IN THE CORONERS COURT
OF VICTORIA
AT MELBOURNE

COR 2017 002729

FINDING INTO DEATH WITHOUT INQUEST

Form 38 Rule 63(2)

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

Findings of:	Coroner Paresa Antoniadis Spanos
Deceased:	Joseph Cardona
Date of birth:	23 January 1968
Date of death:	10 June 2017
Cause of death:	1(a) Haemopericardium 1(b) Ruptured aortic dissection
Place of death:	Sunshine Hospital, 176 Furlong Road, St Albans, Victoria, 3021

INTRODUCTION

1. On 10 June 2017, Joseph Cardona was 49 years old when he died unexpectedly while being treated at Sunshine Hospital (**Sunshine**). At the time, Mr Cardona lived in Melton West, with his wife, Amanda Cardona.

2. Mr Cardona's medical history included hypertension for which he was prescribed perindopril and type II diabetes mellitus treated with glicazide and diet by his General Pactitioner (**GP**)

THE CORONIAL INVESTIGATION

3. Mr Cardona's 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.

4. 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.

5. 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.

6. This finding draws on the totality of the coronial investigation into the death of Joseph Cardona. Whilst I have reviewed all the material, I will only refer to that which is directly relevant to my findings or necessary for narrative clarity. n the coronial jurisdiction, facts must be established on the balance of probabilities.[1]

[1] 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.

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

Identity of the deceased

7. On 10 June 2017, Joseph Cardona, born 23 January 1968, was identified by his wife, Amanda Cardona, who signed a formal Statement of Identification to this effect before a member of clinical staff of Western Health.

8. Identity is not in dispute and requires no further investigation.

Medical cause of death

9. Forensic Pathologist Dr Victoria Francis from the Victorian Institute of Forensic Medicine (**VIFM**) conducted an autopsy on Mr Cardona's body in the mortuary on 13 June 2017 and provided a written report of her findings dated 28 September 2017.

10. The post-mortem autopsy revealed an aortic dissection (Debakey type I, Stanford A) from the aortic root to the right common iliac artery,[2] a horizontal intimal tear in the posterior ascending aorta and 200ml of blood clot within the pericardium with diffuse adhesions over the anterior myocardial surface.

11. Sternal wires, anterior rib and sternal body fractures with intercostal muscle haemorrhage and alveolar haemorrhage and fat emboli in the small pulmonary vessels were also observed, as was right kidney clear cell renal cell carcinoma, cardiomegaly with mild myocardial fibrosis and cardiomyocyte hypertrophy, and diabetic nephropathy.

12. Routine toxicological analysis of post-mortem samples detected the opiate oxycodone at a concentration of ~ 0.02mg/L, paracetamol at ~ 6 mg/L, and salicylic acid (a metabolite of aspirin) at ~ 8 mg/L, all at levels consistent with normal therapeutic use but no ethanol/alcohol or other commonly encountered drugs or poisons.

13. Dr Francis noted that aortic aneurysmal dilation and dissection is very rare. When it occurs in younger individuals (like Mr Cardona), it is usually due to heritable disorders, including Marfan syndrome, Ehlers-Danlos syndrome, Loeys-Dietz syndrome, as well as the phenomenon of familial thoracic aortic aneurysm and dissection.

[2] An aortic dissection is a weakness in the wall of aorta immediately above the aortic valve which has effectively burst with blood collecting in the sac around the heart (the pericardium). This collection of blood prevents the heart from pumping and death occurs within a very short time.

14. Other risk factors associated with aortic dissection include hypertension, coarctation of the aorta and bicuspid aortic valves. The autopsy demonstrated a tricuspid aortic valve and no evidence of coarctation. The histological examination showed traits consistent with hypertension.

15. The presence of sternal wires and anterior pericardial adhesions were noted to be consistent with Mr Cardona's history of previous cardiac surgery. Anterior rib and sternal fractures, intercostal and alveolar haemorrhage, and fat emboli in the small pulmonary vessels were consistent with cardiopulmonary resuscitation (**CPR**).

16. On the basis of the available information, Dr Francis concluded that Mr Cardona's death, although unexpected, was due to natural causes.

17. Dr Francis provided an opinion that it would be reasonable to attribute Mr Cardona's death to *1(a) haemopericardium (secondary to) 1(b) ruptured aortic dissection*.

18. I accept Dr Francis' opinion.

Circumstances in which the death occurred

19. At about 10.00am on 9 June 2017, Mr Cardona was taken to the Sunshine Hospital Emergency Department (**ED**) by ambulance after experiencing a sudden onset of central chest pressure radiating to his right jaw, neck, and epigastric area.

20. On arrival at the ED, Mr Cardona also complained of back pain in addition to the chest pain noted at triage and was noted to be intermittently hypertensive. Clinical notes indicate that Mr Cardona had been experiencing bouts of chest pain over the past few weeks. While in the ED he described the pain as severe and in the epigastric/retrosternal area.

21. At 5.45pm Mr Cardona was reviewed by a doctor and was discharged home with a letter to his GP that gave the discharge diagnosis as "chest pain, [not elsewhere classified][3]" and indicated that his GP should follow up on the results of an outpatient perfusion scan. The discharge occurred despite Mr Cardona's family raising concerns about his ongoing pain to medical staff, noting that Mr Cardona was still distressed, and was having difficulty walking due to the pain in his chest.

[3] In Mr Cardona's case, this is taken to mean "not demonstrated to be due to coronary artery disease".

22. The following morning, at 5.52am on 10 June 2017, an ambulance was called after Mr Cardona developed pressure in the upper quadrant epigastric area associated with nausea and vomiting. He was triaged at Sunshine ED at 6.59am and was given analgesia but was not immediately reviewed by a doctor despite being hypertensive, tachycardic, and febrile.

23. Whilst waiting to be seen,[4] Mr Cardona was observed to have a seizure before becoming unresponsive. Investigations indicated pulseless electrical activity and a possible cardiac tamponade. Unsuccessful attempts at pericardiocentesis were performed and, after 40 minutes of resuscitation attempts, Mr Cardona was declared as deceased at 12.34pm.

FAMILY CONCERNS

24. Correspondence from Mr Cardona's family received by the Court raised concerns about the adequacy of the clinical management and care provided to him in the Sunshine ED during his two presentations in the 24 hours or so immediately preceding his death.

CPU REVIEW

25. To assist investigation into Mr Cardona's death, Coroner Rosemary Carlin[5] as she then was, asked the Coroners Prevention Unit[6] (**CPU**) undertake a review of the clinical management and care provided to Mr Cardona. Sources of evidence considered included the Sunshine Hospital medical deposition and medical records, Mr Cardona's medical records from Scott Street Medical Clinic, correspondence received from the family, as well as statements received from Dr Peter Ritchie, and Dr Gary Ayton, Directors of Emergency Medicine, Sunshine Hospital.

26. According to Dr Ayton's statement, Mr Cardona's initial management in the Emergency Observation Unit was "appropriate, reasonable, and in line with general expectations of emergency care". Whilst the CPU agreed with Dr Ayton's assessment, there were of the view that several features, including severe pain radiating to the right jaw, neck, and abdomen,

[4] The medical records do not give an exact time for Mr Cardona's seizure however it is likely it was at approximately 11.30am given the time of death.

[5] Coroner Rosemary Carlin has since been elevated and is now Her Honour Judge Carlin of the County Court of Victoria. The investigation into Mr Cardona's death was re-allocated to the Deputy State Coroner Caitlin English and then to me due to my interest in the missed and/or misdiagnosis of aortic dissection in hospital EDs.

[6] The Coroners Prevention Unit (CPU) was established in 2008 to strengthen the prevention role of the coroner. The unit assists the Coroner with research in matters related to public health and safety and in relation to the formulation of prevention recommendations. The CPU also reviews medical care and treatment in cases referred by the coroner. The CPU is comprised of health professionals with training in a range of areas including medicine, nursing, public health and mental health.

associated with significant hypertension, that should have raised concerns about alternative diagnoses, including the possibility of an aortic dissection.

27. Mr Cardona's medical notes do not specifically confirm whether the emergency registrar excluded other conditions such as an aortic dissection. The CPU interpreted the Sunshine ED examination findings as being suggestive that a range of diagnoses, including dissection, were not considered. Whilst Mr Cardona's pain was not highly typical of aortic dissection, his family's comments regarding the pain radiating to his back does raise this suspicion. Dr Ayton noted in his statement that Mr Cardona's Aortic Dissection Detection Risk Score (**ADD-RS**) was "very poorly discriminatory for dissection".

28. According to CPU, the important issue is whether a diagnosis of aortic dissection was considered at all, at the time of Mr Cardona's examination. The registrar appeared to hold the view that a diagnosis was unable to be made based on incomplete recorded clinical information. It is likely that, had the registrar considered an aortic dissection in his differential diagnosis, then they might have sought (and recorded) other clinical features to more accurately confirm or refute this.

29. Additionally, the CPU noted that Dr Ayton's response suggested there are no pathways, guidelines, or policies in place to minimise the risk of missing a diagnosis of aortic dissection as a cause of chest pain. Chest pain pathways are focussed on a risk assessment for coronary artery disease, and consultation with senior clinicians are relied upon.

30. Commonly, chest pain pathways are designed to exclude coronary artery disease as the cause of chest pain, as opposed to other causes. Based on Dr Ayton's response to the CPU investigation, it is likely that during Mr Cardona's clinical assessment, only coronary artery disease was considered as a possible clinical diagnosis which demonstrates a lack of appropriate and thorough broad diagnostic consideration.

31. Dr Ayton attributed this apparent diagnosis bias to the historical creation of care pathways which may actively inhibit the consideration of differential diagnoses. Whilst Dr Ayton opined that staff are encouraged to maintain an "open mind" rather than continue down an incorrect management path, Mr Cardona's clinical pathway would suggest that this trend of diagnostic-bias continues to germinate within junior staff.

32. Patients may be inappropriately treated under an ischaemic chest pain pathway that is designed to stratify risk and may have the effect of narrowing or "blinkering" diagnostic thinking. The

CPU noted that other serious causes of chest pain, including aortic dissection, should be excluded prior to an individual being assigned to a particular chest pain pathway. Initial assessments are often limited due to a range of pressures, including time, and any treatment pathway selected must be done so on the understanding that further evaluation is to be performed to provide a comprehensive assessment.

33. The CPU noted that Mr Cardona was discharged on 9 June despite suffering from ongoing severe chest pain and hypertension without an adequate diagnosis or explanation. Ideally, a patient should only be discharged when pain-free or, failing that, when the pain is relatively minimal, can be managed in the home environment, and there is an adequate explanation for the pain. Additionally, whilst hypertension alone is not a reason to keep people in hospital, that is understood to come with caveats that there is a good explanation (for example chronic, asymptomatic uncontrolled hypertension – not present in this case), a plan to manage or follow up the blood pressure (not done in this case) and no other concerning features (in this case there was ongoing significant pain).

34. On a separate note, the CPU found that there was a significant delay between Mr Cardona's presentation to Sunshine ED on 10 June and his medical review, which did not occur until prompted by his seizure. It is likely that this was due to chronic and widespread ED overcrowding. Furthermore, at the time of Mr Cardona's presentation to Sunshine ED, only one ED physician was available in the department.[7] Dr Ayton noted that inadequate senior staffing levels at Sunshine has been previously discussed but had not been addressed at the time of Mr Cardona's death.

35. Whilst the CPU agreed with Sunshine's assessment that Mr Cardona's death did not qualify as a sentinel event, the ED's Mortality and Morbidity review found Mr Cardona's management was reasonable. This view was not reflected by the In-Depth Case Review, however, which identified several issues, including:

    i. Lack of consideration of wider differentials for chest pain;

    ii. Inadequate ED physician cover on the Saturday;

    iii. Delay in the recognition of an unwell patient; and

[7] The CPU report noted that another ED physician was rostered but was assisting with a patient transfer at the time of Mr Cardona's presentation.

iv. That Mr Cardona's transfer to the Emergency Observation Unit following his initial assessment created an assumption of a lower acuity.

36. Additionally, Dr Ayton's statement gave rise to four systemic issues that likely contributed to Mr Cardona's death, and should be included in any systems-review or Root Cause Analysis:

i. Cognitive bias is a significant problem that is exacerbated by time pressures on doctors;

ii. There is frequently a lack of supervision of junior doctors;

iii. Escalation policies are not a substitute for timely medical assessment; and

iv. The system-wide KPI focus on "wait time" distorts the system's focus to something that is measurable rather than something important (for example timely assessment by a skilled clinician).

FINDINGS AND CONCLUSION

37. The standard of proof for coronial findings of fact is the civil standard of proof on the balance of probabilities, with the Briginshaw gloss or explications.[8]

38. Adverse findings or comments against individuals in their professional capacity, or against institutions, are not to be made with the benefit of hindsight but only on the basis of what was known or should reasonably have been known or done at the time, and only where the evidence supports a finding that they departed materially from the standards of their profession and, in so doing, caused or contributed to the death under investigation.

39. Pursuant to section 67(1) of the *Coroners Act 2008* I make the following findings:

a) the identity of the deceased was Joseph Cardona, born 23 January 1968;

b) the death occurred on 10 June 2017 at Sunshine Hospital, 176 Furlong Road, St Albans, Victoria, 3021;

[8] *Briginshaw v Briginshaw* (1938) 60 CLR 336 at 362-363: 'The seriousness of an allegation made, the inherent unlikelihood of an occurrence of a given description, or the gravity of the consequences flowing from a particular finding, are considerations which must affect the answer to the question whether the issues had been proved to the reasonable satisfaction of the tribunal. In such matters "reasonable satisfaction" should not be produced by inexact proofs, indefinite testimony, or indirect inferences…'.

c) The medical cause of Mr Cardona's death is *haemopericardium secondary to ruptured aortic dissection*; and

d) the death occurred in the circumstances described above.

40. The available evidence supports a finding that Mr Cardona's death was preventable in the sense that his presentations to the ED on 9 June and again on 10 June 2017 were lost opportunities for diagnosis of the aortic dissection to which he ultimately succumbed.

COMMENTS

Pursuant to section 67(3) of the Act, I make the following comments connected with the death.

41. Missed opportunities to diagnose and treat aortic dissections is a theme which continues to feature in this jurisdiction. It is concerning that despite previous coronial investigations on the papers, inquests and recommendations, this continues to be an area of challenge, particularly for Emergency Physicians. These cases generally demonstrate that flawed reasoning, and a lack of awareness of the limitations of the clinical criteria used to exclude aortic dissection confound diagnostic decision making.

42. Furthermore, there have been several cases which bear striking similarity to the circumstances in which Mr Cardona died.[9] Whilst all have some individual differences, there are at least three common themes:

i. Individual clinician factors – principally lack of experience and cognitive bias;

ii. System factors – chest pain pathways, ED overcrowding, and inadequate ED staffing;

iii. Disease factors – aortic dissection is a relatively rare disease that can mimic other disease and is difficult to diagnose.

43. In the Petzierides matter, I made several recommendations, including that the Australasian College for Emergency Medicine increase training regarding aortic dissection diagnosis, and that a structured clinical tool should be developed. Since then, it is important to note that education on aortic dissection routinely occurs in all EDs, and that a clinical risk tool (the ADD-RS) has now been developed. As noted above, the ADD-RS was used in Mr Cardona's case however, when the score generated indicated his risk as "low", it appears to have been

[9] COR 2018 3723, COR 2017 0935, COR 2017 3945 (unpublished), COR 2017 0777 (unpublished), COR 215 5847 (unpublished), COR 2010 1571.

viewed as an absolute indicator, rather a tool to assist decision-making process in the presence of other clinical assessments. It is vital that clinicians perform comprehensives assessments rather relying on single clinical indicators and tools.

44. In the matter of Suttha, another death involving aortic dissection with similar features, Coroner Jamieson recommended that The Northern Hospital adopt a structured cognitive de-biasing strategy such as the New South Wales Clinical Excellence Commission's 'Take 2, Think Do' approach which encourages clinicians not only to document differential diagnoses but also to acknowledge uncertainty, cognitive bias, external pressures (such as time and workload), and to seek second opinions or refer to specialists for review where required.[10]

45. Furthermore, Coroner Jamieson stressed the importance of maximising the presence of senior practitioners as a resource for referral in uncertain situations. At the time of Mr Cardona's initial presentation to Sunshine ED, there was only one emergency physician available as a second emergency physician was accompanying a critically ill patient to another hospital.

46. In support of the need for clinicians to consider a wider range of diagnoses and rule out other conditions, I made several recommendations in the matter of PT,[11] another similar case involving an undiagnosed aortic dissection, including the importance of promoting a wider awareness amongst the medical fraternity of the clinical signs of aortic dissection. I note the formal response to this recommendation from Safer Care Victoria in which they advised that their Chest Pain guidance and fact sheets have been updated to include aortic dissection as a possible cause of chest pain, and their commitment to working with key stakeholders (including the Court through the Coroners Prevention Unit) to promote wider awareness of aortic dissection presentations and missed opportunities to diagnose. This commitment was echoed in the formal response from the Australasian College for Emergency Medicine.

47. More recently, and using Mr Cardona's death as an index case, I approached Safer Care Victoria to commence a dialogue so as to improve the diagnosis of aortic dissections in Emergency Departments and we now have approval in principal for a collaboration between clinicians from Safer Care Victoria and clinicians within the Coroners Prevention Unit with the aim of doing what they can to improve patient safety in this regard.

[10] The "Take 2, Think Do" approach flowchart is available at https://www.cec.health.nsw.gov.au/__data/assets/pdf_file/0010/305848/Take-2-Think-Do-Framework.pdf
[11] COR 2018 3723.

I convey my sincere condolences to Mr Cardona's family for their loss.

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

Amanda Cardona, Senior Next of Kin

Western Health

Safer Care Victoria

Senior Constable Andrew Raffety, Victoria Police, Reporting Member

Signature:

Paresa Antoniadis Spanos

Coroner

Date: 25 February 2022

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.