District Health Board

A Report by the
Health and Disability Commissioner

(Case 20HDC00480)

Health and Disability Commissioner
Te Toihau Hauora, Hauātanga

Contents

Executive summary 1
Complaint and investigation 1
Information gathered during investigation 2
Opinion: Dr C — no breach 10
Opinion: DHB — no breach 12
Changes made 12
Recommendations 14
Follow-up actions 14
Appendix A: Independent clinical advice to the Commissioner 15

Executive summary

1. This report concerns the care provided to a woman in her forties when she presented to an Emergency Department (ED) with severe chest pain. The case highlights the difficulty in diagnosing acute aortic dissection, in the absence of failsafe diagnostic tools.

2. The woman was transported to the ED by ambulance complaining of severe ongoing chest pain. She was assessed and monitored in ED, where she underwent a range of diagnostic testing and received strong pain medication. The woman was discharged home with a diagnosis of prolonged QT syndrome (a heart rhythm condition characterised by irregular heartbeats).

3. Sadly, Ms A died later that night from acute aortic dissection.

Findings

4. The Commissioner found that the appropriate standard of care was provided by the district health board (DHB).

Recommendations

5. The Commissioner recommended that the DHB use an anonymised version of this case as an educational tool to be incorporated into staff training, and that the DHB liaise with the Australasian College for Emergency Medicine about the use of the ADDRS plus D-Dimer diagnostic tool, and consider implementing this for use in the ED when its usefulness has been proven.

Complaint and investigation

6. The Health and Disability Commissioner (HDC) received a complaint from Ms B about the services provided to her late mother, Ms A, by the DHB. The following issue was identified for investigation:

- *Whether the DHB provided Ms A with an appropriate standard of care in 2020.*

7. The parties directly involved in the investigation were:

Ms B	Complainant/consumer's daughter
Provider/DHB	

8. Further information was received from a Senior Medical Officer (SMO), Dr C, a registered nurse, the Coronial Services Unit, and ACC.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

9. Also mentioned in this report:

Dr D	General Medicine registrar
Dr E	Expert for DHB
Dr F	Expert for ACC

10. Independent expert advice was obtained from an emergency medicine specialist, Dr Aileen Conboy (Appendix A).

11. At the outset I extend to Ms A's whānau my condolences for their loss.

Information gathered during investigation

Background

12. At 12.53pm, Ms A (aged in her forties at the time of events) was transported to the ED by ambulance, complaining of chest pain. Ms A had a background of hypertension[1] and a family history of heart disease, and was a smoker.

13. The ambulance service's Care Summary records that Ms A had woken at 6.30am with a sudden onset of chest pain, initially non-radiating pins and needles in her left arm, and a sore jaw. The pain was described as central, sharp, and crushing, especially when breathing in. An electrocardiograph (ECG)[2] undertaken by the paramedics at 12.40pm was abnormal.[3] During transportation to hospital, Ms A was administered 300mg of aspirin and 0.4mg of glyceryl trinitrate spray[4] with minimal effect.

Arrival at ED

14. Ms A arrived at the ED at 1.00pm and was triaged as Code 2.[5] Her initial observations taken on arrival were recorded as: temperature 37.1°C, pulse 70 beats per minute (bpm), blood pressure (BP) 156/113mmHg (high), and pain 8/10. An ECG was conducted at 1.15pm and remained abnormal.[6] Blood tests, including a troponin T[7] test, were undertaken between 1.00pm and 1.30pm, with results in the normal range.[8]

[1] Ms A had been diagnosed with hypertension but did not take medication at the time of events.
[2] A test used to measure the electrical activity of the heart.
[3] It showed sinus rhythm, a prolonged QT interval, and poor R wave progression.
[4] Medication used to treat cardiac chest pain.
[5] The presentation is imminently life-threatening and requires prompt attention (the patient should be seen within 10 minutes).
[6] Sinus bradycardia, 58bpm, sinus bradycardia, prolonged QT; PR 126; QTc 520/510ms; biphasic T waves in V2–V4, t wave inversions in lead aVR; biphasic t waves in III, avF. No Q waves.
[7] A blood test that measures the levels of troponin proteins in the blood. Troponin proteins are released when the heart muscle has been damaged, such as occurs with a heart attack.
[8] Troponin 9ng/L. The normal level for troponin T is under 15ng/L.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

15. At 1.45pm, Ms A was assessed again by the ED Senior Medical Officer (SMO)[9] (a senior doctor), Dr C, as Ms A's pain had increased to 10/10. A repeat ECG remained abnormal,[10] and Ms A was given 2mg of intravenous (IV) morphine for the pain. Ms A was observed in ED from 2pm.

16. At this time, Dr C sought advice from the General Medicine team as to whether Ms A should be admitted. Dr C discussed Ms A's case with a General Medicine registrar, Dr D, and documented:

> "[Dr D was] not impressed at the cause of the chest pain, she questions if this case is requiring admission; I agreed to repeat a 2 hour troponin at 4pm to see the Delta Troponin in the setting of active chest pain."

17. Dr C told HDC:

> "A patient cannot be admitted without discussion and acceptance by someone from the General [Medicine] team … I treated the Medical Registrar as a peer and understood she had a General [Medicine] SMO she could consult with if she felt uncertain."

18. Ms A was not assessed in person by Dr D, and there is no record that Ms A's care was discussed with the General Medicine SMO.

19. In response to the provisional opinon, the General Medicine SMO told HDC:

> "At the time of [Ms A's] presentation to the [ED], [the DHB] had recently introduced medical registrars at [the DHB] as a means to improve safety and early response times for patients. Prior to the introduction of registrars, ED SMOs would discuss all potential admissions with a [General Medicine] SMO. While we have always expected our registrars to discuss all admissions and/or potential admissions with us, [Dr D] was new to New Zealand and had worked previously [overseas] where this was not her experience. She felt comfortable declining the admission based on the information she had received."

20. At 2.45pm, Ms A underwent a chest X-ray as requested by Dr C, which showed a stable and normal appearance.[11] Ms A's ECG remained abnormal.

21. Ms A had repeat observations taken at 4.10pm,[12] and her chest pain was recorded as 8/10. A repeat ECG at 4.30pm showed slight improvement.[13] Ms A was then administered

[9] SMOs are doctors employed or contracted as specialists by a DHB. Dr C was an SMO on the vocational registration pathway.
[10] It showed worsening QT prolongation at 526ms, with no dynamic changes of ST segments.
[11] Reported by a consultant radiologist as: "Stable normal appearance of the chest. No evidence of rib fracture or pneumothorax. No infiltrate, edema, or effusion. The heart size is normal. Normal height and alignment of the imaged vertebral bodies. No suspicious lesions or radiopaque foreign bodies."
[12] Heart rate 68bpm, BP 180/89mmHg.
[13] Sinus bradycardia at 58bpm, QTc 490 (improved), no change in ST segments.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

medication for cardiac chest pain[14] and high blood pressure[15] at 4.35pm and 4.36pm. The amended discharge summary[16] states that Ms A felt better briefly after the administration of the medication, but that the pain was still persistent. Repeat observations taken at 4.40pm showed that Ms A's blood pressure had decreased.[17] A repeat troponin T test was taken, and was reported again as within the normal range.[18]

Discharge from ED

22. Dr C recorded in the amended discharge summary that considering the improvement in ECG, with no new ischaemic changes, she felt that the "pain [was] not likely cardiac". Dr C later explained to HDC that she considered that the pain experienced by Ms A was possibly musculoskeletal as opposed to cardiac, but this was not recorded in the discharge summary. She recorded:

> "I cannot reproduce it, and I do not suspect [pulmonary embolism[19]] as she has no risk factors … [T]he sudden onset of pain alerted me to consider aortic dissection — however, she has no dynamic [ECG] changes, normal troponin, normal perfusion[20]."

23. Ms A was discharged from ED at 5.12pm. The discharge summary noted at the time that her diagnosis was prolonged QT syndrome[21] and non-cardiac chest pain.

24. In response to the provisional opinion, Dr C told HDC that her diagnoses (as recorded on the discharge summary) of prolonged QT syndrome, "were written to highlight for future record reviewing that Ms A had experienced these abnormalities [but] these had resolved at the point of discharge". Dr C stated that on discharge, Ms A's QT had normalised and so she felt comfortable that Ms A would not have an irregular heartbeat at home.

25. The discharge summary updated the following day states that Dr C educated Ms A on QT syndrome, and "gave her a pamphlet as to what to look out for, which medications, herbs to avoid". The discharge summary also states that Ms A had been non-compliant with her blood pressure medication,[22] which Dr C re-initiated on discharge. Ms A left ED walking and in no apparent distress, accompanied by her daughter.

Subsequent events

26. Ms A returned to her daughter's home following discharge from hospital. Later that night, a family member noticed that Ms A was not breathing. CPR was commenced and an ambulance responded at 11.31pm. Sadly, Ms A was unable to be revived.

---

[14] Intravenous parecoxib 20mg.
[15] Intravenous labetalol 20mg.
[16] The discharge summary was amended the day after the events and contains more detailed notes concerning Ms A's presentation and discharge.
[17] To 163/100mmHg.
[18] 9ng/L.
[19] A blood clot that occurs in the lungs.
[20] The passage of blood or other fluid through the blood vessels or other natural channels in an organ or tissue.
[21] A heart rhythm condition that can be characterised by irregular heartbeats.
[22] Losartan.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

27. An autopsy revealed that Ms A had died from an aortic dissection,[23] in which the inner layer of the large blood vessel branching off the heart (the aorta) tears. This is a medical emergency.

Further information

Dr C

28. Dr C told HDC that she was the primary health provider in the ED caring for Ms A. Dr C said that she initiated prompt care to rule out acute coronary syndrome (her first impression), and reviewed Ms A's old records for ECG changes and previous cardiac presentations.[24] Dr C stated that she considered "numerous other diagnoses after [the ECG] eventually improved and normalised".

29. Dr C also told HDC that the reasons for considering an alternative diagnosis to aortic dissection were that Ms A's blood was circulating well to her tissues and organs,[25] her ECG had normalised, she had no numbness or weakness, her cardiac markers were normal, and her inflammatory markers were within normal limits. Ms A's X-ray was also reported as normal. Dr C said that usually aortic dissection would show a finding of a widened aortic silhouette[26] on a chest X-ray (in 60–90% of cases). Of further relevance to the decision-making was that Ms A said that she had experienced a sudden onset of similar pain two weeks earlier, which Dr C said was significant in leading away from an aortic dissection diagnosis.

30. Dr C stated that on Ms A's presentation to ED two weeks previously, her blood pressure had also been elevated,[27] and Ms A had admitted that she had not been taking her blood pressure medication. Dr C said that this led her to consider that this may have contributed to Ms A's presentation with hypertension, which reassured her that Ms A's symptoms were less likely to represent a medical emergency.

31. Dr C stated:

> "This prompted me to consider an alternate diagnosis upon discharge than aortic dissection. Both family and patient were comfortable with discharge home and patient left [walking]."

District health board

Cardiac chest pain pathway

32. The DHB has a cardiac chest pain pathway. It is a diagnostic tool in the form of a flowchart document, which can be used to quickly assess and diagnose the cause of chest pain in adults and to guide treatment options for patients who are experiencing chest pain of

[23] An aortic dissection of the ascending aorta and arch, Type A (the tear extended along the upper part of the aorta).
[24] Ms A had presented to ED ten days earlier. She had been experiencing "[s]ubstantial left lateral chest wall pain, increasing shortness of breath" as a result of an injury she had sustained 48 hours previously.
[25] Good perfusion.
[26] Refers to the widening of the outline of the aorta.
[27] BP 184/117mmHg.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

cardiac origin. However, the tool should not replace clinical judgement. The pathway requires the active exclusion of alternative diagnoses, if this is possible. The DHB said that in this case, other diagnoses were possible because there was active chest pain with normal troponin levels.

CT angiogram

33. The DHB told HDC that CT angiography of the aorta was available at the public hospital at the time of Ms A's presentation to ED. However, the DHB stated:

> "It would not be possible to do a CT [angiogram] for all patients presenting to the [ED] with chest pain. The [e]mergency [p]hysician must walk a careful line between the significant risks of missing the diagnosis and the considerable clinical burden of over testing for this rare entity [aortic dissection]."

Expert advice

Clinical advice for ACC — Dr F

34. ACC approved a treatment injury claim for failure to diagnose an acute aortic dissection in a timely manner. ACC's clinical advisor, emergency medicine specialist Dr F, stated that "a different treatment pathway should and could have been adopted by the treating hospital clinicians". Further, he advised:

> "Acute aortic dissection is a key differential diagnosis for acute, severe chest pain. This condition was not actively excluded, even after it was noted as a possible cause by the emergency department doctor."

35. Dr F also advised that if aortic dissection is considered possible as a differential diagnosis, this needs to be actively excluded by a radiology procedure, "which in the emergency department setting, most commonly is a CT Aortogram".

Independent expert advice for HDC — Dr Aileen Conboy

36. I obtained expert advice from emergency medicine specialist Dr Aileen Conboy as part of my investigation into this complaint. Dr Conboy's full report is included in Appendix A.

37. Dr Conboy considered that Ms A's initial assessment in ED was thorough and appropriate, as Dr C assessed the initial ECG (abnormal) and examined the chest X-ray and first set of blood tests, both of which returned normal results. Dr Conboy said that the treating clinician would then be expected to formulate a differential diagnosis. In this case, Dr C considered life-threatening diagnoses such as aortic dissection, but she ruled out this diagnosis based on "no dynamic ECG changes, normal troponin and normal perfusion".

38. Dr Conboy was critical that Dr C did not use a systematic method to determine Ms A's level of risk (risk stratification) for aortic dissection to decide whether to undertake a CT angiogram,[28] or further tests to rule out aortic dissection as a possible diagnosis. However, Dr Conboy did acknowledge that the benefits and risks of using a CT angiogram needed to

[28] A test that uses X-rays to provide detailed pictures of the heart and the blood vessels that go to the heart. This test can show narrowed or blocked areas of a blood vessel.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

be weighed up in the circumstances. Further, Dr Conboy noted that the use of a CT angiogram was the "gold standard" of care, as opposed to the accepted standard of care.

39. Dr Conboy discusses the use of the Aortic Dissection Detection Risk Score (ADDRS) plus a D-dimer blood test[29] as a possible risk stratification tool, but acknowledges that this tool is not yet commonly applied, and its use is controversial while it awaits further validation.

40. Dr Conboy was also critical of Dr C's early use of the chest pain pathway with the aim of undertaking repeat ECGs and serial troponin T blood tests to rule out acute coronary syndrome. Dr Conboy advised that entry onto the pathway would have required Dr C to be "comfortable that [she] had ruled out other serious non-cardiac causes of chest pain (such as pneumothorax, aortic dissection and pulmonary embolus)", and to be aware of the pitfalls in employing the pathway. Dr Conboy considered that Ms A was not suitable for the pathway, as she had ongoing abnormal ECGs and significant chest pain while in the ED. Dr Conboy considered that as Dr C did not have a clear diagnosis, she should have discussed Ms A's case with a cardiologist or internal medicine specialist. Further, Dr Conboy said that Ms A's diagnosis with "long QT syndrome and non-cardiac chest pain" was premature, as Ms A had not had any definitive testing for coronary artery disease.[30] Dr Conboy considered the discharge of Ms A without the input of a cardiologist to fall "slightly below" the accepted standard of care, but also acknowledged that aortic dissection is a "very easy diagnosis to miss".

Independent clinical advice for the DHB — Dr E

41. Dr Conboy's expert opinion was shared with the DHB, which, in response, sought independent clinical advice from an emergency medicine specialist, Dr E, who works at a different DHB. Dr E was provided with Dr Conboy's expert opinion, but did not have access to Ms A's clinical notes. Dr E stated that the diagnosis of aortic dissection in the absence of "red flag" symptoms[31] is extremely difficult and remains out of reach for most clinicians. Dr E considered that based on the clinical picture at the time, Dr C's decision to rule out aortic dissection was reasonable if there was an absence of red flag symptoms.

42. Dr E also said that the Aortic Dissection Detection Risk Score (ADDRS) + D-Dimer tool is in an early phase, and is not yet a widely supported clinical decision-making tool. Dr E stated that he supports its use only by senior clinicians when necessary until local validation has been undertaken. He said that this is common practice with clinical decision tools, as they "often fail to perform in a population of patients different from the derivation cohort". Therefore, he considered that clinical reasoning is an acceptable alternative. Dr E further stated that there may be some accountability attributable to Dr C and Dr D regarding their following of the chest pain pathway.

[29] The ADDRS is a clinical decision tool that aids in grading the probability of an acute aortic dissection. D-Dimer is a protein that is made when a blood clot dissolves in the body. A D-Dimer test looks for D-Dimer in the blood.
[30] A disease that happens when the major blood vessels in the heart get narrow and stiff. It can cause heart attacks.
[31] Dr E acknowledged that he is unsure whether or not red flag symptoms were present in this case, as he did not access the clinical notes.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

Further comments from Dr Conboy

43. In response to Dr E's clinical advice, Dr Conboy "agree[d] with the comment of [Dr E] that there is no way to ensure that 100% of aortic dissection patients are diagnosed in ED within the current accepted guidelines", and that ruling out a diagnosis of aortic dissection with accuracy in the absence of red flags "remains out of reach for most clinicians". However, Dr Conboy was also in agreement with Dr F's advice that there were some red flag symptoms in Ms A's case, such as ongoing severe chest pain requiring opioid pain relief medication in the ED, and significant ongoing hypertension, which suggested that aortic dissection should have been actively ruled out.

44. Dr Conboy concluded:

> "[O]verall there was a departure from the acceptable standard of care, but I would not consider it to be a severe departure, as I think there is currently no fail safe investigative pathway to ensure that no patients with [aortic dissection] are missed with the current diagnostic guidelines."

45. Dr Conboy confirmed that, in her opinion, the departure from the accepted standard of care was only "mild".

46. In response to the provisional opinion, Dr C told HDC:

> "The [chest pain pathway] was initiated by [the ambulance service] when [Ms A] received Nitroglycerin and Aspirin. After my assessment, I regarded continuing on the [chest pain pathway] to be reasonable given the presentation of chest pain radiating to her jaw, [sweating] and similar pain previously within the past two weeks."

47. Dr C told HDC that the chest pain pathway requires the clinician to screen for other possible diagnoses, including aortic dissection. Dr C said:

> "I did so, applying clinical reasoning, in parallel to progressing through the [chest pain pathway] — which remained appropriate in the presence of ongoing chest pain. I do not believe that following this pathway in the context of abnormal ECGs and ongoing chest pain is a deviation from the standard of care, but rather is part of thorough care. Following it did not mean that I closed my mind to the possibility of non-cardiac causes."

48. Dr C gave the example of ordering a chest X-ray to check for evidence of a widened aorta or a collapsed lung, to rule out other causes of chest pain.

49. Dr C also told HDC that she was aware of the ADDRS plus D-Dimer blood test calculation tool. She said:

> "If I had implemented it, [Ms A's] score would have been 1 — which would require a d-dimer. From my professional experience, I know that a normal d-dimer cannot exclude an aortic dissection and it also delays diagnosis as it takes a long time to come back."

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

50. Dr C said that for the reasons stated above, she has not relied on this tool as an ED physician, as it has been proven in multiple clinical trials to have "poor specificity and sensitivity — it can miss aortic dissections when used and also result in unnecessary testing".

51. The DHB told HDC that it does not have access to inpatient cardiology or cardiothoracic services. Dr C also stated:

> "It is materially important that the HDC understands that in [the public hospital] at the time, there was no cardiologist at [the DHB]. In the alternative, it was suggested that I consult with someone in internal medicine — I did so."

Responses to provisional opinion

52. Ms B, Dr C, and the DHB were given an opportunity to comment on relevant sections of the provisional opinion. Where appropriate, their comments have been incorporated into the report.

Ms B

53. Ms B provided a letter from her sister, who was with Ms A in ED, which outlined her version of events.

Dr C

54. Dr C told HDC:

> "I would like to offer my condolences to [Ms A's] family, particularly her daughters, for their very sad loss. I am deeply appreciative of the thorough review of this case and have reflected on the feedback provided. I am sincerely regretful of the outcome. When I heard the news of [Ms A's] death, I was devastated."

55. Dr C told HDC that she remembers Ms A's case clearly. Dr C stated: "The regretful five hours of this case have replayed in my head countless times. This case will continue to affect me in every patient I care for."

DHB

56. The DHB expressed its sincere condolences to Ms A's whānau for their loss.

57. The DHB told HDC:

> "The diagnosis of aortic dissection is … a very difficult one to make in the absence of a classical history, examination or radiological findings. There are no risk stratification tools or screening tests available to assist an Emergency Physician. This has sadly resulted in aortic dissection featuring prominently in Morbidity and Mortality reviews in [h]ospitals, including tertiary ones. In our humble opinion, [Dr C's] management is in keeping with the current standards of practice of Emergency Physicians."

58. The DHB mirrored Dr C's comments that Ms A's case has had a profound impact on Dr C and her practice.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

Opinion: Dr C — no breach

Diagnosis of aortic dissection

59. It is my role to assess whether, with the information available to Ms A's healthcare providers at the time of events, those providers acted appropriately and in accordance with an acceptable standard of care. When retrospectively assessing the care provided, it is important that I make that assessment free from hindsight bias notwithstanding the tragic outcome.

60. As discussed above, the diagnosis of aortic dissection is particularly difficult. Dr Conboy stated that the clinical presentation of aortic dissection is commonly one of central chest pain, and the textbook symptoms (tearing, severe central chest pain with radiation to the back) are not always present. Dr Conboy further stated that aortic dissection is relatively uncommon (approximately one in every 10,000 hospital admissions) and classically occurs in older patients. Abnormalities of the aorta on a plain X-ray are not always visible.

61. Dr E concurs in part with Dr Conboy's advice in this respect. He stated:

> "The presumptive clinical diagnosis of [aortic dissection] is extremely difficult in the absence of strongly predictive clinical factors. If a patient presents in an atypical way (without strongly predictive symptoms or clinical signs often called 'red flags' then the diagnosis is often missed while other diagnos[e]s are pursued."

Care provided by Dr C

62. Dr C's differential diagnoses for Ms A's pain included aortic dissection, which she ruled out because Ms A did not have "dynamic ECG changes", and her troponin and perfusion were normal. Dr Conboy advised that at this stage, the decision "not to risk stratify the patient and consider further workup for aortic dissection was incorrect". Dr Conboy stated that the acceptable standard of care would have been to risk stratify Ms A to determine whether or not to use a CT angiogram to check for aortic dissection.

63. Dr Conboy considers that an appropriate tool to rule out aortic dissection would be the AADRS plus D-dimer blood test. However, Dr Conboy acknowledges that there is controversy amongst emergency physicians about the use of this scoring system, and Dr E told HDC that this particular tool is still in the early adoption phase and is not yet widely supported. Dr E considers that "clinical reasoning" in the absence of clinical red flags is an acceptable alternative to the use of the tool.

64. It is clear that the ADDRS plus D-dimer diagnostic tool is not yet in regular use. While I accept that it may be an appropriate and useful decision-making tool in some circumstances, at this stage of its development it cannot be used to define the standard of care, and therefore I am not critical that Dr C did not use it in this case. In the absence of an alternative accepted risk stratification tool, based on Dr E's advice, I consider that it was appropriate for Dr C to use her clinical reasoning when ruling out aortic dissection.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

65. Dr Conboy was also critical of Dr C's early use of the chest pain pathway to rule out acute coronary syndrome (ACS). Dr Conboy stated:

> "The decision to enter the pathway requires the treating doctor to be comfortable that they have ruled out other serious non-cardiac causes of chest pain[32] and to be aware of pitfalls in employing the pathway."

66. In this case, Ms A had ongoing significant chest pain and abnormal ECGs, which Dr Conboy said made the chest pain pathway an inappropriate diagnostic tool. I acknowledge Dr C's explanation that the chest pain pathway had been commenced by ambulance staff when they administered medications to treat Ms A's chest pain. Dr C explained that she considered it was reasonable for her to continue using the pathway, but in doing so she did not close her mind to the possibility of other causes of chest pain. She gave the example that she ordered a chest X-ray to check for evidence of a widened aorta or a collapsed lung. In the circumstances I am satisfied that Dr C appropriately turned her mind to other possible causes of Ms A's chest pain.

67. Ultimately, Ms A was discharged with a diagnosis of long QT syndrome and non-cardiac chest pain. Dr Conboy considered that the decision to assume that the pain was non-cardiac was premature without definitive testing for coronary artery disease (such as a CT angiogram). However, Dr Conboy acknowledged that the benefits and risks of using a CT angiogram need to be weighed up (including, for example, the potential risks of radiation and contrast exposure), and she commented that using a CT angiogram was the "gold standard" of care, as opposed to the accepted standard of care. I accept Dr Conboy's advice and consider that not undertaking a CT angiogram was reasonable in these particular circumstances.

68. In my provisional opinion, I accepted Dr Conboy's advice that it was a slight departure from the acceptable standard of ED care that Dr C did not discuss Ms A's care with a cardiologist. Following further information from both Dr C and the DHB, I now appreciate that this was not an option available to Dr C as there is no inpatient cardiologist at the public hospital, and that, in the alternative, she consulted a medical registrar.

69. I acknowledge that the ACC advice in this case is impliedly more critical of the care provided by Dr C in the public hospital ED, in comparison to my expert, Dr Conboy, and Dr E. I note that the purpose for which ACC advice is sought is to assess whether a treatment injury caused an outcome for a patient. Conversely, expert advice is provided to HDC in order to measure the care that was provided against appropriate standards. I have therefore preferred the evidence of Dr Conboy (which is, in part, supported by Dr E) in my assessment of this matter.

Conclusion

70. It is clear that aortic dissection is a relatively difficult and rare diagnosis for clinicians to make, and this context must be borne in mind when assessing the factors in this case. Dr C

[32] For example, pneumothorax, aortic dissection, and pulmonary embolism.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

was the primary clinician involved in Ms A's care, and I therefore consider that she was responsible for the decision-making during Ms A's admission.

71. I note Dr Conboy's comment that currently there is no failsafe investigative pathway to ensure that no patients with aortic dissection are missed with the current diagnostic guidelines. I acknowledge that this is a factor that makes this diagnosis very difficult to reach. As stated, Dr Conboy's initial advice was that the overall care that Ms A received fell "only slightly below" the accepted standard of care. However, in advice provided after the provisional opinion, Dr Conboy further stated:

> "I would temper that by reiterating that aortic dissection is a rare diagnosis and an easy diagnosis to miss, and that there would be no guaranteed method of making the diagnosis in a similar case presenting to any ED in New Zealand."

72. Taking into consideration this advice and the context of Ms A's presentation, I conclude that Dr C's actions do not amount to a breach of the Code of Health and Disability Services Consumers' Rights (the Code).

73. I acknowledge that this finding may not meet Ms A's whānau's expectations, considering the tragic outcome. However, I hope that the recommendations I make below will aid in minimising such outcomes for other patients and their whānau.

Opinion: DHB — no breach

74. As a healthcare provider, the DHB is responsible for providing services in accordance with the Code. In this case, noting my findings above (in relation to Dr C), and that no broader systems issues at the DHB have been identified, I find that the DHB did not breach the Code.

Changes made

75. The DHB told HDC that since these events, it has undertaken the following steps:

1. Discussion with the General Medicine service about engagement of registrars when consulted. General Medicine SMOs expect all cases referred for assessment/admission to be discussed with them in a timely fashion and assessed directly by the SMO in person as indicated.
2. Ms A's case was presented and discussed at the ED and hospital-wide Mortality and Morbidity meetings.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

3. A face-to-face meeting was held with Ms A's daughters and three support persons, along with the ED Head of Department, ED Clinical Nurse Manager, and the Quality and Risk Manager. An apology was provided and a written response was sent to Ms B.
4. Dr C completed an internationally recognised continuing medical education course overseas, with a strong focus on critical management of chest pain, including aortic dissection.
5. ED nursing staff have been given training on differential diagnoses for different causes of chest pain and the need to advocate for patients.
6. The DHB is actively engaged in the Health Quality & Safety Commission (HQSC) programmes, such as the "Deteriorating Patient Programme".[33] The DHB is also implementing the "Kōrero Mai"[34] and "Shared Goals of Care"[35] work streams. These work streams are part of a five-year national patient deterioration programme that aimed to reduce harm from failures to recognise or respond to acute physical deterioration for all adult inpatients by July 2021.

76. The DHB also told HDC that it has been "working to ensure additional support from the General Medicine [SMO] is available, if required".

77. In response to the provisional opinion, the DHB provided a statement from the General Medicine team, who accepted that there was a lesson to be learnt in communication between the General Medicine and Emergency departments, and told HDC that the following changes have been implemented as a result:

- Orientation for registrars has been improved to ensure that all potential admissions are discussed with an SMO.
- A policy has been made to accept referrals from ED SMOs for medical review. Patients are not declined for admission without a medical review by a registrar and discussion with the General Medicine SMO.

78. Dr C said that since these events:

> "I have sought to learn more about aortic dissections — and distribute knowledge on the condition — since [Ms A's] death. In … 2020 I completed a 5-day course [overseas] which had a strong focus on critical management of chest pain, ECG's and medical emergencies including aortic dissection. With the knowledge I obtained from the course, I presented [Ms A's] case to my peers in [the public hospital] at an ED Morbidity and Mortality meeting."

[33] A work stream to develop a recognition and response system (including a standardised national vital signs chart and early warning score, and a localised clinical escalation and response system).
[34] A work stream to develop a patient, family, and whānau escalation process.
[35] A work stream to develop approaches for determining and documenting shared goals for patient care.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

Recommendations

79. I recommend that the DHB:

a) Use an anonymised version of this case as an educational tool to be incorporated into staff training. An anonymised copy of this report will be sent to the DHB for this purpose.

b) Liaise with the Australasian College for Emergency Medicine about the use of the ADDRS plus D-Dimer diagnostic tool, and consider implementing this for use in the ED when its usefulness has been proven.

c) Report back to HDC on the progress of recommendations a) and b) within six months of the date of this report.

Follow-up actions

80. A copy of this report with details identifying the parties removed, except the expert who advised on this case, will be sent to the Australasian College for Emergency Medicine and the Health Quality & Safety Commission.

81. A copy of this report with details identifying the parties removed, except the expert who advised on this case, will be placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

Appendix A: Independent clinical advice to the Commissioner

The following expert advice was obtained from emergency medicine specialist Dr Aileen Conboy:

"I have been asked to provide my opinion on the quality of the above patient's care when she presented to the Emergency Department at [the DHB]. I have read and agree to follow the guidelines for independent advisors provided to me by the Health and Disability Commissioner's office. I have been specifically asked to comment on: 1. The adequacy of the care provided to [Ms A] by [the DHB] and its staff, including the adequacy of the care provided by [Dr C]. 2. The reasonableness of the decision to not admit [Ms A]. 3. The adequacy of [the DHB's] Cardiac Chest Pain pathway. 4. Any other matters in this case that you consider warrant comment.

My qualifications

I am an Emergency physician. My qualifications include MBChB (Bachelor of Medicine, Bachelor of Surgery, Manchester UK) in 1993, and FACEM (Fellowship of the Australasian College of Emergency Medicine) in 2007. I have been working as an Emergency specialist in New Zealand since 2006.

Documents reviewed

I have reviewed all of the documentation pertaining to this case including the clinical notes and investigations of the paramedics, treating Emergency department doctor and registered nurse, as well as the post mortem report. I have also reviewed the letter of complaint from [Ms B] (the patient's daughter) and the response from the Quality and Risk Systems Manager at [the DHB], as well as the statements of the ED treating physician and nurse.

Summary of the Case

The patient [Ms A], [in her forties], presented [in 2020] with sudden onset of severe central chest pain early in the morning, with radiation to her jaw and altered sensation in her left arm. She had a background of hypertension, a family history of heart disease and was a smoker. The impression of ambulance staff was of cardiac chest pain. The ambulance ECG showed anterior biphasic T waves. She was triaged on arrival in ED and assessed by [Dr C], an Emergency department SMO. The patient went on to have had several ECGs, and blood tests including full blood count and troponin, and a chest xray. [Dr C] noted that the initial ECG showed biphasic T waves in various leads and a prolonged QTc of 510. The rest of the tests were normal. [Dr C] and the nursing staff observed and monitored the patient for several hours in ED. [Dr C] noted several times in her clinical notes that the patient was still complaining of severe chest pain, and this was treated with pain relief including morphine and parecoxib. At one stage a discussion occurred with a medical registrar [Dr D], and the advice given appears to have been that the patient may not require hospital admission, and that the ED doctor should employ the chest pain pathway to rule out an acute coronary syndrome. After [Dr C] employed this pathway, and the patient had 2 normal troponins returned from the lab, and an

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

ECG which continued to be similar to the ECG on arrival (ie no evolving changes of an acute myocardial infarction), she made the decision to discharge the patient at 5.30 pm. [Ms A] died at 11.30 pm that evening at home, and a post mortem revealed that the cause of death was acute aortic dissection involving the ascending aorta on a background of hypertensive cardiovascular disease.

Comment

The diagnosis of aortic dissection is a challenging conundrum in that it is a relatively uncommon disorder (approx. 1 in every 10,000 hospital admissions) that classically occurs in older patients but can occur at any age, and the clinical presentation is a very common one of central chest pain. The textbook symptoms of tearing severe central chest pain with radiation to the back are not always present. Abnormalities of the appearance of the aorta on plain Xray are also often not present. The benefits and risks of the gold standard test of CT angiogram need to be carefully weighed up with potential challenges of lack of access to Radiology and considerations of radiation and contrast exposure.

Initial ED Assessment

In my opinion this patient's initial assessment in ED was timely, thorough and appropriate. A reasonable history was taken and appropriate investigations done. The ED doctor [Dr C] assessed the initial ECG and noted biphasic T waves in various leads and a prolonged QT interval. The patient's chest Xray and first set of bloods came back normal. At this stage the treating doctor would be expected to formulate a differential diagnosis (consider the most likely possible diagnoses and decide which ones need to be ruled in or out). [Dr C] appears to have done this according to an acceptable standard of care.

Formulating a differential diagnosis

According to the clinical notes, [Dr C] has considered life-threatening diagnoses such as pulmonary embolism and aortic dissection, as well as acute coronary syndrome. More benign diagnoses such as oesophageal pain and musculoskeletal pain would commonly also be considered as possible explanations for the pain. At this stage in the process, when [Dr C] considered aortic dissection to be a possibility, she has ruled it out based on the fact that the patient had 'no dynamic ECG changes, normal troponin and normal perfusion'. At this point, in my opinion, the decision not to risk stratify the patient and consider further workup for aortic dissection was incorrect. The acceptable standard of care would have been to risk stratify the patient to determine whether to image them with a CT angiogram to look for aortic dissection. An acceptable rule out strategy for aortic dissection would be to employ the Aortic Dissection Detection Risk Score and D-Dimer in which details of the clinical picture combined with a D-dimer blood test indicate whether to scan the patient or not. The following is quoted from UpToDate: 'The Aortic Dissection Detection Risk Score (ADD-RS) Plus D-Dimer in Suspected Acute Aortic Dissection (ADvISED) study used a combination of the ADD-RS and D-dimer as a diagnostic tool for acute aortic syndrome (AAS; ie, aortic dissection, penetrating aortic ulcer, aortic intramural hematoma, aortic rupture). This multicenter study included

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

1850 patients for whom AAS was considered a possibility. The combination of ADD-RS (0 to 1) **and** negative d-dimer (<500 mg/dL) effectively ruled out AAS with a failure rate of less than 1 in 300 patients. Based on these results, about 60 percent of patients with a low probability for AAS might be spared from unnecessary conclusive vascular imaging. For ADD-RS>1, D-dimer was not discriminatory, requiring conclusive imaging. Although this initial experience appears promising, additional validation in a broader patient population is needed before routine use of this combination as a diagnostic tool can be recommended'. There is currently some controversy amongst Emergency physicians about the use of this scoring system, as it awaits validation in a larger patient population.

Decision to employ the chest pain pathway

Possibly partly under the influence of the medical registrar, there appears to have been a relatively early decision by [Dr C] to enter the patient onto the chest pain pathway and aim to rule out Acute Coronary Syndrome with serial troponins and ECGs. The chest pain pathway at [the DHB] is a standard one similar to other DHBs. The decision to enter the pathway requires the treating doctor to be comfortable that they have ruled out other serious non-cardiac causes of chest pain (such as pneumothorax, aortic dissection and pulmonary embolus), and to be aware of pitfalls in employing the pathway. In my opinion, this patient was not appropriate for the pathway because she had ongoing severe chest pain and an abnormal ECG. The biphasic T waves in the anterior leads on ECG would suggest the possibility of posterior ischaemia. In my opinion this decision was not consistent with accepted standards of care because there were non-specific ST/T changes on the ECG and the patient had ongoing significant chest pain while in the Emergency Department. I think at this point the ED doctor did not have a clear diagnosis for the patient, and should have considered discussing the case with a Cardiologist (or Internal Medicine Specialist if a Cardiologist was not available).

Discharge of the patient

The patient was discharged with a diagnosis of 'long QT syndrome and non-cardiac chest pain'. I think that the assumption that the pain was of non-cardiac origin was premature considering that the patient had not had any definitive testing for coronary artery disease. In my opinion the discharge of this patient without a Cardiology opinion falls slightly below the acceptable standard of ED care. However it is quite possible that if a Cardiologist or Internal Physician had been consulted, the patient may have been admitted to hospital and still had the same tragic outcome. But there is also a chance that the opportunity for assessment by another senior doctor may have led to the correct diagnosis being made.

Overall standard of care in ED

I think that the overall standard of care provided in the ED for this patient falls slightly below the acceptable standard of care. However, it is not possible to know in retrospect if a higher standard of care would have changed the outcome in this case. If the patient had been appropriately diagnosed and referred for transfer to a cardiothoracic centre

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

and subsequent aortic surgery, there still would have been a significant mortality rate. I think this case would be regarded by my peers in Emergency Medicine as a 'there but for the grace of God go I' situation, in that aortic dissection is a very easy diagnosis to miss.

Recommendations to prevent a similar occurrence in future:

It is important to have a high index of suspicion for diagnosing aortic dissection, and to consider it in a patient with severe ongoing chest pain. Education of staff members including ED SMOs, RMOs and senior nurses is very important, including the opportunity to attend Continuing Medical Education (CME) courses and conferences and update their knowledge on a regular basis. One useful aspect of CME is Morbidity and Mortality review meetings, during which cases such as this one can be reviewed and used as an educational tool to prevent similar cases occurring in the future. These should be scheduled to occur on a regular basis in ED. A more difficult and nebulous point, but nevertheless crucially important is: establishing an organisational culture which is non-hierarchical, non-confrontational and patient safety orientated, with promotion of established clear communication lines between ED staff and hospital specialists. Regular liaison between speciality services such as Cardiology and the Emergency Department staff is important to promote ongoing communication and highlight any issues. Time and resource constraints may of course make high standards of clinical care more challenging to achieve, and I am unaware whether they had any effect in this case on the decisions made by the treating doctor.

References

Diagnostic Accuracy of the Aortic Dissection Detection Risk Score Plus D-Dimer for Acute Aortic Syndromes: The ADvISED Prospective Multicenter Study. Nazerian P, Mueller C, Soeiro AM, Leidel BA, Salvadeo SAT, Giachino F, Vanni S, Grimm K, Oliveira MT Jr, Pivetta E, Lupia E, Grifoni S, Morello F, ADvISED Investigators Circulation. 2018;137(3):250. Epub 2017 Oct 13."

Dr Conboy was provided with a copy of [Dr E's] expert report, and provided the following further advice:

"I have reviewed the documents you sent.

In my opinion, there was a mild departure from the accepted standard of care in that the patient had an abnormal ECG and should have been admitted or discussed with a Cardiologist at the very least. This may not however have prevented the tragic outcome for this patient.

I agree with the comment of [Dr E] that there is no way to ensure that 100% of aortic dissection patients are diagnosed in ED within the current accepted guidelines."

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

Dr Aileen Conboy was provided with a copy of the ACC clinical report, and provided the following further advice:

> "I have perused the expert reports provided by [Dr E] and [Dr F]. There are elements of each of their opinions that I agree with. I agree with [Dr E's] statement that 'Ruling out the diagnosis of TAD with 100 percent accuracy, in the absence of red flags remains out of reach for most clinicians'. However I would tend to agree with [Dr F] that there were actually some red flags in this case ie sudden onset of pain, ongoing severe pain requiring opioids in the ED and significant ongoing hypertension, suggesting that thoracic aortic dissection should have been actively ruled out. So I think overall there was a departure from the acceptable standard of care, but I would not consider it to be a severe departure, as I think there is currently no fail safe investigative pathway to ensure that no patients with TAD are missed with the current diagnostic guidelines."

Dr Conboy was provided with a copy of the DHB's response to the provisional opinion, and provided the following further advice:

> "I have reviewed the documents that you sent to me. I understand the comments that have been made.
>
> I wouldn't change my previous opinion that the care of [Ms A] was at a level slightly below the accepted standard of care. I would temper that by reiterating that aortic dissection is a rare diagnosis and an easy diagnosis to miss, and that there would be no guaranteed method of making the diagnosis in a similar case presenting to any ED in New Zealand. I would not wish to imply that [Dr C's] practice was not at an acceptable level in general, as I can only comment on the case that I have been asked to review.
>
> Regards,
>
> Aileen Conboy"

Names have been removed (except the expert who advised on this case) to protect privacy. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.