Capital and Coast District Health Board

A Report by the

Health and Disability Commissioner

(Case 13HDC00453)

Health and Disability Commissioner
Te Toihau Hauora, Hauātanga

Table of Contents

Executive summary

1. Mrs A (aged 51 years) had multiple medical problems. In mid 2012, she experienced a sudden episode of shortness of breath, and an ambulance was called, which took her to the public hospital's Emergency Department (ED).

2. At 3.21pm, registered nurse (RN) RN D triaged Mrs A as Category 3 (response, assessment and treatment to be provided within 30 minutes). However, it was not until around 4.35pm that Mrs A was reviewed by ED registrar Dr E.

3. Dr E considered it likely that Mrs A had a chest infection, and she requested a chest X-ray, blood tests and an electrocardiogram (ECG). Dr E noted that Mrs A was likely to require admission under the medical team. At 6.42pm, Dr E referred Mrs A to the medical team.

4. The results of the blood tests showed a raised creatinine level of 296mmol/L, raised potassium at 6.0mmol/L, and a mildly raised troponin level at 62mg/L. Mrs A's ECG was consistent with a sinus rhythm[1] and a left axis deviation,[2] and there were no indications of acute ischaemia[3] or high potassium.

5. General medical registrar Dr I reviewed Mrs A at 12.37am. Dr I concluded that Mrs A was likely to be suffering from an exacerbation of asthma/COPD (chronic obstructive pulmonary disease) with pleuritic chest pain.[4] Dr I's plan was to repeat the venous blood tests, including the potassium and troponin tests, and to repeat the ECG. Dr I also performed an arterial blood gas test.

6. At 1.17am Dr I reviewed the arterial blood gas results, which showed an improvement in Mrs A's respiratory acidosis, but her potassium level was high at 6.8mmol/L. Dr I decided to wait for the potassium result from the venous blood tests before commencing treatment for hyperkalaemia (elevated blood potassium level).

7. At 2.56am Dr I was called to assess Mrs A, because she was complaining of chest pain. Dr I checked the repeat venous blood results, which showed an increased potassium level of 7.4mmol/L and a decrease in the troponin level to 56mg/L. Dr I prescribed treatment for high potassium, including intravenous calcium, insulin and dextrose, and nebulised salbutamol. Glyceryl trinitrate (GTN) was given for Mrs A's chest pain.

[1] Sinus rhythm is the normal beating of the heart, as measured by an electrocardiogram (ECG).
[2] Left axis deviation (LAD) is a condition whereby the mean electrical axis of ventricular contraction of the heart lies in a frontal plane direction between –30° and –90°. Common causes of LAD include left ventricular hypertrophy (enlargement of the muscle tissue that makes up the heart's main pumping chamber (the left ventricle), left anterior fascicular block (or hemiblock) (a deficiency in conductivity of electrical impulses in the heart) and inferior myocardial infarction (heart attack). Less commonly, LAD may be a normal variant, particularly in obese individuals.
[3] Insufficient supply of blood.
[4] Chest pain related to respiratory pathology rather than a cardiac cause.

8. Approximately 10 minutes later, there was a run of ventricular tachycardia[5] on the cardiac monitor, which self-terminated after a few seconds. Approximately 30 seconds later, the ventricular tachycardia returned. At 3.20am, the emergency alarm was activated and, at approximately 3.25am, Mrs A lost consciousness and cardiac output. Sadly, Mrs A died at 3.50am.

Findings

9. The care provided to Mrs A in the ED was a serious departure from accepted standards. Mrs A was not monitored adequately by nursing staff while she was in the ED, there were delays in her being assessed by the medical registrar, and the medical registrar's reaction to concerning changes in Mrs A's condition was inadequate.

10. Mrs A was entitled to expect that Capital and Coast District Health Board (CCDHB) would provide her with services of an appropriate standard. CCDHB failed to provide services to Mrs A with reasonable care and skill and, accordingly, breached Right 4(1)[6] of the Code of Health and Disability Services Consumers' Rights (the Code).

Complaint and investigation

11. The Commissioner received a complaint from Mrs B regarding the services provided to her late mother, Mrs A, at a public hospital (the Hospital).

12. An investigation was commenced on 20 March 2014. The following issue was identified for investigation:

- *Whether Capital and Coast District Health Board provided appropriate care to Mrs A (dec) in 2012.*

13. The parties directly involved in the investigation were:

Mrs A	Consumer
Mrs B	Complainant/Consumer's daughter
Capital and Coast District Health Board	Provider
RN C	Registered nurse
RN D	Registered nurse
Dr E	Registrar
Ms F	Student nurse
RN G	Registered nurse
RN H	Registered nurse

[5] A rapid heartbeat that arises from improper electrical activity of the heart, presenting as a rapid heart rhythm, which starts in the bottom chambers of the heart (the ventricles). This is a potentially life-threatening arrhythmia because it may lead to ventricular fibrillation (uncoordinated contraction of the heart muscle of the ventricles), asystole (no contractions of the heart muscle), and sudden death.

[6] Right 4(1) states: "Every consumer has the right to have services provided with reasonable care and skill."

Dr I	Registrar
Dr J	Registrar
RN K	Registered nurse

14. Information was also reviewed from the Coroner.

15. Independent expert advice was obtained from an emergency physician, Dr Shameem Safih (**Appendix A**), and a registered nurse, Ms Dawn Carey (**Appendix B**).

Information gathered during investigation

Background

Mrs A

16. Mrs A (aged 51 years) was a smoker, was obese, and had multiple medical problems, including:

- type 2 diabetes;
- deteriorating renal function and heavy proteinuria,[7] likely due to her diabetic nephropathy,[8] obesity and smoking;
- a history of heart murmur with mild mitral regurgitation;[9]
- a chronic left breast infection;
- a history of asthma or COPD (chronic obstructive pulmonary disease); and
- hypertension.[10]

17. In 2000, Mrs A was referred to a consultant cardiologist because of concerns about her chest pain and breathlessness. The cardiologist stated that the chest pain appeared to be related to a coincident respiratory tract infection, and the breathlessness was felt to be multifactorial and related to her morbid obesity, COPD, and hypertension, with evidence of left ventricular hypertrophy[11] on an echocardiogram.[12] There was also evidence of impaired renal function.

18. In late 2011, while overseas, Mrs A had an episode of rapid atrial fibrillation,[13] with a fast ventricular rate of over 130bpm. The cardiologist reviewed Mrs A in 2012. At that time, she had not had any further problems with chest pain, but she was becoming

[7] An abnormal amount of protein in the urine.
[8] Progressive kidney disease caused by longstanding diabetes mellitus.
[9] A disorder of the heart in which the mitral valve does not close properly when the heart pumps out blood.
[10] High blood pressure.
[11] Thickening of the ventricular walls (lower chambers) in the heart.
[12] A diagnostic test that uses ultrasound waves to make images of the heart muscle.
[13] An abnormal heart rhythm, which is often associated with palpitations, fainting, chest pain, or congestive heart failure. Its presence can be confirmed with an electrocardiogram (ECG).

breathless on exertion and experiencing some nocturnal breathlessness. At that stage, Mrs A weighed 134kg, and her calculated body mass index[14] was 52.3. The cardiologist stated:

> "Our sense at that time was that [Mrs A's] issues [while overseas] were related to the atrial fibrillation and that the thickening of the myocardium was due to high blood pressure over many years. We questioned the possibility of underlying coronary disease, but did not contemplate further investigation at that time and planned to review [Mrs A] in three months for a repeat echocardiogram."

19. Mrs A was due to have the repeat echocardiogram later in the year with a review five days later. Because of subsequent events, that did not happen (see below).

20. Mrs A was also under the care of the Renal Department because of her kidney function, and was due to see the respiratory physicians regarding concerns about her sleep disorder and breathing issues.

21. Mrs A had been prescribed a variety of medications including insulin, Symbicort 200/6 inhaler, Ventolin inhaler, glycerol trinitrate (GTN) spray,[15] allopurinol,[16] Aspirin EC, furosemide,[17] diltiazem,[18] simvastatin,[19] and cilazapril.[20]

Mid 2012

22. In mid 2012, Mrs A experienced a sudden episode of shortness of breath at home. She used her Ventolin inhaler and GTN spray with no effect so, at approximately 1.50pm, an ambulance was called.

23. The ambulance arrived at Mrs A's home at 2.09pm. The Patient Report form completed by the ambulance service states that when the ambulance officers arrived at Mrs A's home, Mrs A was not short of breath and was able to speak full sentences. However, when she went to the toilet before the ambulance departed, she became very breathless, but recovered quickly when she was given oxygen. Mrs A again became short of breath when the oxygen was stopped, at which time her oxygen saturations rapidly dropped to 80%. At 2.38pm, Mrs A was taken by ambulance to the Emergency Department (ED).

Triage

24. Mrs A arrived at ED at 3.12pm. She was admitted into the ED at 3.15pm, where she was triaged by registered nurse (RN) RN D.

[14] Body mass index (BMI) is a measure of body fat based on height and weight that applies to adult men and women. Normal BMI is considered to be a score of 18.5 to 24.9. A BMI score of 30 or greater is classified as obese.
[15] Used to treat angina pain.
[16] Allopurinol is a drug used primarily to treat chronic gout.
[17] Furosemide is a diuretic that is used to treat excessive accumulation of fluid and/or swelling (oedema) in the body.
[18] Diltiazem is used to treat high blood pressure and to control angina.
[19] Simvastatin is a drug used to lower high levels of cholesterol and other fat-like substances in the blood.
[20] Cilazapril is used in the treatment of hypertension and heart failure.

25. CCDHB's "Triage of Patients Presenting to the Emergency Department" policy in place at that time states that all patients who present to the ED must receive a triage assessment to determine their presenting complaint, identify clinical urgency, and set a priority of care. Patients are triaged according to the Australasian Triage Scale (ATS), which assigns patients a triage number on a scale of one to five, depending on level of urgency.

26. ATS Category 1 relates to an immediately life-threatening situation, and requires immediate assessment and treatment. ATS Category 2 relates to a condition that is immediately life-threatening, or treatment and response are time critical, and the patient is required to be assessed and treated within 10 minutes. ATS Category 3 relates to urgent, potentially life-threatening or situational urgency, and the response and assessment and treatment are to be provided within 30 minutes. If the triage nurse feels that the patient is likely to be an ATS 2 or above, then the patient is taken to the triage Category 1 (T1) bay, triage Category 2 (T2) bay, or directly to the resuscitation bay (resus) to be triaged. The policy states: "NB — Chest pain that is non-cardiac in nature in a stable patient does not require an ATS 2."

27. RN D completed an initial assessment, and documented on the triage assessment that Mrs A was an unwell adult, and that the admission was non-trauma related. RN D noted in the clinical records that Mrs A had chest pain radiating to her neck, which was relieved by massage, had a cough, was short of breath on exertion, and had hyperglycaemia.[21]

28. RN D recorded that Mrs A was alert, her heart rate was 60bpm,[22] and her oxygen saturation was 88%, which was brought up to 98% on 8L (litres) of oxygen. Mrs A was able to speak five to six words, and had no ketones in her urine.[23] At 3.21pm, RN D triaged Mrs A as triage Category 3.

29. RN D does not recall being aware of Mrs A's extensive co-morbidities at the time she triaged Mrs A. RN D said that Mrs A responded to oxygen therapy, and her oxygen saturations improved while being triaged. RN D stated:

> "[O]n reflection and in hindsight from a nursing perspective I agree that a category 2 would have been a more appropriate triage category, however at the time and with the information I had, I triaged a category 3 but ensured [Mrs A] was allocated to a nurse right away."

30. CCDHB agrees that Mrs A should have been assigned a triage Category 2 based on "the reported respiratory distress, chest pain maybe cardiac in origin and possible underlying sepsis".

31. Mrs A's blood pressure was not assessed at triage. CCDHB advised that at the time, the triage policy did not require the triage nurse to take a full set of vital signs at the

[21] High blood sugar.
[22] A normal resting heart rate for adults ranges from 60 to 100 beats per minute (bpm).
[23] Ketones in urine can give an early indication of insufficient insulin in a person who has diabetes.

initial triage assessment, particularly if the patient was to be taken directly from triage to the clinical treatment area.

Monitoring prior to medical review

32. At 3.26pm, Mrs A was transferred to a cubicle, and RN C was assigned to care for her. RN C was also caring for three other patients at that time.

33. At 4.04pm, RN C took Mrs A's observations. The records state that her temperature was 36.9 degrees Celsius,[24] her heart rate was 95bpm, respiratory rate (RR) 30 breaths per minute,[25] blood pressure 212/139mmHg (lying down),[26] and her oxygen saturations were 100% on high flow oxygen.

34. RN C stated that he connected Mrs A to a central cardiac monitor, and started regular blood pressure readings at 30-minute intervals. He stated: "This enabled me to review her haemodynamic status on the monitor. This was done as I was aware that, given the workload I had, I may not be able to take her vitals as frequently as I would want to. This proved to be the case." Mrs A's full vital signs were not recorded again until 8.49pm, although her pulse, blood pressure and oxygen saturations were recorded at 6.21pm as 85bpm, 123/60mmHg, and 96% respectively.

35. RN C stated that he had difficulty inserting a cannula, and had one or two attempts without success. As a result, he did not draw bloods for testing immediately after Mrs A's arrival, as he would normally have done. He stated that Mrs A was left with a call bell and advised to call if she required anything.

Medical review

36. At around 4.35pm, Mrs A was reviewed by an ED registrar, Dr E.[27] Dr E said that she "started seeing" Mrs A at 4.35pm, and started writing her notes at 5.19pm. Dr E stated that the delay between Mrs A's arrival in ED and Dr E's review of Mrs A, which was outside the required triage time of 30 minutes, was likely because it was a busy Sunday afternoon. CCDHB agreed that the waiting time for Mrs A to see a doctor was too long in this case.

37. Dr E recorded Mrs A's past medical history and medications, and noted that she had been feeling increasingly short of breath for the previous week. She was taking an antibiotic, Augmentin, for a recurrent breast infection, had a cough that was productive of yellow sputum, and had been using her Ventolin inhaler with some relief.

38. Dr E noted that Mrs A had been experiencing some chest tightness over the previous few days, which had responded partially to her GTN spray. However, that day Mrs A had become more short of breath and unable to catch her breath, was generally feeling

[24] The normal body temperature is around 37 degrees Celsius.
[25] Normal respiration rates for an adult at rest range from 12 to 16 breaths per minute.
[26] Blood pressure should normally be less than 120/80mmHg for an adult aged 20 years or over.
[27] Dr E advised HDC that, at that time, she was working as an advanced trainee registrar. She stated: "It was not uncommon for me to manage cases on my own without significant senior input."

weak, and was experiencing tingling in both hands and central chest tightness. Dr E noted that Mrs A required her daughter's assistance to go to the bathroom.

39. Dr E told HDC that her examination found that Mrs A had a low grade temperature at 37.7 degrees Celsius, a normal heart rate, hypertension, a high respiratory rate at 24 breaths per minute, and oxygen saturations of 100% while on 5L/minute oxygen via a non re-breathing mask. Dr E noted that Mrs A was short of breath at rest with accessory muscle use, and was able to speak only three to four words per breath. Dr E told HDC that when she examined Mrs A's chest there was some end expiratory wheeze and bronchial breath sounds in the right middle zone of her lung.

40. Dr E considered it likely that Mrs A had a chest infection, either pneumonia or an infectious exacerbation of her COPD. Dr E requested a chest X-ray, blood tests[28] (venous blood gas, full blood count, electrolytes, creatinine,[29] troponin[30] and C-reactive protein (CRP)) and an ECG, and noted that Mrs A was likely to require admission under the medical team.

41. Mrs A was discussed during the registered medical officer (RMO) handover to a consultant at around 5pm. CCDHB stated that "there was only one SMO [senior medical officer] on duty, overseeing a very busy department and picking up his own patients". The consultant stated that he has no recall of his having any involvement with Mrs A, and cannot see any clinical notes written by him. CCDHB confirmed that there was no ED consultant input into Mrs A's care.

Test results and referral to the medical team

42. Blood was taken from Mrs A at 5.20pm in accordance with Dr E's request, and the blood sample was received by the laboratory at 5.30pm. CCDHB advised that the usual turnaround time for the tests was 10–15 minutes for the venous blood gas, 40–60 minutes for the FBC (full blood count), electrolytes, creatinine and CRP, and around 60–90 minutes for troponin.

43. Results from the venous blood gas showed a potassium level of 5.6 milli-equivalents per litre (mEq/L). The full biochemistry results showed a potassium level of 6mEq/L.[31] The normal potassium level in the blood is 3.5–5.0mEq/L. Potassium levels between 5.1mEq/L to 6.0mEq/L are considered to be mild hyperkalaemia (excessive level of potassium in the bloodstream). Potassium levels of 6.1mEq/L to 7.0mEq/L are considered moderate hyperkalaemia, and levels above 7mEq/L reflect severe hyperkalaemia.

[28] At that time there was no point-of-care blood gas analyser in the ED, which enables more immediate bedside and patient point-of-care diagnostic testing.

[29] Creatinine is filtered through the kidneys and excreted in urine. The blood creatinine level is measured to test kidney function.

[30] A troponin test measures the levels troponin T or troponin I proteins in the blood. These proteins are released when the heart muscle has been damaged, such as occurs with a heart attack. The more damage there is to the heart, the greater the amount of troponin T and I there will be in the blood.

[31] Potassium is important for maintaining normal heart electrical rhythm and for normal electrical signals in the nervous system. The kidneys remove excess potassium in the urine to keep a proper balance of potassium in the body. If a person's kidneys are not working well, they may not be able to remove the proper amount of potassium and, as a result, potassium can build up in the blood.

44. Emergency treatment is required for a patient with high potassium levels. CCDHB stated: "Local guidelines … suggest treatment to be commenced when potassium level exceeds 6.5mmol/l and/or ECG changes [are] consistent with hyperkalaemia."

45. The ECG Dr E requested was performed at 6.15pm. Dr E signed the hard copy to confirm that she had reviewed it. CCDHB advised that the ECG "demonstrated sinus rhythm with first degree heart block, left axis deviation and … prominent T-waves isolated to the inferior leads only". It stated that "no action was required based on this ECG".

46. CCDHB stated that based on Mrs A's blood results and ECG, there was no indication to commence urgent treatment. CCDHB further stated that Mrs A's results would not have prompted urgent treatment, "but would indicate the need for close observation and repeating". CCDHB stated:

> "[Mrs A's] full blood count was normal, she had known renal impairment and thus a chronically elevated creatinine level, known longstanding diabetes and thus elevated glucose level without ketonaemia and chronically low sodium level; none of these indicated an acute deterioration. She had an elevated high-sensitivity Troponin which is difficult to interpret in the context of known renal failure, previous elevated Troponin and no ischaemic changes on an ECG. The normal practice in CCDHB would be to repeat and compare these after 6 hours."

47. CCDHB stated that there is no evidence that any ED staff were aware of the results of Mrs A's blood tests, and so they did not perform repeat blood tests and ECGs.

48. Dr E said that, at that time, the Hospital did not have electronic signoff of blood results, so there is no record of her having checked those results, although it is her usual practice to follow up and check any blood tests she orders. She also stated: "The lab will call and bring to the requesting clinician's attention any grossly abnormal blood results."

49. The chest X-ray Dr E ordered was performed at around 6.20pm,[32] and further (limited) observations were recorded at 6.21pm. Student nurse Ms F recorded at 6.22pm: "Pt returned from X-ray. Sitting comfortably in bed eating dinner. SaO_2 [oxygen saturation] 96% on RA [room air]. ECG done."

50. At 6.42pm Dr E referred Mrs A to the medical team. At 6.55pm, intravenous cefuroxime[33] was commenced, and roxithromycin[34] and prednisone[35] were given.

51. CCDHB stated that although Mrs A was prescribed antibiotics and prednisone, "there does appear to be a lack of an ongoing management plan whilst awaiting medical review".

[32] The results of the chest X-ray were not reported on until 9.48am.
[33] An antibiotic.
[34] An antibiotic used to treat respiratory tract infections including pneumonia.
[35] A synthetic corticosteroid drug used for many different indications including asthma and COPD.

52. Dr E said that Mrs A had still not been seen by the medical team at 11.30pm when she finished her shift. She stated:

> "[T]his is an unusually long delay, as we would usually expect patients to be seen by the medical registrar, and care taken over by their team within 1–2 hours of referral. My notes do not state whether I have formally reviewed [Mrs A] over the evening, but on a busy shift like the one in question, I would have relied strongly on the nursing staff to alert me if they had any concern about the patient's condition."

53. Dr E stated that, from the nursing staff notes, it appears that Mrs A remained well for the duration of her shift (further observations were recorded at 8.49pm[36] and 11.22pm[37]). Dr E is unsure whether she discussed Mrs A with an ED consultant, as she has not documented any discussion in her notes. She stated:

> "[I]t is possible that I did not as at the time I saw [Mrs A] I thought the case was a fairly straight forward one with a woman with significant medical comorbidities presenting with a likely chest infection, no current haemodynamic compromise, simply requiring antibiotics, continued O_2 therapy and admission under the medical team."

54. Dr E said that the ED medical staff handed over to the night team between 10.30pm and 11.30pm and, at that time, she passed Mrs A's care to the night ED registrar to await review by the medical team.

Night shift

55. RN H told HDC that she took over Mrs A's care at approximately 11pm. At that time, Mrs A looked tired and was sitting in a chair with a Hudson oxygen mask on, and was receiving 6L of oxygen. RN H said that she weaned Mrs A to 2L of oxygen administered by way of nasal prongs, and she maintained her oxygen saturations at approximately 97–100%. RN H organised a larger hospital bed, as the ED trolley was uncomfortable for Mrs A.

56. General medical registrar Dr I[38] said that Mrs A's care was handed over to her at 10.30pm.[39] Dr I stated that she contacted the on-call medical consultant shortly after receiving handover, and discussed the prioritisation of her workload and made sure that the ED co-ordinating nurse and senior ED doctor were aware of the patient numbers. Dr I stated:

[36] The recorded vital signs were: temperature 36.7 degrees Celsius; pulse 76bpm; respiration rate 24 breaths per minute; blood pressure 118/57mmHg; and oxygen saturation 98%.
[37] The recorded vital signs were: temperature 37.3 degrees Celsius; pulse 50bpm; respiration rate 20 breaths per minute; blood pressure 169/82mmHg; and oxygen saturation 100%.
[38] At the time of these events, Dr I was a first-year registrar with three years' clinical experience since graduating in 2009.
[39] Dr I noted that Mrs A's referral to the medical team had been received by the daytime registrar, but that due to a large number of patients awaiting medical review, Mrs A had not been assessed by the daytime medical team.

> "[I]t is recognised practice at [the Hospital] that the referring doctor (in this case the ED registrar) continues to be responsible for the patient until the specialist doctor (in this case the medical registrar) has assessed the patient and accepted care. In the ED it is usual practice for the patients to remain the responsibility of the ED doctors and nurses. On transferring to the medical ward the medical team take clinical responsibility."

57. Dr I reviewed Mrs A's records, then, at 12.37am, assessed her. Dr I told HDC that Mrs A's ECG was consistent with a sinus rhythm[40] and a left axis deviation,[41] and that there were no indications of a high potassium or acute ischaemia.

58. Dr I stated that the results of the blood tests showed a raised creatinine level of 296mmol/L, suggesting an acute deterioration of renal function on the background of chronic kidney disease, and a potassium level of 6.0mmol/L, which is a mildly raised level that usually does not warrant clinical intervention. She stated that "a repeat test would sometimes be ordered both to check validity of the result and also to assess whether rising as this can effect decision to treat acutely". She also said that the troponin level was mildly raised at 62mg/L (normal is less than 13).

59. On examination, Dr I noted that Mrs A had a normal temperature, her heart rate and respiratory rate were within normal limits, her blood pressure was slightly raised at 169/82mmHg, and her oxygen saturation was 97% on three litres of nasal oxygen. Dr I auscultated Mrs A's chest, and noted "reduced air entry at the bases with expiratory wheeze". Dr I stated:

> "The chest radiograph showed an enlarged heart suggestive of underlying heart disease and changes consistent with chronic airway disease. There was no obvious collapse or consolidation suggesting a pneumonia and no signs of heart failure."

60. Dr I stated that her assessment was that Mrs A was likely to be suffering from an exacerbation of asthma/COPD with pleuritic chest pain (because the ECG showed no ischaemic changes, the troponin result was borderline, and because of the description of the pain from the patient), acute on chronic renal failure with a mildly raised potassium level that required further monitoring, and respiratory acidosis[42] due to respiratory impairment. Dr I's plan was to repeat Mrs A's venous blood tests (including potassium and troponin), and to repeat the ECG to rule out an acute cardiac event as the cause of Mrs A's chest pain. Dr I said that she communicated her diagnosis and plan to Mrs A and her husband, who was also present. Dr I prescribed Mrs A nebulisers, steroids and antibiotics.

61. ED nursing staff drew the repeat blood samples requested by Dr I, and the bloods were received by the laboratory at 12.55am.

[40] See footnote 1.
[41] See footnote 2.
[42] A condition that occurs when the lungs cannot remove all of the carbon dioxide the body produces. This causes body fluids, especially the blood, to become too acidic.

62. Dr I also performed an arterial blood gas test at the time of her assessment, for a more accurate assessment of Mrs A's oxygenation and gas transfer. Dr I told the nursing staff that Mrs A could be admitted under the medical team.

63. CCDHB advised that the ECG performed at the time of Dr I's assessment of Mrs A showed "probably slow atrial fibrillation and/or junctional rhythm, left axis deviation", and that there was "no ECG suggestion of hyperkalaemia".

64. At 1.15am Mrs A's heart rate was 94bpm, her blood pressure was 172/59mmHg, and her oxygen saturation was 97% on 2L oxygen.

65. At 1.17am Dr I reviewed the arterial blood gas results, which showed an improvement in Mrs A's respiratory acidosis, but her potassium level was high at 6.8mmol/L. Dr I stated that it is usual practice to ensure the accuracy of the blood gas result through a venous potassium result before commencing treatment for hyperkalaemia. Accordingly, she decided to wait for the potassium result from the venous blood tests before commencing treatment for hyperkalaemia. She noted that the potassium test she requested following her review of Mrs A at 12.37am had been received by the laboratory, and she recorded in Mrs A's clinical notes to "await lab potassium".

66. RN H stated that she noticed that Mrs A's bed on the ward was ready, but because of her patient load she was unable to take Mrs A upstairs to the ward.

Deterioration

67. RN H said that at approximately 1.45am Mrs A was given a nebuliser as she was short of breath. At 2.55am her oxygen was turned up and she was transferred to a resuscitation room, as she had become very short of breath.

68. Dr I was called to assess Mrs A at 2.56am. Mrs A was complaining of chest pain. Dr I checked the results of the venous blood test she had requested at 12.37am. The results showed an increased potassium level of 7.4mmol/L and a decrease in the troponin level to 56mg/L compared to 62mg/L at 5.30pm. Dr I noted that as there was no rise in Mrs A's troponin level, she considered that an ischaemic cardiac event was unlikely. Dr I ordered an ECG, which noted changes consistent with an increased potassium level, which she described as "now in the risky range".

69. Dr I prescribed treatment for high potassium, including intravenous calcium, insulin and dextrose, and nebulised salbutamol. GTN was given for Mrs A's chest pain. Dr I said that she explained to Mrs A and a family member who was present that Mrs A was becoming unwell because of her high potassium level, and explained the treatment required. Dr I stated that Mrs A was alert and demonstrated her understanding.

70. Approximately 10 minutes later, Dr I noticed a run of ventricular tachycardia[43] on the cardiac monitor, which self-terminated after a few seconds. Approximately 30 seconds later the ventricular tachycardia returned. At 3.20am the emergency alarm

[43] A rapid heartbeat that arises from improper electrical activity of the heart.

was activated and, at approximately 3.25am, Mrs A lost consciousness and cardiac output.

71. The advance life support algorithm commenced, which included cardiac compressions, oxygenation, ventilation, and defibrillation. Various drugs were administered including treatment for hyperkalaemia (insulin/dextrose, calcium gluconate and salbutamol). At 3.45am blood was drawn but the results were not available for at least 40 minutes.[44]

72. At 3.50am Mrs A remained in a slow and unshockable rhythm, and had no pulse, no respiratory effort, and no signs of life. The team concluded that further attempts to revive her would be futile, and Mrs A died at 3.50am.

Further information — CCDHB

Supervision of junior staff

73. CCDHB stated that the duty SMO had overall responsibility for all patients in ED. In the afternoon when Mrs A arrived, an SMO was on duty, and a consultant took over at 5pm as the evening SMO on duty. Neither consultant had any contact with Mrs A.

74. CCDHB advised that there are no specific policies in the ED regarding the point at which junior doctors ought to seek senior input. However, SMOs are on the ED floor daily between 8am and midnight and are available for patient reviews and discussions. Escalation and approaching SMOs is discussed with ED doctors at orientation, and there are three formal handovers daily with the SMO present, at which patients are discussed.

Changes made at CCDHB since these events

75. CCDHB acknowledged and apologised for "some system failures" at the time of Mrs A's death. It stated that on that day there was "a sustained increasing presentation rate of high acuity" in the ED, "which in addition to flow issues in the hospital, led to a significant increase in ED workload". CCDHB agreed that Mrs A waited too long to be seen by a doctor, and noted:

> "Unfortunately these types of delays were more frequent [at that time]. CCDHB struggled with acute flow from the ED to the wards at the time, which in turn led to congestion and overcrowding in ED. The compliance with the Shorter Stays in ED (SSiED) health target at the time was around only 76%. [At that time] only 18% of Triage 3 patients were seen within 30 minutes and the average time to see these patients was 98 minutes.
>
> …
>
> Whilst there was a delay in getting blood tests and x-rays done, these were done only after the patient was reviewed by the ED Registrar, which is normal practice in CCDHB as we need to avoid unnecessary and potential[ly] harmful investigations.

[44] The subsequent result showed sodium 125, potassium 5.6mmol/L and creatinine 323.

> …
>
> Although the referral to medicine is time stamped on the EDIS system [ED Information System] at 1842, there is no record in the EDIS notes of what time that conversation took place … If the referral was received on the phone by the Medical Registrar at 1842 hours then the delay in seeing the Medical Registrar is inappropriate, however the workload at that time in General Medicine was generally very heavy and long delays were not uncommon."

76. CCDHB advised that there were normal numbers and levels of registered nursing staff at the time of the event, and there were no gaps in the roster. At the time there were no ED specific policies relating to escalation of patients during times of high volumes and acuity, management of patients awaiting assessment/treatment, or follow-up of test results.

77. CCDHB noted that significant changes have occurred since the time of these events, to enhance patient safety in ED and the Department of Internal Medicine, including:

- Changes in the internal processes in the ED leading to improved triaging, more rapid assessment of patients, additional staffing to support the changes, acquiring a blood gas analyser within the ED to ensure that the turnaround time for some blood tests is less than 5 minutes at all times of the day, and the development of new guidelines and policies around the care of patients within the ED (see below).
- Changes within the wider CCDHB to improve acute flow through the hospital, reducing ED congestion and overcrowding.[45] These include considerable changes in the model of care in the Department of Internal Medicine (see below), the development of escalation processes, and the introduction of electronic signoff of laboratory and radiology results.

78. Mrs A's death was reviewed by the ED Morbidity and Mortality Group. No reportable event was completed. However, since 2012, a new system has been introduced whereby all events at CCDHB involving CPR are entered as reportable events on the CCDHB reportable events system. That is audited by way of the 777 emergency call-out system, where all 777 calls are logged through the CCDHB telephonist officers, who check to ensure that a reportable event has been submitted.

79. CCDHB advised that in December 2013 the Internal Medicine Department "completely redesigned its model of care". It advised that the department is now an SMO led service, with an SMO on duty in the medical assessment and planning unit until 8pm from Monday to Friday. There has been an increase in the number of admitting junior staff, and an updated triage policy was introduced in mid 2012. Furthermore, changes were made to the internal medicine handbook and orientation in order to provide greater clarity regarding escalation of patients to SMOs. CCDHB

[45] CCDHB advised that at that time approximately 24% of ED patients stayed in ED for longer than six hours. In January 2014 this was reduced to less than 5%, despite an increase of 8% in total presentations to ED. It stated: "This assists the ED to use the ED cubicles for new patients, rather than boarding inpatients, and thus causing a significant decrease in new patient assessment delays."

stated that most admissions to internal medicine are now seen by a consultant within three hours, and that the increase in admitting junior staff has "greatly reduced delays in [internal medicine] assessment of referred patients in the ED". It stated: "[S]uch a delay is highly unlikely to occur in the current working environment."

80. The ISBAR clinical communication (including handover) tool has been implemented across CCDHB.

81. CCDHB stated that in 2012 the triage policy and orientation package for the ED did not require the triage nurse to take a full set of vital signs at initial triage assessment, particularly if the patient was to be taken directly to the clinical treatment area. At the time of Mrs A's admission, a separate ED Vital Signs Assessment Standard identified the requirement for vital signs assessment and, in early 2013, that was extended to encompass vital signs assessment at triage. CCDHB advised that this has led to most patients having a full set of vital signs taken at triage, "enabling the triage nurse to make a more informative decision on the allocation of the correct triage category".

82. Since mid 2012, CCDHB ED has increased its medical staffing levels in order to improve patient and staff safety, and has also increased its registered nurse staffing levels. CCDHB stated that increased SMO numbers "means an increased presence of SMOs on the floor 16 hours per day (0800–2400)", and this "leads to improved supervision of junior medical staff, as well as earlier intervention in sick patients".

83. CCDHB has also zoned the ED into two separately staffed areas, which it states "has also improved awareness and care of patients in the ED, leading to patients being seen sooner and discussions with SMOs taking place much earlier". It advised that approximately 45% of triage Category 3 patients are seen within 30 minutes, and that the average time to be seen for triage Category 3 patients is 48 minutes.

84. CCDHB stated that it has reviewed and updated its RMO guidelines "specifically in terms of their responsibility to see patients quickly, make quicker decisions and to discuss with an SMO earlier". It further advised that "there is also an audit process in place to monitor RMO performance in terms of productivity and time-efficiency which enables us to assist those RMOs who may have difficulty in this area".

85. CCDHB advised that it has progressively increased its SSiED compliance since mid 2012. In August 2013, compliance was at 89% and, in March 2014, it was at 94%.

86. CCDHB has reviewed its clinical guidelines relating to the management of patients in ED, including the management of hyperkalaemia.

87. CCDHB has also introduced a "Sepsis Pathway". It stated that the pathway "is triggered at triage to identify patients with possible sepsis; they are allocated a triage 2 category with the aim of receiving antibiotics within 30 minutes of arrival. [Mrs A] would likely have triggered this pathway."

88. In 2013, CCDHB developed a Triage Direct document, to provide additional information to four receiving facilities within CCDHB to whom a patient may be "fast

tracked". It includes the taking of an Early Warning Score (EWS) in ED, which can be compared with an EWS on the receiving ward to help identify deteriorating patients and in order for ED to identify patients whose EWS is such that consideration should be given to keeping the patient in ED.

Apology

89. CCDHB stated that it would like to apologise to the family for the events surrounding Mrs A's admission in 2012. The DHB stated:

> "[W]e acknowledge that this whole experience has been extremely distressing for them. We wish them to know that we have taken this event very seriously and have taken numerous steps to improve the service CCDHB ED offers its patients."

Response to provisional opinion

90. In response to my provisional opinion, CCDHB further stated that it "wishes to apologise unreservedly for failing to provide Mrs A with an appropriate standard of care during her presentation to the [ED] [in] 2012".

91. CCDHB accepts my decision that it breached Right 4(1) of the Code.

92. In addition, Dr I stated:

> "I too extend my sincere regret for the systemic failings which CCDHB have accepted cumulatively resulted in [Mrs A] not being provided with the appropriate standard of care during her presentation to the Emergency Department [in] 2012."

Opinion: Breach — Capital and Coast District Health Board

Introduction

93. CCDHB was responsible for ensuring that Mrs A received care of an appropriate standard that complied with the Code. That responsibility comes from the organisational duty on district health boards to provide a safe healthcare environment for their patients.

94. In my view, the care provided to Mrs A fell well short of accepted standards. Several of the individuals who provided care to Mrs A hold a degree of responsibility for the shortcomings in Mrs A's care. However, overall, I consider that the shortcomings in the care provided to Mrs A occurred in the context of deficiencies in the systems operating at CCDHB. Accordingly, I consider that CCDHB bears ultimate responsibility for failing to provide an appropriate standard of care to Mrs A.

Assessment and treatment — Breach

Triage

95. At 3.21pm Mrs A was triaged in the ED. The complaints recorded were that she was experiencing chest pain radiating to her neck, had a cough, and was short of breath on

exertion. Her oxygen saturation was 88% on air, and she was speaking only five to six words at a time. RN D triaged Mrs A as triage Category 3, which according to the ATS meant that she should be assessed and treated within 30 minutes.

96. My expert advisor, emergency physician Dr Shameem Safih, advised that Mrs A's symptoms implied significant respiratory compromise. He stated: "[S]he needed urgent rapid assessment and should have been given a triage category of 2, i.e. to be seen within ten minutes."

97. CCDHB agreed that Mrs A should have been assigned a triage Category 2 based on her respiratory distress, chest pain, which was possibly cardiac in origin, and her possible underlying sepsis.

98. However, RN D does not recall being aware of Mrs A's extensive comorbidities at the time she triaged Mrs A. She stated: "[O]n reflection and in hindsight, from a nursing perspective I agree that a Category 2 would have been a more appropriate triage category, however at the time and with the information I had, I triaged a Category 3 but ensured [Mrs A] was allocated to a nurse right away."

99. I accept that RN D's categorisation of Mrs A as triage Category 3 was not wholly unreasonable on the basis of the information available to her, although it is now clear that Mrs A should have been assigned a triage Category 2.

Monitoring

100. Mrs A's blood pressure was not assessed at triage. However, at 4.04pm her observations were taken and, at that time, her blood pressure was significantly elevated at 212/139mmHg, and her respiration rate was 30 breaths per minute.

101. My expert advisor, registered nurse Ms Carey advised that vital signs outside normal parameters need to be repeated within a clinically appropriate time frame, which did not occur in this case. Mrs A's vital signs were not repeated until 6.21pm, and at that time the observations taken were incomplete in that they did not include Mrs A's temperature or respiration rate. Ms Carey noted Mrs A's respiration rate of 30 breaths per minute, and stated:

> "[R]elevant clinical studies have established even moderate rates of tachypnoea [rapid breathing] as a reliable indicator of critical unwellness. I consider [Mrs A's] BP [blood pressure] to be significantly high and concerning. … [B]ased on [Mrs A's] age, presentation and history I am critical that a routine non-invasive investigation such as an electrocardiogram (ECG) was not completed until 6.16pm and was not initiated as part of the nursing assessment."

102. Mrs A's full set of vital signs were not repeated until 8.49pm, and then 11.22pm. Ms Carey stated:

> "Between 6:21pm and 2:49am [Mrs A] had her vital signs checked on five separate occasions. However, I consider that only two sets were comprehensive assessments, which included respiration rate and temperature. This is also despite

incidences of the clinical record noting an increased work of breathing and [Mrs A] complaining of dyspnoea."

103. Ms Carey was also critical of the lack of consistency recording the absence or presence of chest pain. Ms Carey said that Mrs A required regular monitoring of all her vital signs, and is critical of incidences where there were omissions. I accept Ms Carey's advice. In my opinion, Mrs A was not monitored adequately in the ED.

Delay in medical review

104. Dr E said that she first saw Mrs A at 4.35pm, which was approximately 1 hour and 15 minutes after Mrs A's arrival at the ED, and outside the required triage time of 30 minutes. Dr Safih stated that although Mrs A should have waited no more than half an hour, many triage Category 3 patients "wait up to two hours or more to be seen regularly in EDs all over New Zealand".

105. CCDHB advised that on that day there was "a sustained increasing presentation rate of high acuity" in the ED, "which in addition to flow issues in the hospital, led to a significant increase in ED workload". CCDHB advised that at the time only 18% of triage Category 3 patients were seen within 30 minutes, and the average time to see those patients was 98 minutes.

Medical response to Mrs A's condition

106. Dr E noted that Mrs A had been experiencing chest pain, was short of breath, and was able to speak only three to four words per breath and was using her accessory muscles. Mrs A's respiration rate was 24 breaths per minute, and she had a normal heart rate and a low-grade temperature. Mrs A was also experiencing tingling in both her hands. Dr E considered it likely that Mrs A had a chest infection, and requested a chest X-ray, blood tests (including a venous blood gas) and an ECG. The blood test was taken at 5.20pm and received at the laboratory at 5.30pm. Dr E noted that Mrs A was likely to require admission under the medical team, but did not refer Mrs A to the medical team until 6.42pm (this was two hours after Dr E first reviewed Mrs A, and three and a half hours after Mrs A's arrival at the ED).

107. Dr Safih was critical of the delay in referring Mrs A to the medical team, and advised that the decision to refer Mrs A to the medical team could have been made when Dr E first saw Mrs A (at around 4.42pm).

108. The ECG requested by Dr E was performed at 6.15pm and, as stated by CCDHB, showed "sinus rhythm with first degree heart block, left axis deviation and … prominent T-waves isolated to the inferior leads only". Dr E signed the hard copy of the ECG to confirm that she had reviewed it. The venous blood gas results showed that Mrs A's potassium level was 5.6mEq/L, and the full biochemistry result showed a potassium level of 6mEq/L.

109. While CCDHB advised that it considered that no urgent action was required on those results, it acknowledged that the results did indicate the need for close observation and repeating. However, there is no evidence that any ED staff were aware of Mrs A's blood test results, and ED staff did not perform any repeat blood tests or another ECG.

Dr E stated that she was unable to see any record of her having checked the results, although it is her usual practice to follow up and check any blood tests she orders. It was not until 12.37am that medical registrar Dr I reviewed Mrs A's records and noted the results of Mrs A's blood test, including her potassium levels. I am concerned that Mrs A's blood test results were either not followed up by ED staff, or that staff did view the results but failed to appreciate their significance and the need for close observation and repeating.

110. Following her review of Mrs A at 12.37am, Dr I documented her plan, which included that Mrs A was to be admitted to the ward, undergo repeat blood tests (including potassium and troponin and an arterial blood gas) and a further ECG, and that Mrs A was to be administered prednisone, antibiotics and nebulisers.

111. At 1.17am Dr I checked the arterial blood gas results, which showed a potassium level of 6.8mEq/L. Dr I stated that it is usual practice to ensure the accuracy of the blood gas result through a venous potassium result before commencing treatment for hyperkalaemia. She noted that the potassium test she had requested following her review of Mrs A at 12.37am had been received by the laboratory, and she recorded in Mrs A's clinical records to "await lab potassium".

112. Dr Safih was critical that Dr I's response to the potassium level of 6.8mEq/L at 1.17am was to wait for a further laboratory test, rather than ordering an ECG. However, I note that Dr I had requested a further ECG following her assessment at 12.37am, at the time a repeat blood test was taken. Although the repeat blood sample was received by the laboratory at 12.57am, the result (which showed that Mrs A's potassium level was 7.4mEq/L) was not reviewed until 2.56am, when Dr I was called to review Mrs A because of her chest pain. As noted by Dr Safih, by 2.56am the potassium result of 7.4mEq/L, which is a result that reflects severe hyperkalaemia, was two hours old. He stated that "treatment was now commenced for serum potassium that could have been noted and taken care of two hours previously". He advised that treatment for hyperkalaemia should have been considered and commenced earlier, and he does not consider there to be any grounds to disbelieve a potassium result on a blood gas sample, particularly a result that is significantly elevated.

113. Dr Safih also noted that the laboratory had received the blood sample at 12.57am and would have had the potassium result within an hour, or sooner, if the results had been requested urgently. He stated:

> "[T]he laboratory scientist would have known the result was dangerously high and perhaps should have called the ED to alert them of the result. One of the very reasons that blood gas samples are done on very unwell patients is that the results are often available earlier than standard tests."

114. Dr Safih noted: "As a strategy for risk management there are systems in place where the lab will alert the department or the requesting doctor of a critical result immediately." Similarly, Ms Carey questioned why Mrs A's abnormal potassium

result was not telephoned through when noted by the laboratory technician who processed it.

Summary

115. Dr Safih advised that the delay in the care provided to Mrs A was a serious departure from accepted standards. Dr Safih said:

> "[Mrs A] was under triaged, there was delay to being seen by the medical registrar, and there was slowness in reacting to alarming changes and findings in Mrs A's condition in the last few hours. There was a delay to receiving a critical treatment — calcium. That is not to say the death was preventable. There was no consultant input from the ED or from the medical team. Much of this was related to resource, the busyness of the department and the individuals staffing the department and the hospital (the medical registrar) that night."

116. In my view, the delays in Mrs A being assessed by the medical registrar and the medical registrar's reaction to concerning changes in Mrs A's condition were inadequate, and led to a delay in Mrs A receiving treatment for hyperkalaemia. Furthermore, Mrs A was not monitored adequately in the ED.

117. Mrs A was entitled to expect that CCDHB would provide her with services of an appropriate standard, and the above-mentioned failings resulted in unacceptable delays in Mrs A's assessment and treatment. In my view, CCDHB failed to provide services with reasonable care and skill to Mrs A and, accordingly, breached Right 4(1) of the Code.

Recommendations

118. CCDHB has instigated a number of changes in response to the recommendations in my provisional opinion as follows. I recommended that CCDHB:

a) Apologise in writing to Mrs A's family for its breach of the Code. *CCDHB apologised in writing directly to Mrs A's family, and a copy of this apology was provided to HDC.*

b) Audit the effectiveness and level of compliance with its triage policy for the previous six months, and report the findings to HDC.
CCDHB provided HDC with the results of an audit of its compliance with the ED triage policy from August 2014. From the audit sample, 79.8% of patients were seen within their triage code time. 67.9% of patients had vital signs (relevant to their presenting complaint) recorded, and in 32.1% of patients the vital signs recorded were incomplete for their presenting complaint.

- I note that there are areas that require improvement, and recommend that CCDHB undertake a further audit of compliance with the ED triage policy and report the findings to HDC within three months of the date of this report.

c) Provide the results of its 2013 and 2014 SSiED (shorter stays in emergency departments) health target compliance.
CCDHB provided HDC with these results. From January 2013 to November 2014 the SSiED compliance ranged between 84% and 96%.

d) Review the effectiveness of the revised clinical care guidelines, RMO Role Guidelines, and RMO Orientation and Sepsis Pathway, and report the findings to HDC.
CCDHB explained to HDC that revision of the clinical care guidelines is an ongoing process, as the guidelines continue to change as new studies and developments occur.

- I further recommend that CCDHB conduct training for staff when clinical care guidelines are updated, and provide refresher training on the updated clinical care guidelines on a regular basis, and confirm to HDC within three months of the date of this report that this training has been scheduled.

CCDHB told HDC that the RMO guideline is mandatory reading for all RMOs, and that they are expected to follow these recommendations.

- I further recommend that CCDHB conduct a random audit of ED RMOs' understanding of the RMO guidelines, in particular, the circumstances under which the RMO should notify the SMO (or senior registrar overnight), and report the findings of this audit to HDC within three months of the date of this report.

CCDHB explained that the ED RMO orientation programme has been extended significantly over the past two years to encompass discussions and "on-the-floor" training over a four-day period. CCDHB provided a copy of the orientation schedule and letter of expectations that is provided to RMOs.

CCDHB provided an audit report for the implementation of the ED Severe Sepsis Pathway. The audit found that resuscitation measures were performed more consistently for those on the pathway, and a recommendation was made that ED increase the use of the pathway for patients with probable severe sepsis.

e) Assess the changes made relating to ED length of stay and improvements to patient flow through the hospital, and report the findings to HDC.
CCDHB advised HDC that many changes have been made to improve patient flow from ED. However, CCDHB recognises that it is not consistently meeting SSiED targets and stated that this remains a major focus of clinical activity.

f) Put in place a system where the laboratory immediately alerts the relevant department or requesting doctor of a critical result, and confirm that this has occurred.
CCDHB confirmed that there is a protocol in place where the laboratory must directly phone the doctor, or most senior medical staff member looking after the

patient, in the event of a potentially life-threatening result outside of clearly specified ranges.

g) Review the role of the ED consultants to ensure that adequate supervision of junior doctors is occurring, and report the outcome of the review to HDC.
CCDHB has reviewed the role of the SMOs to ensure that adequate supervision of junior doctors is occurring. CCDHB stated that providing adequate supervision of RMOs is taken seriously and is reinforced continually.

Follow-up actions

119. • A copy of this report with details identifying the parties removed, except the experts who advised on this case and CCDHB, will be sent to the New Zealand Faculty of the Australasian College for Emergency Medicine, the Medical Council of New Zealand, the Director-General of Health (Ministry of Health), and DHBSS, and placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.

• A copy of this report will be provided to the Coroner.

Appendix 1 — Independent expert advice

The following expert advice was obtained from emergency physician Dr Shameem Safih:

"[Mrs A] was a 51 year old female seen in [the Hospital's] ED [in] 2012. She died in the Emergency Department about 12 hours after admission. The Health and Disability Commissioner has asked me to review the care provided to [Mrs A] during the ED stay.

In particular the HDC has asked me to address the following specific questions.

1. Was the care provided appropriate?
2. Was the assigned triage category appropriate?
3. Was the two hour wait to be seen by a doctor appropriate?
4. Did the delay between triage and being seen by the ED registrar contribute to the death?
5. Given [Mrs A's] clinical presentation and known co-morbidities should she have been transferred to a monitored bed in the resuscitation area from the outset?
6. Was the delay of over six hours between being seen by the ED Registrar and the Medical Registrar appropriate and did the delay between being seen by that ED registrar and the medical registrar contribute to [Mrs A's] death?
7. Should the intensive care team have been involved?

Review of Events
Background
[Mrs A] was a 51 year old woman with multiple co-morbidities.

Her medical problems included
Type two diabetes
Chronic obstructive airway disease
Severe obesity with a BMI of 50
Hypertension
Abnormal cardiac echo in 2005: LVH, mild mitral regurgitation

She had been episodically unwell in the past: she had had complicated pregnancies, pneumonia, an episode of rapid atrial fibrillation, and a cardiac arrest related to a Caesarian section. She also had chronic left breast infection and she was a smoker.

She was on multiple medications.
These included insulin, Symbicort, Salbutamol inhaler, GTN spray, Aspirin, Frusemide, Diltiazem, Simvastatin, and Cilazapril.
1347 Ambulance was called to her home.

Ambulance notes
Main complaint was shortness of breath. She had been on antibiotics for six days for probably a chest infection. She experienced sudden shortness of breath at home, took Ventolin and GTN with no effect. She also complained of tightness centrally on the chest and pain in the back of the neck. While being attended to by ambulance officers, she went to the toilet and became very short of breath. The shortness of breath was relieved by supplemental oxygen. Heart rate was recorded at 66 BP lowish at 96 on 60 to l00 on 60. Without supplemental oxygen her saturation dropped to 89%. ECG showed atrial fibrillation. Rhythm strip done by ambulance around 1415hrs showed peaked T waves. She was transported as a status 2.

Emergency Department
1521 She was triaged in the emergency department at [the Hospital]. The complaints recorded were chest pain and neck pain, cough and shortness of breath. Oxygen saturation was 88% on air and she was talking only 5 to 6 words at a time. *This implies significant respiratory compromise*. Significantly her BP was 212/139.

With neck pain, chest pain, SOB and very high blood pressure a number of significant life threatening conditions are possible: Acute left ventricular failure, exacerbation of Chronic Obstructive Airways Disease (COAD), pulmonary embolism, acute coronary ischemic syndrome, and acute dissection of the aorta. She needed urgent rapid assessment and should have been given a Triage category of 2, ie to be seen within 10 minutes.

She was given a triage score of 3.

1719 She was seen by an ED registrar. This was 2 hours after triage. The ED registrar found her to be quite short of breath, speaking 3 to 4 words at a time only and using accessory muscles. Working on a diagnosis of chest infection with failed oral antibiotic therapy and angina secondary to chest infection she made a plan to do a chest X-ray, blood tests and ECG and refer to medical team. It is not clear when the ECG was done, and when exactly the blood tests were done.

1835 [Mrs A] returned from chest X-ray and was noted by a student nurse to be comfortable and having dinner.

1916 She was given antibiotics (nearly 4 hours after her arrival in ED) and a note is made 'waiting for the medical registrar'. It is unclear when a referral had been made. The DHB's response suggests the referral was not made till 2358.

2257 She went to toilet and was noted to become short of breath.

2339 Nursing notes indicate she was very uncomfortable on the chair; she was on 2 L Oxygen and still awaiting the medical registrar.

0037 She was seen by the medical registrar. The medical registrar noted cough with bloody sputum and pleuritic chest pain, which had not been noted before. She reviewed the blood tests. These showed a potassium of 6.0, a creatinine of 296 and a ph of 7.18. *It is not clear when exactly these results became available. Were the ED staff aware of these results?*

The troponin was raised but the CRP and clinical blood count are noted as normal. She thought the chest X-Ray did not show pneumonia, but showed an enlarged heart and some 'fluffy changes both costo-phrenic angles'.

The medical registrar wrote a plan which included 'admit to the ward, continue serial blood tests and ECGs, and continue prednisone, antibiotics and nebulisers.'

The medical registrar makes a couple more entries in the notes, at 0041 and 0046 with no obvious concern being noted. There is a further entry on ABG results at 0117. The potassium is noted as 6.8. No action was taken. The plan even at this stage was to wait for further lab report on the potassium.

Arrest and subsequent events

0145 Going from notes written retrospectively it seems like at 0145 [Mrs A] became quite short of breath. The primary nurse was away with another patient going to the theatre. Her colleagues administered a nebulizer. When the primary nurse returned she found [Mrs A] to be more short of breath with low oxygen saturation.

0256 The medical registrar was called. [Mrs A's] breathing had become quite laboured. She was cyanosed (blue), and her oxygen saturation had dropped to 75 to 85% (dangerously low). She was speaking 2 to 3 words only. She complained of chest pain. She was moved to the resusc room.

Many of the notes subsequently are written retrospectively so it's difficult to time the sequence of events. The serum K [potassium] was now 7.4 and she was having runs of VT. She was placed on BIPAP (non-invasive mask ventilatory support) and standard treatment was given for hyperkalaemia.

0325 She arrested and resuscitation was continued for 25 minutes before being called off at 3:50.

DHB Response

In response to the complaint lodged by [Mrs A's] family the DHB has responded with the following. They have apologised for the delay in being seen by the ED doctor. They have stated that the referral to the medical registrar was made at 2358 after all results had come back. The medical registrar saw the patient at 0030. While investigations were done and results were awaited [Mrs A] was being cared for by the medical and nursing staff of the ED.

They state that [Mrs A] did not appear to be in discomfort. The rest of the document describes the deterioration and the cardiac arrest and the events after death.

Summary
[Mrs A] was a 51 year old with multiple co-morbidities. She presented with shortness of breath, chest discomfort and poor oxygenation. It was subsequently determined that she also had acute renal failure and a rising serum potassium. While she was being investigated and assessed her condition deteriorated till she had a cardiac arrest from which she was unable to be resuscitated.

She was triaged as a 3 which implies the triage nurse felt that by College (ACEM) standards her condition allowed a safe wait of 30 minutes prior to being seen by a doctor. She was seen about 2 hours after arrival. She was referred to the medical registrar 9 hours after arrival, 7 hours after being seen by the ED doctor. She was still in the ED when she arrested 4 hours after being seen by the Medical registrar, 12 hours after arrival in the ED.

Comments on issues raised by the HDC
1. Was the care provided appropriate?

There were numerous delays in provision of [Mrs A's] care. The waiting time to see the doctor was too long. It seems also there was a long waiting time to get blood results and X-rays done. There seems to be long periods when nothing was done. It is unclear who first saw the abnormal blood tests and what their response to these was. The blood tests were sent after she was seen by the ED registrar. This caused a further delay of 2 hours. Turn around time for most labs is benchmarked for basic tests (CBC, electrolytes) at one hour.

There is a statement saying she was referred to the medical registrar after all tests were available. This was at close to midnight. The implication is that is when all the blood tests were available. This indicates serious systemic problems and delays, with ED/hospital processes.

The lab turn around time (from specimen being taken to result being available including transit time) for basic critical tests (CBC, electrolytes) should be about 1 hour. In urgent cases often arrangement is made for tests to be expedited with a turn around time of less than 30 minutes for critical results including transit. Blood gases results are available within 30 minutes, or within 5 minutes if there is (as is in many but not all EDs) a point of care (POCT) machine.

Tests should be initiated as soon as possible, even if the doctor cannot see the patient on time, it is customary practice around the country for nurses to send off protocol based blood tests. This will expedite patient care and the decision making process as the results will be available when the doctor sees the patient.

[Mrs A] was referred after all tests were available, yet the decision to refer her could have been made when the ED registrar saw her first, at around 5 pm. In fact

she wrote the comment 'likely med referral'. She made this impression on the basis of chest infection with failed oral therapy, angina, and oxygen requirement.

At the time of writing this report I had not been shown any treatment charts, so I am not sure what treatment if any was given. There was some fluid charted, although its administration appeared to be delayed. She was on oxygen, and some nebulised salbutamol had been administered when she became really short of breath.

The ED registrar's notes do not reflect any intervention. Even when she has noted accessory muscle use, the ability to speak a few words only, she has not mentioned nebulised bronchodilators as part of her treatment plan. The medical registrar's plan included nebulised bronchodilators, antibiotics, and steroids. The medical registrar notes at 0256 that fluids charted at 'clerking of the patient' (presumably the initial assessment by the ED doctor) had not been given.

There is also no evidence that there was any senior (ED consultant) input into the management of [Mrs A]. When faced with complex patients ED registrars should consult their consultants early. ED consultants managing a shift should also be aware of sick patients in the department and have early input into their care. Junior doctors should be supervised adequately by ED consultants. In practice this supervision is variable, depending on local systems, processes and resources.

Thus in terms of care provided I find the following
a) The waiting time to see a doctor was too long.
b) Lab investigations were delayed in being initiated.
c) Lab tests should have been initiated by nurses.
d) The turn around time for blood tests was probably too long.
e) The referral to the medical team was delayed.
f) Initial blood tests were abnormal, implying [Mrs A] was sick but there does not appear to be any intervention to correct the abnormalities.
g) There is no evidence of any ED consultant input.

2. Was the assigned triage category appropriate?

No.

With her extensive co-morbidity and abnormal vital signs (poor oxygenation, high blood pressure, oxygen supplement need), reported respiratory distress and chest pain which could have been of cardiac origin, she should have been a triage category of 2. It appears that how unwell she was was underestimated. Had she been triaged as a 2 it would certainly have painted a more critical picture of her presentation and expedited her care.

3. Was the two hour wait to be seen by a doctor appropriate?

No, this was too long.

She should have waited no more than half an hour at the most. Having said that it would be fair to say that many triage 3 patients frequently wait up to two hours or more to be seen regularly in EDs all over New Zealand. This is partly because there aren't enough resources to meet the ED work load in busy departments, particularly after hours.

4. [Information redacted as not relevant to the matters under investigation.]

5. Given [Mrs A's] clinical presentation and known co-morbidities should she have been transferred to a monitored bed in the resuscitation area from the outset?

She should have been monitored in an acute bed in a high level care area in the department, not necessarily in the resuscitation room.

6. Was the delay of over six hours between being seen by the ED Registrar and the Medical Registrar appropriate [information redacted as not relevant to the matters under investigation]?

The delay was inappropriate [information redacted as not relevant to the matters under investigation].

Apparently the referral was made very late, 'when results of all investigation were back'. But while this was happening I suspect some treatment was held back. An ECG was done. I haven't seen that ECG but it possibly might have shown changes associated with hyperkalemia. The med reg saw the patient possibly an hour and a half after referral.

7. Should the intensive care team have been involved in [Mrs A's] care?

She had evidence of rising potassium, she was acidotic, she had renal failure. Her serum potassium at midnight on a blood gas was 6.8. She required early treatment for the raised potassium (deranged potassium level — either very high or very low — is dangerous to cardiac conduction and pre-disposes to cardiac dysrhythmias). This can be treated with calcium infusions amongst other treatments to reduce the risk of serious cardiac arrhythmias and arrest.

She had a complex history and was short of breath and desaturating. She did not require intensive care treatment at this stage, but she did require urgent treatment of her hyperkalaemia and hypoxia. Hospitals have different local systems set up to look after unwell or deteriorating patients. In some places this care is defaulted to ICU early. What is clear is that the medical registrar should have consulted with the medical consultant and the renal physician. She had a renal appointment later on so her renal failure was pre-existing and known about. Only after her collapse and cardiac arrest did ICU become involved, and everything was done to revive her but it was too late.

My impression is that senior doctor (specialist emergency or general physician) input earlier on would have been very useful but whether or not it would have averted disaster is difficult to say.

Overall comment
I believe that there was considerable delay in the treatment and management of [Mrs A]. There was no senior input from specialist clinicians, ED, medical or renal. The raised serum potassium level which probably led to her arrest could have been addressed earlier. Whether there were other pathological processes happening such as pulmonary embolism that would account for her hypoxia, chest pain and shortness of breath we would not know for sure.

I believe the care provided to [Mrs A] represents a serious departure from expected standards."

On 4 June 2014 Dr Safih provided the following additional advice after reviewing further information from CCDHB, including information clarifying the times at which certain events occurred:

"My name is Shameem Safih. I am an Emergency Physician, a Fellow of the Australasian College of Emergency Physicians. I provided advice to the Health and Disability Commissioner's office on the care provided to [Mrs A] [in] 2012 at the Emergency Department of [the Hospital]. Subsequently I have been asked by the HDC to provide further advice in the light of response by the DHB, and further information provided by the DHB.

Specifically the HDC has asked me to advise whether the responses received cause me to revise or affirm my original advice.

In summary [Mrs A] was a 51-year-old woman with multiple medical problems who presented to the ED early afternoon with shortness of breath and chest pains over the preceding few days. She was triaged as a category 3. The waiting time to be seen by the ED registrar was 1 hour 20 minutes. The time to referral to the GM [general medical] registrar after being seen by the ED registrar was about 2 hours (3 and a half hours after arrival). The wait time to see the medical registrar was 6 hours after the referral. The medical registrar initiated some treatment, reviewed investigations that had been done, ordered further investigations, and formulated a plan for on-going management. While [Mrs A] was waiting for an inpatient bed she suddenly deteriorated and shortly afterwards suffered a cardiac arrest and was unable to be resuscitated. The duration between the time of arrival and the time of death was 12 hours. This is based on revised times given to me by the DHB. The waiting times to be seen and referred were reported inaccurately by the DHB for the initial advice.

I have read the following documents

1. My previous advice to the HDC

2. Letter of DHB response from [the] Operations Manager, dated 14 February 2014 (included in this response are guidelines to the RMO around their delegated responsibility, and guidelines around when they should consult or inform the SMO on duty, how they should work in the department, handover guidelines and communication guidelines)
3. A response to my advice written by [the] Executive Director of Operations
4. Statement by Staff Nurse [RN C]
5. Statement by ED registrar [Dr J]
6. Statement by GM registrar [Dr I]
7. Statement by [ED consultant]
8. Statement by ED registrar [Dr E]
9. Statement by Staff Nurse [RN K]
10. Statement by Staff Nurse [RN H]
11. Letter from Associate Commissioner of Investigations Dr Cordelia Thomas to [the] Interim CEO of Capital and Coast DHB
12. Response to Dr Cordelia Thomas from [the] Executive Director Clinical and the deputy CMO
13. Appendix 1 Chronology of Events related to [Mrs A's] presentation to the ED
14. Appendices 2 to 9, related to demographics, performance and busyness of the department around the time of her presentation
15. Appendix 10 which is a policy document around triage of patients presenting to the ED
16. Appendices 11, 12 and 13 and 16 which are also documents around the triage process and education
17. Appendices 14 and 15 around vital sign monitoring in the ED
18. Appendix 17 Escalation Process when there is delay to patient being seen by a specialty registrar after referral by ED
19. Appendix 18 A policy document around Responsibility for patient care during different phases of the patient's journey through the ED — while the patient is in the ED, from the time of arrival to the time of referral, from the time of referral to the time seen by a specialty and from the time seen by a specialty to the time leaving the ED (admit or discharge).

The salient points in the response to my initial advice and my comments are as follows.

1. The DHB acknowledges the information given to me regarding the assessment and referral times were incorrect. No comment.
2. They dispute my inference from ambulance notes that the antibiotics [Mrs A] was on were for a chest infection. Comment: The DHB's comment is incongruous with the ED registrar's notes noted in Appendix 1, Chronology of Events which says 'Likely chest infection — failed oral antibiotics'. The medical registrar writes in her statement that the GP had given [Mrs A] oral antibiotics 2 weeks ago for a presumed chest infection. This is however not a critical point worth arguing.
3. ECG changes and hyperkalemia: The DHB disputes that there was a need for treatment for hyperkalemia because the serum K was 6 and the ECG changes

were only present in 3 leads. I am not concerned about the 1730 blood test or ECG. My specific comment related to this (see point 7 of my first advice) is around the serum potassium result on a blood gas requested around midnight, when [Mrs A] was seen by the medical registrar. We are informed now by the medical registrar's statement that this was requested by her around 0030, received by the lab around 0055, and not reviewed by her till 0117. It was then 6.8. The medical registrar's action in response to this was to wait for the lab test. As she states, this is her usual practice. An ECG was not done at this point. If [Mrs A] was being monitored there is no comment on the cardiac waveform at this point. The other blood sample in the biochem tube was received by the lab at 0057. The result of this was not reviewed till 0255. The serum potassium was 7.4. This however was a result that was 2 HOURS old. An ECG was now done and it showed changes consistent with dangerous hyperkalemia. Treatment was now commenced for serum potassium that should have been noted and taken care of 2 hours previously. At this stage [Mrs A] was starting to have runs of VT, and she arrested shortly afterward. Comment: I reaffirm my earlier advice that the treatment for hyperkalemia should have been considered and commenced earlier. The evidence for this is most clear in the statement made by [Dr I], points 18 to 21. There are no grounds to disbelieve a potassium result on a blood gas sample, particularly one that is significantly elevated.

4. The other comment made is that the Blood Pressure of 212/139 was not recorded at triage, but was done afterward. Comment: This is immaterial. There was enough to say this patient should have been a triage category 2. The fact that the first blood pressure on a sick patient was not done till 43 minutes after arrival could be of concern in itself. And as the DHB points out, when it was done it was unacceptably high and should have been rechecked immediately or soon afterward.
5. The DHB agrees there was delay to being seen by the first doctor, and there was a considerable unacceptable delay to being seen by the medical registrar. No further comments.
6. Laboratory tests: I appreciate the statement that unnecessary tests are harmful and costly. I therefore cannot understand the utility of the CRP that was requested in this case. Having said that, a nurse initiated blood test is useful when there is a long wait time for assessment by a doctor, particularly when indications for the tests are clear. What concerns me more is the lab potassium result of 7.4. It seems like the medical registrar reviewed this result only when called to review [Mrs A] because of chest pain at 0255. The lab had received the sample at 0057 and presumably would have a final result well within an hour from that, and even sooner had they been requested urgently. The laboratory scientist would have known the result was dangerously high and perhaps should have called the ED to alert them of the result. One of the very reasons that blood gas samples are done on very unwell patients is that their results are often available earlier than standard tests. As a strategy for risk management there are systems in place where the lab will alert the department or the requesting doctor of a critical result immediately. I would assume

Capital Coast DHB has the system, if not I would suggest they would find it useful to set up the system.

7. Evidence of SMO input. The DHB agree there was none, and explain that the department was very busy and the SMO was picking up his own patients. They say the patient would have been discussed at handover and if presented as not unwell would not have raised any alarm with the SMO. While this is true, and perhaps even common around the hospitals in NZ it does represent a failure of supervision. The onus has been placed on the ED RMO to seek advice and present the patient in a timely fashion and to give the SMO enough information so they can gain an impression of how sick the patient is. The reality is often junior doctors may not have the experience to know how unwell the patient they are dealing with could be, and we find as supervising ED physicians we have to be vigilant and ask probing questions to get an accurate picture. We may then decide to personally review the patient. Variables include the seniority or 'juniority' of the RMO presenting the case, the presence of 'red flags' and also how busy the department is. This is very much resource dependent. If a truly consultant lead service is desired then the consultant needs to be mostly free of picking up his or her own patients from start to finish. Then he or she is free to actively keep an oversight on every (at least sick) patient in the department, seek to actively supervise RMOs and manage patient flow (such as time to being seen by a specialty registrar, disposition etc). The consultant needs to be able to become engaged in the care of sick patients, usually with a registrar or SHO, and then be able to disengage after the initial critical bits have been done for the patient and a plan has been formulated for on going management. Staffing wise this can be expensive but the benefits to patient flow, quality of care and patient safety is enormous.
8. Contribution of delay to being seen by the ED registrar to the death. With the revised times given there was not a huge delay to being seen by the ED doctor, but there was a significant delay to being seen by the medical registrar, and further there was some tardiness of action around the last couple of hours which I will suggest may have contributed to the arrest. Whether death as an outcome was preventable or not one cannot say, but administration of calcium is well described as 'stabilising the myocardium in the face of hyperkalaemia' and may possibly have prevented the cardiac arrest.
9. There is no further disagreement with my initial advice.

The DHB has initiated some changes in response to this case.

I accept that the department was very busy with 21 patients arriving in a space of 2 hours around when [Mrs A] came into the department. The DHB have increased medical staffing, increased SMO presence on the floor, created zones with their own teams to expedite care, have improved their waiting times, and introduced a point of care blood gas analyser (I would suggest critically abnormal results need to be acted upon or verified immediately). They have also reviewed clinical care guidelines, RMO role guidelines, revamped their orientation of RMOs, done work around triage and education on triage, and introduced a sepsis pathway. Work has been done around the ED Length of Stay to improve performance, reduce ED congestion by improving patient flow through the hospital, helped by the creation

of a Medical Assessment and Planning Unit. There was a single medical registrar on duty and I can see that they had a significant workload. Two Medical registrars are now utilised to cover night shift. These measures are to be commended. These measures will clearly have a positive impact on patient safety in the department. One thing I would reiterate is that the role of the ED consultant be looked at more closely. One of their critical roles is oversight of the whole department or at least of their own zone if there are two consultants, and close supervision of the RMOs.

Final comment

There were some serious issues in the management of [Mrs A] in the ED at [the Hospital]. I still feel the care provided represented a serious departure from expected standards. The critical points remain the same after this review: She was under triaged, there was delay to being seen by the medical registrar, and there was slowness in reacting to alarming changes and findings in [Mrs A's] condition in the last few hours. There was a delay to receiving a critical treatment — calcium. This is not to say the death was preventable. There was no consultant input from the ED or from the medical team. Much of this was related to resource, the busyness of the department and the individuals staffing the department and the hospital (the medical registrar) that night."

Appendix 2 — Independent expert advice

The following expert advice was obtained from registered nurse Ms Dawn Carey:

"Thank you for the request that I provide clinical advice in relation to the complaint from [Mrs B] about the care provided to her late mother [Mrs A], in the Emergency Department (ED) at [the Hospital]. In preparing the advice on this case to the best of my knowledge I have no personal or professional conflict of interest. I have read and agree to follow the Commissioner's Guidelines for Independent Advisors.

1. I have reviewed the available documentation on file: complaint from Mrs B; responses from Capital & Coast DHB (CCDHB) including staff statements, policy documents, [Mrs A's] clinical notes; clinical advice from Dr Safih.

2. [Mrs B] considers that there was negligence in the care that was provided to her mother [during her admission] and that this may have contributed to her mother's cardiac arrest. She is concerned that her mother's condition was not properly managed by [hospital] staff.

3. I have been asked to review the nursing care provided to [Mrs A] [in] 2012. In particular I have been asked to comment on the following:

- Was the triage assessment undertaken consistent with expected standards and was the categorisation appropriate?
- Was the monitoring of [Mrs A] while she remained in the ED consistent with expected standards?

4. Review of submitted documentation in relation to Triage Assessment and monitoring

— [Mrs A] was transported to [the] ED by [the ambulance service]. [The ambulance service] documentation reports her experiencing a sudden onset of shortness of breath approximately two hours earlier that was unrelieved by her GTN spray and Salbutamol inhaler. Provisional diagnosis is documented as chest infection with a cough and brown sputum being noted. On route vital signs show [Mrs A] responding to 3litres oxygen therapy with tachypnoea resolving — 3.02pm pulse *62*, blood pressure (BP) *102/60*, oxygen saturations (SpO_2) *98%*, respiration rate (RR) *18*, Glasgow Coma Scale (GCS) GCS *15*. Earlier recording include temperature *37.7* and blood glucose level (BGL) *HI*. A reliance on administered oxygen is also noted — *SpO_2 ↓89% quickly once O_2 stopped*.

— Triage Record (TR) reports assessment time as 3.21pm and being completed by Triage RN D. [Mrs A] was assessed as *Unwell adult — non trauma. Chest pain radiating to neck, relieved by massage, Cough, SOBOE* [shortness of breath on exertion], *Hyperglycaemia. O/A alert, HR* irregular *60,* SpO_2 *88%* [presumed on room air] *98%* on *8 Litres* oxygen, *Talking 5–6 words, Ketone 0*. Based on this assessment Triage Category 3 was assigned to [Mrs A] and she was allocated a primary RN.

— Comment: Australasian Triage Scale (ATS) Categories are based on objective assessment by a skilled practitioner and need to be promptly allocated[1]. ACEM Policy[2] reports that triage categorisation is in response to the question: 'This patient should wait for medical assessment and treatment no longer than …'. In relation to this case, [RN D] clinically assessed [Mrs A] — Category 3 — as requiring further assessment/treatment within 30 minutes. In my opinion, the documented triage assessment reports signs and symptoms consistent with a moderate degree of shortness of breath, leaning towards respiratory infective processes rather than cardiac. Based on the contemporaneous information available to [RN D] at 3.21pm, I agree that the allocation of Category 3 to be appropriate.

— At 4.04pm a full set of vital signs are recorded on the TR. These are unremarkable except for the elevated BP 212/139 and RR 30. Received response indicates that the vital signs were taken by the allocated primary RN, [RN C]. Response statement reports attempting to cannulate [Mrs A] without success. Despite reporting that BP monitoring was set to 30 minute intervals the next printed vital sign recordings are timed 6.21pm.

— Comment: In my opinion, vital signs outside 'normal' parameters need to be repeated within a clinically appropriate timeframe. This did not occur for [Mrs A]. Whilst I note the additional commentary that [Mrs A's] breathing was *unlaboured* and that she was *talking full sentences*, her rate was elevated from last recording of 18. Relevant clinical studies have established even moderate rates of tachypnoea as a reliable indicator of critical unwellness[3]. I consider [Mrs A's] BP to be significantly high and concerning. I note that documentation by the Primary RN reports that [Mrs A] used GTN and had ... *irregular heart rate under Ix* [investigation]. Based on [Mrs A's] age, presentation and history I am critical that a routine non invasive investigation such as an Electrocardiogram (ECG) was not completed until 6.16pm and was not initiated as part of the nursing assessment.

— Between 6.21pm and 2.49am [Mrs A] had her vital signs checked on five separate occasions. However, I consider that only two sets were comprehensive assessments, which included respiration rate and temperature.

[1] Australasian College for Emergency Medicine (ACEM), *Guidelines on the Implementation of the Australian Triage Scale in Emergency Departments*, Guideline NR: G24, (Victoria, Australia: ACEM, 2005).

[2] Australasian College for Emergency Medicine (ACEM), *Policy on the Australasian Triage Scale*, Policy Nr: P06 (Victoria, Australia: ACEM, 2013). Retrieved from http://www.acem.org.au/media/P06_Policy_on_ATS_v4__Jul-13_.pdf.

[3] Hodgetts, T.J., Kenward, G., Vlachonikalis, I.G. et al. (2002). The identification of risk factors for cardiac arrest and formulation of activation criteria to alert a medical emergency team. *Resuscitation (54)*, 125–131; Goldhill, D.R., McNarry, A.F., Mandersloot, G., et al. (2005). A physiologically based early warning score for ward patients: the association between score and outcome. *Anaesthesia (60)*, 547–553; Harrison, G.A., Jacques, T.C., Kilborn, G., et al. (2005). The prevalence of recordings of the signs of critical conditions and emergency responses in hospital wards — the SOCCER study. *Resuscitation (65)*, 149–157.

> This is also despite incidences of the clinical record noting an increased work of breathing and her complaining of dyspnoea. I am also critical of the lack of consistency recording the absence or present of chest pain. In my opinion, [Mrs A] required regular monitoring of all of her vital signs and I am critical of incidences where there were omissions. I consider that the monitoring of [Mrs A] was suboptimal.

5. Additional comments

I agree with CCDHB that unless other signs of hyperkalaemia are noted, it is usual practice to await serum biochemistry results rather than act on the Potassium result from the blood gas. However, I question why [Mrs A's] abnormal Potassium result was not telephoned through when noted by the laboratory technician who processed it. A timely realisation of [Mrs A's] hyperkalaemia would have enabled closer monitoring of her serum Potassium levels, closer monitoring of heart through regular ECGs and earlier consideration of treatments to manage the hyperkalaemia. In my opinion, these are the actions that would have made a difference to [Mrs A's] outcome rather than allocating her an ATS Category 2 instead of 3 at 3.21pm.

In relation to [Mrs A's] results her initial biochemistry results — Potassium 6mmols/L — was available at approximately 6.30pm. The next biochemistry results — Potassium 7.4mmol/L — were available at approximately 1.40am. Before the prescribed treatments — 2.56am — could be administered, [Mrs A] had intermittent runs of Ventricular Tachycardia — 3.20 am — resulting in a loss of cardiac output at 3.25am. Despite good quality resuscitation [Mrs A] was pronounced dead at 3.50am.

6. Clinical advice

In my opinion, the triage assessment undertaken by [RN D] was consistent with expected standards.

In my opinion, the triage assessment categorisation — 3 — was appropriate.

In my opinion the monitoring of [Mrs A] was suboptimal and a mild–moderate departure from expected nursing standards.

In my opinion, there is evidence that processes prevented [Mrs A's] deteriorating condition being realised in a timely fashion, which affected the ability to prevent her cardiac arrest."