Health and Disability Commissioner
Te Toihau Hauora, Hauātanga

A Decision by the Deputy Health and Disability Commissioner

(Case 20HDC01970)

Introduction

1. This report is the opinion of Dr Vanessa Caldwell, Deputy Health and Disability Commissioner, and is made in accordance with the power delegated to her by the Commissioner.

2. The report concerns a complaint from Mrs A and Ms B about the care and treatment provided to their late husband and father, Mr A, by Health New Zealand|Te Whatu Ora (Health NZ) Te Toka Tumai Auckland[1] at Auckland City Hospital. My sincere condolences go to the family for their loss.

3. Mr A had multiple myeloma (blood cancer) and was in a period of remission. After receiving an autologous stem cell transplant (SCT)[2] at Auckland City Hospital, Mr A's condition deteriorated eight days following the SCT, and he passed away shortly afterwards from neutropenic sepsis.[3] This report focuses on the timeliness of recognising and responding to his deterioration.

[1] On 1 July 2022, the Pae Ora (Healthy Futures) Act 2022 came into force, which disestablished all district health boards. Their functions and liabilities were merged into Te Whatu Ora|Health New Zealand (now called Health New Zealand|Te Whatu Ora). All references in this report to Te Whatu Ora Te Toka Tumai Auckland District and Auckland District Health Board now refer to Health NZ.
[2] Healthy blood stem cells from a patient's body are used to replace their diseased or damaged bone marrow.
[3] A life-threatening reaction to an infection, which can occur in patients with a low level of neutrophils (a type of white blood cell). It is a common and predictable risk of stem cell transplants.

Names have been removed to protect privacy (except Health NZ Te Toka Tumai Auckland, Auckland City Hospital and the advisor. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

4. The following issue was identified for investigation:

- *Whether Health New Zealand provided Mr A with an appropriate standard of care between 22 Month2[4] to 1 Month3 2020 (inclusive).*

5. The parties directly involved in the investigation were:

Mrs A	Complainant/wife/executor
Ms B	Complainant/daughter
Health NZ	Provider

6. Independent advice was obtained from a consultant haematologist, Mr Peter Ganly (Appendix A).

7. Health NZ completed an Adverse Event Review (AER) (Appendix B), which is discussed in this report.

8. Further information was obtained from ACC.

Background

9. Mr A, aged in his fifties at the time of events, was diagnosed with multiple myeloma[5] in 2019. Mr A underwent chemotherapy, and subsequently he went into deep remission.[6] In 2020 he was referred to the Auckland City Hospital Stem Cell Transplant Unit for consideration of a transplant.

10. Mr A was reviewed at the Bone Marrow Transplant (BMT) Clinic. Mr A was determined to be a suitable candidate[7] for an autologous SCT. The intended purpose of the SCT was to prolong Mr A's disease remission and improve his overall survival.

11. Mr A's stem cells were collected over 2–3 Month1. The AER states that his case was discussed at the BMT multi-disciplinary meeting, and on 3 Month2 he was approved to proceed with the procedure. Mr A signed the consent form on 7 Month2, with a plan to undergo the SCT that month.

Admission for melphalan chemotherapy and stem cell infusions — 22 Month2 to 1 Month3

12. On 22 Month2, Mr A was admitted to the haematology ward at Auckland City Hospital for the SCT.

13. That day, Mr A was administered a high-dose chemotherapy melphalan infusion in preparation for the transplant. On the following day (23 Month2) at around 5pm, the stem

[4] Relevant months are referred to as Months 1-3 to protect privacy.
[5] An incurable blood cancer that arises when plasma cells (a type of white blood cell that typically arises in the bone marrow) become malignant and multiply.
[6] A state of remission with little or no risk of disease progression.
[7] During the procedure, drugs were used at their maximum possible dose. This meant that only the 'fittest patients' were eligible — typically those aged over 50 years with good physical fitness.

cells were reinfused (Day 0). It was documented that there were no complications during these infusions.

Initial post-procedure period 24–30 Month2

14. On 24 Month2, a medical review indicated that Mr A was clinically stable. On 25 Month2 (Day 2), the clinical records show that Mr A began to experience nausea and was given regular anti-emetics.[8] The clinical records indicate that the nausea continued over 26–27 Month2, but Mr A's observations were stable.

15. On 28 Month2 (Day 5), it was documented that Mr A had developed neutropenia (very low levels of a type of white blood cell), diarrhoea, and abdominal pain. It was noted that Mr A had lost approximately 10 kilograms since his admission (likely from reduced food and fluid intake, and volume losses from diarrhoea),[9] and he was seen by the nutritionist.

16. On 29 Month2, a medical review noted the impression of chemo-induced nausea. The plan included to commence G-CSF (granulocyte colony stimulating factor — a treatment that increases white blood cells) that day. Mr A's observations remained largely stable over 29–30 Month2, although the nausea continued.

Significant deterioration — 31 Month2 and 1 Month3

Early Warning Score

17. Health NZ advised HDC that the Early Warning Score (EWS) assigns a score based on a patient's core vital signs[10] to determine the actions staff must take on a mandatory, graded escalation pathway.[11] The more abnormal the vital signs, the sooner the involvement of senior members of the medical and nursing team is required. Therefore, a key function of the EWS is to help staff identify acutely unwell and deteriorating patients and escalate care appropriately.

Morning ward round — 31 Month2

18. On Friday 31 Month2 (Day 8), junior registered nurse RN C[12] was assigned to look after Mr A for the morning shift. It was documented that at 8am, Mr A's EWS was 2, as he was experiencing a high heart rate (125 beats per minute (bpm)).

19. At 9.15am, Mr A was reviewed on the ward round by the Haematology Senior Medical Officer (SMO), Dr D, Haematology registrar Dr E, and the haematology ward charge nurse. The documented impression was of persisting nausea, and Mr A was prescribed further

[8] Medication used to treat nausea and vomiting.
[9] It was documented that Mr A had an elevated body mass index (and weighed approximately 140 kilograms prior to the SCT).
[10] This involves recording measurements of a patient's respiratory rate, oxygen supplementation, oxygen saturation, heart rate, blood pressure, temperature, and level of consciousness.
[11] The EWS escalation pathway has four 'zones', which correspond to required actions: 1–5 (yellow zone), 6–7 (orange zone — 'acute illness or unstable chronic disease'), 8–9 (red zone — 'likely to deteriorate rapidly') and 10+ (blue zone — 'immediately life-threatening critical illness').
[12] Health NZ told HDC that this nurse was new to the ward and had no previous nursing experience in Haematology.

intravenous (IV) fluids, his nausea medication was changed to olanzapine,[13] and an electrocardiogram (ECG) was ordered.

Visit from daughter

20. Ms B[14] said that she visited her father at approximately 11am. She told HDC:

> '[T]here was something really wrong with him. He got his vital signs checked quite regularly, approximately every hour but I felt like he actually should have been monitored much more closely, as his vitals were dangerous at what they were. I believe he should have been in [the High Dependency Unit] at this point under constant watch. I was repeatedly told he would come right and that it would come right after having the next bag of fluids … Then the next bag … then the next. He didn't improve one little bit.'

21. Ms B said that her father was breathing rapidly, had a high heart rate and low oxygen levels, and was unable to keep his eyes open for more than 30 seconds at a time. She also noted his urgent need to go to the toilet with diarrhoea, his difficulty getting up to go to the bathroom, and the stomach pains and extreme bloating he had experienced all day. Ms B told HDC that at the time, staff 'put [his symptoms] down to the diarrhoea'.

22. In response to the provisional opinion, Ms B told HDC:

> 'It is clear to me now that Dad was in fact septic from 11am, and increasingly got worse throughout the day. [H]e didn't become suddenly septic at 8pm as stated. He had obvious vital signs and overall presentation from 11am …'

Increased EWS

23. Health NZ stated that an ECG was taken at 11.26am and showed that Mr A had sinus tachycardia (increased heart rate).

24. At 12.30pm (four and a half hours after the previous observations had been taken), it was recorded that Mr A's EWS was 5, as he had a fast respiratory rate (22 breaths per minute) and increased heart rate (135bpm), but Mr A's heart rate was within the red zone[15] of the vital signs chart.

25. Health NZ advised HDC that tachycardia is common in patients who have undergone an SCT, due to the stress of the transplant and dehydration. However, Health NZ qualified this further by noting that tachycardia can also be an indication of developing infection and sepsis.

26. The mandatory escalation EWS pathway stated that for any vital sign in the red zone, the following actions should have occurred:

[13] A drug used to treat chemotherapy-related nausea. Drowsiness is a common side effect of olanzapine.
[14] In response to the provisional opinion, Ms B stated that she has worked on the front line as an emergency medical technician.
[15] The 'red zone' indicates that the patient is 'likely to deteriorate rapidly'.

'Registrar & P[atient] a[t] R[isk][16] review within 30 min (call SMO if Registrar unavailable). Consider ICU referral.

- Notify Registrar & PaR Nurse
- Inform Nurse in Charge/CNS
- Increase Obs[ervation] frequency to minimum [every] 30 minutes[17]
- Document in notes'

27. There is no evidence in the clinical records that the registrar, PaR nurse, or charge nurse were informed of Mr A's red zone vital sign. However, the AER states that registrar Dr E was informed that Mr A's heart rate was within the red zone,[18] but neither the charge nurse nor the PaR team were informed. Health NZ said that at the time, Dr E attributed Mr A's rapid breathing to a failure to take asthma medication since admission.[19] Although this review was not documented, asthma medication was prescribed by Dr E at this time, with a first dose recorded as being given at 1pm.

28. In response to the provisional opinion, Mrs A and Ms B stated that Mr A was instructed to use his inhaler 'despite telling the nurse he [did not] feel short of breath', and there was no improvement in his tachypnoea after he used the inhaler.

29. At 1pm, Mr A's EWS increased to 6, and both his respiratory rate (28 breaths per minute) and heart rate (132bpm) were within the red zone.

30. The mandatory escalation EWS pathway also provided (in addition to 'red zone' escalation) that when the EWS is 6–7 (acute illness or unstable chronic disease), the following actions should have occurred:

'House Officer & PaR review within 60 mins (call Registrar if [house officer] unavailable).

- Notify [house officer] & PaR Nurse
- Inform Nurse in Charge/CNS
- Increase Obs[ervation] frequency to minimum [every] 60 minutes[20]
- Document in notes'

[16] The AER stated that the Patient at Risk (PaR) team is a group of specialist nurses who provide a 24-hour service aimed at assisting in the management of deteriorating patients on wards, focusing on early patient assessment and timely intervention by providing independent recommendations.
[17] Increase the frequency of observations to every 30 minutes.
[18] The exact time Dr E was notified of this was not documented in clinical notes. However, Health NZ stated that the review likely occurred between 12.30pm and 1pm (as Mr A was administered medication to treat asthma at 1pm).
[19] Ms B told HDC that her father was not reliant on daily use of his inhalers.
[20] Increase frequency of observations to every 60 minutes.

31. There is no documentation to indicate that staff escalated Mr A's EWS in accordance with the mandatory red zone escalation pathway or the EWS 6–7 score pathway. The AER states that at approximately 1pm, Mr A's assigned nurse, RN C, spoke to another junior nurse on the ward, RN F, who suggested that a Patient at Risk (PaR) review[21] occur. At 1.28pm, RN C requested a non-urgent PaR review, and the message request indicated 'already informed registrar'. However, the AER states that the registrar, charge nurse, and ward coordinator were unaware that RN C had contacted the PaR team.

32. At 2pm and 2.30pm, Mr A's EWS remained at 6, and his respiratory rate and heart rate remained in the red zones. At 2.30pm, RN F also documented: 'PaR informed and registrar.'

33. Ms B told HDC that at approximately 3pm, she noticed that her father's feet were 'purple and swollen'. She said that she informed the nurse, who then spoke to the registrar on the ward. There is no documentation of this discussion.

34. No further observations were taken until 3.45pm, when it was documented that Mr A's EWS was still 6.

PaR review and escalation to registrar — 3.55pm

35. At 3.55pm (almost two and a half hours after the PaR request[22]), PaR nurse specialist[23] RN G[24] reviewed Mr A. She noted that Mr A was breathing rapidly, speaking in shortened sentences, appeared drowsy, and had experienced watery diarrhoea throughout the day.

36. RN G documented Mr A's observations and the EWS of 6 in the chart at 4.05pm. The documented PaR plan included chest X-ray, further IV fluids ('per registrar advice'), to re-escalate for concern or per the EWS pathways, and to increase observation frequency, and for further PaR nursing review in two to four hours.

37. Although not documented, Health NZ stated that RN G then called for assistance from a senior colleague in the PaR nursing team (name unknown), who reportedly became immediately concerned by Mr A's clinical status and notified Dr E.

Medical review — 5pm

38. Dr E documented that he reviewed Mr A at 5pm. After reviewing Mr A, Dr E documented his impression of dehydration and charted further intravenous fluids. Dr E documented that Mr

[21] A group of specialist nurses (the PaR team) provided a 24-hour service to assist in the management of deteriorating patients on wards. The PaR team prioritises patients depending on the information received when a referral is made, the acuity of other requests received, and any code calls to which they need to respond.

[22] The AER stated that after Mr A's review request came through, the PaR team responded to two code calls and an urgent referral, resulting in a delay in reviewing Mr A.

[23] On Friday 31 Month2, the PaR team had an additional nurse specialist (PaR A) on duty from 3pm–3am. Health NZ stated that this shift was an additional shift introduced as part of the District Health Board's COVID-19 and winter planning (to cover anticipated higher admissions to the hospital). However, Health NZ told HDC that the PaR service no longer has this additional shift.

[24] Health NZ told HDC that RN G was new to the team and orientating to the role.

A had increased drowsiness with olanzapine medication and made a note to decrease the dose for the next day.

39. The AER states that neither SMO Dr D nor the charge nurse were informed of the change in Mr A's clinical status and that he had been reviewed by the PaR team.

40. The AER states that at 4.41pm, the chest X-ray showed no abnormality or features suggestive of infection. At 5.04pm, a blood test indicated that Mr A had raised lactate,[25] and his creatinine[26] levels had risen from the previous test at 2.10pm the same day.

41. Ms B told HDC that at this time, she observed her father having hot and cold sweats. She stated that she had asked staff 'numerous times if they thought he had a fever', to which they replied that he did not. However, Ms B was concerned that staff 'only took his temperature under his tongue' when he was breathing through his mouth and seemed too weak to hold the thermometer in his mouth.

Haematology handover

42. The AER states that between 5.30pm and 6pm, Dr E provided an off-ward, in-person handover to the on-call Haematology registrar, Dr H,[27] who was beginning her shift, but Dr E did not convey any urgent concerns and asked Dr H to review Mr A later that evening.

43. The AER also states that Dr E updated[28] the Haematology SMO, Dr D, about Mr A's condition — namely that Mr A was experiencing on-going tachycardia, receiving intravenous fluids, experiencing drowsiness related to the olanzapine, was answering appropriately, and was clinically stable.

44. The AER states that neither Dr E nor Dr D provided a handover to the night on-call Haematology SMO, Dr I, who was starting her shift and working from home. Health NZ said that Haematology SMO-to-SMO handovers do not normally occur unless there are 'major specific concerns' about a patient, and nor does the day Haematology registrar routinely hand over patients to the on-call Haematology SMO, unless there are 'specific concerns' about a patient.

45. Mr A's observations were taken at 6.30pm (2.5 hours after his last documented observations), and it was documented that his EWS was 6, Mr A had an increased heart rate and respiratory rate, he had been seen by the PaR nurse, and the registrar had been informed.

46. Ms B told HDC that around this time, she noticed that her father had a 'very deep blood looking rash on his chest, neck and ears', and described it as a 'meningitis looking rash'. Ms

[25] A raised lactate level may signify that organs and tissues are not receiving enough oxygen (anaerobic metabolism) or impairment of the body's ability to remove lactate.
[26] A high or rising creatinine level typically indicates that a patient's kidneys are not functioning properly.
[27] Health NZ told HDC that Dr H was an experienced Haematology registrar.
[28] Health NZ's AER notes that there were differing recollections regarding whether Dr E informed Dr D about Mr A's fast breathing rate (tachypnoea).

B stated that she was informed that it was likely due to the magnesium being given to her father and would go away once her father was given potassium.

First Code Red — 31 Month2 at 7.30pm

47. At 7.30pm, a Code Red[29] was called by the night nurse. Mr A's EWS was not calculated, but his heart rate had increased to 140–150bpm and his respiratory rate had increased to 50 breaths per minute, which were both in the 'blue zone', and he now had a high temperature of 39.4°C.

48. This appears to have been in accordance with the escalation EWS pathway, which stated:

> 'EWS 10+ or any vital sign in the blue zone — Immediately life-threatening critical illness
>
> Action:
>
> - Dial 777
> - State "Code Red" and give the patient's location
> - State "Code Blue" in the event of cardiac arrest
> - Stay with patient, continuous monitoring if available
> - Support airway, breathing and circulation'

49. Ms B told HDC that she was concerned by the attitude of staff, as they started to appear worried only at this point, despite her father having been like that all day.

50. The resuscitation record indicates the attendance by staff at 7.35pm. The AER states that both Dr H and PaR RN G attended, as well as the Department of Critical Care Medicine (DCCM)[30] registrar and medical registrar, although the medical registrar did not stay as Dr H and the DCCM registrar were actively managing the Code Red.

51. The AER states that the DCCM registrar did not hand over a review of Mr A or the code call to the oncoming night DCCM registrars (Dr J and Dr K) at the end of the DCCM registrar's shift at 8pm, nor document a review in the DCCM outlier book.

52. At 8.14pm, Dr H documented that she had attended the Code Red, and she recorded her examination findings. She documented her impression of neutropenic fever with systemic inflammatory response syndrome (SIRS).[31] The documented plan included antibiotics, oxygen therapy, and various tests, with further review later. There is no documentation from the DCCM registrar or PaR nurse about this attendance.

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[29] Health NZ stated that a Code Red is a medical emergency in which people from key medical teams respond (such as the medical registrar, DCCM registrar, and PaR nurse specialist).

[30] The DCCM provides critical care to patients with sudden and potentially life-threatening diseases or injuries and is divided into two areas/units: intensive care (ICU) and high dependency (HDU).

[31] A serious condition in which there is inflammation throughout the whole body. The presence of SIRS with a suspected source of infection is known as 'sepsis'.

53. Between 8pm and 8.15pm, Mr A was administered antibiotics (Tazocin and gentamicin).

54. Dr H did not admit Mr A to the DCCM or escalate his care to the on-call SMO. The AER states that while she was concerned about his clinical status, she did not think DCCM admission was needed at this stage as he was receiving the required medical management in the form of antibiotics and intravenous fluids on the haematology ward. Therefore, Dr H did not feel that escalation to the on-call SMO, Dr I, was required.

55. Ms B stated that during this time, the nurses assured her that this was a 'textbook' situation, stating that if her father's blood pressure was stable, he would be fine and there was no need to alert family.

56. At 8pm, 8.30pm, and 9.30pm, Mr A's EWS was documented as remaining at 10+ with his respiratory rate in the blue zone, and his heart rate still in the blue zone at 8.30pm. There is no evidence that the 8.30pm and 9.30pm recordings were escalated as directed by the EWS escalation pathways.

Handover to on-call Haematology SMO and Medical Specialties registrar

57. At 10pm, Dr H reviewed Mr A again and documented that he remained tachycardic and tachypnoeic.

58. The AER states that at approximately 10pm, Dr H provided end-of-shift handover to:

a) The night on-call Haematology SMO, Dr I, via telephone. Dr H informed Dr I that Mr A had neutropenic sepsis. The AER states that Dr I was not aware that Mr A had been significantly unwell all afternoon and believed that the onset of sepsis had occurred around 8pm, and so was 'content with the current management plan'.

b) The on-call Medical Specialties registrar, Dr L, via a face-to-face handover.

59. Ms B said that around this time she was told that her father might need to go to the High Dependency Unit (HDU) 'at some stage if he didn't improve or respond to the antibiotics'. She was told not to go far but was reassured by staff that this 'wasn't a huge cause for concern'.

60. At 10.30pm, Mr A's EWS is documented as remaining at 10+ with his respiratory rate in the blue zone.

Review by Medical Specialties registrar — 10.50pm

61. At 10.50pm, Dr L reviewed Mr A and noted that he looked very unwell, had a tight distended abdomen and was having trouble breathing (despite having a clear chest). Dr L's documented impression was that Mr A had neutropenic colitis.[32]

[32] A serious complication of having low neutrophils (a type of white blood cell), often resulting in the death of parts of the bowel and colon.

62. The AER states that Dr L did not think that Mr A met the criteria for DCCM admission, as he considered that Mr A did not need inotropic support[33] at this stage. Dr L documented that he planned to re-review Mr A.

Second Code Red — 11.55pm

63. At 11.15pm, Mr A's EWS was recorded as 10+ with his respiratory rate still in the blue zone, and at around 11.55pm, a second Code Red was called for his EWS of 10+ and two vital signs in the blue zone. The AER states that the Code Red was called by PaR RN G when she attended for a re-review.

64. DCCM registrar Dr J attended the code call and documented that Mr A would likely need to be admitted to the HDU. Dr J documented that he discussed this with Dr L, who was to discuss with the SMO whether Mr A would require a CT scan first. The AER indicates that the DCCM requested a CT scan.

65. At 12.13am (1 Month3), Dr J left the haematology ward to respond to a trauma emergency code in the Adult Emergency Department (AED).

66. The AER states that at 12.30am, Dr L telephoned Dr I, who advised against a CT scan as this would be risky given that Mr A was showing signs of acute kidney injury.[34] Dr I advised giving Mr A meropenem (an antibiotic) to broaden the antibiotic spectrum cover. The AER states that Dr I was under the impression that Mr A was going to the DCCM 'imminently'.

67. At this time, Ms B received a telephone call from Health NZ stating that staff were about to admit her father to the DCCM as he had deteriorating kidney function.

68. The AER states that at 12.45am, RN G, who had stayed at Mr A's bedside, had not received an update regarding Mr A's admission to the DCCM, and she called Dr J. The AER states that as Dr J was still attending to the patient in AED, he did not have an opportunity to speak with the DCCM Acting Charge Nurse (DCCM ACN) about bed availability.

69. The AER states that at 1.03am, Dr J informed the DCCM ACN that two patients required admission (Mr A and the AED patient), and that the AED patient would require admission first (as this patient was intubated).

70. The AER states that at 1.13am, RN G had not received a further update from Dr J, so she called the DCCM ACN directly. The DCCM ACN advised that Mr A 'could be admitted in 30 to 40 minutes', although this is not documented.

DCCM admission — 1 Month3 at 2am

71. Mr A arrived in the DCCM at approximately 2am, with a diagnosis of septic shock of likely gastrointestinal source.

[33] Inotropic medications help to stabilise blood pressure and optimise oxygen supply to vital organs.
[34] Health NZ stated that the doctors did not think Mr A's kidneys would tolerate the radiographic contrast media (a colourless dye that shows up on X-ray pictures and scans), as it can damage impaired kidneys further.

72. The AER states that Mr A continued to deteriorate, and there was discussion between the DCCM team and Dr I about whether to undertake a CT scan of his abdomen. However, this was decided against as it would not change his current management plan.

73. The AER states that the DCCM SMO, Dr K, recognised that Mr A was critically ill and dying and that no intensive care treatment would reverse this outcome, and so Dr K decided to provide palliative care while keeping Mr A conscious enough to allow time for his family to arrive and spend time with him. Sadly, Mr A passed away at 8am on 1 Month3.

74. In response to the provisional opinion, Mrs A told HDC that Mr A did not have a support person with him when they told him he was dying, and she considered that this would have been a 'very frightening experience for him'.

Subsequent events

Family meetings

75. Health NZ met with the family on 31 Month3 (initial family meeting[35]) and in 2020 (follow-up meeting[36]).

Adverse Event Review

76. On 19 March 2021, Health NZ's AER was distributed to the family and HDC. The AER findings included the following:

a) Finding 1: There was a delay in recognising neutropenic sepsis in a patient with no fever. This resulted in the delayed administration of antibiotics. In addition, there were issues with neutropenic sepsis education and guidelines.

b) Finding 2: There were issues with the recognition and response to a deteriorating patient, particularly around escalation and handover:

   i. Missed escalation: There were multiple occasions on 31 Month2 where actions and escalation based on the mandatory EWS escalation pathway did not occur, indicating that 'all parts of the system [were] not working well' (including in the nursing, PaR and medical streams). In addition, there was a lack of interdisciplinary communication and robust support for junior or less experienced nurses.

   ii. The culture of escalating concerns to senior nursing colleagues on the ward: RN C was new to the ward and sought advice from another junior nurse, RN F, which led to the request for a PaR team review.

[35] The purpose of the meeting was to acknowledge and discuss the complaint the family had made with Health NZ. The family were told that a review would occur within six weeks and the team would answer the family's questions.

[36] During the follow-up meeting, Health NZ apologised that the review was taking longer than six weeks. The Clinical Effectiveness Advisor apologised for the 'unrealistic timeline given' and for the 'distress and disappointment' caused. Health NZ provided a revised timeframe for completion of the report (between the end of February and the beginning of March 2021).

iii. Senior medical staff were not informed: Neither the registrar, charge nurse, nor ward co-ordinator were informed that a PaR review had been requested.

iv. PaR nurse specialists did not escalate concerns to the Haematology SMO: The standard practice in the Haematology service was for the PaR team to escalate concerns to the Haematology registrar (and not directly to an SMO).

v. The Haematology SMO did not review Mr A after the Haematology registrar update.

vi. There was no formal medical[37] handover process or update on patients in the haematology ward. However, it was noted that there were ongoing SMO reviews occurring[38] and ward rounds.[39]

vii. The clinical management plan was not re-evaluated when there was no improvement in clinical status: Mr A's respiratory rate was consistently within the 'blue zone', but care was not escalated.

viii. There was a lack of documentation and handover of reviews and code calls.

ix. The on-call Haematology registrar did not inform the on-call Haematology SMO about the code calls (as the Haematology registrar felt that escalation was not required at that stage).

x. There were missed opportunities for earlier admission to the DCCM. This included 'the uncertainty and communication around whether [Mr A] required a CT scan [which] distracted from earlier admission opportunity to the DCCM'.

c) Finding 3: There were various concerns with the model of care[40] on the haematology ward. This included:

i. Pressures on the ward to increase ward bed capacity and staffing (given the COVID-19 pandemic and winter season).

ii. Education and training for new nurses: Due to contract time constraints, RN C received a shorter than normal orientation and retracted version of the 'New to Cancer' course. It is 'not possible to provide all the necessary training to a nurse who is on a short, fixed term contract', and 'there is no current system in place to mitigate this risk'.

[37] Between the Haematology SMO and Haematology registrar.
[38] In the BMT/SCT team (routinely, two in-person SMO rounds per week); SMO attends the ward every day to provide support for the registrars and will review any patient about whom the registrar or nursing team are concerned.
[39] A weekly ward meeting was held on a Wednesday afternoon, where targeted case reviews occurred. Health NZ stated that this was attended by the majority of the Haematology SMOs and registrars. In addition, there was an MDM held every Friday, where haematologists and Infectious Disease and Radiology colleagues reviewed patients. Health NZ stated that these Friday meetings incorporated a handover process for the weekend team.
[40] The way health services are delivered. It outlines best practice care and services for a person, population group, or patient cohort as they progress through the stages of a condition, injury, or event.

iii. Ward acuity: On 31 Month2, the ward had a negative staffing variance, meaning that the acuity of patients[41] and the number of nursing hours they required was more than the number of hours the nurses could provide on the shift.

iv. Allocation of nurses to patients: Nurses are typically assigned to look after patients based on their experience and patient acuity. However, as the charge nurse was not aware of any concerns with Mr A, RN F (another junior nurse) was assigned to look after Mr A for the afternoon shift (3–7pm).

v. Medical management and nursing: The DCCM was not resourced to admit all patients following a Code Red;[42] however, there were no capacity issues with beds or staffing at the time Mr A was admitted. Further, there was no intermediary set-up or nursing resource in the ward to provide a high dependency nursing model of care for Haematology patients who required near-continuous assessment and monitoring, and aggressive fluid management.

d) Finding 4: The family felt that their concerns were not always heard and responded to.

e) Finding 5 (incidental finding[43]): There were issues with the onsite support of senior medical staff after hours and registrar workload.

ACC treatment injury

77. Dr I submitted a treatment injury claim with ACC for 'death from infection complicating autologous stem cell transplant for myeloma'.

78. After declining the first treatment injury claim on 14 July 2021, ACC sought external haematology and nursing advice. A subsequent treatment injury claim was accepted on 27 July 2021 for 'death from complications of treatment appropriately given'.

79. A haematologist advised ACC of the following:

a) Mr A's initial post-transplant process followed an expected pathway. For example, Mr A's severe diarrhoea and abdominal pain was consistent with an expected melphalan-induced intestinal mucositis.

b) However, by Friday 31 Month2, the clinical situation 'significantly changed with the development of tachycardia and tachypnoea and a systolic [blood pressure] of 100'.

c) Neutropenic sepsis is an expected consequence of the treatment Mr A received.

d) When attempts to obtain Mr A's blood pressure failed, manual blood pressure recordings should have been attempted to determine whether Mr A had low blood pressure.

[41] How unwell a person is and how much care they need.
[42] However, Health NZ noted that an escalation plan for capacity constraints is available in the DCCM.
[43] Health NZ stated that this finding 'did not have a direct impact' on Mr A's outcome (as Mr A was 'fortuitously' first on the Medical Specialties registrar's list to be reviewed).

e) Mr A was known to have a severe neutropenia and was therefore at risk of neutropenic sepsis. In this complex clinical situation, the clinical practice would be to resuscitate the patient with IV fluids, to improve the blood pressure and protect the renal function, and, if infection was considered possible, empirically start intravenous broad-spectrum antibiotics whilst awaiting the results of blood cultures. It could not be known for certain if the earlier administration of empirical parenteral antibiotics would have changed Mr A's outcome.

f) Given Mr A's progressive deterioration on 31 Month2, it would have been prudent to have had a low threshold for transferring Mr A to HDU or ICU.

80. A registered nurse advised ACC that the nursing care provided to Mr A on 31 Month2 was reasonable and appropriate.

Responses to provisional opinion

Mrs A and Ms B

81. Mrs A and Ms B were given an opportunity to respond to the information gathered during the investigation. Their comments have been incorporated into this report where relevant and appropriate.

82. In response to the instances where actions were said to have occurred but were not documented, Mrs A and Ms B considered that 'if it wasn't recorded or documented, it didn't happen'. In addition, they stated that Mr A was not given appropriate pain relief to manage his severely sore back (particularly in the last 12 hours), which 'added stress to his already vulnerable state'.

83. Mrs A and Ms B told HDC that it was 'blatantly obvious' that Mr A was let down by the medical professionals involved in his care. They stated that he did not receive the early or appropriate care he deserved and should have received, and therefore, 'wasn't given the opportunity to fight' (which led to his very sudden death) due to 'negligence'.

Health NZ

84. Health NZ was given an opportunity to respond to the provisional report. Health NZ stated that it agreed with the recommendations (listed below).

Opinion: Health NZ — breach

Introduction

85. Health NZ is responsible for the operation of the clinical services it provides. Under the Code of Health and Disability Services Consumers' Rights (the Code), Health NZ must ensure that its staff provide health services with reasonable care and skill and with an adequate level of co-operation, to ensure the quality and continuity of services.

86. Mr A's progress after his SCT followed the expected course over the first eight days, but he deteriorated over 31 Month2 and, sadly, he passed away the next day.[44] I am concerned that several opportunities to recognise Mr A's deterioration and to escalate his care were missed.

87. This case highlights several systemic and organisational issues within the Haematology service at Auckland City Hospital at the time of events, which will be discussed in this section of the report.

Standard of care 31 Month2–1 Month3 — breach

88. Right 4 of the Code provides a right for the provision of services of an appropriate standard and affirms the duty of 'reasonable care and skill' on providers (Right 4(1)).[45] In my view, there were several deficiencies in the standard of care provided to Mr A on 31 Month2. This included the delayed recognition of neutropenic sepsis (a known possible outcome of SCT) and the subsequent delay in administration of antibiotics, and issues with escalation of care.

Delayed recognition of sepsis and administration of antibiotics

89. In the morning of 31 Month2, Mr A's EWS was 2, as he was experiencing a high heart rate. By 12.30pm, Mr A's EWS was 5 and his heart rate was within the red zone of the vital signs chart. At 1pm, Mr A's EWS increased to 6, and both his respiratory rate and heart rate were within the red zone.

90. Mr A's EWS remained at 6, and no fever was recorded until 7.30pm, when a Code Red was called for his heart and respiratory rate, which were both in the 'blue zone', and his high temperature of 39.4°C. It appears that neutropenic sepsis was considered for the first time at this point, and antibiotics were first administered to Mr A between 8pm and 8.15pm.

91. Mr A was reviewed by multiple staff after the morning ward round and throughout the day, including by a registrar, a PaR nurse, and several ward nurses.

92. At the time of events, Health NZ's 'Neutropenic sepsis in adult haematology guideline' emphasised that diagnosis of neutropenic sepsis required the presence of a high temperature (alongside the presence of neutropenia).[46] The AER notes that the guideline did not mention the possibility of neutropenic sepsis in the absence of a high temperature, and, as Dr E had not seen neutropenic sepsis without a high temperature, he did not include it in the differential diagnosis. Taking these factors into account, I cannot be critical of Dr E individually for not considering this in the initial working diagnosis, and I will look to the systemic issues that contributed to this situation developing.

[44] Dr Ganly advised that Mr A underwent a procedure with accepted significant morbidity and low mortality and followed the expected course throughout the first eight days.
[45] Right 4(1) of the Code states: 'Every consumer has the right to have services provided with reasonable care and skill.'
[46] The guideline defined neutropenic sepsis as 'neutropenia and either temperature [greater than] 38.5°C on one occasion (or at least [greater than] 38°C on two occasions within two hours'.

93. However, the AER states that neutropenic sepsis is a 'common and predictable complication of bone marrow disorders and cytotoxic chemotherapy', and there is widespread recognition that it is a medical emergency. Therefore, Health NZ accepted that 'there needs to be a high index of suspicion for infection in all patients undergoing chemotherapy who become unwell, even in the absence of fever'. Further, the AER states that the preferred method for taking Mr A's temperature should have been axillary (under the arm), given the standard practice on the haematology ward to take a patient's temperature orally, 'unless the patient has mucositis and/or is mouth breathing'; and in the event of difficulty in taking a patient's temperature, the next method would be to take an axillary temperature.

94. My independent advisor, Dr Peter Ganly, advised that the recognition of sepsis is based on the development of abnormal symptoms and signs — in particular, the presence of a fever, tachycardia, and tachypnoea. Dr Ganly noted that the absence of fever in a patient with severe neutropenia is 'well documented', and while a fever may be a strong indicator of sepsis, 'it does not have to be present and may not be present'.[47]

95. Dr Ganly advised that regardless of the presence of a fever or whether the correct technique for measuring temperature was performed correctly by nursing staff, observations made in this case (a patient who was seven days post high-dose melphalan and had severe neutropenia) made it likely that sepsis was well established approximately 12 hours before the time at which high fever was first recorded (ie, approximately 7.30am on 31 Month2). Dr Ganly advised:

> '[Mr A's] deterioration was highly unlikely to be due to asthma, electrolyte infusion or sedative effects of drugs. [R]ather, the overwhelming likelihood was neutropenic sepsis from some source or another, and the correct treatment was the immediate introduction of broad spectrum antibiotics, on the morning of 31 [Month2], irrespective of whether or not a fever was present.'

96. Dr Ganly said that the care provided was inadequate as Mr A's deterioration from early in the morning was not recognised for several hours, and that delayed the commencement of antibiotic therapy. Dr Ganly advised that the 12-hour delay in treatment with antibiotics constituted a 'moderately serious departure from the standard practice expected in a specialised haematology service'.

97. I accept Dr Ganly's advice. I note also that the AER identified that there was a delay in recognising neutropenic sepsis in a patient with no fever, and this resulted in the delayed administration of antibiotics. While I am unable to determine whether earlier recognition and administration of antibiotics would have altered the course of Mr A's deterioration, I am critical that he did not receive timely treatment.

Delay in escalating care on 31 Month2

98. Health NZ's 'Adult Vital Sign Monitoring, Early Warning Score Measurement and Clinical Escalation' guideline defined minimum standards for measuring and recording the vital signs

[47] For example, a temperature below normal due to hypoperfusion (low blood flow) can indicate sepsis.

of adult inpatients, calculating the EWS, and using the escalation pathway. The purpose of the guideline was to ensure the timely recognition and response to inpatient physiological deterioration. As highlighted within the guideline, the risk of non-compliance was 'significant harm to the patient/DHB'.

99. Dr Ganly told HDC that score charts and pathways are critical in balancing out variables such as training, experience, personalities, and team culture. He noted that these variables influence the process of patient handovers, degree of concern, and indications of escalation of care within teams.

Failure to follow EWS and escalation pathways

100. The mandatory EWS escalation pathway was not followed on multiple occasions on 31 Month2. I note the following:

a) After 12.30pm, Mr A's observations should have been taken at least every 30 minutes. However, observations (and EWS calculations) were not taken at 1.30pm, 3pm, 3.30pm, 4.30pm, 5.30pm, 6pm, and 7pm.

b) At 4.05pm, increased observations were recommended by the PaR nurse, but as noted above, this did not occur.

c) Despite the Code Red at 7.30pm, there were further occasions on which Mr A's observations were not taken, at 9pm, 10pm, and 11pm. Observations were taken at 11.15pm (which showed an EWS of 10+ and blue zone vital signs), but the next set of observations taken were at 11.55pm when a second Code Red was called by the PaR nurse who had returned for review.

d) All of Mr A's observations taken after the Code Red at 7.30pm had his respiratory rate and heart rate in the blue zone. However, a further 777 call was made only at midnight.

e) On multiple occasions (as outlined in the 'Background' section above), the relevant staff members (such as the registrar, PaR nurse, and charge nurse) were not notified of the abnormal observations.

f) Following Mr A's first red zone vital sign at 12.30pm, there were no documented considerations of DCCM (ICU or HDU) referral until 12.30am on 1 Month3.

g) There was a lack of direct escalation to the DCCM by staff at 12.30am on 1 Month3, despite delays in Mr A being transferred to the DCCM (after the DCCM registrar review).

101. Dr Ganly advised that the EWS systems were not always followed in Mr A's case. Dr Ganly noted the findings of the AER and agreed that the care provided was inadequate, in that despite staff having been aware of Mr A's deterioration since midday and having observed a change in his vital signs, rapid escalation of care to the ICU/DCCM did not occur, based on the established protocols of EWS response. Dr Ganly also noted that after the first Code Red call, there was further delay in Mr A being admitted into the DCCM.

102. Dr Ganly advised:

> 'The standard of care in managing patients who have had highly toxic intensive treatment of haematological conditions with predictable significant morbidity includes the ability to identify deterioration and rapidly escalate care and I consider the delay in treatment to be a serious significant departure from this standard.'

103. I note that ACC's external advisor similarly stated:

> 'Given [Mr A's] progressive deterioration later in the day and his severe neutropenia, it would have been prudent to have had a low threshold for transferring the patient to either high dependency unit or ICU to maximise his supportive care, in terms of fluid replacement and maintenance of his blood pressure.'

104. Health NZ's AER also acknowledged that on 31 Month2 there were multiple occasions on which actions and escalations did not follow the mandatory EWS escalation pathway. The AER states:

> 'There was a lack of awareness during the duration of the problem and the progression over the course of the evening. There was no improvement in clinical status despite fluids and antibiotic therapy and [Mr A's] respiratory rate remained in the blue zone, yet there was no escalation.'

105. The AER also states that there was inconsistency regarding the most appropriate timing of admission to the DCCM, with some staff holding the view that patients were admitted only when they required organ support. Health NZ accepted that there was an 'undue emphasis on preservation of blood pressure without recognising the significance of sustained and marked tachypnoea'. The AER also states that the perception that patients are admitted to the DCCM only when they require organ support may have been a barrier for re-escalation to DCCM or the calling of another code.

Family-led escalation

106. When Ms B visited her father at around 11am on 31 Month2, she observed that his vital signs were at a dangerous level, and she believes he should have been in a high dependency unit under constant watch. However, she recalled that Health NZ staff repeatedly told her that further intravenous fluids would help, and that his stomach pains and extreme bloating were due to diarrhoea.

107. As outlined in the 'Background' section above, Ms B raised concern with staff on multiple occasions, but these concerns do not appear to have been documented in the patient notes.

108. Despite the EWS setting 'mandatory' escalation actions and 'minimum standards', there is a clear subjective element to the application of the EWS. This is evidenced in the 'Mandatory escalation EWS pathway', which states:

> 'ESCALATE CARE FOR ANY PATIENT YOU, THEY OR THEIR FAMILY ARE WORRIED ABOUT, REGARDLESS OF VITAL SIGNS OR EWS.'

109. As advised by Dr Ganly, '[F]amily concerns must always be heeded, family often have additional insights about what is normal for the patient which can help to assess disease severity.'

110. In my view, the above statement in the EWS acted as a clear qualification to the prescribed mandatory actions of the EWS, allowing for clinical, consumer, and family judgements about escalating care. Family/whānau are ideally placed to identify signs of clinical deterioration, as generally the patient is well known to them, and they may be a consistent presence at the bedside; therefore, they can recognise subtle changes or signs of clinical deterioration, and act as a 'safety net' when staff fail to recognise, respond to, or manage acute patient deterioration. Accordingly, in my opinion, Health NZ staff should have acted to verify Ms B's concerns more appropriately and escalated care based on Ms B's observations and concerns.

111. Ms B stated that she asked staff 'numerous times' about whether her father had a fever, given her observations and concerns. She said that staff measured Mr A's temperature only orally, and he struggled to hold the thermometer in place. As discussed above, it is clear that based on family concerns (and standard procedure on this ward), Mr A's temperature should have been taken in the axilla.

112. In my view, this is another example of a potential missed opportunity for earlier escalation and a failure to listen to the family's concerns.

113. Ms B also stated that she was concerned that the blood pressure machine was unable to obtain a reading. The AER states that the nurse assigned to Mr A cannot recall why a manual blood pressure test was not conducted. Dr Ganly noted that electronic blood pressure monitoring may not work if a patient's blood pressure is very low; therefore, Mr A's blood pressure should have been checked manually. Dr Ganly also noted that in larger patients like Mr A, 'a large cuff size must be used to obtain a reliable blood pressure'. Similarly, ACC's external clinical advisor stated that manual blood pressure recordings should have been attempted to determine whether Mr A had low blood pressure. In my view, despite Mr A's blood pressure being documented as within the normal range on the EWS chart on 31 Month2, the numerous instances of 'faulty' machines should have prompted staff to conduct a manual blood pressure test. The failure to listen to the family's concerns and the focus on assessing the machine instead of the patient was another missed opportunity for earlier escalation of care.

Conclusion

114. In my view, the evidence is clear that Health NZ staff failed to recognise and manage Mr A's sepsis early, and this led to a delay in the administration of antibiotics (of approximately 12 hours). The AER states that neutropenic sepsis is a common and predictable complication of bone marrow disorders and cytotoxic chemotherapy, and that neutropenic sepsis can occur in an afebrile patient, and the early administration of antibiotics is 'frequently lifesaving'. Given these failings, I consider that Health NZ staff failed in their duty to escalate Mr A's

care appropriately, regrettably missing several opportunities to do so between 31 Month2 and 1 Month3.

115. I note that the AER identified that Health NZ was facing resourcing and staffing pressures at the time of the events (as discussed above). However, in my view, the care outlined above demonstrates a concerning lack of critical thinking by multiple staff when they were each involved in Mr A's care, in considering his deterioration, the duration of his concerning signs, the lack of improvement despite treatment, and the lack of consultation with senior staff, and I consider that the repeated missed opportunities and failings in this case, which involved multiple individuals in different clinical teams, constituted a service delivery failure for which ultimately Health NZ is responsible. Accordingly, I find that Health NZ breached Right 4(1) of the Code.

Co-operation amongst providers — breach

116. Alongside the right to receive services with reasonable care and skill, Right 4(5) of the Code states that 'every consumer has the right to co-operation among providers to ensure quality and continuity of services'.

117. As noted by Dr Ganly:

> 'During the afternoon, evening and first part of the night of 31 [Month2], successive handovers of this patient occurred through the many layers of the hospital system, between one nurse to another, between one doctor to another, of varying nursing, medical and haematological experience, as is common in the overcrowded overworked health care system which we have in NZ today. This is a whole-of-system failing, a good result depends on communication between individuals of all disciplines up to the most senior and experienced level, and there were several places during 31 [Month2] in [Mr A's] care where this broke down (the Haematology SMO not apparently aware of what was going on, doctors unaware of EWS significance, nursing staff not escalating or acting on EWS scores, DCCM staff unaware of severity of situation, or not communicating the severity to other team members).'

118. The AER identified the following:

a) The Haematology SMO would receive updates from the Haematology registrar only if there were specific concerns about a particular patient.

b) Similarly, there was no formal process where every patient was handed over to the on-call Haematology SMO. Therefore, the daytime Haematology registrar had discretion about whether to inform the on-call Haematology SMO of any unwell or unstable patients.

c) There was no formal handover process between the day Haematology SMO and the on-call Haematology SMO.

d) The Haematology registrar did not document the review undertaken at around 12.30–1pm.

e) The DCCM registrar would hand over a patient only if there were specific concerns and the patient had been seen in the wards (for example, during a code call). Therefore, the DCCM registrar would not typically hand over a patient if they thought the patient was unlikely to require further DCCM involvement or admission.

f) DCCM ward reviews were to be documented with a 'reason/summary/outcome' in the DCCM outlier's book.

g) The DCCM registrar did not hand over to the oncoming DCCM registrar at 8pm. In addition, the DCCM registrar did not document his attendance or details of the 7.30pm Code Red in the DCCM outliers book. As a result, the DCCM was not aware of Mr A's Code Red in the haematology ward, and that Mr A might require further DCCM review that evening. There is no routine system in place for discussion of all Code Red calls.

h) There was delayed communication between the DCCM registrar and DCCM ACN to arrange DCCM admission, as the DCCM registrar had attended a Trauma Code call in the AED. This resulted in a missed opportunity for earlier admission, as the DCCM ACN was not aware that Mr A would require admission.

i) After concerns were raised about Mr A's EWS, the Haematology registrar did not document the review undertaken in Mr A's clinical notes.

j) When documentation did occur, there were further issues in recording of the information. For example, pages of the 'ACH/Starship Resuscitation Record (CR8545)' were missing from the database, and the code response team recorded information in different places.

Conclusion

119. Dr Ganly considered that all the processes that contributed to this delay constitute a serious departure from standard practice in a haematology service that cares for patients undergoing autologous transplants.

120. I accept Dr Ganly's advice that there was a 'whole-of-system failing' and communication breakdown in Mr A's case, and I consider that this lack of co-operation was exemplified during handover of Mr A's care. When a patient is handed over between shifts, adequate communication between clinical staff about the patient's condition is critical in ensuring the appropriate continuity of care. This includes an element of responsibility and accountability amongst clinicians to communicate vital information, such as the patient's diagnosis and treatment plan. Accordingly, I find that Health NZ breached Right 4(5) of the Code.

Documentation — adverse comment

121. As outlined previously in this report, there were several instances of poor documentation by Health NZ staff during Mr A's care on 31 Month2. This regrettably led to clinical staff not being informed or aware of Mr A's deterioration in a timely manner, and included the following examples:

a) Staff did not clearly document their actions when Mr A's vital signs first went into the red zone at 12.30pm.

b) Dr E did not document Mr A's review at approximately 12.30–1pm.

c) Staff did not document the escalation of Mr A's EWS at 1pm.

d) Staff did not document discussions with the family, including their concerns (for example, that Mr A had purple and swollen feet).

e) The DCCM registrar did not document his review in the DCCM outliers book at 7.30pm.

122. As noted by Dr Ganly, 'a good result depends on communication between individuals of all disciplines up to the most senior and experienced level'. In my view, Health NZ's poor documentation is a further indicator of systemic issues that were present during Mr A's admission and illustrate a low regard for collaborative practice within Health NZ.

Impact on investigation

123. In addition, I note that the poor documentation led to a reliance on the responses of Health NZ, namely the AER report, to determine the chronology of events (as opposed to clinical notes in the first instance). I consider that this hindered my investigation into aspects of this complaint, and therefore I encourage Health NZ to ensure that its staff maintain clear and accurate clinical records.

Delay in CT scan and CRP test — educational comment

CT scan

124. Dr Ganly noted that during the morning of 31 Month2, when Mr A deteriorated with a history of gastrointestinal symptoms and was severely neutropenic, he did not have investigations of his GI tract, specifically an abdominal CT scan, due to concerns that Mr A's poor renal function could have been exacerbated if he received the IV contrast. Dr Ganly advised that the standard of care in managing patients with neutropenia who are deteriorating with GI symptoms is to investigate the GI tract, and impaired renal function is not a contraindication. He said that a CT scan *without IV contrast* could have provided much of the information needed. Therefore, Dr Ganly considered that it was a minor deviation from standard practice that Mr A did not have CT imaging earlier on 31 Month2, when he was well enough to have it and when it may have emphasised his unwellness and suggested a target for intervention.

125. Health NZ told HDC that it disagrees with Dr Ganly's advice and stated that it does not consider that the failure to arrange a CT scan earlier was 'an important contributing, or relevant, factor' in Mr A's case. Health NZ said that CT imaging could have been considered, but usually the more likely diagnosis of neutropenic colitis is made on clinical grounds, and there were no definite objective clinical findings to suggest that ordering a CT scan was required in this case.

126. I acknowledge Health NZ's view that there were 'no definite objective clinical findings to suggest ordering a CT abdomen was required in [Mr A's] case'. However, the point remains that an earlier CT (without contrast) would likely have provided valuable information for the team and focused efforts on what was causing his deterioration much earlier, and, given

how common neutropenic sepsis is in this situation, the threshold for considering imaging should be correspondingly low.

CRP tests

127. Dr Ganly stated that testing for C-reactive protein (CRP)[48] plays a role in suggesting sepsis as a cause for symptoms and signs, as a high CRP level is associated with an infection (particularly a bacterial infection).

128. Dr Ganly stated that Mr A's CRP was not measured routinely,[49] but he noted that it is possible that Mr A's CRP may have been elevated long before he had a fever, and such information could have contributed to the earlier introduction of antibiotics.

Conclusion

129. I remind Health NZ that where there is uncertainty around the differential diagnosis, undergoing a CT scan in a timely manner may provide clinicians with clarity around appropriate interventions, treatment options, and management (in turn, positively affecting patient outcomes).

130. In addition, I highlight the following recommendations made by Dr Ganly:

a) Health NZ staff should seek to improve their understanding of which circumstances are relative and absolute contraindications for CT imaging and utility of CT without contrast for persons in renal failure.

b) The Haematology and Infectious Disease teams should consider re-examining the role of CRP monitoring in Haematology patients.

Deteriorating Patient Escalation Chart — other comment

131. The AER outlined that during the later stages of finalising the AER, the review team was made aware of the '[Haematology] Ward Deteriorating Patient Escalation Chart'. This chart was implemented in June 2018 and outlined the escalation pathway to be taken if there were concerns about a deteriorating patient in the haematology ward.

132. The AER stated that the pathway did not include notifying the charge nurse, and that the on-call SMO must be notified by the registrar and/or nurse shift coordinator for deterioration causing concern, such as a rising EWS score, any Code Blue or Code Red, and a DCCM interaction.

133. The AER stated that this chart was located in the front of the clinical notes for every patient on the ward. However, the AER noted that when asked, the Haematology registrar, Dr E, had not seen this escalation chart and was unaware of its location in the clinical notes folder.

[48] A protein made by the liver and released into the blood in response to inflammation. It plays an important role in the immune process.

[49] Dr Ganly said that this may have been due to concerns that CRP does not add more information, or that there are many reasons for false positive and false negative results.

134. It is concerning that this ward-specific escalation pathway did not fully align with the standard EWS escalation pathway, which may have created confusion for staff, and Dr E's comment appears to illustrate a systems issue around staff awareness of, and compliance with, mandatory escalation pathways.

135. However, I note that this issue was addressed in the AER with several recommendations, including that the Deteriorating Patient Escalation Pathway be reviewed, updated, and aligned with a generic deteriorating patient pathway (that includes notification of appropriate staff).[50]

Changes made since events

136. I commend Health NZ on undertaking a robust and comprehensive review of these events and on the quality of the report, as well as the meaningful recommendations that have resulted. I note that Health NZ has also met with the family on two occasions and offered apologies for the shortcomings identified. There is a clear intent to be open and engaged in the review process with a view to contributing to improvements and minimising such an event occurring again. Health NZ made many recommendations in the AER report (Appendix B). It noted that while this was not standard best practice for an adverse event review, significant change was required to improve systems and processes, and this may require additional resources. I strongly support the consideration of the additional resources required to improve the safety of this service.

137. Health NZ also stated that it had appointed an improvement advisor to support the implementation of the recommendations from the adverse event as outlined in its report, and progress is being made and is ongoing. The review and the case have been presented at the Haematology quality meeting, and staff education on the recognition of neutropenic sepsis has been embedded into orientation for nursing and is part of the educational curriculum in the department.

Recommendations

138. Further to the recommendations already outlined in the internal review, I recommend that Health NZ Te Toka Tumai Auckland:

a) Provide a formal written apology to the family for the breaches of the Code found in this investigation. The apology is to be sent to HDC within six weeks of the date of this report, for forwarding to Mrs A and Ms B.

b) Consider reviewing its policies and guidelines on CT imaging and CRP monitoring and report back to HDC on the outcome of the consideration. In response to this proposed recommendation in my provisional report, Health NZ has considered reviewing its policies and guidelines on CT imaging and CRP monitoring. It told HDC that these investigations were incidental and not material to Mr A's outcome and that Health NZ

[50] Recommendation 2.g of the AER.

'currently does not have specific clinical guidance around the use of CT imaging or using CRP for specific conditions and [did] not consider this would be helpful to [its] clinical staff'.

c) Provide HDC with a copy of the new/updated policies, guidelines, and processes on sepsis, escalation, and handover, within three months of the date of this report.

d) Use this case as a basis for developing education/training on sepsis, escalation, and handover for staff. Evidence confirming the content of the education/training (such as training material), and delivery (such as attendance records) is to be provided to HDC within three months of the date of this report.

e) Remind nursing staff about relevant ward protocols, including but not limited to, taking vital signs and using preferred methods when patients are otherwise compromised. Evidence confirming this is to be provided to HDC within three months of the date of this report.

Follow-up actions

139. A copy of this report with details identifying the parties removed, except Health NZ Te Toka Tumai Auckland, Auckland City Hospital, and the independent clinical advisor on this case, will be sent to Te Tāhū Hauora|Health Quality & Safety Commission, the Accident Compensation Corporation, and the New Zealand Sepsis Trust.

140. A copy of this report with details identifying the parties removed, except Health NZ Te Toka Tumai Auckland, Auckland City Hospital, and the independent clinical advisor on this case, will be placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.

Appendix A: Independent clinical advice to Commissioner

The following independent clinical advice was obtained from Dr Peter Ganly, a consultant haematologist:

> 'Response to a request from the office of the Health and Disability Commissioner to give advice about the care provided to [Mr A] NHI [#], a patient with multiple myeloma
>
> Peter Ganly
> Consultant Haematologist
> Christchurch Hospital
> 14 August 2023
>
> [Mr A] was a man [in his fifties] who presented with myeloma in [2019]. He had treatment for myeloma at [a public hospital] and had a good response. He was admitted to Auckland Public Hospital in [Month2] for consolidation treatment with high dose melphalan and autologous peripheral blood stem cell rescue ("autologous transplant or autograft"). After an uneventful first week in hospital following PBSCT reinfusion, he developed signs of abdominal sepsis and then had cardiorespiratory decompensation over 24 hours and died on the morning of 1 [Month3].
>
> I have been asked to review the following documentation about this patient's care:
>
> 1. Letter of complaint dated [2020].
> 2. Te Whatu Ora — Te Toka Tumai Auckland's response dated 22 April 2021.
> 3. Clinical records from Te Whatu Ora — Te Toka Tumai covering the relevant period.
> 4. Te Whatu Ora — Te Toka Tumai Auckland's adverse event review report (redacted)
>
> and to advise whether I consider the care provided to [Mr A] by Te Whatu Ora — Te Toka Tumai Auckland was reasonable in the circumstances, and why.
>
> I have been asked to particularly comment on:
>
> 1. Whether the care provided during [Mr A]'s admission 22 [Month2]–1 [Month3] was adequate/appropriate, including the timeliness of recognition of his deterioration during this period, and whether his deterioration was responded to or escalated appropriately.
> 2. Any other matters in this case that I consider warrant comment or amount to a departure from accepted standards.
>
> And for each question, to advise:
>
> a. What is the standard of care/accepted practice?
> b. If there has been a departure from the standard of care or accepted practice, how significant a departure (mild, moderate, or severe) do you consider this to be?

Names have been removed to protect privacy (except Health NZ Te Toka Tumai Auckland, Auckland City Hospital and the advisor. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

c. How would it be viewed by your peers?

d. Recommendations for improvement that may help to prevent a similar occurrence in future.

If you note that there are different versions of events in the information provided, please provide your advice in the alternative. For example, whether the care was appropriate based on scenario (a), and whether it was appropriate based on scenario (b).

My background

I have worked as a specialist Haematologist since 1993, in the United Kingdom and since 1999 in Christchurch New Zealand. I have treated patients with myeloma throughout that time, including with autologous transplant since that procedure was first introduced. I estimate that I have treated or been involved with the treatment of approximately 500 patients with myeloma who have had autologous transplants. I served as Chair of NZ Myeloma Working Group (2012 to 2019). I directed the Haematopoietic Transplant group in Edinburgh 1996–1999 and in Christchurch 2006–2011. I have been a member of PTAC advisory committees for Cancer Treatment (CaTSOP, now CTAC) since 2000, and of Transplant and Immunosuppressants Treatments (TIAC 2003–2019). I have published several papers on the treatment of myeloma, including with autologous transplant, with colleagues from Christchurch and from international groups.

The place of autologous transplants in the treatment of myeloma

Autologous transplant for the treatment of myeloma was introduced in the early 1990s and following several randomised trials has become standard of care in the treatment of eligible patients. The procedure is effective in deepening response and prolonging remission, but it is not curative, and it is more difficult to discern an effect on overall survival, especially now that other highly effective treatments have become available for use in later lines of therapy. However, none of these more recently available treatments is funded in NZ, and autologous transplant retains its place as an important component of first line treatment designed to prolong remission.

In autologous transplant, drugs are used at their maximum possible dose, and the procedure causes inevitable significant morbidity and even mortality. At first only the fittest patients were considered able to cope with this, and they were described as "transplant eligible" — which translated into patients who were younger, typically < 50. With time, more experience, better supportive care and recognition of good results, the procedure has been used much more widely; age is considered only one of many factors to assess transplant eligibility, and if patients are physically fit they are usually offered autologous transplant as standard of care. In general, most patients in NZ with myeloma younger than 70 would be considered for transplant, and most patients older would not be offered transplant.

[Mr A]'s eligibility for autologous transplant for treatment of myeloma

At the time of his peripheral blood stem cell collection, [Mr A] travelled to a new hospital, Auckland Public Hospital, for further assessment on 2 [Month2]. [Mr A] was younger ([in his fifties]), his principle comorbidity was obesity class III (BMI 45). He also had asthma and impaired glucose tolerance. He had Karnofsky performance score 100%. His echocardiogram showed mild left ventricular hypertrophy, with normal ejection fraction. He was rhinovirus positive.

The influence of BMI on transplant outcomes is not completely clear. Early studies suggested a considerable increase in non-relapse mortality with increasing BMI, the most cited more recent work shows no increase. (Vogl, D.T. et al, Effect of obesity on outcomes after autologous hematopoietic stem cell transplantation for multiple myeloma. Biol Blood Marrow Transplant 17: 1765–1774; 2011). Rhino virus is a not infrequent occurrence for patients, my practice is to continue with transplant if patients have no respiratory symptoms at the time of admission for transplant.

On this basis [Mr A] was told that the likelihood of treatment related death post-transplant was around 2–3% of patients. [Mr A] agreed to go forward for this treatment, the risk benefit ratio being moderately favourable. (High likelihood of prolonging remission versus high likelihood of significant morbidity, low likelihood of mortality, modest likelihood of prolonging survival from myeloma in the NZ context.)

The expected course of high dose melphalan and autologous peripheral blood transplantation

Progress post high dose melphalan is reasonably predictable. The patient receives high dose melphalan which is usually uncomplicated. The following day the haematopoietic stem cells collected some weeks before, are reinfused. This too is usually straightforward. The patient is often able to be discharged from hospital for 3 to 4 days until the expected consequences of high dose melphalan manifest themselves. These are principally gastrointestinal toxicities, especially loss of appetite, nausea and vomiting, diarrhoea, and mouth, throat and abdominal pain. The patient requires close control of hydration and nutrition. Symptomatic measures are employed wherever helpful. The other principle toxicity is bone marrow suppression, the patient becomes severely pancytopenic, and requires transfusion support (red cells, platelets). Severe neutropenia is inevitable and this together with loss of skin and mucosal integrity (central line insertion, inflamed GI tract) commonly allows translocation of bacteria and other microorganisms into blood, particularly from line and from gut. Without the defence of neutrophils these organisms can have high proliferation rates in the blood (septicaemia or sepsis, the terms used as equivalents here), and can cause rapid decompensation. Therefore, prevention and control of infection particularly bacterial, is crucial. The great majority of patients will have infections manifest as fever during their post-transplant neutropenia, the mean time of onset is 6 days post stem cell reinfusion. If a patient becomes very ill and dies, it is almost always due to infection, the source usually the respiratory or gastrointestinal tract.

After approximately 14 days, PBSC have engrafted and the peripheral blood count starts to improve with resolution of severe neutropenia. This typically coincides with improvement of symptoms of GI toxicity so that the patient can maintain sufficient intake. At around the same time the patient may be able to stop any intravenous treatment for infection and can often be discharged to outpatient review.

[Mr A's] treatment course

[Mr A] started his treatment with the administration of high dose melphalan on 22 [Month2] and had reinfusion of his PBSC on the following day 23 [Month2]. His course for the next seven days was not unusual. He had the expected nausea, requiring several different antiemetics including ondansetron and eventually olanzepine. He did not have bowel motions for several days, he was given various laxatives and enemas. By 28 [Month2] he had developed diarrhoea and abdominal pain and on 29 [Month2] he had, for the first time, profound neutropenia.

On the 8th day after return of stem cells, 31 [Month2] at 0800 [Mr A] developed tachycardia with heart rate 125. At 1230, his EWS score was calculated at 5, and the heart rate was higher at 1300, by then he had poor urine output and EWS score was 6, with one vital sign in "red zone", (likely to deteriorate rapidly, review by registrar & PaR, call SMO if registrar unavailable, consider ICU referral). At 1430 PAR nurse and registrar were informed, ECG demonstrated sinus tachycardia, monitoring was increased and inhaler for asthma was emphasised. At 1700 these signs were acknowledged by the registrar, together with somnolence (although [Mr A] was described as "alert" on the observation chart) and he had reduced urine output. At around that time he had a normal chest X-ray showing no heart failure or pneumothorax and the overall picture was interpreted as dehydration and adverse effects of olanzepine which had been used for nausea. There was further monitoring of EWS score which continued at 6, and fluid balance was more strictly measured at 1830. [Mr A] first had a fever recorded at 1930. He was reviewed by the registrar and broad-spectrum antibiotics (piperacillin/tazocin and gentamicin) were prescribed and the first doses were given at 2000h together with increasing volumes of intravenous fluid. At 2014 EWS score became "code red" principally because of a very high respiratory rate. At 2200 h [Mr A] had not improved, he had colicky abdominal pain and diarrhoea, and was reviewed by the haematology registrar and handed over to the medical specialties registrar who reviewed at 2250. A urethral catheter was inserted at 2350, [Mr A] was anuric with high creatinine and high lactate. A further "code red" was called at midnight and the Department of Critical care medicine registrar reviewed at 0030 on 1 [Month3], who considered performing CT scan, and discussed with SMO in DCCM. It was decided to admit [Mr A] to the Intensive Care Unit and [Mr A] was transferred there at 0216 on 1 [Month3]. Unfortunately, [Mr A] continued to deteriorate in ICU despite additional support, administration of vasopressor agents, high flow O_2 etc and died 4 hours later at 0638.

Overview

[Mr A] underwent a procedure with accepted significant morbidity and low mortality and followed the expected course through the first 8 days. He then became unwell on

the morning of 31 [Month2] and steadily worsened over the 24-hour period before his death. He almost certainly had neutropenic sepsis from the beginning of that 24 hours, probably with an abdominal source, perhaps an intestinal perforation.

Management of neutropenic sepsis

Sepsis recognition is based on development of abnormal symptoms and signs, particularly fever. However, it is well documented that a patient with severe neutropenia may have sepsis and yet not be febrile, at least not at the time the temperature is measured. Indeed, a temperature below normal due to hypoperfusion may indicate sepsis. Tachycardia and tachypnoea are often early signs of sepsis. Early treatment with antibiotics is the single most important tool in management of neutropenic sepsis and is frequently lifesaving. Empirical antibiotics are selected to target the organisms which are most likely to cause sepsis in neutropenic patients. Where possible there should be control of sepsis, ie removing or draining septic foci, eg IV lines, or controlling bacterial leakage.

There has been concern from [Mr A's] daughter that fever was not recorded properly because his mouth was open, and that temperature should have been measured from the axilla. Different types of thermometer recording ear, sublingual, axillary, rectal temperature are available, they all have strengths and weaknesses, we currently use ear thermometers at Christchurch, having previously used sublingual/axillary thermometers. The important point is that although fever is a strong guide to sepsis it doesn't have to be present and may not be present. Later [Mr A's] blood pressure fell. [Mr A's] daughter has been concerned that the blood pressure monitoring equipment was faulty and did not give a reading. Electronic blood pressure monitoring may not work because blood pressure may be very low. This should be checked by manual means, it wasn't always in [Mr A's] case, instead reliance was placed on trying to find different machines which did not give error messages. And blood pressure recording is difficult if the wrong cuff size is used. In larger patients such as [Mr A], a large cuff must be used to obtain a reliable blood pressure monitoring. I am not able to comment on whether the vital signs monitoring techniques were a departure from standard practice, beyond acknowledging that family concerns must always be heeded, family often have additional insights about what is normal for that patient which can help to assess disease severity.

Whether fever was present or not, whether or not the techniques for measuring temperature and blood pressure were correctly performed, I think the observations which were made along with the setting in which they were made (severe neutropenia in patient 7 days post high dose melphalan) make it likely that sepsis was well established approximately 12 hours before the time that high fever was first recorded. [Mr A's] deterioration was highly unlikely to be due to asthma, electrolyte infusion or sedative effects of drugs, rather the overwhelming likelihood was neutropenic sepsis from some source or other, and the correct treatment was immediate introduction of broad-spectrum antibiotics, on the morning of 31 [Month2], irrespective of whether or not a fever was present. I think that the 12-hr delay in treatment with antibiotics is a

moderately serious departure from the standard practice expected in a specialised haematology service.

Piperacillin/Tazobactam together with gentamicin had been specified as the antibiotic [Mr A] should start on when sepsis was recognised. Commonly no organisms are isolated from neutropenic patients with sepsis, in [Mr A's] case blood samples taken at the time of commencement of antibiotics, 12 hours before his death, later grew streptococcus mitis and staphylococcus aureus. Either, both or neither may have been the cause of his sepsis. S. aureus was shown to be sensitive to Piperacillin/tazobactam, I can't tell whether the S. mitis was sensitive, I can't find a published EUCAST breakpoint for pip/tazo against this organism. The penicillin MIC of 1 is only one dilution away from being called resistant so neither penicillin nor piperacillin/tazobactam could really be considered adequate. That is why gentamicin was also used empirically, it is very unlikely for severely pathogenic organisms to be resistant to both antibiotics. If things had continued there would likely have been fine tuning of antibiotic treatment based on these sensitivities. I do not think there was any departure from the standard of care in the choice of this antibiotic combination for empirical treatment of neutropenic sepsis.

With the sudden onset of collapse, history of GI symptoms, abdominal pain, abdominal distension, it is quite possible that [Mr A] had suffered an abdominal catastrophe such as perforation or bowel infarction, at the least he had severe colitis, sometimes called typhlitis. Colitis to some degree is universal following high dose melphalan and autologous transplant. This could have been investigated by imaging, that was held up because of concerns that his poor renal function could have been exacerbated if he had IV contrast. CT without IV contrast may have given much of the information needed and this should be remembered by staff who are investigating sepsis. Later when the CT abdominal scan was reconsidered he was too unwell to have it without being paralysed and intubated, and it did not proceed. Unfortunately, our experience with surgery in this situation, if he had a "surgical abdomen" such as perforation, is almost uniformly attended by the patient's rapid demise. Therefore, it is appropriate to use conservative measures, (antibiotic therapy, physiological support) and hope for improvement, rather than laparotomy. I consider it a minor deviation from standard practice that [Mr A] did not have CT imaging early on 31 [Month2], when he was well enough to have it and when it may have emphasised his unwellness and suggested a target for intervention.

Laboratory tests, specifically measurements of C reactive protein (CRP) have a role in suggesting sepsis as a cause for symptoms and signs. CRP is typically high in patients who have infection, particularly bacterial infection. CRP was not routinely measured in [Mr A's] case probably because there have been concerns that CRP does not add more information, and that there are many reasons for false positive and false negative results. My personal experience is that I have often had a lower threshold to start broad spectrum antibiotics in a neutropenic patient, at the time they may be expected to develop a fever, just because the CRP is rising, and even before patient has had fever. [Mr A's] CRP may have been elevated long before he had a fever and this information

may have contributed to an earlier introduction of antibiotics. It would be appropriate for the haematology and infectious disease teams to re-examine the role of CRP monitoring in haematology patients.

Routine observations and their role in identifying the deteriorating patient.
Routine observations taken from the beginning of the hospital admission show that from the time of stem cell reinfusion [Mr A] often had rather reduced O_2 saturation for a man aged 54, down as low as 94%. This is not a normal O_2 saturation. It may have been attributed to a history of asthma, for example it was noted that he had had a wheezy episode one week before the admission on 7 [Month2], also he was on asthma inhalers, also there may have been a history of smoking, it was remarked in one summary that he had not smoked >28days before admission. In his base line admission, he had a chest X-ray which showed no cardiomegaly or consolidation. He had a recent finding of rhinovirus. [Mr A] also had a raised heart rate of around 85–90 throughout this first week. The slightly low O_2 saturations and raised HR were insufficient to score much or anything at all on the Early Warning Scores system but might have suggested that [Mr A] was under considerable cardiorespiratory stress for much of the time post PBSC return, long before he had dramatic decompensation on 31 [Month2].

On the morning of 31 [Month2] [Mr A] had a further increase in his heart rate, his Early Warning Scores had significantly increased by midday, with tachycardia into the red zone. Further worsening of vital signs occurred throughout the afternoon and into the evening. In addition, and not really acknowledged as far as I can tell from the clinical notes, is that these signs were occurring in a patient with severe obesity. (It was well recognised during the Covid19 pandemic that patients with severe obesity perform more poorly than those with normal weight if they acquire additional disease.)

Whatever his weight, [Mr A] must have been exhausted with work of breathing, and could be seen to be steadily decompensating. The monitoring of patients, especially with the Early Warning Score system, is designed to identify problems and rapidly and semi-automatically escalate care if appropriate. Historically patients with haematological diagnoses, with neutropenia, who had had transplants did extremely poorly when admitted to ITU. More recently it has become clear that with "full code" support, if patients improve, they may recover to be discharged from ITU and eventually from hospital. So it is now usual to support these patients intensively early, for 24–48 hours, and if they are holding their own or improving to continue, and only to deescalate if patients are deteriorating despite all appropriate support. Nevertheless, patients admitted to ITU with neutropenic sepsis, especially if they require invasive ventilation, have multiorgan failure and resistant organisms, have very high mortality, well over 50%, and most of that occurs in the first 24 hours of admission to ITU. [Mr A] spent the last few hours of his life in the ITU, I think things had progressed so far at the time of admission there that the outcome was entirely unsurprising. I can see why [Mr A] was not invasively ventilated, ITU staff are well aware of the usefulness of that support and are best placed to judge when it is appropriate. I do not think CT scanning at that stage

would have been possible or would have changed the outcome. I do not consider there to have been any deviation in standard care by not intubating earlier or at all.

The processes of patient handovers, degree of concern, indications for escalation of care are subject to some inconsistencies, dependent on training, experience and even personality of individuals within teams. Systems such as Early Warning score charts and mandated escalation pathways are designed to even out these variabilities in team members' reactions. These systems were not always followed in [Mr A's] case, it's not possible to be accurate from the clinical record, but Te Whatu Ora's adverse event review report, which was supplied, did comment that *"… the mandatory EWS escalation pathway (see Appendix C) was not followed as it should have been and there were seven missed occasions between 1300 and 1930 hours when observations should have been taken. There were also missed opportunities to escalate [Mr A's] EWS in accordance with the mandatory EWS escalation pathway after the Code Red call at 1930 hours. Mandatory EWS escalation as per the pathway should still have occurred."*

Patient handovers from one service to another are also dependent on team culture. Intensive Care services should and usually do always want to be contacted earlier to be able to assess what is coming up, at the expense of some unnecessary contacts, rather than later when it may be too late. I have been very glad in my experience when my junior staff have contacted ICU outreach, without going through me, to get an opinion on an ill patient who might become a candidate for admission to ITU. The Te Whatu Ora adverse event review comments *that "referral to DCCM is via the medical staff responsible for the patient or from an emergency code call. The DCCM registrar did not document their attendance or details of [Mr A's] 1930 hours Code Red in the DCCM outliers book and did not handover [Mr A] to the oncoming DCCM night registrars at 2000hours which resulted in DCCM not being aware that there was a patient in [the] ward that had had a Code Red and might possibly need further DCCM review that evening."*

In [Mr A's] case, and with hindsight, ICU outreach should have been involved early on Friday 31 [Month2], much earlier than at midnight 31 [Month2] or even at 1930 on 31 [Month2] when ICU registrar attended but did not document or hand over. During the afternoon, evening and first part of the night of 31 [Month2], successive handovers of this patient occurred through the many layers of the hospital system, between one nurse to another, between one doctor to another, of varying nursing, medical and haematological experience, as is common in the overcrowded overworked health care system which we have in NZ today. This is a whole-of-system failing, a good result depends on communication between individuals of all disciplines up to the most senior and experienced level, and there were several places during 31 [Month2] in [Mr A's] care where this broke down (the Haematology SMO not apparently aware of what was going on, doctors unaware of EWS significance, nursing staff not escalating or acting on EWS scores, DCCM staff unaware of severity of situation, or not communicating the severity to other team members). I believe that all the processes which contributed to

this delay constitute a serious departure from standard practice in a haematology service which cares for patients undergoing autologous transplants.

Conclusion and Recommendations

1. The care provided was inadequate on 31 [Month2] in that when deterioration was recognised, at midday, (based on [Mr A's] worsening and very abnormal EWS scores), rapid escalation of care to ITU should have occurred, based on established protocols of EWS response. When escalation did occur at the first "code red" at around 2000, there was further delay in transferring [Mr A] at around midnight to an environment where effective treatment might have been delivered. The standard of care in managing patients who have had highly toxic intensive treatment of haematological conditions with predictable significant morbidity includes the ability to identify deterioration and rapidly escalate care and I consider the delay in treatment to be a serious significant departure from this standard.

2. The care provided was inadequate on 31 [Month2] in that [Mr A's] deterioration from early in the morning was not recognised for several hours, and that delayed the commencement of antibiotic therapy. The standard of care in managing deteriorating patients with severe neutropenia includes the early introduction of antibiotics if they become unwell, whether or not they have fever and I consider the delay in introduction of antibiotic to be a moderately significant departure from this standard.

3. The care provided was inadequate on 31 [Month2] in that during the morning when [Mr A] deteriorated with a history of GI symptoms and was severely neutropenic, he did not have investigations of his GI tract, specifically abdominal CT because of impaired renal function. CT later when he was transferred to ITU would have been unsafe and was anyway too late. The standard of care in managing patients with neutropenia who are deteriorating with GI symptoms is to investigate the GI tract, and impaired renal function is not a contraindication. I think not doing GI investigation when it was safe to do so was a minor significant departure from this standard.

I believe that my peers would view these matters in the same way.

There are different versions of some of the events in the information provided. In one version (a) the observations were as described in the clinical record. In [Mr A's] daughter's memory (b) not all the investigations were performed correctly, and [Mr A's] status may have been worse than recorded. In either version my conclusions remain the same.

Recommendations

1. Review the understanding and the effective working of the EWS monitoring system in speedy escalation of care for deteriorating patients.

2. Emphasise to all staff who treat patients with severe neutropenia that neutropenic sepsis does not always require fever for its diagnosis.

3. Consider utility of serial CRP measurement as an additional factor to assess sepsis.

4. Improve understanding of which circumstances are relative and absolute contraindications for CT imaging and utility of CT without contrast for persons in renal failure.'

Appendix B: Recommendations from Health NZ's Adverse Event Review

Related to Finding 1: Delay in recognising neutropenic sepsis in a patient with no fever

Recommendations		Outcome measures	Responsible	Due date
1.a.	Develop a guide to the unwell neutropenic patient in haematology, including a sepsis pathway and revision of the neutropenic sepsis algorithm into one document. Include the consideration of sepsis in afebrile patients and align to the patient pathway.	Guideline to the management of the neutropenic patient in haematology implemented. Updated pathway is communicated to all haematology nursing and medical staff and embedded in to the induction programme for staff, including medical registrars participating in the medical specialties after-hours roster.	SCD Haematology	Within 3 months
1.b.	All haematology nurses receive specific training that includes recognising and managing neutropenic sepsis.	A formal training module is developed and implemented	Nurse Educator Haematology	Within 6 months

Related to Finding 2: Recognition and response to a deteriorating patient

Recommendations		Outcome measures	Responsible	Due date
2.a.	Redesign the patient deterioration system in Haematology in line with HQSC guidance in addition to addressing each of the specific issues below.	Gap analysis of HQSC recommended system in [the haematology ward], re-design and implement patient deterioration system.	Service Clinical Director and Nurse Unit Manager Haematology	Within 9 months

Names have been removed to protect privacy (except Health NZ Te Toka Tumai Auckland, Auckland City Hospital and the advisor. Identifying letters are assigned in alphabetical order and bear no relationship to the person's actual name.

2.b.	Present this report as a case study in both Haematology medical and nursing education sessions and/or quality meetings to reinforce the expectation of following the mandatory EWS escalation pathway.	Evidence that this report has been presented and discussed at Haematology quality and/or education sessions for all medical and nursing staff	Service Clinical Director and Nurse Unit Manager Haematology	Within 3 months
2.c.	Establish a shared and standardised process within the Haematology service of managing deteriorating patients including appropriate escalation and use of the EWS system by mandating that all Haematology staff complete the: 'ADHB Patient Deterioration and EWS: recognition & escalation training' on the Ko Awatea learning platform.	An audit demonstrating 100% of Haematology staff have completed mandatory EWS training. Evidence that appropriate EWS escalation is a priority in the service e.g. record it routinely on the MOS board including audit and documentation	Service Clinical Director Haematology	Within 6 months
2.d.	Review the format and frequency of SMO medical ward rounds of BMT patients in [the haematology] ward with a view to optimising clinical quality and safety	Findings of the review are documented and discussed with Cancer & Blood Directorate Leadership Team and recommendations from findings are implemented	Service Clinical Director Haematology	Within 6 months
2.e.	Implement a robust system for interdisciplinary handover for BMT patients in [the haematology] ward with a view to	Robust system implemented	Service Clinical Director Haematology	Within 6 months

	optimising clinical quality and safety			
2.f.	Review the PaR escalation pathway for both [the haematology ward] and Adult Medical services including escalation to SMOs, dispute resolution and measures to take when EWS fails to respond to initial intervention e.g. sustained blue zone EWS parameters.	PaR nurses and all Haematology staff can escalate concerns directly to a Haematology SMO	Service Clinical Director Haematology in conjunction with the Adult PaR Charge Nurse	Within 3 months
		PaR nurses can escalate concerns directly to SMOs in the whole of Adult Services	Chair of Deteriorating Patient Committee	Within 6 months
2.g.	Review and update the [the haematology ward] Deteriorating Patient Escalation Pathway and ensure it aligns to the generic deteriorating patient pathway. Including: • Notification of the appropriate staff (Nurse in Charge, Haematology registrar and Medical Specialties registrar) • If DCCM admission thought needed — SMO to SMO discussion should occur if admission	Updated Escalation Pathway is circulated to all Haematology Staff and displayed in the appropriate places within [the haematology ward] as a visual reminder	Service Clinical Director Haematology	Within 1 month

	has not been planned • Align shared goals of care to the deteriorating patient pathway and implement			
2.h.	Review the current DCCM handover, follow-up and documentation processes for patients that are outliers requiring further DCCM review, including follow-up of codecalls.	Audit the processes in DCCM for outlier patients including handover, documentation and follow-up	Service Clinical Director DCCM	Within 3 months
2.i.	Review the acute DCCM admission process for ward-based patients, particularly after hours and timeliness of response and expectations around junior to senior staff communication.	Review and modify the standard operating process for patients that require acute admission to DCCM including audit of time elapsed between code call and admission	Service Clinical Director DCCM	Within 3 months
2.j.	Review the secondary response process involving DCCM registrars when they are required to attend simultaneous Code and AED Trauma Emergency calls both during and after hours, while maintaining safe staffing in DCCM and deteriorating patient safety in the hospital	The secondary response process requiring ICU medical staff (DCCM and CVICU) is reviewed and discussed with the deteriorating patient committee and communicated to all directorates.	Service Clinical Director DCCM	Within 6 months

2.k.	Review code calls including definition of 'ownership', training, documentation and communication expectations.	A robust process with clear definition of ownership, documentation and communication expectations. Audit confirms implementation.	Chair of Deteriorating Patient Committee	Within 6 months

Related to Finding 3: Issues with the model of care on the haematology ward

Recommendations		**Outcome measures**	**Responsible**	**Due date**
3.a.	Undertake a review of patients in [the haematology ward] with high complexity/acuity with a view to optimising clinical safety and effectiveness of the care provided including both the medical and nursing model of care and incorporating the implementation of CCDM (care capacity demand model) and addressing the provision of oversight of junior nurses by senior nursing staff.	Evidence that a review has occurred and findings from the review are discussed at Directorate Senior Leadership Team Meetings.	Service Clinical Director — Haematology	12 months
		Recommendations from findings are drafted and presented to the Senior Leadership Team at Auckland DHB.	Service Clinical Director — Haematology	18 months
		CCDM is implemented in [the haematology] ward	Nurse Director — Cancer & Blood	12 months

Related to Finding 4: The family felt concerns they raised were not always heard and responded to.

Recommendations		Outcome measures	Responsible	Due date
4.a.	Implementation of the Auckland DHB version of Kōrero Mai in the Cancer and Blood Directorate as part of the organisation wide roleout.	Kōrero Mai is implemented in Cancer and Blood directorate.	The Cancer & Blood Directorate (will require specific programme support)	12 months

Relevant to Finding 5 (incidental): Onsite support of senior medical staff after hours and registrar workload

Recommendations		Outcome measures	Responsible	Due date
5.a.	The Haematology service develops and implements a SMO escalation guideline which describes when a registrar is expected to escalate to the SMO. This will include workload triggers, e.g. if urgent review within 1 hour is not possible. Implementation should extend to all registrars and after hours med specs registrars. The format should follow the policy CP01/BRD/139 — v01.00	Escalation policy completed for Haematology and implemented	Service Clinical Director Haematology	6 months

5.b.	Med specs roster reviewed to address concerns regarding workload related to completing acute demands	Med specs roster reviewed and modified	Director — Adult Medical Services	6 months