CORONERS COURT OF THE AUSTRALIAN CAPITAL TERRITORY

Case Title:	**AN INQUEST INTO THE DEATH OF ADRIAN CHARLES WILFRED VAN DIE**
Citation:	**[2018] ACTCD 17**
Date of Findings:	26 November 2018
Before:	Coroner L E Campbell
Decision:	1. Adrian Charles Wilfred Van Die died on 18 April 2015 at The Canberra Hospital, 1 Dann Close, Garran; 2. The manner and cause of death of Mr Van Die are sufficiently disclosed and a hearing is unnecessary; 3. The manner and cause of Mr Van Die's death was multi-organ failure, caused by low flow ischaemia of coeliac artery and superior mesenteric artery territory viscera, due to obstruction of the coeliac, renal and superior mesenteric arteries by an Intra-Aortic Balloon Pump; and 4. Pursuant to s 52(4)(a)(i) of the *Coroners Act 1997* no matter of public safety is found to arise in connection with this inquest.
File Number:	CD 81 of 2015

1. The death of Mr Van Die was reported to me on 18 April 2015, after he had been declared life extinct at The Canberra Hospital ("TCH") on that day. At the time of Mr Van Die's death, paragraph 13(1)(e) of the *Coroners Act 1997* (ACT) relevantly provided that a Coroner must hold an inquest into the manner and cause of death of a person who dies during or within 24 hours after, or as a result of, an operation of a medical or surgical or like nature, or an invasive medical or diagnostic procedure.

Facts

2. Mr Van Die was born in 1964 in Wentworthville, NSW, but grew up mainly in Canberra and completed his schooling in the ACT. He was a hairdresser by trade.

3. Mr Van Die was a "pack a day" smoker, and by his mid-forties was said by his family to be living a sedentary lifestyle. He had a poor diet. In the early 2000s Mr Van Die started frequenting hospital emergency rooms due to issues including chest pain and breathlessness. He was diagnosed with chronic episodes of pneumonia and ischaemic heart disease. As a result, Mr Van Die had to give up working full time.

4. In about March 2014 Mr Van Die was diagnosed with diabetes, for which he was prescribed insulin twice daily. He also underwent an angiogram which found significant stenosis in his left descending artery, 80% stenosis in his right descending artery, and a left ventricular ejection fraction of 30%. Accordingly he was diagnosed with severe ischaemic cardiomyopathy. He was prescribed medication for his heart condition but was also offered the possibility of elective coronary artery bypass surgery. He ultimately elected to undergo this procedure.

5. On 16 April 2015 Mr Van Die was admitted to TCH to undergo a triple (involving three vessels) coronary artery bypass graft. At about 8:46am, Mr Van Die was admitted to the TCH Cardiac Catheter laboratory, where an intra-aortic balloon pump ("IABP") was inserted via his right femoral artery to support his cardiac function.

6. At about 10:30am Mr Van Die went into theatre for surgery. The surgeon discovered that the IABP previously inserted was leaking with blood and had burst. He immediately removed the IABP and replaced it. The surgeon then performed three separate bypass grafts on Mr Van Die's heart. Surgery was completed by about 3pm and Mr Van Die was moved onto the recovery ward where he appeared to have tolerated the surgery well. At about 4pm Mr Van Die was moved to the Intensive Care Unit ("ICU") of TCH.

7. Mr Van Die's condition initially appeared stable but at about 4am the following day (17 April 2015) ICU staff observed that he had decreased urine output and decreasing blood pressure. Blood tests also showed Mr Van Die had reduced liver function and renal function. Mr Van Die was started on haemodialysis at about 5am. A CT scan was conducted which showed Mr Van Die had an ischaemic liver, small intestines and spleen which had all been obstructed by the IABP or possibly a previous thrombotic event.

8. An emergency laparotomy performed at 3pm on 18 April 2015 confirmed the CT findings and part of Mr Van Die's ischaemic bowl was resected. Mr Van Die was then transferred back to ICU and intubated, with a repeat laparotomy scheduled for the next day depending on his clinical situation. He was also medicated to try to maintain his blood pressure.

9. However, at about 9pm that day Mr Van Die's blood pressure dropped and a decision was made in conjunction with his family that he would be palliated. Mr Van Die was formally declared life extinct at 11:48pm.

10. A post mortem examination was undertaken at my direction. The cause of death opined by the pathologist was "multi-organ failure caused by low flow ischaemia of coeliac artery and superior mesenteric artery territory viscera, presumably related to arterial ostial obstruction by intra-aortic balloon pump."

Expert Review

11. I directed that a review of Mr Van Die's treatment at TCH, and specifically the use of the IABP, be undertaken by a suitably qualified independent expert. The process of locating an expert who was available and willing to take on the task took some time. Ultimately, Dr David Collins, an Intensive Care Consultant in both private and public practice in cardiac surgical centres, took on the task.

12. Dr Collins was asked to comment on a number of matters:

    a. What is the currently accepted process and/or method in Australian hospitals for operating IABPs and conducting these procedures;

b. Was an IABP an appropriate procedure to offer Mr Van Die in the light of his clinical history;

c. Was Mr Van Die's balloon procedure appropriately conducted, and in particular, was the IABP placed and operated correctly; and

d. Did the balloon procedure undertaken contribute to Mr Van Die's death?

13. As to the first issue, Dr Collins explained that an IABP consists of a long sausage-shaped balloon connected by tubing to a computerised console that is connected to a supply of helium gas. The balloon is placed in the intrathoracic and intraabdominal aorta and is inflated and deflated with very rapid transitions at carefully timed intervals synchronised to the heart's contraction. In that way it assists cardiac function. Dr Collins said that there is no binding policy or agreement between or among Australian hospitals for the insertion or operation of IABPs, but that there is a field of broadly accepted practice. Notably Dr Collins said that the appropriate balloon size must be chosen for each patient, and that in Australia, most centres use an algorithm based on a patient's height, but that there are many alternative algorithms published in the medical literature.

14. Dr Collins agreed that inserting an IABP was an appropriate procedure for Mr Van Die. He noted that there are two accepted indications for pre-operative insertion of an IABP for coronary artery bypass graft surgery and Mr Van Die had both of those indications.

15. On the third issue, whether the procedure was properly conducted, Dr Collins noted that two balloon procedures were in fact conducted. As to the first procedure (the balloon that leaked) Dr Collins noted that the balloon size that was chosen for Mr Van Die was considered appropriate under multiple guidelines in use in Australia. He also noted that observations were made after placement of the balloon to confirm that the IABP had been placed appropriately. Dr Collins commented that certain matters about the conduct of the procedure such as a sterile operating environment, balloon inflation volume and timing, and frequent observations, were not well documented in the medical records; however he also noted that such matters may well be considered routine.

16. As to the second procedure conducted in theatre to remove and replace the leaking balloon, Dr Collins observed that there was no documentation at all of that procedure on Mr Van Die's medical record. However, it is apparent from other records, specifically the RN theatre report form, that the same size of balloon as had been first placed was used again. He also noted that there was no formal record of anyone checking to confirm appropriate placement of the balloon, but considered that it would have been highly likely that the cardiac anaesthetist in theatre used transoesophageal echocardiography to confirm correct placement of the balloon. I note that a statement later obtained from the cardiac surgeon confirms that transoesophageal echocardiography was used to confirm correct placement of the balloon in theatre.

17. As to whether the balloon procedure contributed to Mr Van Die's death, Dr Collins ultimately concluded that it did. He noted however that Mr Van Die's interoperative course was not unusually problematic by cardiac surgical standards, particularly given Mr Van Die's pre-operative state.

18. Dr Collins ruled out Mr Van Die's ischaemic injury having been caused from a gas embolism from the first ruptured balloon, or from the release of atheromatous plaque or cholesterol

from Mr Van Die's arterial walls: in the former case, there was no ischaemic damage to the lower limbs at autopsy as would be expected in this case; and latterly, the autopsy found only mild atheromatous disease, and no embolised material in Mr Van Die's arteries. [I note that the cardiac surgeon who performed Mr Van Die's surgery suggests that it is technically impossible to exclude helium embolization, as helium is insoluble in blood, but I do not think anything turns on this.]

19. Dr Collins said that while the documentation relating to the insertion of the second IABP was lacking, the least that can be said was that it was probably appropriately sized, and the position of the upper end of the balloon was appropriate when imaged in ICU on 16 April 2015. Dr Collins noted that the CT scan taken on 17 April 2015 showed that the balloon had covered Mr Van Die's coeliac and superior mesenteric arteries, as well as his renal arteries. He noted that coverage of the coeliac and superior mesenteric arteries by an IABP balloon is a recognised side effect of treatment, but that it is unusual for this to cause ischaemic damage. If such ischaemic injury does occur however, the mortality risk for the patient is very high. To have prevented multi-organ failure and death, the IABP would have needed to have been removed much earlier than it was in Mr Van Die's case.

20. Dr Collins observed that there were early signs after Mr Van Die returned from the operation that his liver, kidneys and gut were receiving inadequate blood flow. However, Dr Collins said that recognising ischaemic injury in a patient like Mr Van Die who was expected to have severe post-operative left ventricular failure might be extremely difficult. He concluded that the obstruction of the coeliac, renal and superior mesenteric arteries contributed to ischemia of the liver, spleen, kidneys and bowel through obstruction to the origins of their arteries in the aorta. Over time this resulted in irreversible cardiovascular collapse. Death was probably unpreventable by the time the IABP was removed.

Formal Findings

21. On receipt of Dr Collins' report I requested the preparation of a brief of evidence in this matter. Statements were obtained from the cardiologist who performed the first balloon procedure, the surgeon who performed the coronary artery bypass grafts (and the second balloon procedure) and the ICU intensivist who treated Mr Van Die on the ward. I also received from TCH a copy of a report from the manufacturer of the balloon that ruptured, which stated that they were not able to determine the ultimate cause of the rupture.

22. I also received several documents from the TCH Clinical Review Committees which conducted extensive internal reviews of Mr Van Die's death. I thank those committees for releasing that material to me and I have found it helpful. However, the *Health Act 1993* (ACT) limits what I may do with that material, and to whom I may release the information in those documents. I will say only that the review identified a number of areas for potential change and all of those matters appear to be appropriate.

23. In all the circumstances in my view there is no necessity to hold a public hearing in relation to Mr Van Die's death. I believe I have all the evidence which exists or is likely to exist which could possibly bear on the decisions I must make. There is no issue about which I would be empowered to hold a public hearing and which in and of itself warrants that course being taken, and further my ability to make recommendations is not contingent on the holding of a hearing.

24. I make formal findings in accordance with the post mortem report and expert report as follows:

> Adrian Charles Wilfred Van Die died on 18 April 2015 at The Canberra Hospital, 1 Dann Close, Garran from multi-organ failure, caused by low flow ischaemia of coeliac artery and superior mesenteric artery territory viscera, due to obstruction of the coeliac, renal and superior mesenteric arteries by an Intra-Aortic Balloon Pump.

25. In the light of Dr Collins's report, there is no cogent evidence supporting any adverse finding or comment against TCH or any individual medical practitioner. In circumstances where the procedure was conducted in accordance with accepted Australian medical procedure, and with reference to published medical literature, no matter of public safety arises.

26. It is very unfortunate that the operation record does not appear to have been placed on Mr Van Die's hospital record, or at least, on the version of the records which was provided to me in response to a subpoena I issued. However, Dr Collins appears to have had sufficient information before him to review and form his opinions, and clearly this is not a matter going to either the manner and cause of Mr Van Die's death or a wider matter of public safety.

27. Given the top end of the balloon was confirmed to be correctly placed on a number of occasions by imaging, and given the ultimate fact that the distal end of the balloon obstructed the lower trunk arteries, I conclude that the balloon used was too long in Mr Van Die's specific case. Ms De Chellis, Mr Van Die's sister, reported to Police after his death that she recalled staff saying in her presence that "they looked at Mr Van Die's height and weight" to calculate the right size of balloon; the treating team appears to have ultimately come to the same conclusion as I have. However, the choice of balloon was within recognised parameters within the applicable literature, and therefore the choice of balloon cannot be criticised.

28. Mr Van Die's death appears to have been as the result of a rare but recognised complication of the procedure. Mr Van Die was appropriately informed of the risks pre-operatively and accepted them. As Dr Collins has explained, while Mr Van Die's worsening symptoms and possible reasons for them were not recognised as quickly as might have been the case, this was likely due to other confounding conditions, and accordingly I consider no adverse comment is warranted.

29. I note for completeness that an ICU review of the circumstances of Mr Van Die's death identified that the pulmonary artery catheter inserted in Mr Van Die as part of the first balloon procedure was a little lower than was ideal and it was ultimately repositioned. However two chest x-rays of Mr Van Die failed to pick up this issue. Discussions with staff identified that Mr Van Die's co-morbid cardiomegaly made interpretations of x-rays direct from the machine before processing challenging, and all medical staff were reminded to recheck formal x-rays once processed. Additionally, subsequent consideration of events around the first ruptured balloon suggested that the balloon should have been changed in the Cardiac Catheter laboratory before Mr Van Die went into theatre. As these do not appear to be matters going directly to Mr Van Die's death, I do not consider they are matters for me to enquire into, but I acknowledge the work done by TCH on this issue.

30. Notwithstanding that I have found no matter of public safety arises in relation to Mr Van Die's death, the *Coroners Act 1997* (ACT) clearly contemplates that I can make recommendations in relation to the prevention of deaths, the administration of justice and the need for a matter to

be investigated or reviewed by another entity. Coroners also have a well-recognised power at common law to make recommendations in the public interest. Accordingly, I make the following recommendations on that basis.

31. I recommend:

    (a) If it has not already done so TCH should implement all of the "Suggestions for Improvement" from its Clinical Review Committee reviews of Mr Van Die's death.

    (b) TCH should put in place procedures to ensure that operation reports are appropriately recorded and accessible on a patient's file.

    (c) The Cardiac Society of Australia and New Zealand, as the professional body for cardiologists and those working in the area of cardiology, should consider the development and promulgation of:

        (i) An alert to its members of the facts of Mr Van Die's case, noting that although the balloon used was in accordance with published algorithms, nevertheless it was too large in his case.

        (ii) Guidelines or procedures, formalising the broadly accepted practices, as to the practice of insertion or operation of intra-aortic balloon pumps, and particularly the selection of appropriately sized balloons.

32. I direct that a copy of these findings and reasons be forwarded to the Attorney-General and the Minister for Health for their information and consideration of my recommendations. I direct also that a copy of my findings and Dr Collins' report be forwarded to the Cardiac Society of Australia and New Zealand. I propose to publish my findings, recommendations and comments on the ACT Coroners Court website, together with any response I might receive in response to my recommendations.

33. I convey again my sympathies to Mr Van Die's family. It is my sincere hope that my recommendations might provide a lasting legacy from his death.

I certify that the preceding thirty-three [33] numbered paragraphs are a true copy of the findings of Coroner L E Campbell

Associate: Emma Bayliss

Date: 26 November 2018