



IN THE CORONERS COURT
OF VICTORIA
AT MELBOURNE

COR 2022 001708

FINDING INTO DEATH WITHOUT INQUEST

Form 38 Rule 63(2)

Section 67 of the Coroners Act 2008

Findings of:	Coroner David Ryan
Deceased:	Joshua Paul Coates
Date of birth:	8 November 1972
Date of death:	29 March 2022
Cause of death:	1(a) Acute myocardial infarction complicating prosthetic valve thrombosis in a man with mechanical aortic valve replacement and remote reconstructions of the ascending aorta
Place of death:	Monash Medical Centre, 246 Clayton Road, Clayton, Victoria
Keywords:	Aortic dissection, warfarin care plan, clinical communication

INTRODUCTION

1. On 29 March 2022, Joshua Paul Coates was 49 years old when he passed away at Monash Medical Centre (MMC). At the time of his death, Mr Coates resided with his wife, Maree Coates, in Frankston.

THE CORONIAL INVESTIGATION

2. Mr Coates' death was reported to the Coroner as it fell within the definition of a reportable death in the *Coroners Act 2008* (the Act). Reportable deaths include deaths that are unexpected, unnatural or violent or result from accident or injury.
3. The role of a coroner is to independently investigate reportable deaths to establish, if possible, identity, medical cause of death, and surrounding circumstances. Surrounding circumstances are limited to events which are sufficiently proximate and causally related to the death. The purpose of a coronial investigation is to establish the facts, not to cast blame or determine criminal or civil liability.
4. Under the Act, coroners also have the important functions of helping to prevent deaths and, promoting public health and safety and the administration of justice through the making of comments or recommendations in appropriate cases about any matter connected to the death under investigation.
5. This finding draws on the totality of the coronial investigation into Mr Coates' death, including evidence contained within his medical records, statements provided on behalf of Monash Health and Dorevitch Pathology, and advice received from the Coroner's Prevention Unit (CPU).¹ While I have reviewed all the material, I will only refer to that which is directly relevant to my findings or necessary for narrative clarity. In the coronial jurisdiction, facts must be established on the balance of probabilities.²

¹ The CPU was established in 2008 to strengthen the prevention role of the coroner. The CPU assists the coroner with research in matters related to public health and safety and in relation to the formulation of prevention recommendations. CPU staff include health professionals with training in a range of areas including medicine, nursing, and mental health; as well as staff who support coroners through research, data and policy analysis.

² Subject to the principles enunciated in *Briginshaw v Briginshaw* (1938) 60 CLR 336. The effect of this and similar authorities is that coroners should not make adverse findings against, or comments about, individuals unless the evidence provides a comfortable level of satisfaction as to those matters taking into account the consequences of such findings or comments.

BACKGROUND

6. Mr Coates' medical history included abdominal aortic aneurysm, asthma, spondylolisthesis and allergic rhinitis.
7. Mr Coates had recently transferred his general medical care to Dr Palvo Korol, a general practitioner (**GP**) at Beach Street Family Medicine (**BSFM**). He had previously attended Dr Kam Pong Lee at Total Care Medical Group in Frankston.
8. Mr Coates also had a type A aortic dissection for which he underwent ascending aorta and aortic arch replacement with a 30mm Dacron graft³ on 1 December 2021.
9. On 24 February 2022, Mr Coates presented to Frankston Hospital with aortic root dissection with aneurysmal aortic root-producing central regurgitation. He was immediately transferred to MMC and following a surgical evaluation, underwent a redo St Jude mechanical Bentall's procedure on 1 March 2022. The surgery was uneventful and he was discharged to the post-surgical ward for monitoring.
10. On 3 March 2022, Mr Coates was commenced on warfarin. His warfarin dosage was titrated according to his daily international normalise ratio (**INR**).
11. On 10 March 2022, Mr Coates was discharged home with his warfarin managed by the Warfarin Care Clinic⁴ within Dorevitch Pathology. His warfarin dosage at the time of discharge was 2mg. He was also advised to attend his GP to review his INR within the week.

MATTERS IN RELATION TO WHICH A FINDING MUST, IF POSSIBLE, BE MADE

Circumstances in which the death occurred

12. On 27 March 2022, at 3.00 pm, Mr Coates was conveyed to Frankston Hospital Emergency Department (**ED**) following an onset of chest pain. An initial electrocardiograph (**ECG**) showed changes suggestive of myocardial ischemia (reduced oxygen flow to the heart muscle).
13. On 28 March 2022, at 4.00am, an interim ECG showed near resolution of the previous ECG findings, and his chest pain subsided.

³ A synthetic polyester graft sutured to the aorta to repair an ascending aortic aneurysm.

⁴ A clinic which monitors the blood of patients on warfarin so that the dosage is kept at a safe level.

14. An angiography was initially planned but abandoned due to the anatomical complexity of his previous aortic reconstructions. Mr Coates was then referred to the Cardiothoracic Surgery and Cardiology Teams at Monash Health. He was accepted at MMC with a plan for transfer at approximately 1.00pm that afternoon.
15. Mr Coates later underwent several ECGs that revealed fluctuating changes with a recurrence of concerning features for myocardial ischaemia throughout the morning.
16. At approximately 4.53pm, Mr Coates arrived at MMC with ST segment elevation on his ECG with associated chest pain, nausea and vomiting, a heart rate of 131 beats per minute, and blood pressure of 101/71. Treating physicians escalated a transfer to MMC ED given the recurrence of chest pain, ECG findings, and echocardiography abnormalities.
17. At approximately 5.37pm, Mr Coates arrived at the cardiac catheterisation laboratory for an urgent angiography. During the procedure, he became hypotensive, tachycardic and hypoxic. A Code Blue⁵ was called.
18. At approximately 6.12pm, Mr Coates became profoundly bradycardic, followed by an asystolic arrest⁶ requiring 31 minutes of cardiopulmonary resuscitation (**CPR**) and defibrillation. He was commenced on extracorporeal membrane oxygenation (**ECMO**).⁷
19. Mr Coates' haemodynamic state was later stabilised, and cardiologists proceeded to perform an angiography with catheterisation of the left heart and percutaneous coronary intervention (**PCI**) to a vein graft supplying the left coronary artery.⁸ Angiographic findings concluded severe stenosis of the venous graft attached to the left main coronary artery, and a drug-eluting stent was inserted.
20. Following the procedure, Mr Coates was admitted to the Intensive Care Unit (**ICU**) on ECMO. Brain and chest computed tomography (**CT**) scans performed while *en route* revealed a hypoxic brain injury.

⁵ A Code Blue is called to alert staff that a patient has gone into an unexpected cardiac or respiratory arrest.

⁶ A type of cardiac arrest when the heart stops beating entirely.

⁷ Extracorporeal membrane oxygenation (**ECMO**) is a form of life support for people with life-threatening illness or injury that affects the function of their heart or lungs. ECMO keeps blood moving through the body and keeps blood gasses (oxygen and carbon dioxide) in balance.

⁸ A percutaneous coronary intervention (**PCI**) is used to treat the symptoms of coronary artery disease, which is narrowing of the coronary arteries (blood vessels that supply your heart muscle with oxygen). A PCI is a procedure to widen or unblock an artery using a small inflatable balloon.

21. While in the ICU, Mr Coates required increased inotropes, and his neurological state continued to deteriorate with fixed dilated pupils. There was no evidence of improvement in his cardiac function. Discussions took place between Mr Coates' family and treating clinicians in relation to his poor prognosis, after which a decision was made to redirect his care. The ECMO was ceased, and sadly, he passed away at 6.26pm on 29 March 2022.

Identity of the deceased

22. On 29 March 2022, Joshua Paul Coates, born 8 November 1972, was visually identified by his wife, Maree Coates.
23. Identity is not in dispute and requires no further investigation.

Medical cause of death

24. On 31 March 2022, Forensic Pathologist Dr Chong Zhou from the Victorian Institute of Forensic Medicine conducted an autopsy and provided a written report of her findings dated 24 May 2022.
25. Dr Zhou explained that the mechanism of death was due to cardiogenic shock (the inability of the heart to pump enough blood, leading to circulatory collapse) secondary to a significant obstructing thrombus associated with a mechanical aortic valve replacement (**AVR**), which was complicated by a large acute myocardial infarction.
26. The post-mortem examination showed a large thrombus (blood clot) associated with a mechanical AVR, which subtotally occluded the lumen of the ascending aorta graft and the left ventricular outflow tract. A clot was also noted to have been aspirated off the mechanical aortic valve during the cardiac catheterisation procedure.
27. Dr Zhou explained that the extent of this blood clot would have significantly impaired the heart's ability to pump out blood to the rest of the body and increased strain on the left ventricle (the heart's main pumping chamber). This predisposed Mr Coates to heart failure and ischaemia of the heart muscle.
28. Dr Zhou noted mechanical prosthetic heart valves are at a significantly increased risk of thrombosis (blood clot formation), which is an indication of anticoagulation. Blood test results from Dorevitch Pathology showed that Mr Coates' INR levels ranged from 1.6 to 2.0 in five tests conducted between 11 and 15 March 2022. The INR level of a blood sample collected on 27 January 2022 was 1.0.

29. Dr Zhou commented that these results were below the stated target INR of between 2.5 and 3.5. The only result within this range was 2.6 for the test on 27 March 2022. Dr Zhou considered that inadequate anticoagulation in the community in the setting of a mechanical AVR significantly increased the risk of clot formation.
30. Dr Zhou noted the thrombus within the ascending aorta graft extended above the level of the ostia of the saphenous vein grafts (**SVG**) to the left main coronary artery (**LMCA**)⁹ and right coronary artery (**RCA**), which was likely associated with occlusion of the ostia. In this case, there was a large acute myocardial infarction (death of heart muscle cells), which is a distribution consistent with occlusion of blood flow to the LMCA. Myocardial infarction predisposes to cardiac arrhythmias (abnormal heart rhythms), heart failure, and cardiogenic shock.
31. Dr Zhou commented that the transient occlusion of the augmented coronary ostia by thrombus may have accounted for the fluctuating symptoms and ECG changes noted at Frankston Hospital.
32. The post-mortem examination also revealed the presence of hypoxic ischaemic encephalopathy (**HIE**), which refers to the death of brain cells (particularly neurons). Neuronal death occurs due to inadequate blood flow to the brain which in Mr Coates' case, arose from cardiac arrest and cardiogenic shock. There was also evidence of acute tubular necrosis, which is also a consequence of cardiogenic shock.
33. Patchy acute bronchopneumonia was also noted in the lungs. Since medical records from Peninsula Health (Frankston Hospital) noted that Mr Coates was afebrile with an average white cell count, and his lungs were clear on auscultation, it was likely that it was developed after hospitalisation.
34. Dr Zhou commented that there were no direct complications of the cardiac catheterisation and PCI procedure. A patent metallic stent was observed to be present within the SVG supplying the LMCA.

⁹ The LMCA and RCA are the main coronary arteries that supply the heart muscle with blood.

35. Although initial cardiac arrest occurred during cardiac catheterisation, Dr Zhou considered this procedure was conducted as a potentially lifesaving measure to treat critical myocardial ischaemia, which had developed before the procedure. The extent of the thrombus and myocardial infarction was such that cardiac arrest could have reasonably occurred at any stage. In circumstances where Mr Coates' death would have been expected to occur without intervention, the procedure is not considered a significant contributory factor in the death.
36. The autopsy also showed an intact and unremarkable synthetic graft replacement of the ascending aorta. The remote surgeries were considered a potential contributory factor in death as it resulted in the complex anatomy of the coronary arteries such that a coronary angiogram was deemed not appropriate at Frankston Hospital. Having been transferred to MMC for treatment, Mr Coates' treatment was potentially delayed.
37. Toxicological analysis of ante-mortem samples collected at MMC identified the presence of midazolam, desethylamiodarone, metoprolol, warfarin and ondansetron.
38. Dr Zhou provided an opinion that the medical cause of death was 1(a) Acute myocardial infarction complicating prosthetic valve thrombosis in a man with mechanical aortic valve replacement and remote reconstructions of the ascending aorta.
39. I accept Dr Zhou's opinion.

FAMILY CONCERNS

40. On 3 April 2022, Mr Coates' wife, brother- and sister-in-law jointly wrote to the Court and outlined concerns about the treatment and care provided by Monash Health and Dorevitch Pathology. These included whether:
 - The communication between Monash Health and Dorevitch Pathology regarding Mr Coates' warfarin care plan was reasonable;
 - Handover and clinical communication by Monash Health to Mr Coates' GP clinic was appropriate;
 - Mr Coates' INR levels were affected by his diet, medications or comorbidities, and
 - Mr Coates' "*unusually thick and sticky*" blood was a contributing or causal factor to his death

REVIEW BY THE CORONERS' PREVENTION UNIT

41. In light of the family's concerns, I sought advice from the Health and Medicine Investigation Team within the CPU to conduct a review of Mr Coates' care in the context of these concerns. As part of the CPU's review, statements were requested from Monash Health and Dorevitch Pathology. The Court received statements from Paul Navvaro, Quality Manager of Monash Health, and from Timothy Gunzburg, Quality Manager of Dorevitch and Abbott Pathology

Monash Health Response

Reporting to Safer Care Victoria and subsequent actions

42. Mr Navvaro advised that Mr Coates' death was reported to Safer Care Victoria¹⁰ as a sentinel event.¹¹ His death was subsequently the subject of a multiagency review by a panel ('**the panel**'), which consisted of representatives from Monash Health, Peninsula Health, Dorevitch Pathology and a cardiothoracic independent external surgery expert.¹²

43. Mr Navvaro noted that the following issues and associated events were identified during the multiagency review¹³ concerning Monash Health's perspective:

- a) The use of organisational guidelines for the anticoagulation of AVR patients was not sufficiently embedded in practice;
- b) There was a failure to update the discharge summary with the vital details of anticoagulation history;

The panel established that the ward pharmacist had counselled Mr Coates about managing warfarin at home. The ward pharmacist also outlined Mr Coates' recent INR and warfarin doses in his discharge medication plan on 10 March 2022. However, this was never imported into his discharge summary because it was prepared the day before. Accordingly, the panel determined that this resulted from a failure to update the

¹⁰ Victoria's peak authority for leading quality and safety in healthcare.

¹¹ In Victoria, a sentinel event is "*an unexpected and adverse event that occurs infrequently in a health service entity and results in the death of, or serious physical or psychological injury to a patient as a result of system and process deficiencies at the health service entity*".

¹² All sentinel event review panels must include at least one independent subject matter expert. These external experts: (1) are independent clinicians not employed or engaged by the health service (this includes working at other sites under the same employer/organisation); and (2) have expertise in the primary clinical area under review.

¹³ When a sentinel event occurs across more than one health service, all services involved in the patient care may be required to participate in a multiagency review of the event.

discharge summary on the day of discharge. This led to Mr Coates, Dorevitch Pathology, and his GP not receiving a complete discharge summary.

- c) There was a lack of understanding of the external pathology service process, delay in registering the patient and insufficient information supplied;

The multiagency review concluded that there had been a lack of understanding of the registration process at Dorevitch Pathology by junior medical staff. That resulted in a delay in registration, given that Mr Coates' clinical information was missing from the Warfarin Management System request. This delay was compounded by Dorevitch Pathology not being able to obtain the missing information from the Warfarin Management System request as no contact number was available. There was no formal process at Dorevitch Pathology to receive additional information.

- d) Mr Coates' GP details were not confirmed;
- e) Mr Coates was not provided with adequate information regarding registration to the Warfarin Management System or a way to escalate concerns; and
- f) Monash Health delayed accepting Mr Coates as a patient due to miscommunication between the cardiothoracic surgery and cardiology teams.

44. Mr Navvaro advised that the following recommendations were made in response to the above issues:

- Review the *Enoxaparin Medication Profile*, *Warfarin Medication Profile* and the *Antiplatelet and Anticoagulant Medicines – Post Procedural Management Implementation Tool* to ensure they meet best practice standards;
- Optimise and embed the process for anticoagulation of post-operative AVR patients, which ensures effective and coordinated discharge planning;
- Explore the feasibility of providing a warfarin management service to patients 7-10 days post-discharge to ensure consistent warfarin management and a transparent process for patients to escalate questions and concerns;
- Ensure that patient GP details are confirmed before discharge and updated where required in the iPM¹⁴ to ensure accurate distribution of discharge summaries;

¹⁴ iPM is the Monash Health computer program that captures patients' demographic and contact details as well as outpatient appointments. This program is run separately from the EMR (Cerner), although changes made in iPM should automatically update the EMR. iPM is accessible by all ward clerks, but generally not accessible by doctors.

- Ensure that the process for referring and accepting cardiology and cardiothoracic surgery patients to the new Victorian Heart Hospital is communicated internally and to referring networks and stakeholders; and
- Program to ensure learnings are shared with the Cardiothoracic Surgery Department's relevant medical staff.

Dorevitch Pathology Response

45. In his statement, Mr Gunzburg noted the following issues from Dorevitch Pathology's perspective:

- Incomplete handover from Monash Health to Dorevitch Pathology and in particular, the lack of clarity in these areas:
 - Urgency of warfarin dosing. None of MMC's request slips requested urgent results, and instead, it was noted that Mr Coates was being informed he would receive his results by 4.00pm.
 - The registration form completed by a Dorevitch Pathology staff did not include the following information:
 - A complete diagnosis, given Mr Coates had undergone a Bentall's procedure;
 - Mr Coates' dosing history;
 - An indication of the need to administer clexane injections if Mr Coates' INR falls below a certain level;
 - Details of the referring doctor from MMC; or
 - An alert that Mr Coates was a patient new to Dorevitch Pathology, as this would have resulted in priority results.
- The dissatisfaction with service raised by Mr Coates was noted in the requests issued by MMC between 12 and 15 March 2022, but these requests made no indication that they were urgent.

46. Mr Gunzburg advised that the following recommendations were made in response to the above issues:

- Implement and promote easier pre-registration of new patients on warfarin;
- Conduct refresher training sessions for the pathologist team on warfarin management; and
- Ensure complaints and/or queries regarding warfarin management are escalated to a relevant clinical team where appropriate.

Response to family concerns

Clinical communication and handover

47. The CPU noted the findings of the multiagency review, namely that there were issues with clinical communication and completeness of the handover between Monash Health and Dorevitch Pathology regarding Mr Coates' warfarin plan.
48. The CPU noted that Mr Coates first attended BSFM on 14 December 2021 after his surgery on 1 December 2021. On the same day, BSFM sent Monash Health a 'Transfer of Medical Record' request but did not request TCMG. Mr Coates' patient records at TCMG were not subsequently requested by or received from BSFM. No correspondence was received from Monash Health concerning the change of Mr Coates' GP clinic.
49. The CPU considered such a practice unusual as a request for transfer is generally sent to a patient's previous GP clinic, and a request for the latest discharge summary is usually sent to the relevant hospital where a patient received care and treatment.
50. Mr Coates' Monash Health electronic medical record listed his GP clinic as TCMG during his early March 2022 admission, at which time warfarin was commenced. It further recorded that before his discharge on 10 March 2022, a cardiothoracic surgery junior medical officer provided a verbal handover to Dr Lee. Dr Lee's acceptance of the handover suggested he was unaware or not notified of Mr Coates' departure from the practice.
51. BSFM was subsequently listed as Mr Coates' GP clinic following his ED presentation on 27 March 2022.

52. The CPU advised that TCMG's duty of care to inform BSFM of Monash Health's handover only extends to the scenario where TCMG was informed of Mr Coates' departure from TCMG. However, it does not appear in Mr Coates' case that he had notified TCMG of his departure.
53. The CPU further advised that it is unclear why Mr Coates' GP clinic and details were not updated in Monash Health's patient registration system with information reported by Mr Coates during registration on 24 February 2022.

Were Mr Coates' INR levels affected by diet, medication or comorbidities?

54. The CPU advised that all three factors can affect INR levels, although Mr Coates was not on any medications known to affect INR. Minor dietary changes, such as a standard inpatient diet compared to standard home cooking, are unlikely to significantly affect INR levels. The CPU explained that diarrhea can result in decreased absorption and INR levels, but Mr Coates did not appear to have experienced diarrhea.
55. The CPU advised that it could not identify an exact cause of the low INR and attributed the low INR levels to the initial stabilisation period.

Was Mr Coates' "unusually thick and sticky" blood a contributing or causal factor to his death?

56. The CPU advised that this is highly unlikely as Mr Coates did not have a history of blood clots before the heart attack that caused his death.

CONCLUSION

57. The circumstances surrounding Mr Coates' death highlight a unique combination of systemic shortcomings and how they can affect each point of care. The CPU advised that any one of these shortcomings in isolation was unlikely to have resulted in Mr Coates' death.
58. I acknowledge and commend the swift actions of Monash Health and Dorevitch Pathology in responding to their respective systemic issues. While I am satisfied that these proposed changes are preventative and restorative, I consider that they lack greater aftercare for discharged patients.

59. The CPU advised that from a prevention perspective, when formulating protocols and procedures, it is also vital that health services recognise the possibility of failure regardless of the reliability of protocols. Rather than aiming for perfection at the first instance, protocols and procedures surrounding patient and carer escalation for discharged patients or outpatients should be formulated with a view to recognise and respond to potential failure.
60. This observation acknowledges the challenges experienced by patients and their families in navigating the modern healthcare system, be it a scenario like Mr Coates' experienced or an outpatient appointment.

FINDINGS

61. Pursuant to section 67(1) of the Act, I make the following findings:
- a) the identity of the deceased was Joshua Paul Coates, born 8 November 1972;
 - b) the death occurred on 29 March 2022 at Monash Medical Centre, 246 Clayton Road, Clayton, Victoria, from acute myocardial infarction complicating prosthetic valve thrombosis in a man with mechanical aortic valve replacement and remote reconstructions of the ascending aorta; and
 - c) the death occurred in the circumstances described above.
62. I convey my sincere condolences to Mr Coates' family and loved ones for their loss.

RECOMMENDATIONS

Pursuant to section 72(2) of the Act, I make the following recommendations:

- (i) That Monash Health and Dorevitch Pathology consider reviewing the process within their respective clinical information systems, particularly for discharged patients and outpatients, such that:
 - a. it is user-friendly in a way that allows staff to accurately capture patients' information; and
 - b. it is consumer-friendly in a way that allows patients and/or carers to swiftly raise clinical concerns about ongoing care.

Pursuant to section 73(1A) of the Act, I order that this finding be published on the Coroners Court of Victoria website in accordance with the rules.

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

Maree Coates, Senior Next of Kin

Amber Salter, Peninsula Health

Peter Ryan, Monash Health

Dorevitch Pathology

Signature:



Coroner David Ryan

Date : 14 June 2024

NOTE: Under section 83 of the *Coroners Act 2008* ('the Act'), a person with sufficient interest in an investigation may appeal to the Trial Division of the Supreme Court against the findings of a coroner in respect of a death after an investigation. An appeal must be made within 6 months after the day on which the determination is made, unless the Supreme Court grants leave to appeal out of time under section 86 of the Act.
