. This surgery was conducted by cardiothoracic surgeon, Dr Hugh Cullen, who was assisted by surgical registrar, Dr Jose Nadal.

2.4. Mr Rentoulis experienced post-operative atrial fibrillation and was commenced on metoprolol and warfarin. He was discharged from the RAH on 29 January 2018.

2.5. On 9 February 2018, Mr Rentoulis re-presented to the RAH with a history of pleuritic chest pain and shortness of breath. Investigations revealed a pericardial effusion. This is a known complication of cardiothoracic surgery, particularly CABG surgery. A pericardial drain was inserted on the same day. This was noted to drain some fluid, however further investigations revealed residual material in the pericardial space consistent with thrombus.

[13] Exhibit C2a

2.6. A redo sternotomy was planned for 13 February 2018 however, for reasons detailed later in this Finding, the surgery was cancelled. Mr Rentoulis remained in hospital and received antibiotics over the next few days. When Mr Rentoulis' condition became symptomatically worse and the pericardial effusion had not resolved, a decision was made to proceed to surgery.

2.7. On 19 February 2018, Mr Rentoulis underwent a sub-xiphoid procedure in an attempt to evacuate the effusion. A sub-xiphoid procedure is a less invasive procedure than a redo sternotomy for the drainage of pericardial effusion, insofar as it does not involve the opening of the sternum. This procedure was conducted by cardiothoracic surgeon, Dr Michael Worthington and assisted by surgical registrar, Dr Samir Thakur. During an attempt to develop the pericardial plane, bleeding was encountered by Dr Worthington, and Mr Rentoulis developed hypovolaemic shock. In an attempt to stem the bleeding, the procedure was changed to a redo sternotomy. During the sternotomy the bleeding increased significantly.

2.8. Upon the sternum being opened, Dr Worthington identified a large tear to the anterior wall of the right ventricle of Mr Rentoulis' heart. Mr Rentoulis was placed on femoro-femoral cardiopulmonary bypass and the tear was repaired with Gore-Tex patches and Teflon pledgets.

2.9. Mr Rentoulis was transferred to the Intensive Care Unit (ICU) at approximately 2:30pm in an unstable and critical condition. Despite maximal support, Mr Rentoulis deteriorated and was declared life extinct at 6:30pm on 19 February 2018.

2.10. I pause here to explain that surgery to undertake coronary artery bypass grafting requires a sternotomy. Put simply, this is a surgical opening in the middle of the chest at the breastbone (sternum) to provide access to the pericardium (the serous membrane). The pericardium is dissected to reach the heart. At the conclusion of the heart surgery, the pericardium is usually left open and the sternum is closed with sternal wires. After the grafting is undertaken, the heart in its natural healing process, develops adhesions or scar tissue. Another aspect of the healing process is that the pericardial tissue can adhere to the back of the breastbone. It was against this background that the Court considered the difficulties that were encountered in Mr Rentoulis' February 2018 surgery. I will expand on these difficulties later in this Finding.

2.11. The focus of the Inquest was primarily on the care Mr Rentoulis received during his re-admission to the RAH on 9 February 2018, including the surgery on 19 February 2018. These questions were considered in the context of the appropriateness or otherwise of the February 2018 surgery, which saw the injury sustained to Mr Rentoulis' heart.

2.12. The Court also considered whether the injury to Mr Rentoulis' heart could have been prevented if a different approach had been adopted during the surgery and whether Mr Rentoulis' death could have been prevented.

2.13. Aspects of the care Mr Rentoulis received during his admission in January 2018 were also examined. In particular, a laceration sustained to the right ventricular apex requiring repair and patching was considered. The two patches were identified at post-mortem and were located in a different area to the injury sustained in the February 2018 surgery. For reasons detailed later in this Finding, I have found that although not documented in any Operation Surgeon Report, this laceration was sustained during the CABG surgery but did not cause the pericardial effusion, impact on the surgery in February, or play a role in Mr Rentoulis' death.

3. The expert witnesses

3.1. The Court heard oral evidence from two witnesses in their capacity as experts. They were Professor Anthony Thomas, specialist cardiac pathologist and Dr Jacob Goldstein, cardiothoracic surgeon.

3.2. As mentioned above, Professor Thomas was involved in the post-mortem process by undertaking specialist cardiac examination on Mr Rentoulis' heart. At the time of preparing his anatomical pathology report in 2018, Professor Thomas had over 40 years' experience as a senior consultant and senior specialist in anatomical pathology in addition to a teaching role as Professor in Anatomical Pathology at the Flinders University School of Medicine. When Professor Thomas gave evidence in 2022, he had retired from his SA Pathology role, but continued in his professorial position, his liaison with Forensic Science in the investigation of sudden cardiac deaths, and in several different teaching roles for different institutions. I regarded Professor Thomas as an expert in his field of anatomical pathology.

3.3. Mr Rentoulis' clinical and surgical management was examined by Dr Goldstein. Following the commission of his two reports, Dr Goldstein had retired from surgical duties but continued to consult.[14] Prior to that, Dr Goldstein was a cardiothoracic surgeon of some 38 years. In that time he was the Head of Cardiothoracic Surgery at the Monash Medical Centre in Melbourne for seven years and was a supervisor of surgical training at the Monash Medical Centre for 25 years. I regarded Dr Goldstein as an expert in his field of cardiothoracic surgery. Dr Goldstein listened to the evidence of the witnesses and gave his oral evidence via the online video conferencing platform of Webex.

4. The two reports

4.1. As mentioned above, Dr Goldstein provided two reports detailing the clinical and surgical treatment that Mr Rentoulis received. The first report dated 22 July 2019 (*the* '*first report*') was furnished at a time when Dr Goldstein only had reference to the assisting surgical registrar's Operation Surgeon Report (Dr Thakur)[15] and the clinical notes. Dr Worthington's Operation Report was not part of the clinical notes seized by the Court Direction dated 22 February 2018. Nor was it supplied in answer to a further Direction dated 27 August 2019. Dr Goldstein made it clear in his first report that without Dr Worthington's Operation Report, certain aspects of Mr Rentoulis' surgery could not be commented upon.

4.2. Following receipt of Dr Goldstein's first report, an Affidavit was obtained from Dr Worthington[16] which annexed his two-page Operation Report.[17] An Affidavit was also obtained from surgical registrar Dr Thakur.[18] Dr Goldstein reviewed the two Affidavits and furnished his second report dated 11 March 2020 (the '*second report*').[19] Dr Goldstein stated that the Affidavits '*…clarified **some** of the circumstances surrounding the surgery and subsequent death of Mr Rentoulis, mainly by supplying more detailed information about the operative procedure and the subsequent deterioration, leading to death*'.[20]

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[14] Exhibit C10 dated 22 July 2019 and C10a dated 11 March 2020
[15] Exhibit C5, page 84
[16] Exhibit C14a
[17] Exhibit C14a, Annexure A
[18] Exhibit C13
[19] Exhibit C10a
[20] Exhibit C10a, page 1, my own emphasis

4.3. With the additional information, Dr Goldstein raised four concerns in the surgical management of Mr Rentoulis by Dr Worthington in his second report:

- A variance between Dr Worthington's operation record and the autopsy report, relating to the location and number of patches on Mr Rentoulis' heart;
- The failure to institute femoro-femoral bypass as soon as the initial injury was recognised;
- The decision to perform the surgical repair of the injury on a beating heart, thereby increasing the risk of misplacement of sutures and patches;
- The failure to detail why the institution of extracorporeal membrane oxygenation (ECMO) was not considered.

4.4. After having listened to the oral evidence, particularly that of Dr Worthington, Dr Goldstein raised a further issue with Dr Worthington's decision to proceed with the surgery when difficulty was encountered finding the pericardial plane. I will deal with these issues separately below in their chronological order.

5. Clarification

5.1. Two issues were raised in Dr Goldstein's report that can be disposed of relatively swiftly. The first was the size of the second tear (or the extension of the first tear) to Mr Rentoulis' heart in the February 2018 surgery. Dr Goldstein relied on a passage in Professor Thomas' Anatomical Pathology Report which referred to '*right ventricular hypertrophy with repair of anterolateral transmural* ***traumatic injury over a distance of approximately 160mm***'.[21] Dr Goldstein assumed from this, that the ***injury*** was 160mm, rather than the size of the repair.[22]

5.2. It was clarified during the course of Professor Thomas' evidence that any measurements he provided in his report and annotated photographs were of the size of the ***patches*** (whether Gore-Tex or Teflon) and ***not the size of the tear***.[23] The actual size of the tears were not measured by Professor Thomas. He indicated that in order to do so he would have needed to remove the repair materials which would result in cutting the sutures

[21] Exhibit C3a, page 5 in Summary, my own emphasis
[22] Exhibit C10, page 6
[23] Transcript, page 75, my own emphasis

and disrupting the rest of the examination and fragment the patch itself. That in turn would compromise the ability to provide a report about the condition of the heart.[24]

5.3. With this clarified, the size of the second tear was accepted as being approximately 25 x 50mm, as recorded in Dr Worthington's Operation Report, and I so find.

5.4. The second matter was Dr Goldstein's criticism of the failure to detail or document why the institution of ECMO was not considered. This criticism did not relate to the failure to institute ECMO, rather the lack of documentation to indicate consideration or otherwise of use.

5.5. ECMO is a life support technique which provides prolonged cardiac and respiratory support to a patient who is unable to maintain an adequate amount of gas exchange or perfusion to sustain life. The blood is oxygenated and pumped back into the body under pressure.

5.6. Dr Goldstein in his oral evidence told the Court that he had overlooked the notation in Dr Thakur's Operation Surgeon Report which stated, '*Decision made not for ECMO, one-way decannulation*'.[25] Accordingly, Dr Goldstein's criticism fell away.

6. <u>The variance</u>

6.1. As alluded to earlier, an issue was raised by Dr Goldstein relating to the existence of two patches near the right ventricular apex of Mr Rentoulis' heart. It was widely accepted in the oral evidence that this area of the heart was not the area that was injured on 19 February 2018. The obvious question that arose was whether an injury occurred during the CABG surgery that required repair and patching, as that was the only other time Mr Rentoulis had undergone heart surgery.

6.2. The two patches located near the right ventricular apex of the heart measured 27mm x 25mm. After receiving Dr Worthington's Operation Report, Dr Goldstein queried the existence of the patches as he became aware that the patches did not relate to the location of the tear, or the repair of the tear, as detailed in the post-mortem report.[26] To assist the Court in visualising various aspects of his examination of Mr Rentoulis' heart, Professor Thomas provided a bundle of post-mortem photographs

[24] Transcript, page 58
[25] Exhibit C5, page 84; Transcript, page 383
[26] Exhibit C10a, paragraph 6

which were arranged into a PowerPoint slide.[27] The photographs served to depict a number of different pathological findings. Photograph 6 best depicted the two patches near the right ventricular apex.[28]

6.3. Professor Thomas told the Court in his oral evidence that he had been mystified by the presence of the two patches and formed the impression that they were a little older than a day or two.[29] This was primarily because after his examination of the heart, and in preparation for giving oral evidence, Professor Thomas became aware that there was a suggestion that a laceration had been sustained to the right ventricle during the CABG surgery in January 2018. He gave evidence that a laceration to the right ventricle during the January 2018 surgery was the most likely explanation for the existence of the patches near the apex.[30]

6.4. With the variance being highlighted by Dr Goldstein and then commented upon by Professor Thomas, the presence of the two patches near the apex of Mr Rentoulis' heart became a point of focus during the Inquest. This was particularly so given the only Operation Surgeon Report[31] provided to the Court for the CABG surgery was that of Dr Cullen's surgical registrar, which made no mention of a laceration requiring suturing and patching. The absence of the primary surgeon's report authored by Dr Cullen was another point of focus as Dr Cullen was the senior surgeon. Dr Goldstein was of the view that the senior surgeon should always prepare an Operation Surgeon Report.[32] In terms of the clinical casenotes, there were two separate references to a laceration to the right ventricle[33] and one reference to a right ventricular pericardial laceration in the post-operative progress notes following the CABG surgery.[34] All three notes indicated the laceration had been repaired.

6.5. In cross-examination, Dr Cullen was asked whether he lacerated Mr Rentoulis' right ventricle requiring repair during the CABG surgery.[35] Dr Cullen's evidence was that it was possible, but he had no memory of it and in general terms, if that had occurred, he

[27] Exhibit C3d
[28] Exhibit C3d, page 6
[29] Transcript, page 59
[30] Transcript, page 60
[31] Exhibit C4, page 5 (unsigned); C5, page 198 (signed by Tim Surman)
[32] Transcript page 386
[33] Exhibit C5, page 258 dated 23 January 2018; Exhibit C5, page 361 dated 27 January 2018
[34] Exhibit C5, page 326 dated 23 January 2018
[35] Transcript, page 114

would expect to see it recorded in the Operation Surgeon Report.[36] Dr Cullen gave this evidence:

> 'It's possible, but I think it unlikely because that has – I would think I would remember it, I would think it would make it into the operation note at that time. I don't know how that would occur at my first operation but I cannot be absolutely certain. Whether it was, again, and another mechanism could be that there was an injury from the needle during the initial pericardiocentesis that we decided to put…stitch in at the time. I would expect that to get into the operation note but who knows.' [37]

6.6. Dr Cullen explained it was also possible, in the process of exposing a vessel for grafting, that the removal of overlying fat could cause a small bleed. Alternatively, the retraction required to move the heart in preparation for grafting could cause bleeding. Both possibilities would require a small running stitch that would be of no surgical relevance, such that they would not usually be recorded in the Operation Surgeon Report.[38] Dr Cullen hypothesised that the genesis of the entries in the progress notes about the right ventricle repair might have come from an anaesthetist who was present during the surgery who then provided a handover about the repair which he or she thought to be relevant. Dr Cullen also pointed out that the progress note relating to the right ventricle pericardium laceration did not make sense as that structure did not exist.[39]

6.7. Dr Cullen was then referred to photograph 6 and was asked to comment on the two patches near the apex of Mr Rentoulis' heart. He told the Court that it appeared not to be a patch but a pledgeted felt stitch.[40] Dr Cullen gave evidence that something of the nature seen in the photograph should have made its way into the Operation Surgeon Report.[41] At the time of giving his evidence, Dr Cullen was relying on his surgical assistant's Operation Surgeon Report, based on the assumption that he had not prepared one himself. Dr Cullen's evidence was that it was his practice to rely on the surgical registrar assisting him to prepare the Operation Surgeon Report rather than recording one himself.[42] He eschewed the suggestion that he, as the consultant surgeon, was the most appropriate person to have completed the Operation Surgeon Report.[43]

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[36] Transcript, page 115
[37] Transcript, page 121
[38] Transcript, page 116
[39] Transcript, page 118
[40] Transcript, page 120
[41] Transcript, page 121
[42] Transcript, page 114
[43] Transcript, page 147

6.8. Dr Thakur, who gave evidence later in the Inquest, was asked about the patches at the right ventricular apex in the context of the surgery that he assisted with Dr Worthington. Dr Thakur gave evidence that if an injury had occurred to the area near the right ventricular apex on 19 February 2018, it would have been his practice to include those details in the Operation Surgeon Report.[44] Dr Thakur gave some conflicting evidence on this topic in answer to a leading question in re-examination,[45] upon which I placed less weight. Dr Thakur also told the Court that as best he could tell by looking at photograph 6, they looked like Teflon patches.[46]

6.9. Dr Worthington gave evidence that in his surgery he had no memory of placing the patches near the right ventricular apex, whereas he did have a memory of placing the other patches.[47] He also told the Court that a laceration to the surface of the heart is not something that would necessarily make its way into the Operation Surgeon Report, particularly if it only required a small Teflon pledget for repair.[48] Dr Worthington did however agree that the size of the patches seen in photograph 6 tended to indicate that the laceration was perhaps more problematic than not.[49] Dr Worthington was also of the view that the patches looked to be Teflon.

6.10. Ultimately, Dr Worthington, who is a very senior cardiothoracic surgeon,[50] was of the view that the injury and repair to the area near the right ventricular apex as seen in photograph 6 had no impact on the procedure he undertook on 19 February 2018, or the subsequent injury to the right ventricle.[51] Dr Worthington told me that from reviewing the photograph the patches looked to be firmly adhered to the ventricle (more so than the other patches) with no signs of bleeding around the area.[52] Accordingly, he was of the view that the repaired laceration was unlikely to have been responsible for the pericardial effusion that required surgical drainage on 19 February 2018.[53]

6.11. Dr Goldstein who initially raised the '*variance*', gave evidence that the only explanation he could provide for an injury occurring to the right ventricular apex in Dr Cullen's CABG surgery would be through the retraction of the heart to gain access

[44] Transcript, page 180-181
[45] Transcript, page 185
[46] Transcript page 180
[47] Transcript, page 191
[48] Transcript, page 268
[49] Transcript, page 268
[50] Transcript, page 188 – approximately 8000 cardiothoracic surgeries undertaken
[51] Transcript, page 236
[52] Transcript, page 272
[53] Transcript page 236 and 272

to various coronary arteries where they are to be connected to the grafts, which could bruise, bleed, and require repair.[54] Dr Goldstein opined that the explanation provided by Dr Cullen relating to the process of exposing a vessel for grafting, and the removal of overlying fat causing a small bleed, was not plausible.[55] Dr Goldstein gave evidence that it was impossible to know what type of injury was behind the two patches, but the presence of patches (as opposed to a simple running stitch) were more likely to have been required due to the thin right ventricular tissue rather than the severity of the injury caused.[56] Dr Goldstein was of the opinion, based solely on the appearance of the patches in the photograph, that they looked more '*seated*' or flattened on the heart[57] and therefore were likely to have been applied in the first surgery.[58] He agreed that the laceration to the area near the right ventricular apex was unlikely to have caused the pericardial effusion.[59] Dr Goldstein gave evidence that after having listened to the oral evidence from Dr Cullen and Dr Worthington, he was reassured that the laceration and repair was of no significance.[60]

6.12. While Dr Worthington did not rule out having placed the patches near the right ventricular apex in the surgery he performed, the evidence in relation to the adherence of the two patches, the clinical notes in the post-operative phase of the first surgery referring to the repair of a right ventricular laceration, and its location away from the injury sustained in the second surgery, was strongly suggestive of the laceration occurring in the surgery performed by Dr Cullen. Dr Cullen agreed this was a possibility, however he simply could not remember.[61]

6.13. Based on the evidence as a whole, I find that the laceration to the area near the right ventricular apex of Mr Rentoulis' heart was caused during the CABG surgery and repaired at that time. I find that the laceration and its repair did not cause the pericardial effusion or impact on the surgery conducted by Dr Worthington. I find that it had no bearing on Mr Rentoulis' death.

6.14. In a curious development, after Dr Cullen had given his evidence, the Rentoulis family provided clinical records to Ms Emma Roper of counsel assisting. I understood these

[54] Transcript page 339
[55] Transcript page 341
[56] Transcript, page 341
[57] Transcript, page 384
[58] Transcript, page 385
[59] Transcript, page 385
[60] Transcript, page 385
[61] Transcript, page 146

casenotes had been obtained by the Rentoulis family from the RAH through a Freedom of Information (FOI) application. The documents included Dr Cullen's Operation Surgeon Report[62] and coding reports for both the CABG surgery[63] and the sub-xiphoid procedure.[64] These documents had not been provided to the Court in answer to the Court's Directions dated 22 February 2018, 27 August 2019 or 3 May 2022. The very existence of Dr Cullen's Operation Surgeon Report was surprising given his earlier evidence about his general practice.[65]

6.15. While Dr Cullen's surgical note made no reference to a laceration to the right ventricle, the coding document for the admission relating to the CABG surgery included a code for '*Accidental puncture and laceration of heart during a procedure*', '*Unintentional cut, puncture, perforation or haemorrhage during surgical operation*', and a handwritten addition of '*repair ® ventricle*'.[66] Dr Worthington, when asked about the coding documents,[67] explained that they were reflective of a financial collation from the clinical notes of the patient's admission relating to matters like the number of bed days and the disposables used for the hospital to claim back from Medicare.[68] He told me that the coding process was complex and historically had been inaccurate, but had improved in the last few years.[69]

6.16. As the laceration that was repaired in the area near the right ventricular apex did not have an impact ultimately on the February 2018 surgery, I did not see it necessary to recall Dr Cullen after receiving the documents into evidence. I was however concerned that an FOI application made by the family yielded documents that were not provided to the Court. No satisfactory explanation was provided as to why these documents had not been provided, particularly in answer to the Direction dated 3 May 2022. The consequence of having incomplete records (including the late provision of Dr Worthington's Operation Report) impacted on Dr Goldstein's ability to provide a complete overview on all clinical and surgical matters and there was a focus on the unexplained patches during the oral evidence that might have been condensed or avoided all together.

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[62] Exhibit C18
[63] Exhibit C15 and Exhibit C16
[64] Exhibit C15 and Exhibit C16
[65] Transcript pages 114 and 146
[66] Exhibit C15
[67] Exhibit C15 and C16
[68] Transcript, page 263
[69] Transcript, page 263

7. Re-admission

7.1. As mentioned above, Mr Rentoulis was conveyed to the RAH by ambulance on 9 February 2018 with symptoms of pleuritic chest pain, shortness of breath on exertion and lethargy.[70] The casenotes reflected that a post-operative pericarditis was suspected.[71] This is an inflammation of the pericardium. A transthoracic echocardiogram (TTE) diagnosed the presence of a 4.7cm pericardial effusion.[72] As there was no evidence of tamponade, a pericardial drain was inserted into Mr Rentoulis' chest wall on 9 February 2018 in an attempt to drain the pericardial fluid. Initially, approximately 240ml of fluid was drained[73] with approximately another 25ml a few hours later.[74] A further 50ml was noted to have drained the next morning.[75]

7.2. On 10 February 2018, Mr Rentoulis reported feeling better following the drainage of fluid. He was noted to be afebrile with improved vital signs.[76] However, the next day a further TTE[77] revealed residual material in the pericardial space with a highly echogenic appearance over the right ventricle consistent with thrombus between 15-20mm in size.[78] Noting that the drain had only drained a further 20ml of fluid over the last 24 hours, Dr Worthington (who was the cardiothoracic surgeon on call at that time) reviewed the TTE results and expressed the view that Mr Rentoulis should undergo a redo sternotomy to evacuate the pericardial haematoma. The entry in the clinical record reflected that Dr Worthington tentatively booked the surgery for 13 February 2018 on Dr Cullen's list.[79] It was noted that Mr Rentoulis was to fast from midnight on 12 February 2018.

7.3. On 12 February 2018, a CAT scan (CT) of Mr Rentoulis' chest confirmed the presence of high-density material suggestive of a haematoma within the posterior aspect of the pericardial stent site and measuring 33mm x 27mm x 79 mm.[80] In preparation for surgery, Mr Rentoulis signed a consent form for a '*redo sternotomy + evacuation of*

[70] Exhibit C5, page 219-220 (SAAS record in clinical notes)
[71] Exhibit C5, page 9
[72] Exhibit C5, page 512
[73] Exhibit C5, pages 73-74
[74] Exhibit C5, page 73-74
[75] Exhibit C5, page 514
[76] Exhibit C5, pages 514-515
[77] Exhibit C5, page 167
[78] Exbibit C5, page 517
[79] Exhibit C5, page 518
[80] Exhibit C4, pages 12-13

pericardial haematoma'[81] and a pre-operative assessment summary was prepared.[82] The clinical notes reflected the usual preparation for an imminent surgery.

8. Cancelled surgery and discharge

8.1. While Mr Rentoulis' temperature was noted to spike at approximately 8:15pm on 12 February 2018, it returned to a normal level overnight. On the day planned for surgery, Dr Cullen reviewed Mr Rentoulis. The entry in the clinical notes reflected that this review took place at 2pm with Drs Cullen and Surman. I understood the clinical note to have been made by Dr Surman. The pericardial drain was removed and it was noted that Mr Rentoulis was '*Not for operation as per Mr Cullen*'.[83] There were also two references for the plans to discharge Mr Rentoulis after one day.[84]

8.2. Dr Goldstein touched upon Dr Cullen's decision not to operate on 13 February 2018 in his first report.[85] He was of the view that due to the large pericardial collection and Mr Rentoulis displaying signs of tachypnoea in the first two to three days of admission, there was sufficient indication to proceed to surgery on 13 February 2018, even without evidence of tamponade.[86] Dr Goldstein stated that it appeared as though Mr Rentoulis' fever may have been regarded as a reason to delay surgery. He opined that a fever would give greater cause to proceed to surgery.[87] However, it is apparent from the clinical notes that a persistent fever only developed after Dr Cullen's review.[88]

8.3. Dr Cullen gave evidence that the reason for his decision not to proceed to surgery on 13 February 2018 was that he considered Mr Rentoulis well enough to be treated conservatively at that point. Dr Cullen described seeing Mr Rentoulis before the planned procedure and being struck by how well he appeared. He said:

> 'I went to see him before the procedure and he struck me as very well, surprisingly well. He was not short of breath. There was no evidence of any tamponade from a clinical inspection. He was not short of breath, he was not febrile. The drain had drained 280ml of fluid initially and then had not drained any more over the subsequent five days. So the decisions were that the drain was removed because it wasn't functional. He looked very well and therefore – and he'd already had some fluid taken off so I thought a reasonable

[81] Exhibit C5, pages 43-45
[82] Exhibit C5, pages 46-49
[83] Exhibit C5, page 526-527
[84] Exhibit C5, page 527
[85] Exhibit C10, page 3
[86] Exhibit C10, page 3
[87] Exhibit C10, page 4
[88] Exhibit C5, pages 29 and 21

course of events at that stage was to treat him conservatively and not do the operation that afternoon…' [89]

8.4. Dr Cullen was of the opinion, based on Mr Rentoulis' stable condition and the drainage of a volume of fluid, that it was possible the remaining pericardial effusion (thrombus included) could have been absorbed by his body without the need for surgery.[90] While Dr Cullen willingly accepted that he had cancelled Mr Rentoulis' surgery, he expressed doubts that he would have allowed Mr Rentoulis to be discharged after one day, as was recorded in the progress note. Dr Cullen told the Court that he would not have said Mr Rentoulis could be discharged. He stated '*that's not the approach I would ever use*'.[91]

8.5. It must be observed that every aspect of Dr Surman's entry is supported by other evidence except that relating to Mr Rentoulis' discharge. It is also difficult to understand how a junior doctor could have misinterpreted or misunderstood discharge instructions as stated by the assessing senior doctor. However, the fact remains that Mr Rentoulis was not discharged after one day. He remained in hospital and underwent surgery six days later. Furthermore, after having listened to the evidence of Dr Cullen, Dr Goldstein softened his view on the decision to cancel the operation, stating that Dr Cullen's decision-making process was reasonable.[92] It is therefore not necessary to take any issue arising from Dr Surman's progress note entry further. I find that it was not unreasonable for Dr Cullen to have cancelled Mr Rentoulis' surgery on 13 February 2018, preferring to observe him for a further period of time. I find that the delay in surgery of six days did not play a role in Mr Rentoulis' death.

9. Worsening of symptoms

9.1. As mentioned earlier, it was after Dr Cullen's review of Mr Rentoulis that he developed a fever which persisted over the following three days. When the pericardial drain was initially inserted on 9 February 2018, a sample of the pericardial fluid was obtained and cultured, revealing a growth of Propionibacterium species. At that early stage, the bacterial growth was thought to be a probable contaminant. Upon the development of a fever on 13 February 2018, the result of the culture was revisited, and the infectious

[89] Transcript, page 125
[90] Transcript, page 126
[91] Transcript, page 127
[92] Transcript, page 364

diseases team were consulted.[93] The notes reflected that a pericardial bacterial infection was suspected as the likely source.[94] Mr Rentoulis' antibiotic therapy was changed to intravenous (IV) vancomycin.[95]

9.2. The clinical notes reflected that on 15 February 2018, Mr Rentoulis and his family were spoken to by a Dr Tran from the cardiothoracic team. This entry detailed a discussion that was held concerning the risks of surgical management, as opposed to conservative management, given the bacteria that was thought to be in the pericardial collection. It was also reflected in this note that the discussion with the Rentoulis family was relayed to Dr Cullen, who advised that surgery was not yet indicated, but to continue with IV antibiotics.[96]

9.3. Over the next two days the observation chart recorded a normalising of Mr Rentoulis' temperature.[97] Despite this, on 17 February 2018, Mr Rentoulis reported '*feeling fatigued/weak*',[98] and '*very flat today…worse today than before*'.[99] An entry made by Dr Thakur on 17 February 2018 reflected the decision to proceed to a sub-xiphoid pericardial drainage of the effusion on 20 February 2018.[100] Mr Rentoulis continued to complain of exhaustion and shortness of breath[101] and on 18 February 2018, a casenote entry reflected that the procedure was to be brought forward by a day.[102]

10. Difficulty finding the pericardial plane

10.1. On 19 February 2018, Dr Worthington assisted by Dr Thakur commenced the sub-xiphoid procedure to drain the pericardial effusion. The Operating Theatre Record contained within the OACIS[103] records reflected that the procedure commenced at 10:40am.[104] Dr Worthington and Dr Thakur gave oral evidence about the procedure. Despite assisting with the surgery in its entirety, preparing an Operation Surgeon Report, meeting with the Rentoulis family to report on the critical condition of Mr Rentoulis and swearing an Affidavit on 17 January 2020, Dr Thakur's memory of

[93] Exhibit C5, pages 530 and 538
[94] Exhibit C5, page 530
[95] Exhibit C5, page 538
[96] Exhibit C5, page 539
[97] Exhibit C5, pages 25 and 93
[98] Exhibit C5, page 543
[99] Exhibit C5, page 543
[100] Exhibit C5, page 544
[101] Exhibit C5, page 547
[102] Exhibit C5, page 548
[103] Open Architecture Clinical Information System
[104] Exhibit C4, page 9

the operation was limited.[105] I observed Dr Thakur to be somewhat cautious in his evidence, often preferring to '*defer*'[106] to Dr Worthington's evidence (or Surgical Report) as the senior surgeon.

10.2. While Dr Thakur stated that he was unable to exactly recall the difficulty that he encountered when attempting to find the pericardial plane in order to make the incision for the sub-xiphoid procedure, he gave evidence in a general sense about his reasons for handing over to Dr Worthington to find the pericardial plane. He said:

> 'So the initial incision is through the skin and through the soft tissues and carefully sort of dissecting down to that space, that anatomical space. And normally, like I said, you establish a clear plane. In this particular case I've written there that I was unable to feel a clear plane and so therefore, at least in my experience, I didn't feel confident proceeding further.' [107]

10.3. Dr Worthington gave evidence that he felt a level of concern when Dr Thakur was unable to find the pericardial plane and that is why he took over. Dr Worthington also encountered difficulties finding the plane and conceded very frankly that these difficulties were the reason why he ended up with a hole in the right ventricle; namely inadvertently entering the right ventricle with his finger.[108] The difficulties he encountered were explored in detail during cross-examination. Dr Worthington told the Court that he was initially unaware he had damaged the right ventricle, believing that the venous blood that emerged was in fact from the pericardial effusion, such that he applied the suction. When the anaesthetist informed Dr Worthington that Mr Rentoulis' blood pressure was dropping, he realised that the bleeding was from an injury.[109]

10.4. Dr Goldstein initially opined that when Dr Worthington encountered difficulties finding the pericardial plane, the procedure should have been aborted.[110] It was Dr Goldstein's view that with the difficulties encountered, there was a risk of injuring the heart and a conversation with Mr Rentoulis and his family about a more invasive procedure (a redo sternotomy), outside the operating theatre was warranted.[111] Dr Goldstein did clarify his opinion during oral evidence. He stated that if the patient had consented to a redo

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[105] Exhibit C13
[106] Transcript, pages 162, 168, 173, 175
[107] Transcript, page 172
[108] Transcript pages 223-224
[109] Transcript page 223
[110] Transcript page 391
[111] Transcript, page 316

sternotomy (as well as a sub-xiphoid procedure) and there was no alternative to surgical drainage (conservative management), then it would be appropriate to continue to proceed with the surgery.[112] I understood Dr Goldstein to mean the '*surgery*' was a redo sternotomy.

10.5. Given Mr Rentoulis had originally consented to a redo sternotomy when it was planned earlier in his second admission,[113] and a trial of conservative management had occurred after Dr Cullen cancelled the operation on 13 February 2018, there is little basis to argue the operation should have been abandoned. This is particularly so given Mr Rentoulis' worsening symptoms in the days leading up to surgery. The only remaining question was whether Dr Worthington should have persisted with attempting to find the plane for the sub-xiphoid procedure or placed Mr Rentoulis on femoro-femoral bypass and then converted to a redo sternotomy.

10.6. In his post-mortem report, Dr Gilbert noted the '*presence of dense adhesions over the anterior wall of the right ventricle*'.[114] Dr Gilbert stated that it would be very easy to accidently tear the right ventricular wall when trying to employ blunt dissection to break down the adhesions. In addition, Dr Gilbert reported that the sub-xiphisternal approach would give the surgeon limited view of the plane in which the dissection was taking place and adhesions would make the determination of the precise location of the right ventricular wall problematic.[115] Professor Thomas' examination of the heart revealed that the adhesions around the heart were variable, with some areas more densely adherent than others.[116]

10.7. On that point, Dr Worthington was cross-examined at length about whether he had underestimated the presence of dense adhesions thereby causing the initial injury to Mr Rentoulis' right ventricle when attempting to find the plane. Dr Worthington disagreed that he was dissecting dense adhesions when he entered the right ventricle. He agreed that he did encounter dense adhesions after the initial tear occurred, more towards the anterior surface of the heart, near the right atrium.[117] This evidence is supported by his Operation Report.[118] However, Dr Worthington stated that when

[112] Transcript, pages 316-317
[113] Exhibit C5, page 43, consent form
[114] Exhibit C2a, page 3
[115] Exhibit C2a, page 3
[116] Transcript, page 90
[117] Transcript, page 248
[118] Exhibit C14a, annexure A '*It was densely adherent anteriorly, inferiorly and on the right atrial side*', page 1 of 2

attempting to find the pericardial plane, he was not dissecting dense pericardial adhesions, he was dissecting the tissue usually expected in the plane of a patient who had undergone a previous cardiac surgery.[119] This evidence is consistent with Dr Worthington's account in his Affidavit affirmed on 27 February 2020.[120] It is also supported by Dr Worthington's oral evidence that he was not aware he had entered the right ventricle until Mr Rentoulis became haemodynamically unstable, which is the same account he provided to the Rentoulis family in a letter he wrote, dated 15 September 2018.[121]

10.8. While Dr Goldstein was of the view that the very difficultly encountered in finding the plane could only mean the presence of dense adhesions, he did state that proceeding in light of the difficulty was a clinical judgment call, albeit a risky one.[122] While Dr Goldstein expressed a level of confusion with Dr Worthington's explanation in his oral evidence, Dr Worthington resolutely maintained that he did not encounter dense adhesions when looking for the pericardial plane. Of particular note was his evidence that:

> 'normally when you're on a ventricle you can feel it pulsating, you can feel it beating. I did not feel anything like that which made me think I was going into the right space.' [123]

10.9. I have found it difficult to reconcile this particular aspect of the evidence. I have noted Dr Goldstein's difficulties with Dr Worthington's evidence on this topic, however I formed the impression that Dr Worthington was a sincere and candid witness who at times made concessions against his interests. As Dr Goldstein stated on more than one occasion, it was Dr Worthington at the coalface, so to speak, and he was the one navigating his way through the surgery, making decisions in a surgical setting.[124] It is evident that Dr Worthington was not in the right space by virtue of the injury that was sustained however, it is important to note that Dr Worthington's oral evidence on this topic is entirely consistent with other accounts he provided, referred to above. I therefore accept Dr Worthington's evidence that prior to the initial injury occurring, he

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[119] Transcript, page 248
[120] Exhibit C14a, paragraph 13 '*With the initial tear, I felt a normal amount of resistance which you would expect to feel in that kind of procedure*', page 3 of 4
[121] Exhibit C6b
[122] Transcript, page 374
[123] Transcript, page 198
[124] Transcript, pages 383 and 389

did not encounter unusually dense adhesions, could not feel the pulsating ventricle, and thought he was in the right space.

11. The failure to institute femoro-femoral bypass as soon as the initial injury was recognised

11.1. Upon realising that he had entered the right ventricle, Dr Worthington told the Court that he thought the injury to be approximately 10mm in diameter (the diameter of the suction tube). Dr Worthington stated that Dr Thakur was able to control the bleeding at that point, with his finger and a swab, as a temporising measure.[125] Dr Worthington explained that to repair the injury, he considered the best option was to re-open Mr Rentoulis' sternum. He gave evidence that:

> 'The defect in the right ventricle at that stage was less than a centimetre in size. My initial clinical judgment was with the sternum being a centimetre apart [from the previous surgery] was to open the sternum totally and do a small dissection to get to a stage where I could put in two small pledgeted sutures to close the defect. That was my clinical decision behind that.' [126]

11.2. Dr Worthington gave evidence that while Dr Thakur held his finger and a swab over the tear, he commenced cutting through the skin of the midline sternotomy, cutting down and removing the sternal wires. With the bottom half of the sternum already apart, Dr Worthington used scissors to split the top half of the sternum while he attempted to dissect the heart off the back of the breastbone.[127] Unfortunately, during the dissection, the initial tear became significantly bigger, splitting along the right ventricle causing what has been described as a '*massive*' bleed.[128] This tear was much larger than the first, estimated to be approximately 50mm x 25mm.[129] Dr Worthington's estimate of the length of the tear is supported by the pathological evidence that the length of the Gore-Tex patch extended down the supraventricular crest for a distance of 50mm.[130]

11.3. Dr Goldstein was initially critical of Dr Worthington's decision not to institute femoro-femoral bypass before opening Mr Rentoulis' sternum. Dr Goldstein explained that had this been done, the right ventricle would have decompressed, making its

[125] Transcript, page 198
[126] Transcript, page 197
[127] Transcript, pages 198-199
[128] Transcript page 199
[129] Exhibit C14a, page 6. Transcript, page 192
[130] Exhibit C3D, slide 10 page 10

dissection away from the sternum technically easier, thus lessening the chance of the extension of the injury.[131] In answer to this criticism, Dr Worthington stated that he did not anticipate or expect the tear to become larger by his dissection. He explained that had the sternum been totally adherent, he might have considered instituting femoro-femoral bypass as the dissection would have been more difficult.[132] With the sternum being partially apart, he formed the view that he could get into the space and dissect the heart off the back of the sternum sufficiently enough to put in two sutures to repair the defect.[133]

11.4. After the receipt of Dr Worthington's Operation Report, and listening to his oral evidence, Dr Goldstein expressed a better understanding of Dr Worthington's decision not to put Mr Rentoulis on bypass before undertaking the sternotomy. He stated the following:

> 'See the thing is, when I had the original, before I had Mr Worthington's operation report, I couldn't really tell how he tried to control the bleeding after the initial hole was made and I thought that would be very, very difficult to do in such a confined space as you would have behind the sternum through a subxiphoid approach. And it turns out from his evidence that he was pretty successful in controlling the bleeding with a combination of gauze and finger pressure on the surface of the heart not pushing the finger through the heart through the hole to block the hole but to just cover it over, and according to his evidence that provided pretty….not perfect control of the bleeding. And I image that was one of the reasons that led him to persevere with trying to avoid…bypass and just extend…somewhat so that he could repair it through a sub-xiphoid approach, but of course it turned out not to be successful.' [134]

11.5. One of the reasons suggested for the second and larger tear was the unusually thin, right ventricle wall. It is necessary to pause here to revisit the topic of the dilatation of Mr Rentoulis' right ventricle as touched upon at the beginning of the Finding. Professor Thomas told the Court that his specialist examination of Mr Rentoulis' heart revealed a significantly dilated right ventricle.[135] Professor Thomas, with reference to photograph 5 of the PowerPoint slide, told the Court that usually a right ventricle wall measures between 3-5mm, but in Mr Rentoulis' case it was more likely in the order of 1-2mm.[136] Professor Thomas explained the following:

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[131] Exhibit C10a, page 4
[132] Transcript, page 209
[133] Transcript, pages 197 and 224
[134] Transcript, page 378
[135] Transcript, page 81
[136] Transcript, page 55

> 'With increasing age you get an increase in fatty infiltration of the muscle of the right ventricle which you don't necessarily get with the left ventricle, and that increasing fatty infiltration I think can make the wall weaker or more fragile…' [137]
>
> '[that] fatty tissue on the endocardial, the inner aspect of the heart – of the right ventricle – was more than I would expect to see and I believe that in that context with a lot of fat on the outer pericardial aspect, that that would have led to or enhanced thinning of the right ventricle in terms of the muscle present.' [138]

11.6. While Dr Worthington made it clear that at the time of the surgery, he was not aware of the dilated right ventricle wall, he expressed the view that this may have been a contributing factor to the tear, after having listened to the pathological evidence of Professor Thomas.[139] Considering the pathological evidence, it is entirely plausible that an abnormally thin right ventricular wall would tear more easily than anticipated. Dr Worthington's decision to stem the bleeding from the initial tear by opening the sternum to gain access enough to repair the injury, was a decision that he accepted carried more of a risk than placing Mr Rentoulis on femoro-femoral bypass.[140] Dr Worthington conceded that with the benefit of hindsight, the decision not to institute femoro-femoral bypass before the redo sternotomy was an error. However, Dr Worthington told the Court that his decision not to commence bypass was a valid clinical decision at the time.[141] Dr Worthington stated a number of times in cross-examination that the risk of the right ventricle tear extending was possibly reduced, but still remained with the institution of bypass.[142]

12. <u>The decision to perform the surgical repair of the injury on a beating heart, thereby increasing the risk of misplacement of sutures and patches</u>

12.1. Dr Goldstein's criticism of Dr Worthington's decision not to administer cardiocentesis to undertake the surgery related primarily to the repair of the injury on the beating heart.[143] This criticism was made at a time when there was no explanation for the two patches on the ventricular apex, and when there was some confusion about the size of the injury to Mr Rentoulis' heart.[144] With the oral evidence clarifying these aspects of the surgery, Dr Goldstein's remaining concern was why Dr Worthington required such

[137] Transcript, page 56
[138] Transcript page 92
[139] Transcript, page 205, 254
[140] Transcript, pages 255 – 256
[141] Transcript, page 254
[142] Transcript, pages 255, 257
[143] Transcript, pages 378 – 380
[144] Transcript, page 382

an extensive repair for the extension of the tear. Dr Goldstein opined that the extensive repair contributed to the heart's lack of contractility which in turn contributed to Mr Rentoulis' death.[145] He was concerned that attempting to place patches on a beating heart in some way saw more patching material used than was necessary.

12.2. Dr Worthington clearly stated in his evidence that he chose not to administer cardioplegia for three reasons:

- He was working on the right side of the heart which is safer to work on whilst beating than the left side;
- To adequately cardioplege the heart, a dissection over to the outside left of the heart, with a clamp on the left internal mammary artery, was necessary. This put the artery at risk of damage (which would require bypass grafting to repair) as well as the risk created by a large dissection;
- The best protection to the heart was to have the heart totally perfused (beating).[146]

12.3. Dr Goldstein stated in his evidence that the consideration of the decision to cardioplege or not, were both legitimate approaches. The ultimate decision making relied on the safer approach at the time. Dr Goldstein could not say definitively whether Dr Worthington's decision not to administer cardioplegia affected the size of the repair, which in turn affected the heart's ability to contract.[147]

12.4. Dr Worthington told the Court that he expected the repair using the Gore-Tex patch to have impaired ventricular function to a degree.[148] He did however, consider that there would be adequate contractility after repairing the tear, as there was still the remaining 50% of the ventricle contracting all the anterior and inferior walls and the septal walls.[149] However, after repairing Mr Rentoulis' heart with the Gore-Tex patches and Teflon, it became apparent that the right ventricle was not functioning adequately. He attributed this to the injury and the repair in combination.[150]

12.5. After hearing the evidence, it was clear that the decision not to administer cardioplegia was appropriate, particularly on the background of the previous CABG surgery.

[145] Transcript, page 382
[146] Transcript, pages 200-201
[147] Transcript, pages 380-381
[148] Transcript, page 259
[149] Transcript, page 260
[150] Transcript, page 260

Further, Dr Worthington did not dispute that the material used in the repair contributed to the loss of contractility of the right ventricle.

12.6. To my mind, the evidence established the following facts, all of which I find:

- On 19 February 2018, Mr Rentoulis' condition was such that surgical intervention was the only remaining option.
- Given Mr Rentoulis was symptomatically unwell and had previously undergone CABG surgery in addition to developing a large pericardial effusion, the sub-xiphoid approach was a reasonable first option in the circumstances.
- When difficulty was encountered finding the pericardial plane, it was a reasonable clinical decision for Dr Worthington to continue, rather than aborting the procedure.
- An injury to Mr Rentoulis' right ventricle was sustained when Dr Worthington was attempting to find the pericardial plane via the sub-xiphoid approach.
- When the initial injury occurred, Dr Worthington's decision to proceed to a redo sternotomy rather than immediately placing Mr Rentoulis on femoro-femoral bypass, primarily due to the sternum being partly open, was a reasonable one at the time.
- It cannot be said with any certainty that had Dr Worthington placed Mr Rentoulis on femoro-femoral bypass before attempting the redo sternotomy that the further tear in the right ventricle would have been prevented. At its highest, the risk of the further tear would have been reduced.
- The pathological finding of the thin and friable right ventricle contributed to the tear in the right ventricle. This risk could not have been known by Dr Worthington prior to the procedure.
- The application of the patches were necessary in the circumstances, but almost certainly contributed to loss of the contractility of the heart.
- It cannot be said with any certainty that the decision to repair the tear to the right ventricle on a beating heart contributed to the misplacement of repair materials.

13. Was Mr Rentoulis' death preventable?

13.1. This is an issue that is not free from difficulty. In one sense Mr Rentoulis' death could be seen as preventable on the basis that the injury from which Mr Rentoulis died was suffered during surgery and was iatrogenic in its nature. If this injury had not occurred and the pericardial effusion drained as planned without complication, Mr Rentoulis would likely have recovered and been discharged from hospital. It is not difficult to see that if different surgical decisions had been made during the surgery, the injury may not have extended to a point requiring such extensive repair. However, an associated question in the assessment of preventability is whether it was clinically unreasonable to have made the decisions that Dr Worthington made.

13.2. When examining the reason Mr Rentoulis was in hospital and his clinical course over the second admission, it is plain that the surgery, whether by way of sub-xiphoid or redo sternotomy, was indicated. Dr Worthington told the Court several times that he did not encounter dense adhesions and believed he was in the right space as he was unable to feel the pulse or beating of the right ventricle. His response to proceed with a midline sternotomy to repair the first injury because the sternum was partly open, rather than institute femoro-femoral bypass, was a decision made in an emergency setting. Dr Worthington accepted that, in hindsight, placing Mr Rentoulis on bypass before commencing the redo sternotomy reduced the risk of the extension of the tear. However, at the time, he stated he was only looking for exposure enough to repair the initial tear. There was no definitive evidence to support the proposition that by instituting bypass the heart would have completely fallen away from the breastbone, preventing the further tear. The thin right ventricle, identified pathologically, increased this risk of a tear irrespective of the clinical decision making.

13.3. The surgical decisions made by Dr Worthington during the second surgery were largely endorsed by Dr Goldstein after he had the benefit of listening to his oral evidence. The one issue where Dr Goldstein maintained his criticism was the difficulty finding the pericardial plane and persisting, notwithstanding. As I have stated earlier, I was impressed with Dr Worthington as a witness and accept his evidence.

13.4. This is a tragic outcome to what could have been a relatively straightforward procedure, but one that in the circumstances I do not believe was preventable on the balance of probabilities.

13.5. I make no recommendations.

Key Words: Heart Surgery; Iatrogenic Injury

In witness whereof the said Coroner has hereunto set and subscribed her hand and Seal the 27th day of October, 2022.

Coroner