Southern District Health Board

A Report by the

Health and Disability Commissioner

(Case 12HDC00548)

Health and Disability Commissioner
Te Toihau Hauora, Hauātanga

Table of Contents

Executive summary

Facts

1. In 2011 Mrs A, was admitted to the Critical Care Unit (CCU) of a public hospital (the hospital) suffering from lower lobe pneumonia. Mrs A's health, while in the CCU, was variable.

2. On Day 12 of her admission[1] Mrs A required a tracheotomy[2] to assist her breathing. On Day 18 medical staff began weaning Mrs A off assisted ventilation. On Day 30, continuous monitoring of Mrs A, including ECG monitoring for heart rate, heart rhythm and respiratory rate, was stopped. Only pulse oximetry, which monitored Mrs A's oxygen saturation via a finger probe, remained in place. At times, Mrs A removed the finger probe.

3. On Day 32 medical staff began to wean Mrs A off her tracheotomy. On Day 33 a respiratory physician assessed Mrs A as being clinically stable, but he noted that a chest X-ray taken that day showed a worsening condition. On Day 35 at 9.15pm Mrs A was found to have suffered a cardiac arrest. She was not wearing her finger probe. The exact time of Mrs A's arrest is unknown.

4. At 9.36pm it was documented in Mrs A's clinical notes that her outlook was grim. When her family arrived at the hospital they agreed that she was not for resuscitation. At 8.00am on Day 36, Mrs A was taken off ventilation, and she died the following day.

Findings

Southern District Health Board

5. Mrs A should have been subject to continuous monitoring, and Southern District Health Board should have had in place robust guidelines to ensure that every patient was monitored appropriately while in the CCU. It was found that Southern District Health Board did not provide services to Mrs A with reasonable care and skill and, accordingly, breached Right 4(1)[3] of the Code of Health and Disability Services Consumers' Rights (the Code).

6. Adverse comment was made in relation to failing to mitigate the risk presented by Mrs A removing her finger probe.

7. Various aspects of Mrs A's care were not fully documented in the clinical notes, including Mrs A having removed her finger probe, discussion on when Mrs A was to be discharged to the ward, and, following her cardiac arrest, her treatment plan. As set out in the Health and Disability Services (Core) Standards, consumer information

[1] Relevant dates are referred to as Day 1 – Day 37 to protect privacy.
[2] A surgically created breathing hole in the neck — an incision is made through the neck into the trachea (windpipe) to form a direct airway to relieve obstruction or to assist with artificial respiration.
[3] Right 4(1) states: "Every consumer has the right to have services provided with reasonable care and skill."

must be uniquely identifiable, accurately recorded, current and accessible when required.

8. A pattern of suboptimal clinical documentation was found amongst multiple clinical staff, indicating a lax attitude towards documentation at SDHB. Therefore, it was found that SDHB breached Right 4(2)[4] of the Code.

Complaint and investigation

9. The Commissioner received a complaint from Mr A (now deceased) about the services provided by Southern District Health Board (SDHB) to his wife, Mrs A (also deceased). The following issue was identified for investigation:

- *Whether Southern District Health Board provided Mrs A (dec) with an appropriate standard of care in 2011.*

10. An investigation was commenced on 13 May 2013. The parties directly involved in the investigation were:

Mrs A	Consumer (dec)
Mr A	Complainant
SDHB	Provider
Dr C	Medical physician
RN B	Registered nurse
RN D	Registered nurse

Also mentioned in this report:

Dr E	Intensive care specialist
Dr F	Consultant physician

11. Independent expert advice was obtained from an intensive care medicine specialist, Dr Ross Freebairn (**Appendix A**).

Information gathered during investigation

Mrs A

12. Mrs A was suffering from shortness of breath and a bad cough. She developed sharp chest pains.

[4] Right 4(2) states: "Every consumer has the right to have services provided that comply with legal, professional, ethical, and other relevant standards."

Admission to hospital

13. Mrs A was admitted to a local hospital, where an unconfirmed diagnosis of pneumonia[5] was made. The following day, Mrs A was transferred to a larger hospital, where she was admitted to the CCU. A chest X-ray confirmed that Mrs A had lower lobe pneumonia.

14. Between Day 1 and Day 7 of her admission Mrs A's condition deteriorated. On Day 3 she was intubated[6] and received assisted ventilation.[7] On Day 5 Dr E, an intensive care specialist, noted that Mrs A was suffering from renal impairment,[8] and that she had a cavitating lesion[9] of the left lung. On Day 6 a chest drain[10] was inserted.

15. By Day 8 Mrs A's condition had improved. On Day 11 Dr E noted: "Significant improvement over weekend. Respiratory function much better." Dr E considered that Mrs A could be weaned off assisted ventilation. However, because Dr E expected weaning to be prolonged, she organised a tracheotomy[11] for Mrs A, to assist her breathing further.

16. On Day 12 a general surgeon performed a tracheotomy on Mrs A, and a respiratory physician performed a bronchoscopy.[12] Following the bronchoscopy and a chest X-ray, Dr E noted that Mrs A was suffering from "extensive surgical emphysema".[13] At 8.10pm Dr E recorded in Mrs A's clinical notes that the emphysema was "massively increasing". That night, a general surgeon inserted a second chest drain.

17. From Day 14 there was some improvement in Mrs A's condition. On Day 18 Dr E noted that Mrs A's emphysema was "much improved" and she was making good progress weaning off the ventilator with the aid of the tracheotomy. On Day 19 one of the two chest drains was removed and, on Day 21, the second chest drain was removed.

18. From Day 21 Mrs A was able to spend an hour a day sitting in a chair (rather than remaining in her bed) although, on Day 27, the clinical notes record that Mrs A had developed a persistent *Escherichia coli*[14] infection and hypertension.[15] Throughout this period Mrs A remained in CCU.

[5] An inflammatory condition of the lung.
[6] Insertion of a tube into the windpipe (trachea) through the mouth or nose to maintain an airway.
[7] Assistance with breathing using a machine to move air into and out of the lungs.
[8] Inability of the kidneys to filter waste products from the blood adequately.
[9] A hollow area.
[10] A tube used to drain blood, fluid or air from around the lungs.
[11] A surgically created breathing hole in the neck — an incision is made through the neck into the trachea (windpipe) to form a direct airway to relieve obstruction or to assist with artificial respiration.
[12] A procedure in which a hollow, flexible tube is used to view inside the airways.
[13] Damage to the air sacs in the lungs.
[14] A bacterium that can cause infection.
[15] High blood pressure.

Plan to transfer to ward

19. There is no documentation in Mrs A's clinical notes that a decision had been made to transfer Mrs A out of CCU and onto the ward. However, on Day 29, Dr E recorded a care plan, because she was going on leave. As part of that plan, Dr E documented the following:

> "I would be reluctant to send [Mrs A] to the ward with a tracheotomy as she would be a high risk of 'bouncing back'. The aim should be to remove the trache tube and have a clear plan in place what to do in the event of failure."

20. Dr E had no further contact with Mrs A after Day 29. From that time, Mrs A was under the care of consultant physician Dr F.

21. SDHB advised HDC that the decision to transfer Mrs A to the ward was to be made once her tracheotomy tube had been removed.

Monitoring

22. Until Day 30 Mrs A received standard CCU monitoring, which included ECG[16] monitoring for heart rate, heart rhythm and respiratory rate, and continuous pulse oximetry (via a finger probe), which monitored Mrs A's oxygen saturation.

23. On Day 30 Mrs A's continuous ECG monitoring for heart rate, heart rhythm and respiratory rate was discontinued. It is not clear who decided to discontinue the monitoring, and the decision is not documented in the notes. The finger probe remained in place, except when Mrs A was being assisted with personal cares. Mrs A's Observation Charts record that her blood pressure, heart rate and respiratory rate were documented two to four hourly.

24. The hospital's CCU's "Observations and Monitoring Guidelines" in effect at the time state that the "[f]requency of observations will be guided by assessment of the condition and stability of individual patients, or medical staff instructions". However, the Guidelines also state: "All patients have ECG monitoring. Exceptions being the patient about to be transferred to the ward."

25. SDHB told HDC that Mrs A's oxygen saturation monitoring was interrupted at times when she removed the finger probe, but this is not recorded in the clinical notes. SDHB further stated: "[T]here was no consideration given to options, such as ECG monitoring, to mitigate the risk this presented to [Mrs A's] safety."

26. On Day 32 medical staff began weaning Mrs A off her tracheotomy, and she required it only overnight.

27. On Day 33 the respiratory physician assessed Mrs A and recorded in her clinical notes: "[Mrs A] is clinically stable, bloods are better but chest X-ray is worse and

[16] Electrocardiogram — monitoring of the electrical activity of the heart.

there is ooze from the drain site." He also documented that a CT[17] scan was required prior to the possible reinsertion of a chest drain.[18]

28. On Day 35 Mrs A's clinical notes document that she was "chatty" and out of bed for periods sitting in a chair.[19] Registered nurse (RN) B advised HDC that when she settled Mrs A for bed, she "put the oxygen probe on [Mrs A's] finger".[20] At around 8.15pm, RN B recorded that Mrs A "appeared to be sleeping".

Cardiac arrest

29. At 9.15pm on Day 35, RN D found Mrs A "collapsed" and "pulseless". RN D immediately activated the alarm, alerting doctors that Mrs A had suffered a cardiac arrest.[21]

30. SDHB told HDC that the time of Mrs A's cardiac arrest cannot be determined because of the absence of any monitoring. Mrs A was no longer wearing the finger probe, and it is not known when or how this was removed.

31. RN D commenced cardiopulmonary resuscitation (CPR), and medical physician Dr C was the first doctor to attend the alarm. Spontaneous circulation was achieved after three 1mg doses of adrenaline and a single defibrillation.[22] However, Mrs A made no respiratory effort, had a poor neurological response, and her pupils were dilated and fixed.

Care following cardiac arrest

32. Dr F was informed of Mrs A's arrest. While awaiting his arrival, Mrs A was placed back on the ventilator. When Dr F arrived, he and Dr C discussed Mrs A's condition. They decided to continue to ventilate Mrs A, and to review her condition in an hour's time. The discussion was documented in the clinical notes at 9.36pm as follows:

> "Outlook grim → not for repeat resuscitation, not for inotropes,[23] ventilate for 1 hour until adrenaline has worn off, review neurological status, if remains obtunded[24] palliate[25]."

33. Dr C commented:

> "[Mrs A] had had a prolonged CCU admission with a severe necrotising pneumonia, respiratory failure and malnutrition. The high CO_2 level despite vigorous mechanical ventilation indicated to us that she had suffered a period of

[17] CT (computerised tomography) is a form of X-ray examination used to create images of cross-sections of the body.
[18] The CT scan was not undertaken until the early afternoon of Day 35, and the result had not been reviewed by a physician prior to Mrs A's cardiac arrest on Day 35.
[19] This was documented retrospectively later that day.
[20] It had been removed temporarily while she settled Mrs A back into bed.
[21] Cessation of effective pumping action of the heart.
[22] Administration of a controlled electric shock to restore normal heart rhythm following cardiac arrest.
[23] Intervention to support cardiac function.
[24] Depressed level of consciousness and diminished sensation of pain.
[25] Focus care on comfort rather than cure.

> hypoxia prior to her arrest and was highly likely to have suffered a significant hypoxic brain injury.
>
> As adrenaline can affect the pupils it was decided to continue to ventilate while the effects of the adrenaline wore off, and then to reassess [Mrs A] neurologically. An arbitrary period of approximately one hour was decided upon. Considering her pre-existing pathology we felt that her outcome, particularly her neurological outcome, would be very poor following the arrest.
>
> At this stage we did not think that further measures to support her blood pressure would be beneficial. We were also of the opinion that if [Mrs A] was to arrest again, further attempts at resuscitation would not change the outcome."

34. SDHB provided its policy on "Providing, Foregoing, or Withdrawing Life-sustaining Medical Treatment". This states:

> "[I]f the health care team has concluded that further treatment should be withheld, withdrawn, or not provided, because it is futile or not in the patient's best interests, that decision can be made by the team and does not require consent from the patient or anyone else."

35. At 10.00pm Dr C recorded that Mrs A had pinpoint pupils, was non-reactive, had no gag reflex and no cough reflex, and that her blood pressure was dropping. Hypoxic brain injury[26] was noted, and that it was "unlikely survivable". Dr C documented that the plan was "1. Await arrival of husband 2. Not for inotropic support." No further plan was documented.

36. At 12.05am on Day 36 the anaesthetic registrar reviewed Mrs A and recorded that she did not respond to voice or pain and had no cough reflex, but that there was a return of the gag reflex. The anaesthetic registrar noted: "[Advised Mr A that] [Mrs A] will probably pass away tonight … Husband stated that he would not want [Mrs A] resuscitated again."

37. At 5.30am on Day 36 an RN recorded in the clinical notes that Mrs A was suffering from diarrhoea. At 8.00am, ventilator support was removed. At 11.00am Dr F recorded that Mrs A was convulsing and non-responsive. Mrs A passed away at 11.45pm the following day.

Events following Mrs A's death

38. On 13 April 2011 a meeting was held between Mr A and representatives from SDHB. SDHB's notes from that meeting record that SDHB told Mr A that, at the time of Mrs A's arrest, she had been in the process of being weaned off the monitoring, as the medical staff were going to transfer her to the medical ward on Day 36.

39. SDHB's Surgical Medical Director advised Mr A at the meeting that "[Mrs A] should have been monitored and wasn't. The state of her health had been underestimated and

[26] A deficiency of oxygen to the brain.

we recognise that." Further, the Surgical Medical Director advised that "the arrest was missed when it could have been picked up if monitoring had been on".

40. SDHB advised HDC that, when preparing to transfer patients from CCU onto the medical ward, it was common practice to discontinue continuous ECG monitoring so as to prepare patients for not having such monitoring on the ward. However, since this event, it has put in place a change in practice to "ensure continuous monitoring of CCU patients".

41. SDHB provided an updated version of the hospital's Observations and Monitoring Guidelines, which include a section entitled "Transfer of Critical Care Patients to Wards". The guideline states:

> "NOTE: While the patient is in CCU they should have either continuous electrocardiograph (ECG) or oxygen saturation monitoring."

42. The updated policy no longer includes the exception for patients being transferred to the ward.

43. Regarding Mrs A being found without a finger probe at the time of her arrest, SDHB advised HDC that, in July 2011, an upgrade was carried out on the CCU pulse oximetry machines. The changes made include increased sensitivity to the alarm functionality in response to an interruption of signal.

Response to Provisional Opinion

44. Mrs A's family, the DHB and relevant staff members, were given the opportunity to respond to relevant sections of my provisional opinion.

45. Mrs A's family and the DHB confirmed that they had no issues in respect of any of the information gathered in the investigation. Some staff members responded however, and their responses have been incorporated into the report where relevant.

46. SDHB accepted the preliminary conclusions provided in my report.

Opinion: Southern District Health Board

Introduction

47. SDHB had an obligation to provide Mrs A with appropriate care that complied with the Code. It may be held directly liable for any failure to meet this duty.

48. Mrs A's condition was unstable, although she appeared to be improving. She was in CCU because she required intensive care. In my view, adequate monitoring, together

with vigilant staff, are core capabilities of all intensive care units. Mrs A was not monitored adequately and, as a result, her cardiac arrest was not noticed immediately. I consider that to be unsatisfactory care.

Lack of monitoring while in CCU — Breach

49. On Day 30, while Mrs A was still in CCU, her continuous ECG monitoring was discontinued. SDHB said that this was because staff were preparing to transfer Mrs A from CCU to the ward.

50. The transfer plan is unclear. Following Mrs A's death, SDHB told Mr A that the plan had been to move Mrs A from CCU onto the ward on Day 36. However, SDHB advised my Office that the decision as to when Mrs A would be transferred to the ward was to have been made once her tracheotomy tube had been removed. There is no documented plan in her records. I consider it more likely than not that transfer was dependent on the removal of Mrs A's tracheotomy tube, and that no transfer date had been set.

51. I note that SDHB's CCU Observations and Monitoring Guidelines in effect at that time stated:

> "Frequency of observations will be guided by assessment of the condition and stability of individual patients, or medical staff instructions … All patients have ECG monitoring. Exceptions being the patient about to be transferred to the ward."

52. I do not accept that Mrs A was about to be transferred. As stated, it was unclear when she would be fit for transfer. In any event, my expert advisor, intensive care medicine specialist Dr Ross Freebairn, questioned the appropriateness of that policy for a CCU ward. He advised that adequate monitoring is a core capability of the CCU, and that "[i]t is usual for monitoring to be continued until the patient is transferred [out of CCU] to the ward".

53. On Day 35, at some time between 8.15pm and 9.15pm, Mrs A experienced a cardiac arrest. I am concerned that, due to a lack of monitoring, Mrs A's cardiac arrest was not noticed immediately.

54. I agree with SDHB that its guidelines were inadequate. Dr Freebairn stated:

> "The withdrawal of ventilation (weaning), which had occurred, and the progression to decannulate the tracheotomy (by downsizing the cannula) are a period of some jeopardy to the patient, and not an indication for a reduction in vigilance. If physiological monitoring was not possible because of non-compliance, and agitation, this should have been documented, and close physical observation should have been employed."

55. In my view, Mrs A should have been subject to continuous monitoring, and SDHB should have had robust guidelines in place to ensure that every patient was monitored

adequately while in CCU. I find that SDHB did not provide services to Mrs A with reasonable care and skill. Accordingly, SDHB breached Right 4(1) of the Code.

Removal of finger probe — Adverse comment

56. Mrs A was required to have her oxygen saturation monitored continuously by a finger probe while she was in CCU, other than when she was assisted with personal cares. However, SDHB said that Mrs A's oxygen saturation monitoring was interrupted at times when she removed the finger probe.

57. When Mrs A was found to have suffered a cardiac arrest, she was not wearing the finger probe. Although Dr Freebairn advised me that it is not uncommon for patients to remove monitors, I am critical that no alternatives to mitigate this risk were introduced, such as different monitoring techniques and/or closer physical monitoring.

58. I note that, since these events, SDHB has upgraded its CCU pulse oximetry machines to provide for increased sensitivity to the alarm functionality in response to an interruption of signal.

Documentation — Breach

59. A number of aspects of Mrs A's care are not fully documented in the clinical notes. These include Mrs A having removed her finger probe. As stated above at paragraph 54, if "physiological monitoring was not possible because of non-compliance, and agitation, this should have been documented". Other aspects not fully documented include the decisions around when Mrs A was to be discharged to the ward, and her treatment plan after her cardiac arrest.

60. As set out in the Health and Disability Services (Core) Standards,[27] consumer information must be uniquely identifiable, accurately recorded, current and accessible when required.

61. In my view, the pattern of suboptimal clinical documentation by multiple clinical staff involved in Mrs A's care indicates a lax attitude towards documentation within the CCU. I find that SDHB failed to comply with legal standards and, accordingly, breached Right 4(2) of the Code.

Care following the cardiac arrest — Other comment

62. Dr Freebairn advised that the initial plan made on Day 35 at 9.36pm to withdraw active therapy and to institute palliative care if there was no neurological improvement after one hour was premature.

63. Mrs A's clinical notes indicate that immediately prior to suffering the cardiac arrest, she appeared to be making a slow but steady recovery, she was receiving a diminishing level of respiratory support, and was to be transferred from CCU after removal of her tracheotomy. Dr Freebairn advised that, at 9.36pm,

[27] NZS 8134.1.2:2008, Standard 2.9.

> "[t]he cause of the cardiac arrest was unknown, the duration was unknown, and therefore the likely outcome (prognosis) could not be accurately predicted, especially in the early post arrest period".

64. In light of the above advice, further information was obtained from SDHB. Dr C advised HDC that, prior to making that decision, she and Dr F discussed Mrs A's background and, in light of her pre-existing pathology, felt "that her outcome, particularly her neurological outcome, would be very poor following the arrest".

65. Dr C said that the "high CO_2 level despite vigorous mechanical ventilation indicated … that [Mrs A] had suffered a period of hypoxia prior to her arrest and was highly likely to have suffered a significant hypoxic brain injury".

66. I note that Mrs A continued to be ventilated until 8am on Day 36 and, that morning, she developed convulsions and diarrhoea. Dr Freebairn advised that those new signs indicated that, in retrospect, the correct decision was made, "even if somewhat prematurely" as, by then, "[Mrs A's] outcome was extremely likely to be very poor, as they are markers of prolonged ischaemia during the cardiac arrest". In further advice on this issue, Dr Freebairn highlighted "a minor but potentially important learning point" that consideration should be given as to whether the arterial carbon dioxide levels do reflect duration of hypoxaemia in the post cardiac arrest scenario.

67. Mrs A had been very unwell and had suffered a cardiac arrest of unknown duration. While I am mindful of Dr Freebairn's advice, I consider that decisions to withdraw treatment are complex medical decisions, and it is apparent that in this case careful consideration was given to all of the circumstances, including Mrs A's best interests. However, I consider it appropriate to bring to SDHB's attention Dr Freebairn's comments regarding carbon dioxide levels and hypoxaemia.

Recommendations

68. I recommend that SDHB undertake the following:

- Provide a written apology to Mrs A's family, and highlight in the letter the changes made since these events. The apology is to be sent to HDC within **three weeks** of the date of this final report for forwarding to Mrs A's family.

- Review the CCU Observations and Monitoring Guidelines and consider including a requirement that all patients must have appropriate monitoring until the patient is transferred to the ward.

- Arrange an audit of monitoring within the CCU and compliance with the amended CCU Observations and Monitoring Guidelines, and provide HDC with the outcome of the audit, within **six months** of the date of this final report.

- Arrange an audit of its clinical documentation within the CCU and provide HDC with the outcome of the audit, within **three months** of the date of this final report.

Follow-up action

69. A copy of this final report, with details identifying the parties removed, except the expert who advised on this case and SDHB, will be sent to the Australian and New Zealand Intensive Care Society and placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.

Appendix A — Independent expert advice to the Commissioner

The following expert advice was obtained from Dr Ross Freebairn, a consultant intensive care medicine specialist:

"**1. Personal statement**

1.1. I am a Consultant Intensive Care Medicine Specialist, Intensive Care Services and Clinical Director of Acute Services, at Hawke's Bay Hospital, Hastings. I have a MB ChB (Auckland). I am a Fellow of the Australian and New Zealand College of Anaesthetists (FANZCA), and President and Fellow of the College of Intensive Care Medicine of Australia and New Zealand (FCICM). I am an adjunct Associate Professor at the Chinese University of Hong Kong, Shatin, Hong Kong, China, and an Honorary Clinical Senior Lecturer in the Department of Anaesthesiology, School of Medicine, Faculty of Medical and Health Sciences at the University of Auckland. I am vocationally registered in Intensive Care Medicine and in Anaesthesia. I have been asked to advise the Health and Disability Commissioner on the care of [Mrs A], specifically to answer the questions raised below.

1.2. Declaration **of potential conflicts or dualities of interest**.

1.2.1 I am an ex-officio member (as President of the CICM) of the NZ National Committee of the College of Intensive Care Medicine, which [Dr E] was previously a Member. I have no other conflicts to declare.

2. Should there have been consideration given to transfer of [Mrs A's] care to a tertiary facility at any stage?

2.1. There was no absolute indication to transfer [Mrs A] to another centre.

2.2. [The] Hospital as a regional hospital has an intensive care unit that is best described as a Level 1 (CICM 2010). Level I ICUs should have an established referral relationship with a Level II or Level III unit that should include mutual transfer and back transfer policies and an established joint review process.

2.3. Provision of mechanical ventilation and simple invasive cardiovascular monitoring for more than 24 hours is acceptable when the treating specialist is a Fellow of the College. In circumstances where the treating specialist is not a Fellow of the College this should only occur within the context of ongoing daily discussion with the referral Level II or Level III unit as outlined above.

2.4. It appears that [Dr E] was involved in [Mrs A's] care until at least the 18th. During this time there appears to be a slow but steady progression from being critically ill to a slowly weaning patient. There was consultation to the cardiothoracic unit in [another hospital (Hospital 2)] about the need to undertake decortication of the lung, with an agreed plan for this to be assessed at 6 weeks. [Dr E]

consulted the [Hospital 2] respiratory physician on the 16th, and there was subsequent discussion with the Cardio-thoracic team in [Hospital 2]. It is unclear if [Dr E] was available, or did review the patient in the subsequent week, or whether their VR–ICM was available for consultation in [Hospital 2].

2.5. The referral to [Hospital 2] was unnecessary, as all expertise and therapies that would benefit [Mrs A] were available [where she was]. Indeed, until the cardiac arrest and subsequent hypoxic encephalopathy [Mrs A] was making gradual improvement.

2.6. Nonetheless, if at any time there is insufficient expert intensive care medicine advice available within the hospital, advice on optimal management of the patient should be sought from a centre with specialist intensive care medicine expertise. Seeking advice should not necessarily mandate transfer on every occasion, but in the absence of a vocationally registered intensive care specialist, there should be an extremely low threshold for such consultation. However routine transfer of a patient should only be undertaken if it improves the care that is able to be provided. Patients admitted to an ICU from another hospital have higher hospital mortality and longer stay than those admitted from the ED (Flabouris, A., Hart, G.K., George, C. Transfers of critically ill patients carries a morbidity and mortality in excess of similar patients that do not require transfer and outcomes of patients admitted to tertiary intensive care units after interhospital transfer: comparison with patients admitted from emergency departments. (2008) Critical care and resuscitation: Journal of the Australasian Academy of Critical Care Medicine, 10 (2), pp. 97–105) so clinical acumen needs to be employed.

3. As far as you can determine, was the standard of monitoring of [Mrs A] in CCU consistent with expected standards and appropriate to her clinical condition? Was it standard practice in New Zealand critical care units for continuous monitoring to be discontinued in the period prior to transfer out of the unit?

3.1. Adequate monitoring is a core capability of all Intensive Care Units. Monitoring methods are not intended to replace vigilance by medical and nursing staff in the unit and may fail to detect unfavourable clinical developments. Furthermore, it is understood that the use of monitoring does not guarantee any specific patient outcome, since detection of a problem does not guarantee that treatment is appropriate or possible.

3.2. **Key appropriate monitoring includes**

3.2.1 **Personnel**

3.2.1.1 Clinical monitoring by a vigilant nurse is the basis of intensive patient care. This should be supplemented by appropriate devices to assist the nurse.

3.2.2 **Patient Monitoring**

3.2.2.1 *Circulation* — The circulation must be monitored at frequent and clinically appropriate intervals by detection of the arterial pulse, ECG display and measurement of the arterial blood pressure.

3.2.2.2 *Respiration* — Respiratory function should be assessed at frequent and clinically appropriate intervals by observation, supported by capnography and blood gas analysis.

3.2.2.3 *Oxygenation* — The patient's oxygenation should be assessed at frequent and clinically appropriate intervals by observation, pulse oximetry and blood gas analysis.

3.3. During the period in the intensive care clinical staff, aided by a number of devices measuring physiology parameters, monitored [Mrs A]. The letter from [the] (CEO) said there were 'some challenges' providing continuous monitoring. There are comments early on in the admission of agitation and demanding and 'throwing things on the floor' although I was unable to find specific mention of monitoring in the nursing notes. In the period from the 20th onwards her mood was described as 'flat'. There are regular recordings of the expected physiological parameters.

3.4. The period immediately prior to the cardiac arrest, there was period of undetermined length when [Mrs A] was neither observed by staff (sleeping behind closed curtain), nor had physiological monitoring connected.

3.5. It is unclear why this would be the case. She remained a patient in a critical care unit, with a tracheostomy in situ and despite a putative plan that she would be transferred to the ward, there was no indication that this was imminent. The withdrawal of ventilation (weaning), which had occurred, and the progression to decannulate the tracheotomy (by downsizing the cannula) are a period of some jeopardy to the patient, and not an indication for a reduction in vigilance. If physiological monitoring was not possible because of non-compliance, and agitation, this should have been documented, and close physical observation should have been employed.

3.6. It is usual for monitoring to be continued until the patient is transferred to the ward. The exception would be if a patient was discharged, but bed blocked from leaving the unit, and therefore may be treated as a ward level patient. This was not the case with [Mrs A].

3.7. It would appear that the standard of monitoring was below that expected for a patient in an intensive care unit, and there is no documentation in the clinical note that justifies a departure from what appears to be the normal standard in [the region]. However it is reassuring the staff and the administration have acknowledged this, apologised to the family, and taken steps to ensure that such a circumstance is unlikely to occur again. The new protocol for [the

hospital] specifies that monitoring should be continued throughout the stay.

4 Should there have been documentation of, or discussion regarding, [Mrs A's] resuscitation status prior to her collapse on [Day 35] given the nature and severity of her condition.

4.1 There is no indication in the notes, or elsewhere (other than in [Dr F's] letter) that [Mrs A] was not for full resuscitation in the event of a cardiac arrest. It was appropriate to initiate resuscitation when she arrested. However re-evaluation of that decision a short time later is also appropriate, as circumstances had changed. The [Day 29] entry makes no mention of a poor prognosis, or limitation in any therapy.

4.2 It is not uncommon for not for CPR orders to be revised, rescinded or instituted during time in the unit. In some units where there is immediate access to Intensive care consultants pre-emptive orders for CPR are not made, as the decisions about instigating and or continuing CPR is made at the time of arrest based on the best available clinical information at that time. One reason for this is that prognosis from a cardiac arrest may change over time, although not always for the worse. If a patient with septic shock, profound hypotension and anuria (despite very high dose vasopressor support) and with refractory hypoxaemia (despite ventilatory support) suffered a cardiac arrest, then CPR would not improve the outcome. However if the arrest did not occur in the acute phase but much later when intensive support has been successfully weaned, although the prognosis remains grave, then CPR is not necessarily futile. This may well have been the case in [Mrs A's] case. Even meticulously considered medically initiated "Not for CPR" orders need to be reconsidered as patients progress or diagnoses change. However as no documented decision appears to have ever been made to withhold CPR, and the staff appears to be not aware of such an order (or chose to ignore it) the impact of any decision by [Dr F] is non-existent. The in-house staff actions are consistent with [Mr A's] view, expressed in the complaint that the decision was not made until after the arrest. CPR was initiated as soon as the arrest was detected, and was initially successful in achieving a return of spontaneous circulation. Given the unexpected and apparently unheralded nature of the arrest the response of the nursing and junior medical staff was entirely appropriate in the absence of an appropriately documented or a contemporaneous verbal order.

4.3 Should the response to a cardiac arrest have been discussed with [Mrs A]? As the staff did not expect a cardiac arrest (evidenced by the reduction in monitoring vigilance) and it appeared to be an unheralded event, discussion about this eventuality was not necessarily indicated. While end of life decisions are appropriate to

discuss with, there was nothing in her acute presentation up until the time prior to the arrest that did not appear to be potentially reversible.

4.3.1 Reference

4.3.1.1 Freebairn R. CPR for All? Ethical and Medico-legal considerations**.** NZ Med J 2011,124(1328); 7–9.

4.3.1.2 McLennan S, Paterson R, Skegg PDG, Aickin R. The use of CPR in New Zealand: is it always lawful? N Z Med J. 2011;124(1328). http://www.nzma.org.nz/journal/124-1328/4511

5 Was the decision to transfer out of CCU (presumably planned for [Day 36] but to be confirmed by the DHB) clinically reasonable and appropriate?

5.1 There is no indication in the notes that [Mrs A] was to be discharged to the ward the next day, although clearly the patient was (until the arrest) assessed to be slowly improving and would have been in a state to be discharged once the tracheotomy had been de-cannulated. The last entry by [Dr E] on [Day 29] in the notes states 'I would be reluctant to send her to the ward with a tracheostomy, as she would be at high risk of bouncing back. The aim would be to remove the trachetube [tracheotomy tube] and have a clear plan in place what to do in the event of failure.' As neither of these had occurred (the removal or the longer term plan), this differs with the information provided to the family at the family meeting by [the Surgical Medical Director].

5.2 If the decision was made to transfer [Mrs A] out on [Day 36], it would seem (even without the arrest) to have been hasty, counter to the opinion expressed by the Intensive care specialist who cared for the patient only a few days before, and therefore inappropriate.

5.3 The letter from [the DHB] suggests that a non documented interim plan did exist. I accept that not all plans are fully articulated in written notes, and that the nursing staff may have [had] a tentative plan to transfer [Mrs A] to the Ward in the near future, perhaps even the next day.

5.4 It would not be beyond the realms of possibility that [Mrs A] may have been ready to have the tracheotomy de-cannulated, it is likely that a further period of observation would have been prudent. The steps to reduce the cannula size, reports of improvement, and reduction in secretion I am unsure if the comments about being weaned from monitoring are misconstrued or the comment taken out of context, but it is certainly not mainstream teaching that monitoring should be slowly withdrawn. The lack of monitoring is a moderate breach, with unfortunately disastrous consequences.

6 Please comment on the standard of communication with the patient and her family regarding [Mrs A's] condition, progress and prognosis.

6.1 Early in the admission there are daily comments of conversations by telephone or, when the family were visiting at the bedside [Day 34] there is a discussion about ventilation with the husband by [a doctor].

6.2 During the following long month period that [Mrs A] was in CCU there appear to irregular but frequent communication between the family and the clinical staff. The content of these discussions is not detailed [and there] may have been discussions with the family, that are not documented. The nurses have noted the presence of the family, and the presence or absence of phone contact. It appears that they have been made aware of at least some of the major issues with [Mrs A's] health. It may be wise for [the hospital's] CCU to routinely document at least the important family discussion.

6.3 [Mr A] does not complain about a lack of any information early in the care, just the specific not for CPR discussion and the transfer to the ward. These two specific issues, the transfer to the ward and the not for resuscitation order (if either of these were decided), do not seem to be have been communicated to the family. The transfer to the ward decision may not have been made at the time, in which case there is no breach in communication by the CCU staff. However this is contrary to the statement made by [the Surgical Medical Director]. If the decision had been made, and the news of this not communicated, it may have been intended to be communicated the next day, prior to transfer. If anything this is, at worst, a minor breach in information provided, and is explainable as a matter of timing. However as discussed earlier there is no evidence that decision was made, and if it had been made it would be counter to [Dr E's] previously articulated plan. This assertion relies on recall of the CNM, who was not at the meeting. There remains no primary documentation of this. Irrespective of whether discharge was planned, adequate monitoring should have been maintained

6.4 The not for CPR / resuscitation order is discussed above. Again there is no documentation in the clinical notes to support the suggestion a decision had been made prior to the arrest.

6.5 It could be that the communication issue arose because of the disconnect between what the clinical staff caring for [Mrs A] said, and the comments made by the administrative staff to [Mr A] in the subsequent meeting. It appears that in these meetings there were no representatives of the clinical staff present. It is unfortunate that it was not possible for the staff members who had cared for [Mrs A] to meet with [Mr A] in the first instance. [Mr A] [was] provided with explanations in this meeting that are not documented by documentation in the clinical notes.

7 Please comment on the standard of death certification (cause of death recorded with no reference to hypoxic brain damage or any antecedent or contributing pathologies).

7.1 The death certificate signed by [the house officer] includes the detail complying instruction on what is to be placed on the death certificate from [Dr F] (in the notes recorded by ? Dr […]. 016) — severe necrotizing pneumonia.

7.2 Omissions include

7.2.1 The discussed with coroner box is not ticked. This conflicts with the somewhat qualified statement in [Dr F's] letter to ACC.

7.2.2 There is no documentation of any discussion [Dr F] may have had with the coroner, nor any decision made by the coroner.

7.2.3 There is no time given for the approximate interval between onset and death (after 1A).

7.2.4 Nothing listed under Part II: other significant conditions contributing to death.

7.2.5 No mention of the Hypoxic encephalopathy that ensued from the cerebral hypoxia and ischemia during the cardiac arrest.

7.3 The completion of death certification in intensive care patients is difficult and subject to considerable interpretation. The international convention that underpins our death certificate was created in a far simpler world, and the whole death certification process is being reviewed by the Law Commission. 'Multiple causes of death' are involved often in deaths due to natural causes. When describing patterns of causes of death using only terms to indicate the underlying cause, important cause information is overlooked, and may be open to interpretation.

7.4 The accuracy of certificates is acknowledged to be generally poor, although [with] Intensive care patients there is more data, and there [is] more opportunity to make a considered decision. See

7.4.1 McAllum, C., St. George, I., White, G. Death certification and doctors' dilemmas: A qualitative study of GPs' perspectives (2005) British Journal of General Practice, 55 (518), pp. 677–683.(NZ Study)

7.4.2 Swift, B., West, K. Death certification: An audit of practice entering the 21st century (2002) Journal of Clinical Pathology, 55 (4), pp. 275–279.

7.5 There is no doubt that severe necrotizing pneumonia is one of the major factors causing death. The reason that [Mrs A] was in hospital was the severe necrotizing pneumonia, and her death was a consequence of that. However her initial recovery, to the point of being just shy of decannulation begs the clinician to describe the more immediate cause. Had the death resulted from progressive hypoxaemia from the necrotizing pneumonia the certificate, albeit incomplete, would have reflected a reasonable cause of death.

However it did not and the hypoxic encephalopathy occurring during intervening cardiac arrest was the immediate cause of the demise. This makes it very reasonable to include the 'hypoxic encephalopathy' on the form.

7.6 The [hospital] representatives advised [Mr A] to seek independent legal advice and to write to the registrar of deaths. The amended legislation Births, Deaths, Marriages, and Relationships Registration Amendment Act 2008, under 33 84 Correction of errors:

7.6.1 If a Registrar is satisfied, after making any inquiries under section 82 that seem appropriate, that information recorded under this Act or a former Act contains a clerical error, he or she must correct the error and notify the Registrar General of the error and its correction.

7.6.2 If the Registrar General is satisfied, after making any inquiries under section 82 that seem appropriate, that any information —

7.6.2.1 '(a) recorded under this Act or a former Act is incorrect, he or she must cause it to be removed and (if the Registrar General is satisfied that relevant information in the Registrar General is correct) cause the correct information to be substituted; or

7.6.2.2 '(b) in the Registrar General's possession and not recorded under this Act or a former Act is correct and should have been recorded, he or she must cause the information to be recorded.'

7.7 Given that there are several omissions from the original form, including the absence of times and the absence of mention of the other conditions contributing to death, [the DHB] may be prompted to reconsider their stance.

7.8 There is the opportunity for the original doctor, or in his absence the Chief Medical Officer, to write to the registrar seeking a change to the certificate.

7.9 If the cause of death was something directed by the Coroner [There is nothing in the notes to suggest this was the case] then this should be discussed with the coroner.

7.10 The family's concern over the lack of monitoring should have prompted a referral to the coroner.

7.11 If the coroner does not wish to take jurisdiction then I would suggest that a reasonable **Immediate cause of death part 1A:** hypoxic/ischaemic encephalopathy with the **Underlying cause of death: part 1B:** severe necrotizing pneumonia.

7.12 [Mr A's] request that hypoxic encephalopathy is listed as the immediate cause of death is not at all unreasonable.

8 Other issues. Post arrest care:

8.1 Immediately following the cardiac arrest.

8.1.1 Following the arrest and resuscitation a decision was made by the consultant [Dr F]. [Dr F's] recorded instructions are for 'Not for repeated resuscitation, not for inotropes ventilate for one hour until adrenaline wears off and R/V (review) neurological status. if remains obtunded — palliate.'

8.1.2 The cause of the cardiac arrest was unknown, the duration was unknown, and therefore the likely outcome (prognosis) could not be accurately predicted, especially in the early post arrest period. The clinical notes record the opinion that 'the outlook is grim'. There was a return of spontaneous circulation.

8.1.3 Based on these initial observations alone I believe it was premature to withdraw therapy.

8.2 Subsequent examinations and decisions.

8.2.1 There is a brief record of a neurological examination at 0005 by the anaesthetic registrar, which notes the return of the gag reflex demonstrated improvement from the previous examination.

8.2.2 Unfortunately the regular CNS recording on the daily observation sheet seems to have been converted to a record of air entry, and there is no sequential recording of Glasgow Coma scale (GCS) or other sequential observation, such as pupillary activity, in the nursing notes. This and the subsequent administration of the sedative and analgesia medication means further informed comment on the neurological state is difficult.

8.2.3 At 0005 the adrenaline had worn off (the effects would have disappeared less than twenty minutes after the last administration) so the problems facing [Mrs A] appeared to be:

8.2.3.1 the conditions preexisting prior to the arrest, including her resolving respiratory failure

8.2.3.2 the hypoxic/ischemic encephalopathy arising from the cardiac arrest

8.2.3.3 a relatively stable cardiovascular condition with mild hypotension

8.2.4 A record of examination at 005 notes no response to voice or pain, the pupils are small, of uncertain reactivity, and there is absent cough reflex but with a gag reflex present. The blood pressure (without support) was 90/60 and heart rate 90. This suggests an improvement in the neurological condition.

8.2.5 Based on these additional observations I believe it was premature to withdraw therapy.

9 Discussion with the family post arrest

9.1 A clinical note (I have assumed this is [Dr F's]) timed at 0230 on [Day 36] states that [Mr A] would like her to die, wants 'to stop providing further support and give comfort care'. 'He believes that

she would not want to go on like that, and that it has been a difficult time for her and her family.'

9.2 The clinicians are obliged to take into account the wishes of the patient. In patients that are unconscious or otherwise incompetent to provide informed consent and the consumer's views have not been ascertained, the provider takes into account the views of other suitable persons who are interested in the welfare of the consumer and available to advise the provider. [Mr A] was obviously a person with an interest in the patient and was available to advise the staff about the patient's likely desired outcome.

9.3 [Dr F] clearly records [Mr A] stating that [Mrs A] herself would 'not want this'. What 'this' is [is] not clear but if it is the 'outcome' or the 'treatment' the statement must have been based at least in part on the information given to him by [Dr F] and others, and what [Mr A] had observed.

9.4 The notes do not specify what information was given to [Mr A], or what degree of uncertainty in the prognosis was conveyed to him, and what attempts had been made to clarify his interpretation of the observed situation.

9.5 While consideration of a poor prognosis, and the desire to not allow [Mrs A] to suffer needlessly, would make consideration of 'palliative only' approach attractive, it appeared to comply with [Mrs A's] wishes and those of her family. Consideration should have been given to the potential reversibility of her coma, and the likely time course if it was reversible. It is possible to remove the suffering (with sedation and analgesia), while continuing therapy until a clearer prognosis could be established.

10 Withholding and withdrawing therapy

10.1 Subsequently, [Mrs A] developed the convulsions and the diarrhea. These new signs suggest that [Mrs A's] outcome was extremely likely to be very poor, as they are markers of prolonged ischaemia during the cardiac arrest. It may be that these signs were present and known to [Dr F], during his interview with [Mr A] but not documented.

10.2 Consideration of all the information available at 12 hours post arrest, it would be very reasonable to withdraw active treatment, continue with palliative care, and allow natural death to occur. On going active treatment at this time would have been futile.

10.3 However the initial decision to palliate, (withdraw active therapy) based solely upon the neurological status one hour following a cardiac hypoxic arrest has potential to disadvantage future patients. Assessment of the degree of hypoxic brain damage following a cardiac arrest is extremely difficult. Following the return of circulation following CPR, it may be some time before accurate prognostication is possible. The presence of a co-existing deteriorating cardiovascular, respiratory or other organ failure which was not considered reversible, it may be reasonable to withdraw or

with hold therapy. However [Mrs A] [had] undergone a significant recent insult from her pneumonia, but had responded to the intensive care therapy. Immediately prior to the arrest [she] appeared to be making a slow but steady recovery and was receiving a diminishing level of respiratory support, and was on a pathway to decannulation of the tracheotomy and subsequent discharge from the unit (quite possibly in the next few days).

10.4 Subsequent to the arrest decisions were made to withhold and withdraw some therapies. Decisions on withdrawal and withholding intensive care therapies are common, and if made properly are consistent with good medical practice.

10.5 The College of Intensive Care Medicine (CICM), and the Australian and New Zealand Intensive Care Society (ANZICS) have a joint statement on withholding and withdrawing therapy. It states that 'All decisions regarding the withdrawing or withholding of treatment should be documented in the clinical record. The documentation should include the basis of the decision, and should identify those amongst whom the consensus has been reached. Significant treatments that are to be withheld or withdrawn and those to be continued should be specifically documented. (Statement On Withholding And Withdrawing Treatment, College of Intensive Care Medicine of Australia and New Zealand IC14).'

10.6 It is difficult from the notes alone to establish whether a decision had been made to withhold therapy prior to the arrest. If the decision was made before her arrest and not documented, this is a breach in standards as it is not recorded (and therefore not available to other staff). If the decision to withhold CPR was made only after the arrest this would be consistent with acceptable practice, but then [Mr A] has been misinformed, as stated above, and this needs to be addressed. The decision to withdraw and withhold therapies other than CPR needs to be considered further.

10.7 The initial conditional decision to withdraw other therapy was made by [Dr F], after a telephone consultation.

10.8 It is not clear what other considerations [Dr F] made, or what he considered the underlying cause of the cardiac arrest, alternative diagnoses and the prognosis from hypoxic encephalopathy in coming to this decision.

10.9 It is not clear from the record, what [Mr A] was told in the period immediately after the arrest, about the prognosis. [Mr A] believed that [Mrs A] would not want further resuscitation and wanted to stop further support and give comfort care. The team were in agreement with this and subsequently a palliative care pathway was undertaken.

10.10 As the team (led by [Dr F]) and the family held a common view that the outcome for [Mrs A] was poor and unacceptable to [Mrs A] it would be easy to accept that this is not an area of concern. However immediately following the cardiac arrest there was 'a poor neurological response' with pinpoint pupils (non reactive) and no gag,

or cough, with a doll's eye reflex present. [Dr F's] recorded instructions are for 'Not for repeated resuscitation, not for inotropes ventilate for one hour until adrenaline wears off and R/V (review) neurological status. If remains obtunded — palliate.'

10.11 Neurologic prognostication for patients in coma from non-traumatic causes is complex and problematic. Most commentators stating definitive prognosis can be made only 48–72 hours after the event, the clinician must allow at least this amount of time for intensive therapy to have an effect. (Nolan P et al. Post-cardiac arrest syndrome Resuscitation (2008) 79, 350–379) No post arrest physical examination finding or diagnostic study has as yet predicted poor outcome of comatose cardiac arrest survivors during the first 24 hours after ROSC. (Peberdy, M.A., et al. Part 9: Post-cardiac arrest care: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care (2010) Circulation, 122 (SUPPL. 3), S768–S786.)

10.12 The decision to not provide further resuscitation in the event of a subsequent cardiac arrest is justifiable, as the neurological outcome from this is likely to be very poor and further CPR would be futile. Similarly sequential deterioration in other organ systems would be a trigger to review any resuscitation decision.

10.13 I am concerned that [Mr A] may [have] interpret[ed] that the decision was made because he requested the withdrawal. It need[ed] to be made very clear to him firstly that the decision to withdraw is a medical responsibility and should be based upon the summation for all the available information, not just family request, secondly subsequent information (the onset of convulsions and the diarrhoea) indicate that in retrospect the correct decision appears to have made, even if somewhat prematurely, thirdly I believe it is unlikely that [Mrs A] suffered as a result of the decision to withdraw immediately following the arrest.

10.14 My opinion [is] that the withdrawal of active therapy may not be universally held by others, but other intensive care medicine specialist physicians when asked to consider a very similar hypothetical (anonymous) case have stated that while the prognosis may be poor, it is also very unclear, that a good outcome is possible, and in the absence of other significant new organ failure a greater period of time is required before a definitive withdrawal is made. The subsequent changes in her condition would have changed this initial decision. However arbitrarily withdrawing based on an equivocal neurological examination within a very short time frame of a cardiac arrest does not assure that patients have the chance of the best outcome following resuscitation.

11 Summary:

11.1 [Mrs A's] care could have and should have been safely provided in [the hospital]. There was no need to transfer her to another institution.

11.2 The monitoring provided for [Mrs A] immediately prior to her arrest was below the accepted standard, and is a moderate breach in the expected care. The SDHB have formally apologized for this. They have also noted the lack of documentation of the deviation from expected monitoring.

11.3 The documentation and clinical discussion with the family during [Mrs A's] stay prior to the arrest was acceptable, although some aspects of the documentation could be improved.

11.4 The discussion, consideration of possible outcomes, and documentation following the Cardiac arrest could have been improved.

11.5 The death certificate is lacking detail, and does not correctly reflect the cause of death.

11.6 The question of whether there was a discussion with the coroner, needs to be clarified, and a suggestion [made] to either the registrar or the coroner that the death certification be adjusted."

Further expert advice

Dr Freebairn was asked to review his preliminary advice regarding the care provided following the cardiac arrest, based on further information provided to him. Dr Freebairn advised:

> "This information certainly provides a picture of a decision that is more considered than is immediately obvious from reading the clinical notes. My comments that it was premature are limited to only the initial plan made by [Dr F] immediately following the arrest (as conveyed by the entry in the notes immediately after the arrest), and in particular 'palliating' based on an equivocal neurological examination within a very short time frame of a cardiac arrest. This does not assure that future patients have the chance of the best outcome following resuscitation. I accept that the outcome in [Mrs A's] case when viewed in retrospect was very likely to be unchanged no matter what additional support was contemplated, and that in the event of a further cardiac arrest repeated resuscitation would be futile. The appropriateness of the not for further CPR decision is described in the original advice, and is confirmed by [Dr C] in the recent response. However therapy other than palliation could have been considered in the initial plan.
>
> Other events, including the subsequent convulsions, indicate that the hypoxic encephalopathy was highly likely to be severe, the expected outcome poor and the process followed to allow natural death appears reasonable. The unknown duration of arrest, or indeed the exact cause were not entirely clear at that time, along with its unexpected occurrence during a period of recovery means that prognostication is more difficult. Consideration should have been given to the potential reversibility of her coma, and the likely time course if it was reversible.
>
> The use of a neurological examination one hour post arrest as a prognostication tool is unreliable. It is possible to remove the suffering (with sedation and

analgesia), while continuing therapy until a clearer prognosis could be established. The subsequent convulsive activity made this prognosis clearer, and, as stated before it was reasonable to withdraw. [Dr F's] discussion with the family should have provided the opportunity for the likely outcomes to be discussed with a view to ascertaining [Mrs A's] wishes. Apart from a limited documentation of this process by [Dr F], an end of life discussion did take place at an appropriate time. Clinical notes pragmatically are succinct and often some nuances of what is intended are missed. It may be that 'palliate' in the notes may be shorthand for something like 'we need to consider whether further aggressive therapy is in [Mrs A's] best interests, given her morbidity and current situation', or 'consider palliation'. However as written it appears a definite plan, with little other consideration.

A minor but potentially important learning point is that it is unclear how 'a high CO_2 level despite vigorous mechanical ventilation' in the post arrest period necessarily indicates that she had a period of hypoxaemia prior to her arrest. Apnoea is one mechanism by which hypoxaemia can occur, and with the apnoea a rise in Carbon Dioxide would occur. However oxygenation and ventilation (CO_2 removal) are achieved by different but associated mechanisms, and hypercapnoea is not always the result of apnoea. The arterial carbon dioxide level can rise with or without initial hyperaemia (especially if supplemental oxygen is being given), just as hypoxaemia can occur despite normal carbon dioxide levels. There is more evidence of the reverse being true. Retrospective studies have identified hypocapnia in the intensive care unit as being independently associated with worse neurological and mortality outcomes in cardiac arrest patients. [Dr C] should reconsider whether the arterial carbon dioxide levels reflect duration of hypoxaemia in the post cardiac arrest scenario.

Eastwood GMI, Young PJ, Bellomo R. *The impact of oxygen and carbon dioxide management on outcome after cardiac arrest*. Curr Opin Crit Care. 2014 Jun;20(3):266–72."