Health New Zealand|Te Whatu Ora Te Toka Tumai Auckland

A Report by the
Deputy Health and Disability Commissioner

(Case 21HDC00620)

Health and Disability Commissioner
Te Toihau Hauora, Hauātanga

Contents

Complaint and investigation

1. The Health and Disability Commissioner (HDC) received a complaint from the daughter of the late Mrs A (Miss B) about the services provided to Mrs A by Health New Zealand|Te Whatu Ora (Health NZ) Te Toka Tumai Auckland. The following issues were identified for investigation:

- *Whether Health New Zealand|Te Whatu Ora provided [Mrs A] with an appropriate standard of care in [Month8][1] 2021.*
- *Whether [Dr C] provided [Mrs A] with an appropriate standard of care in [Month8] 2021.*

2. This report is the opinion of Carolyn Cooper, Deputy Health and Disability Commissioner, and is made in accordance with the power delegated to her by the Commissioner.

3. The parties directly involved in the investigation were:

Mrs A	Consumer
Miss B	Complainant/consumer's daughter
Dr C	Provider/anaesthetist
Dr D	Provider/registrar

4. Further information was received from the Coroner and ACC.

5. Independent advice was obtained from anaesthetist Dr David Jones (Appendix A).

Information gathered during investigation

Introduction

6. This report considers the care provided to Mrs A at a public hospital on 3 Month8. Mrs A, who was 73 years old at the time of these events, presented to Public Hospital 1 on 3 Month8 for a right mastectomy (surgical breast removal) and sentinel node biopsy (removal of the first lymph node to which cancer cells are likely to have spread), following a recent diagnosis of breast cancer.

7. In preparation for the surgery, Mrs A underwent an anaesthetic procedure and was intubated with an endotracheal tube (ETT). However, Mrs A's condition deteriorated and after some time it was found that the ETT had been placed in her oesophagus (food pipe), instead of her trachea (windpipe). As a result, Mrs A suffered a hypoxic brain injury that was non-survivable and, sadly, she died.

[1] The relevant dates are referred to as Months 1–8 to protect privacy.

Clinical history

8. Mrs A had a history of treated hypertension (high blood pressure), type II diabetes, a high body mass index (BMI) 44kg/m,[2] hypercholesterolaemia (high cholesterol), and three cancers — a multifocal metastatic angiosarcoma[2] of the left forehead/scalp, left cheek and lymph nodes; a poorly differentiated biliary (gall bladder) adenocarcinoma (cancer); and right breast cancer. She also had a known stable nodule in the right middle lobe of her lung.

Anaesthetic history

9. On 13 Month1 Mrs A attended Public Hospital 1's assessment clinic prior to her surgery for gall bladder removal (cholecystectomy). The assessing anaesthetic registrar considered that bag-mask ventilation might be difficult due to Mrs A's weight. The registrar documented a good view of the oropharynx (the area between the soft palate and hyoid bone) with mouth opening Mallampati 1 (the soft palate, uvula, and tonsillar pillars can be viewed)[3] and assessed that there would be no difficulty with direct laryngoscopy.[4]

10. On 8 Month2 Mrs A presented for the cholecystectomy. The anaesthetist documented poor bag-mask ventilation.[5] After Mrs A was intubated, there was minimal end-tidal carbon dioxide ($EtCO_2$) tracing[6] and the ETT was removed and replaced with a laryngeal mask.[7] There were high airway pressures and reintubation again resulted in poor ventilation (shown by a poor $EtCO_2$ trace), so it was decided to abandon the surgery and wake Mrs A up. The differential diagnoses included severe allergic reaction (anaphylaxis) with severe bronchospasm (narrowing of the airways), severe bronchospasm alone,[8] and mechanical tracheal issues, such as tracheoesophageal fistula,[9] tracheomalacia,[10] or pharyngeal pouch.[11]

[2] A rare and aggressive cancer that starts in the endothelial cells that line the walls of blood vessels or lymphatic vessels. The skin is the most affected area.
[3] The Mallampati score is a way of measuring the space within a person's airway. It is a non-invasive test in which a person sits upright, opens their mouth, and sticks out their tongue. The healthcare provider then provides a Mallampati score based on whether certain structures in the mouth and throat are visible.
[4] A laryngoscope is used to push down the tongue and lift up the epiglottis.
[5] A hand-held device used to provide positive pressure ventilation to patients who are not breathing or not breathing adequately.
[6] $EtCO_2$ in the respiratory system is the partial pressure of carbon dioxide (CO_2) at the end of expiration. It is measured by capnography, and it provides an integrated view of ventilation, metabolism, and perfusion.
[7] A device that keeps a patient's airway open during anaesthesia or while they are unconscious.
[8] See the comments at para 115 regarding whether this actually was a bronchospasm.
[9] A defective connection between the trachea (windpipe) and oesophagus (the tube that connects the throat to the stomach).
[10] A structural abnormality of the tracheal cartilage resulting in the trachea collapsing.
[11] A small bulge or pocket, like a hernia, that occurs in the pharynx.

11. Bloods were taken to test for tryptase levels (an investigation for anaphylaxis), and a referral was made for a naso-endoscopy[12] +/- bronchoscopy[13] for investigation of possible physical problems with Mrs A's airways.

12. The Otorhinolaryngology (ear, nose and throat) service concluded that Mrs A had no mechanical issues in her upper airway. The Respiratory service advised that Mrs A should take oral prednisone and salbutamol nebulisers preoperatively to reduce the risk of bronchospasm during anaesthesia. The allergy service advised that Mrs A's tryptase levels were normal, indicating that the bronchospasm was unlikely to be due to anaphylaxis. Advice was provided to avoid rocuronium (used to produce muscle relaxation to help facilitate surgery and ventilation). The allergy service advised that it would follow up Mrs A in the allergy clinic for a full assessment.

29 Month2 anaesthetic for second attempt at cholecystectomy

13. On 29 Month2 Mrs A was given salbutamol and ipratropium nebulisers (medications used to relax and open the airways) preoperatively, and a salbutamol infusion was prepared but not used. Bag-mask ventilation was difficult, but a good view of the vocal cords was obtained with a GlideScope.[14] Mrs A was hypertensive at times but otherwise her anaesthetic was uneventful, and her surgery was completed.

23 Month3 pre-anaesthetic review prior to removal of multifocal metastatic angiosarcoma at Public Hospital 2

14. On 23 Month3 Mrs A was assessed by a Public Hospital 2 senior anaesthetist, who wrote a letter in the Public Hospital 1 electronic clinical record that included the following:

> '[Mrs A] has been reviewed in [the assessment clinic] (in preparation for a laparoscopic cholecystectomy this year), then afterwards has been referred to [an allergy clinic] (awaiting assessment). The differential diagnosis was severe bronchospasm versus anaphylaxis. She was never particularly hypotensive and her tryptases were negative. Post-operatively [Otorhinolaryngology] did not identify any mechanical issues with her airway and the Respiratory Service recommended prednisone and salbutamol [nebulisers] prior to future anaesthetics. She returned later that month for a second attempt at surgery. She was given salbutamol and ipratropium nebulisers pre-operatively with a salbutamol infusion ready (but not used) … Thought the severe bronchospasm was more likely a primary airway problem due to stimulation from airway manoeuvres, rather than an IgE mediated [allergic] reaction to any anaesthetic drugs. [It was] thought that for future anaesthetics rocuronium should be avoided and that vecuronium would be a good alternative.'

[12] A procedure using a small camera on a flexible tube (an endoscope) that is passed through the nostril and moved to the back of the nose and throat.
[13] During bronchoscopy, a thin tube (bronchoscope) is passed through the nose or mouth, down the throat and into the lungs.
[14] A video device used to view the airway.

27 Month3 anaesthetic for radical excision of angiosarcoma at Public Hospital 2

15. The anaesthetist who assessed Mrs A's records on 23 Month3 also anaesthetised her on 27 Month3 and again noted difficult bag-mask ventilation, a good GlideScope view, and easy intubation, with treatment given pre-emptively for bronchospasm. There was a sudden loss of ventilation with a drop in $EtCO_2$ one hour into the procedure, requiring hand ventilation and administration of intravenous salbutamol.

22 Month5 anaesthetic for revision left lower eyelid and skin grafting at Public Hospital 2

16. On 22 Month5 Mrs A was pre-emptively treated with salbutamol and ipratropium and the induction was uneventful.

Bronchospasm diagnosis and early management of bronchospasm[15]

17. Bronchospasm is not an uncommon event during general anaesthesia. Bronchospasm after intubation usually manifests as increased airway (ventilation) pressures and hypoxia (low oxygen levels).

18. When a bronchospasm occurs, an associated expiratory wheeze may be heard over the chest or in the breathing circuit. Capnography, which measures the amount of carbon dioxide in exhaled breath, typically shows a delayed rise in $EtCO_2$, producing a characteristic 'shark fin' appearance.

19. With restriction to gas flow, a prolonged period of exhalation is required for pressures within the lung to normalise. Positive pressure ventilation delivered before exhalation is complete can result in 'breath-stacking' and the development of intrinsic positive end-expiratory pressure. Management begins with treating the underlying cause, increasing the inhaled oxygen concentration, increasing the inhaled anaesthetic concentration, using medications that ease the bronchospasm, such as salbutamol and adrenaline, and optimising the ventilation settings. It is important to summon help if these measures do not lead to rapid improvement.

20. Bronchospasm is not the only cause of wheeze or increased airway pressures during anaesthesia. There is a wide range of differential diagnoses, including anaphylaxis, aspiration, acute pulmonary oedema, and malposition or obstruction of the breathing tube or circuit.

22 Month7 pre-admission clinic

21. On 22 Month7 Mrs A was reviewed in the Public Hospital 1 anaesthetic pre-admission clinic prior to her right mastectomy and sentinel node biopsy surgery. She was assessed by an anaesthetic Fellow for her medical co-morbidities, the nature and complexity of the operation, and any other issues, to determine whether, from an anaesthesia perspective, she was well enough for the operation, or whether any medical work-up was required to optimise her suitability for surgery.

[15] This information is sourced from the adverse event review report.

22. The anaesthetic Fellow recorded Mrs A's difficult anaesthetic history, her significant co-morbidities, her difficult airway, and her BMI of 43.82. The anaesthetist assessed that Mrs A was ready for her surgery and so she was not referred to the anaesthetic high-risk meeting.

Dr C's prior knowledge of Mrs A

23. Consultant anaesthetist Dr C provides anaesthesia services as a senior medical officer (SMO) at Public Hospital 1.

24. Dr C stated that on 2 Month8 while he was checking his Public Hospital 1 operating room (OR) list for the following day he noted that there were four patients on the list all having moderately long operations, meaning that as he was rostered on at another clinic the following afternoon, he would be the anaesthetist only for the two patients having surgery in the morning. Mrs A was the last on the OR list.

25. Dr C said that he overheard a conversation involving the anaesthetist rostered to be looking after Mrs A in the afternoon about the decision to put Mrs A last on the list even though she was the most complicated patient, because she had a link to COVID-19 exposure via her daughter who worked at the airport. Although eventually it was decided that active COVID-19 infection-control strategies would not be necessary during Mrs A's case, she was confirmed as being last on the OR list.

26. Dr C stated that as he was not rostered to be Mrs A's anaesthetist, he knew very little about her prior to the day of surgery.

Events of 3 Month8

27. Dr C told HDC that early on 3 Month8, Dr E, from the anaesthetic allergy clinic, had seen his name on the OR list for 3 Month8. Before Dr C went to the OR suite, Dr E warned him that during an anaesthetic five months earlier (see paragraph 12), Mrs A had experienced an event diagnosed as bronchospasm that had been so severe that the operation had been abandoned. Dr C said that Dr E told him that the testing of Mrs A for allergies to the drugs used was incomplete and that caution in drug choice would be wise. Dr C said he told Dr E that he would pass that information on to the afternoon anaesthetist who would be looking after Mrs A.

28. Specialist anaesthetist Dr F told HDC that he was the anaesthesia coordinator for the ORs. Dr F stated that at approximately 8am on 3 Month8 Dr C said that he was in the operating theatre that morning and at another clinic in the afternoon, but it would make more sense for him to do the whole day in theatre. Dr F said he told Dr C that he would look into it. Dr F said that at approximately 9.30am the afternoon anaesthetist called in sick, after which Dr F informed Dr C that he could stay in theatre for the whole day and, at around 12.30–1.30pm, Dr F also allocated a registrar, Dr D, to the same theatre.

29. Dr D told HDC that she commenced anaesthetic training with the Australian and New Zealand College of Anaesthetists (ANZCA) in 2017, and as at 3 Month8 she was working predominantly in the role of a senior registrar at Public Hospital 1.

30. Dr D said that she had not worked with Dr C previously. She stated that her usual practice for high-risk patients undergoing elective surgery is to review the notes the day before their surgery to formulate an anaesthetic plan, and to discuss her plan with the responsible anaesthetic consultant. She said that ideally on the day of surgery she would arrive early to assess the patient further to identify any other issues or clinical developments, and to allow time to discuss the plan and any associated risks with the patient. However, as she was not working in the morning, there was no opportunity for her to do this for the patients on the operating list for 3 Month8.

31. Dr C stated that unless he is notified earlier about a potentially challenging patient (from an anaesthetic perspective), he almost invariably checks any elective list to which he is allocated on the previous day and looks up the patients' records on the computer network. If a patient is already in hospital, he (or his registrar or both of them) will see the patient the day before the surgery.

32. Registered Nurse (RN) G stated that on 3 Month8 he was assigned as circulating nurse 2 in the theatre allocated to Mrs A's surgery. He said that usually the scrub and circulating 1 nurses set up in the prep room and the circulating 2 nurse is with the patient.

33. RN G said that as part of usual practice, they had a briefing for the day at around 8am, during which Dr C spoke about Mrs A's anaesthetic complexity.

34. Dr D noted that she was not present for the OR team briefing for Mrs A's surgery that morning. She told HDC that at around midday, she went to another OR to take over the anaesthetic management of a patient whose surgery was underway from another surgeon (who was relieving Dr C for a lunch break). Soon after Dr D's arrival, Dr C returned to the OR for Mrs A's surgery and suggested that they review Mrs A's clinical notes, in particular the clinical notes and clinic letters from her last anaesthetic procedures.

35. Dr D said that she and Dr C undertook the review together in the OR, while the second patient on the afternoon list was on the operating table. She said that Dr C was at the computer screen, and she was behind him looking over his shoulder. They discussed Mrs A's previous anaesthetic procedures in which there had been a difficult bag-mask ventilation and a difficult view of the airway, and Mrs A had suffered severe bronchospasm on intubation, with minimal effective ventilation and no detectable $EtCO_2$ flow. In response to the provisional opinion, Dr C stated that with regard to the exhaled CO_2 in the previous adverse events, two subsequent formal anaesthetic assessments had documented 'loss of CO_2' and 'no CO_2' after intubation.

36. Dr D stated that part way through the preoperative review, Dr C sent her to undertake a preoperative assessment and consent for the third patient on the list, and so she left him to complete the document review for Mrs A.

37. Dr D told HDC that while the third patient was anaesthetised, she and Dr C discussed and agreed on Mrs A's anaesthetic plan, which was to administer a salbutamol nebuliser preoperatively, use a video laryngoscope for an asleep intubation, and deliver intravenous

(IV) salbutamol and magnesium if Mrs A developed a bronchospasm. Dr D said that Dr C agreed with her suggestion to use a volatile anaesthetic (a liquid that is vaporised then inhaled) instead of total intravenous anaesthesia (TIVA), as the volatile anaesthetic promotes bronchodilation (opening of the bronchioles/airways), and it would assist in responding to bronchospasm if it occurred.

38. Dr D said that she also suggested having the analgesic/anaesthetic agent ketamine in reserve, as this has a similar effect as volatile agents. However, Dr C said that he did not want to use ketamine.

39. Dr C told the Coroner:

> 'It is germane to highlight the influential nature of previous serious anaesthetic events in shaping expectations for potential problems in future anaesthetics. We place great importance on the anaesthetic history, and in [Mrs A's] case there had been a recent bronchospasm event severe enough to result in abandoning an operation, and that had provoked three referrals to different investigative services. All of this was conspicuously documented in [Mrs A's] recent records and (appropriately) raised personally with me by my allergy clinic colleague as a matter of concern. We inevitably undertook [Mrs A's] anaesthetic with a very strong expectation that bronchospasm might occur after intubation.'

Anaesthetic consent

40. Dr D told HDC that mid-way through the third patient's operation, Dr C asked her to review Mrs A for a preoperative assessment and obtain her consent for the general anaesthetic.

41. Dr D met with Mrs A, Miss B, and an interpreter, in the preoperative room, for the assessment and consent process. Dr D said that they discussed Mrs A's current medical status and condition in terms of recent coughing and wheezing, and her medical co-morbidities. Dr D examined Mrs A's airway and noted that Mrs A had a Mallampati score of 4, a reduced thyromental distance[16] of less than 6.5cm, minimal neck extension, a forward head position, and a shortened webbed neck. Dr D stated:

> 'These examination findings corresponded to an extremely difficult airway, which was of concern to me. At some length I discussed with [Mrs A] the risks of the anaesthetic, focusing in particular on her difficult airway and her history of bronchospasm, which I recorded on the Agreement to Treatment form. At the conclusion of this discussion, [Mrs A] said she understood the information I had provided, and recorded her informed consent to the general anaesthetic on the Agreement to Treatment form. The form was counter-signed by [an interpreter].'

[16] The thyromental distance measurement is a method commonly used to predict the difficulty of intubation and is measured from the thyroid notch to the tip of the jaw with the head extended. If it is less than 7.0cm with hard scarred tissues, it indicates a possible difficult intubation.

42. Miss B told HDC that a 'female nurse or [Dr D]' asked her mother to go into an office. She said that Dr D asked Mrs A questions and said she was going to be responsible for putting Mrs A to sleep, and the interpreter translated the questions for Mrs A.

43. Miss B said that after Dr D left the room, the surgeon arrived and he told Mrs A that this was her last operation and it was her easiest operation of them all.

Anaesthetic plan

44. The anaesthetic plan was that Dr D would perform the intubation using a video laryngoscope and Dr C would administer the anaesthetic drugs and monitor Mrs A's physiological responses during the induction and intubation.

45. Dr D told HDC that before Mrs A was brought into the theatre, she suggested to Dr C that they should consider an awake fiberoptic intubation. Dr D said that given Mrs A's difficult airway and recent anaesthetic challenges, she considered that this would be a safer method of securing the airway from the outset, but Dr C's response was along the lines of, 'No she has been intubated previously with a GlideScope, so let's keep to the original plan to use the GlideScope 3.'

46. In contrast, Dr C told HDC that Dr D did not suggest that they consider an awake fibreoptic intubation, nor is it credible that she would suggest that given that there is a clear record of 'easy view with glidescope' documented in the formal anaesthetic assessment by the anaesthetist Fellow, which they both read during their assessment of Mrs A.

47. RN G told HDC that at approximately 3.15pm, before they brought Mrs A into the OR, Dr C had another brief discussion with him, anaesthetic technician Ms H, and Dr D about the anaesthetic plan for Mrs A. This included Mrs A's history of bronchospasm and other points that RN G cannot recall.

48. Dr C said that after the third patient had been taken to recovery and prior to Mrs A coming to the OR, he went to the operating room direct admission (ORDA) preoperative area to ensure that Mrs A was being given her Ventolin nebuliser, and he changed the charted dose from 2.5 to 5mg. He said that he also went to the recovery area and sought out one of the recovery nurses to tell her about Mrs A because that nurse has a kind, gentle manner, and he felt that her involvement (with her cultural connection) would be a perfect way of ensuring the best recovery room experience for Mrs A.

49. RN G stated that at around 3.25pm he went to the ORDA to complete the theatre nurse part of the preoperative checklist and bring Mrs A into the OR. He stated that they arrived in the OR at around 3.35pm, and he assisted Mrs A onto the operating table and provided her with some warm blankets and reassurance.

Intubation

50. RN G stated that they then completed a WHO[17] 'Sign In' followed by induction and intubation. He said that he never left Mrs A's side throughout the entire event.

51. Dr D told HDC that after venous access was secured, Mrs A had her anaesthetic induced intravenously with fentanyl (an analgesic and sedative that blunts the response to intubation), propofol (used to induce anaesthesia), and vecuronium (a skeletal muscle relaxant), all of which were given by Dr C.

52. Dr D said that she attempted to ventilate Mrs A manually with a bag attached to the breathing circuit, and a face mask applied over Mrs A's face, but that was unsuccessful. Dr D said that she inserted an oropharyngeal airway, but she was still unable to ventilate Mrs A effectively.

53. Dr D stated that she used both hands to thrust Mrs A's jaw forward and apply the mask, while Dr C squeezed the bag. However, due to the difficulty of trying to manipulate the jaw and hold the mask on Mrs A's face, there was a leak from the mask over Mrs A's nose, and they could ventilate a tidal volume of only around 100mL, which was insufficient for gas exchange. Dr C suggested that they swap roles, and he used both his hands to jaw thrust and hold the mask, while Dr D squeezed the bag, and they were then able to ventilate Mrs A with a greater tidal volume of approximately 300–400mL. Dr D stated that the $EtCO_2$ capnography trace was normal during this process.

54. Dr D said that after waiting three minutes for the vecuronium to take effect and achieve paralysis, Dr C asked her to intubate Mrs A. Dr D stated that the anaesthetic technician handed her a GlideScope size 4 handle, and she was able to insert the video blade into Mrs A's mouth and oropharynx without difficulty. Dr D said that the view of the vocal cords can be wholly or partially obstructed by the epiglottis (cartilage in the throat), which is what happened in Mrs A's case, and because the oesophagus lies just behind the laryngeal opening, sometimes the ETT will go into the oesophagus instead of the trachea. She told HDC that this is a not uncommon complication in difficult intubations.

55. Dr D stated that as it is often not possible to verify the correct placement of the ETT on the screen, they have a routine checklist to verify that the ETT is placed correctly in the trachea. She said that once they have inflated the sealing cuff on the tube and connected the breathing circuit, they deliver a manual breath by squeezing the bag and conducting a 'look and feel' assessment for correct endotracheal placement. They 'look' to assess the rise and fall of the chest as the bag is squeezed to verify lung inflation, and 'look' at the semi-translucent angle-piece connector between the ETT and breathing circuit for 'misting' during the expiratory phase of the respiratory cycle, whilst making a 'feel' assessment for the normal resistance of the lungs to manual inflation.

56. Dr D stated that the objective marker of satisfactory ETT placement within the trachea is the $EtCO_2$ trace on the monitoring system, which not only confirms correct placement, but

[17] World Health Organization.

provides information on the adequacy of ventilation and the presence and severity of any bronchospasm. She said:

> 'Given the intrinsic subjectivity of the "look and feel" checks, it is the dynamic, repeated, and reproducible trace on the capnograph which is the accepted gold standard for confirmation of correct placement of the endotracheal tube.'

57. Dr D told HDC that in Mrs A's case the laryngeal view on the video screen was a suboptimal view of only the epiglottis and a small indeterminate aperture underneath. The laryngeal cartilages and vocal cords could not be seen. There was redundant tissue of the pharynx, and secretions were present, which was why the view was so obscured.

58. Dr D said that during the intubation the GlideScope screen was over Mrs A's abdomen. Dr C was standing to her left, and the anaesthetic technician, Ms H, was to her right. Dr D said that the screen was positioned so that they all saw the laryngoscopic view, and Dr C was watching the video screen while she inserted the ETT into Mrs A's mouth and oropharynx.

59. In contrast, Dr C told the Coroner that while Dr D inserted the GlideScope, he simultaneously gave Mrs A another 50mg of propofol to reduce the chance of the intubation process provoking an airway reaction. Dr C said:

> 'I was not directly watching the intubation unfolding on the GlideScope screen, but was aware of the endotracheal tube being passed. I don't believe the registrar perceived any particular difficulty, though I remember her commenting as the tube was being secured that a size 3 blade might be easier in future.'

60. Dr D recalled that when she advanced the video laryngoscope to the pharynx just proximal to the epiglottis, she said, 'I've got a 2B view,' and Dr C said 'ok', and she advanced the ETT towards the aperture that was visible. However, the view was completely obscured by the tube, so Dr C said, 'Show me the view again.' Dr D said that she pulled the tube back so that Dr C could see the unobstructed laryngeal view once more and said, 'That's my view.' She stated that Dr C said 'ok', and so again she advanced the ETT under the epiglottis into what she believed was the trachea, as Dr C observed the procedure on the screen. She then asked Ms H to inflate the cuff, while she removed the GlideScope and attached the anaesthetic circuit to the end of the ETT. In response to the provisional opinion, Dr C denied any 'directive involvement' in the intubation and stated that he did not ask Dr D to 'show me the view again'.

61. Ms H stated that both she and Dr D saw a hole and Dr D placed the ETT in it, believing it to be the glottis. Ms H recalled that they 'saw the tube go in the hole on the screen' and that she connected the circuit to the ETT and Dr D began bagging.

62. Dr C said that he could not see the screen of the GlideScope clearly as he was giving drugs at the IV site on the left side of Mrs A, but he was aware of the ETT being passed and did not believe Dr D perceived any particular difficulty. Dr C remembers Dr D commenting as the tube was being secured that a size 3 blade might be easier in future. He does not recall Dr D

raising any concerns, but he does recall thinking that from the moment Dr D started hand ventilating, she thought something was wrong. Dr C stated: 'I recall that some $EtCO_2$ came back initially, but this rapidly diminished to "blips" on the monitor, and the airway pressures were high (>40cmH_2O).' He recalls thinking that this was explainable by bronchospasm. In response to the provisional opinion, Dr C stated that his recollection that some $EtCO_2$ came back initially is supported by the automatically compiled anaesthetic record, which clearly shows a fall to zero during the intubation procedure and an initial return of CO_2 at resumption of attempts to ventilate. He said that the initial appearance followed by early loss of CO_2 after intubation, as is clearly shown in the SaferSleep record,[18] is exactly what severe bronchospasm provoked by intubation would look like. Dr D said that she squeezed the bag, while looking at the angle-piece connector and catheter mount for misting, observing the chest for rise and fall, and checking the capnography monitor for $EtCO_2$ flow, to confirm the correct placement of the ETT into the trachea.

63. Dr D stated that she saw none of the confirmatory signs to indicate that the ETT had been situated within the trachea correctly, so she told Dr C that she did not think they were ventilating Mrs A, that it did not seem right to her, and she wanted to check the placement of the ETT using the video laryngoscope, to verify whether the tube was through the vocal cords. Dr D stated:

> 'I recall saying to [Dr C] "I don't think I am ventilating, let me check the tube", or words to that effect. I was leaning over [Mrs A] so that the Anaesthetic Technician could hand me the GlideScope, when [Dr C] told me not to check the placement of the tube, as he believed that the issue was bronchospasm. I reiterated that I needed to confirm the endotracheal placement. [Dr C] told me again not to check the placement of the tube, explaining that by doing so I would dislodge the endotracheal tube. He told me to tie the endotracheal tube in place, which I did. [Dr C], who was standing behind me at the time, said he was putting the patient on the ventilator, which he proceeded to do.'

64. In contrast, Dr C told HDC that Dr D did not ask to check the ETT placement at any time. In response to the provisional opinion, he noted that the OR was quiet and calm at that time and all present would have heard the conversation. As noted in paragraph 72, Ms H and RN G do not recall such a request.

65. Ms H recalled noting that Mrs A's stomach was rising (as usually occurs with successful intubation) and that there was mist in the ETT (suggesting exhaled gas and successful intubation) but there was no CO_2 trace on the capnography monitor. Ms H said: 'We kept bagging, we waited, I said "maybe we're in the stomach"' but she then saw 'little blips of CO_2 trace for a short time' so she said 'nah, never mind'.

66. Dr C said that Mrs A's oxygen saturation stayed stable for around two minutes after intubation, which would be unusual in a high BMI patient whose lungs are not being ventilated, even one who has been well pre-oxygenated. He said that contributed initially

[18] A system that mitigates the risk of drug errors and enhances patient safety and record-keeping during anaesthesia.

to his impression that they must be moving at least some gas in and out of Mrs A's lungs and so long as they did not panic, and continued ventilating and treating the bronchospasm, things would improve, as they almost always do.

67. Dr C told the Coroner that from the moment Dr D started hand ventilating through the ETT, she thought something was wrong. He said that some CO_2 came back initially, but this rapidly diminished to 'blips' on the monitor, and Mrs A's airway pressures were high (>40 centimetres of water — normal pressures to achieve an adequate breath would be 15–20 centimetres of water). He stated that he asked to feel the bag for himself and attempted to give breaths, resulting in the same perception as Dr D and, after several unsuccessful attempts at ventilation with very high pressures, he adjusted the maximum pressure for manual ventilation to 40 centimetres of water in an attempt to avoid pressure damage to Mrs A's lungs.

68. Dr D said that once the ETT was secured in place with tape, she asked RN G to pass her a stethoscope so that she could auscultate Mrs A's lungs. She could hear transmitted sounds that sounded like breath sounds with both inspiratory and expiratory wheeze, so she reported that to the team, saying: 'I can hear breath sounds, there is bronchospasm.' However, there was still no $EtCO_2$ trace on the capnography monitor. She stated that Dr C was at the drug locker drawing up drugs, and she said to him once more that she wanted to check the placement of the ETT and Dr C replied in a raised voice, 'No, we know what we are treating. We are treating bronchospasm,' or words to that effect.

69. Dr C stated that their immediate conclusion was that they had inserted the breathing tube successfully, but Mrs A was suffering a severe bronchospasm event like the one that had occurred in Month2. He said that he drew up 500mcg of salbutamol and 10 millimoles (mmol) of magnesium (both are treatments for severe bronchospasm) and gave them immediately while Dr D continued ventilating Mrs A.

70. Dr D stated:

> 'There was still no end-tidal CO_2 trace on the monitor, and the oxygen saturations were beginning to fall. After attempting to hand ventilate with the bag for a couple of seconds, once more I told [Dr C] that I was not happy with the situation. I cannot remember my specific words, but it was to the effect that I felt that something was wrong. [Dr C] replied in an even louder voice that I needed to stop panicking and to calm down. (I believe I was calm, and I was not panicking but I was very concerned that this clinical problem was deteriorating rather than resolving). [Dr C] took the ventilation bag from me, and said that the oxygen saturations would rise with continued ventilation.'

71. In contrast, Dr C told HDC that Dr D did not repeatedly ask to check the placement of the ETT. He said:

> 'Subsequently, [Dr D] wrote an elaborate account (for the [adverse event review committee]) claiming close supervision/checking of the intubation by me and multiple

> requests to check the tube (which I allegedly denied) prior to the red bells being sounded. All these claims were incorrect. It bears consideration of why, having claimed we carefully checked the tube position together during the intubation (including removing and replacing it), she would ask to check it again a minute later in a patient we strongly suspected of suffering bronchospasm; and why, immediately after the event, she would have texted me to apologise for an oesophageal intubation if I had precisely guided her during the intubation process, and then prevented her from checking the tube as she claims.'

72. RN G stated: 'Incorrect [ETT] placement was not mentioned that I remember.' Ms H stated: 'None of the clinicians named above, [Dr D and Dr C] during complication, before red bell came on, had vocally requested to check the placement of [ETT].'

73. Ms H stated that there was still no $EtCO_2$, and they could see the abdomen rising and falling, and Dr C switched on 100% oxygen and kept pressing the emergency O_2 flush button to fill the bag.

74. Mrs A's oxygen saturation level was now in the 80s. Dr C administered salbutamol 250mcg (at 3.50pm) and magnesium sulphate 10mmol (at 3.51pm) and hand ventilation continued, but Mrs A's condition did not improve. At 3.52pm an adrenaline 200mcg bolus was given, still with no improvement. At 3.55pm Mrs A was given another adrenaline 500mcg bolus.

75. Dr D said that she was increasingly concerned, and she asked RN G to get Dr F. She said that Dr F came into the room (see below — Dr F's account is that he came into the OR in response to the emergency bell). Dr D said that she did not hear the whole conversation as she was concentrating on the administration of the adrenaline, but she did hear Dr C describe the difficult airway and mention bronchospasm. She said that Dr F then auscultated Mrs A's lungs and reported, 'I can hear breath sounds, the tube is in, but you have bronchospasm,' or words to that effect.

76. Dr D told HDC that she saw that the heart rate was down to 30 beats per minute and she suggested to Dr C that she should start chest compressions, to which he agreed. Dr C then asked one of the theatre nurses to activate the red (emergency) bell and Dr D began chest compressions.

Emergency declared

77. RN G stated that the scrub nurse was looking through the window from the preparation room into the theatre, and RN G signalled for her to come in and push the emergency bell while RN G prepared the room for cardiopulmonary resuscitation (CPR) by getting a foot stool.

78. Statements have been obtained from several clinicians who were present in the OR subsequently. There are substantial differences between their accounts, and Dr C disagrees with aspects of their accounts. Each account is set out below with Dr C's responses.

Dr D

79. Dr D told HDC that in response to the emergency bell, several anaesthetic doctors and technicians entered the theatre, including another anaesthetic Fellow, Dr I, who asked whether the ETT had been checked. Dr D said that Dr C replied that the ETT was in the trachea, and the problem was bronchospasm. Dr D recalled that that soon after Dr F arrived in the OR he auscultated Mrs A's chest and reported 'I can hear breath sounds, the tube is in, but you have bronchospasm'.

80. Dr D said that Dr I and Dr F then began inserting an arterial line. Dr D said that there was still no $EtCO_2$ flow, and Mrs A's oxygen saturations dropped to 10%.

81. Dr D stated that she swapped compressions with another person in the room and Dr I then asked Dr C if he should use the GlideScope to check the position of the ETT. Dr D said that Dr C replied 'no'.

82. Dr D told HDC that quite some time after the compressions had commenced, the drapes were removed from Mrs A, revealing her abdomen. Dr D said that she noticed that Mrs A's abdomen was insufflated and told Dr C. She said that it was at that point that Dr C used the video laryngoscope to check the position of the ETT. Dr D said that he obtained the same view that they had seen originally, which was that the laryngeal cartilages and vocal cords could not be seen. She recalled him saying, '[L]ook, we're in,' and then someone else said, '[S]top the tube isn't in.'

Dr F

83. Dr F stated that when the emergency bell was activated, he entered the OR via the side door behind anaesthetic technician coordinator Mr J and the nursing coordinator. Dr F said that he went straight to the head of the table to Dr C, who rapidly said that this was a patient with known difficult intubation with previous bronchospasm, who currently had a severe bronchospasm and possible anaphylaxis.

84. Dr F said that prior to completion of the handover, Mrs A went into a wide complex bradycardia (slow heart rate) of between 30–40 beats per minute, and his immediate thoughts were that asystole (heartbeat stop) would follow shortly. He said that a voice behind him, which may have been Dr D, said loudly: '[S]hould we give adrenalin?'

85. In response to the provisional opinion, Dr C noted that Mrs A had already received multiple doses of adrenaline starting before the emergency alarm was sounded, as documented in paragraph 74.

86. Dr F stated that between 3.59pm and 4.00pm he took up a position to Mrs A's left at the upper abdominal region, where he could observe the monitor, Dr C, and the drug trolley to his right. He said that he was seeking information from the monitor, listening out for potential useful suggestions, and observing Mrs A's response to treatment to try to determine the best approach.

87. Dr F said that Dr I volunteered to place an arterial line in Mrs A's left radial artery. There was a 20G IV cannula in Mrs A's left arm, and the difficult arterial access took approximately 10 minutes.

88. Dr F said that Dr C remained at the head of the bed with his left hand on the ETT, ventilating Mrs A with the bag in his right hand. Dr F stated that he estimated that there were 20 people in the room at that time.

89. Dr F stated that at approximately 4.02–4.03pm Dr D listened to Mrs A's chest and then asked him to listen to it. Dr F said that he used the same stethoscope and listened to both sides of Mrs A's chest and heard coarse sounds bilaterally. He then walked to the head of the bed and took the green bag off Dr C and attempted to feel the compliance. Dr F said that Dr C remained with his left hand on the ETT. Dr F stated:

> 'What I felt was something I have never experienced before, I did not know how to interpret it. In hindsight the high stomach pressures meant oxygen was passing in and out. I returned to the patient's left hand side.'

90. In response to the provisional opinion, Dr C referred to the anaesthetic record, which states: 'Auscultation of the chest again by arriving SMO — also suggested tube in position and bronchospasm.' Dr C stated:

> 'Along with other considerations at the time, this pronouncement by a vastly more experienced colleague supporting the diagnosis of bronchospasm profoundly contributed to reluctance to change course when [Dr I] asked about tube position very soon after, and it certainly felt to me like this was a collective decision and not mine alone.'

91. Dr F said that at approximately 4.04–4.05pm Dr D, who was standing behind him, shouted: '[Dr C] we have to check the tube.' In response to the provisional opinion, Dr C said he believes it was Dr I who made that statement. Dr F said that he then turned to Dr C and said in a firm clearly direct manner and making good eye contact, '[Dr C] do we need to check the tube?' and Dr C's response was that the risk of losing the airway was too great and that he was happy that the ETT was secure. Dr F said he accepted Dr C's answer but at that time he was not aware that Dr D had intubated the patient, he did not know the time between induction of anaesthesia and the red bell being pushed, and he was not aware that the ETT had not been checked.

92. In contrast, Dr C told HDC that the events in paragraph 91 did not happen. He stated that no one else has reported Dr F requesting to check the tube at that point, and there are some statements by others reported in one of the early drafts of the AER report that are inconsistent with Dr F's claim. Dr C is of the view that Dr F agreed with the diagnosis of bronchospasm, and as Dr F was the other senior clinician present, his examination of the chest and concordance with the diagnosis of bronchospasm contributed significantly to the anchoring problem and contributed to the reluctance to change course at that point.

93. Dr F stated that the following four minutes were ones of increasing desperation with rounds of CPR and adrenaline. He said that at approximately 4.09pm two nurses pulled back the blanket, and Dr D exclaimed that there was air in the stomach and Dr F pointed at Mrs A's abdomen and said to Dr C: '[T]hat is air you will check the tube.' Dr F told HDC that 'this was said looking at [Dr C] in a clear direct manner'. Dr F said that he went to the head of the bed intending to perform the intubation but ultimately Dr C intubated the patient. Dr F said that after intubation the situation stabilised, and he left the room.

94. Dr C disagreed with Dr F's account that he pointed at Mrs A's abdomen and said to Dr C, '[T]hat is air you will check the tube,' and that 'this was said looking at [Dr C] in a clear direct manner'. Dr C said that it was Dr F who first noticed that the stomach was distended when they changed operators providing chest compressions, and when Dr F noticed the distension of the stomach he asked something like, '[W]as the stomach distended like that at the start?' and Dr C answered, 'No.' Dr C said that his immediate reaction was to ask for the GlideScope to check the tube.

Dr I

95. Dr I stated that when he entered the OR at approximately 4pm there were a significant number of people in the room, including Dr F, and the surgical Fellow, and multiple anaesthetic technicians. He said that Dr C was at the head of the patient and appeared to be leading the resuscitation.

96. Dr I said that he received a brief handover from Dr C regarding Mrs A having severe bronchospasm, and that initial treatment had been started including IV salbutamol and magnesium. Dr I said that at that point he asked Dr C whether the ETT had been confirmed to be in the correct position in the trachea and he was told that the trachea had been intubated.

97. Dr I stated that Dr F commented on the severe bilateral wheeze on auscultation of the chest and very quickly after this discussion, Mrs A developed a significant bradycardia with hypotension (low blood pressure). CPR was initiated and Dr C assigned him the task of inserting an arterial line for invasive blood pressure monitoring. Dr I said that this was technically difficult, and he requested an ultrasound, which was brought to him by one of the anaesthetic technicians. Dr I said that at approximately 4.07pm, shortly after the arterial line was inserted, it was noted that Mrs A's abdomen had become significantly distended and multiple people including him re-raised the issue of checking the ETT position.

98. Dr C acknowledged that Dr I asked, '[I]s the tube in the right place?' at some time after he arrived in the OR. Dr C stated: 'This was the first and only time the issue of tube position was raised, until [Dr F] noticed the abdominal distension a short time later.'

Mr J

99. Anaesthetic technician coordinator Mr J stated that at 3.55pm he responded to an emergency bell in the OR and, when he entered the room, he saw an intubated patient on the operating table, displaying signs of desaturation. He said that there was no CO_2 visible on the patient monitor, hand bag ventilation was hard, and there was only slight chest movement, if any at all.

100. Mr J stated:

> 'At [3.55pm] … There was no CO_2 visible on the patient monitor … The question was raised by [Dr I], [Dr D] and myself about "tube positioning" and did that need to be checked?'

101. Mr J said that Dr C stated that the ETT had been placed in the correct position and the lack of CO_2 and chest movement was due to bronchospasm, which this patient had developed in her previous anaesthetic.

102. Dr C told HDC that he has no recollection of Mr J asking about the tube position, but he agreed with Mr J's recollection of Dr I doing so.

103. Mr J said that Mrs A arrested at 4pm and CPR was started. Mr J also said that after Mrs A's cardiac arrest:

> 'At this time [Dr I] <u>again asked</u> about tube positioning of the E.T. tube? At [4.10pm], we paused C.P.R to check output … at this time <u>[Dr I] had said he wanted to see the tube position</u>.' (Emphasis in original.)

104. Dr C stated that it was during the pause in CPR that they noted that Mrs A's stomach was distended and decided to check the ETT. Dr C said:

> 'It would be no surprise that in the flurry of activity around noticing the distended stomach multiple people might have advocated for checking the tube (which we chose to do immediately).'

105. Dr C told the Coroner:

> 'In this period, I considered the possibility of removing the endotracheal tube or checking its position and someone (who I subsequently learned was one of our senior anaesthesia registrars) asked about tube position. But in this highly stressful moment, a synthesis of available evidence including the strongly documented past history of intubation-induced bronchospasm, a video intubation (which is very unlikely to result in the tube being misplaced), the initial period of relative stability in saturations after intubation, occasional oximetry readings suggesting oxygenation, and evaluations of the chest by different examiners (including a senior colleague) indicating air entry in both lungs with severe wheeze, caused me to believe we were dealing with a "semi-expected" crisis caused by severe bronchospasm. Moreover, at this point with chest compressions underway, and with [Mrs A] having slipped down off the pillows used to position her for insertion of the breathing tube, performing video laryngoscopy would have required interrupting chest compressions which itself can contribute to a worse outcome in a resuscitation situation. Obviously, with the benefit of hindsight, confirming tube position would have revealed the true nature of the problem sooner, and may have led to a better outcome.'

Reintubation

106. Dr C stated that he used the GlideScope to check the ETT and the view obtained initially appeared to show that the ETT was correctly placed but on further inspection and lifting of the GlideScope, the vocal cords came into view, confirming an oesophageal intubation. The ETT was removed, and he inserted a new ETT into the trachea, requiring a bougie introducer[19] to do so. Once complete and the anaesthetic circuit was attached, CO_2 appeared on the capnography monitor, along with a rapid increase in oxygen saturations and heart rate and blood pressure.

107. Dr C said that the first arterial line pressure trace on the Safer Sleep record is at 4.07pm, almost precisely at the time of reintubation.

Subsequent events

108. After de-sedation in the Department of Critical Care Medicine, Mrs A's electroencephalogram (a test to measure the brain's electrical activity) showed features consistent with status myoclonus (sudden, brief, jerky, shock-like, involuntary movements arising from the central nervous system) and significant cortical brain injury.

109. Family meetings were held, and the family accepted the advice that Mrs A had suffered a non-survivable injury. Mrs A was extubated and, sadly, she died.

Further information from Dr C

110. Dr C said that on 3 Month8 there was a crisis checklist in the operating room but he did not use it. He said that had he done so, it is unlikely to have made any difference to the outcome because oesophageal intubation was not listed as a potential diagnosis in the relevant pathway.

111. Dr C told HDC that the 'massive confounding influence' in this case was the detailed written accounts of there being 'no CO_2' (no capnography trace) in the previous abandoned anaesthetic event that subsequently was diagnosed by multiple senior clinicians as a bronchospasm, which Dr C had read. Dr C said that this meant that in the short time-pressured period prior to anaesthetising Mrs A, they were habituated to an explicitly documented belief, held by multiple senior colleagues who had assessed Mrs A formally, that she had experienced a bronchospasm severe enough to cause complete loss of the CO_2 trace in a very recent anaesthetic. He said that this gave them a peer-supported reason to accept that complete loss of the CO_2 trace was compatible with the diagnosis of bronchospasm.

112. Dr C stated that complete loss of CO_2 due to bronchospasm is reported in the literature (references provided), as is controversy over the obligatory removal of the ETT in such scenarios. He stated that the 'no trace — wrong place' mantra was not front-of-mind at the time of events, although that changed following publication of the Project for Universal Management of Airways (PUMA) guideline in 2022. He stated:

[19] A thin, flexible surgical instrument used to dilate a passage of the body.

> '[R]emoving an endotracheal tube in an extremely overweight desaturating patient, known to be difficult to mask ventilate, when there are very strong grounds for suspecting bronchospasm is a difficult, somewhat counter-intuitive and potentially controversial call (especially prior to release of the recent PUMA guideline).' (Emphasis in original.)

113. Dr C said that the event was caused by a very unfortunate confluence of multiple factors that created an extremely confusing crisis. He said that he has dealt with multiple oesophageal intubations over the years, including two since Mrs A's event, and they have always been diagnosed and rectified quickly and safely, but the critical difference in this case was the 'overwhelming expectation of bronchospasm' arising from Mrs A's recent history, and multiple other factors such as the explicitly documented observation that her recent episode of bronchospasm had resulted in loss of CO_2/no CO_2.

114. Dr C stated:

> 'I wish to be clear that none of my commentary should be viewed as an attempt to place responsibility for events on others. I was the consultant in charge of [Mrs A's] case and was responsible for her care. I do believe, however, that there were multiple factors (as described) that contributed to events taking the course they did, and that under the circumstances that prevailed, most of my colleagues would have found managing this situation similarly challenging. Hopefully the recent educational initiative around the dangers of oesophageal intubation will have reduced this danger.'

115. Dr C told HDC that he now believes that there is a strong possibility that the original 'bronchospasm' event on 6 Month2 may not have been bronchospasm at all, but another misdiagnosed oesophageal intubation.

Further information — Health NZ

116. Health NZ Te Toka Tumai Auckland stated that there was a 'perfect storm' of factors that confronted the team managing Mrs A's airway. The team had been primed by the previous anaesthetics to be expecting high airway pressures and difficulty ventilating Mrs A after intubation. Thus, when a clinical pattern consistent with that occurred, there was a strong confirmation bias in determining that the problem was bronchospasm.

117. Health NZ contended that it was reasonable for the team to establish a working diagnosis of bronchospasm in the minutes after induction. Health NZ stated:

> 'There is no doubt that 17 minutes of "no CO_2" was highly indicative of a misplaced tube and that cognitive biases influenced the decision-making during those 17 minutes … [I]nformation that was highly suggestive of misplacement of the tube was available to both the attending team and to the team that responded to the emergency call.'

118. Health NZ said that it views the rare but well recognised complication of unrecognised oesophageal intubation as a system-based complication, not as an individual practitioner failing.

119. Health NZ said that with the benefit of hindsight, there was a failure to diagnose the problem, but the team were faced with a complex, ambiguous and rapidly evolving situation. Health NZ stated:

> 'It is clear that oesophageal intubation was considered and discounted given the information to hand. It is easy in hindsight to criticise the failure to check the position of the endotracheal tube, but given the situation it is not at all certain that other teams faced with similar circumstances would have done so.'

120. Health NZ told HDC that unrecognised oesophageal intubation is a very rare complication, considered to occur in about 1 in 1 million anaesthetic treatments. Health NZ said that while at the time of these events many professional groups worldwide had produced airway management guidelines that refer to techniques to confirm tracheal intubation, none of those had a focus specifically on preventing unrecognised oesophageal intubation. Health NZ told HDC that the PUMA guidance published in 2022 addresses the specific clinical scenario that occurred with Mrs A and provides comprehensive and systemic guidance to mitigate the risk of unrecognised oesophageal intubation.

Adverse event review

121. The adverse event review report (the AER report) contains a timeline of events that is reproduced in Appendix B.

122. The AER report states that correct placement of the ETT must be confirmed immediately following intubation, and the gold standard for confirming tracheal intubation is the on-going presence of $EtCO_2$.

123. The AER report states that other adjuncts to confirmation include seeing on laryngoscopy the ETT pass into the trachea through the vocal cords, misting of the tracheal tube, rise and fall of the chest, and auscultation of breath sounds over the chest. The AER report states that passing a bronchoscope down the ETT can be used to confirm tracheal placement visually if other measures are not diagnostic.

124. The AER report states that anaesthetists are trained to use a series of rescue plans in the event of difficulty intubating a patient. Often these plans are articulated only to the wider theatre team involved in the surgical procedure when difficulty is known or anticipated. If the preceding plan fails, the following steps are progressed:

> '**Plan A:** Initial tracheal intubation plan.
>
> **Plan B:** Maintenance of oxygenation using a supra-glottic airway device and if successful, consideration of continuation, alternate intubation plan or awakening the patient.
>
> **Plan C:** Maintenance of oxygenation using facemask ventilation and if successful, awakening the patient.

Plan D: Emergency techniques for "can't intubate, can't ventilate" situations e.g. Creating an airway, via surgical access to the front of the throat.'

AER report findings

125. The AER report found that the team did not have a shared systematic approach to solve their inability to ventilate when initial management of the suspected bronchospasm did not lead to improvement. A systematic approach uses slow (also referred to as System 2) thinking to work through a wide range of options deliberately. Factors that may have contributed to the absence of a shared systematic approach include the following:

1. No discrete anaesthetic combined team pre-brief for development and sharing of the airway strategy.
2. Misinterpretation of auscultation findings, $EtCO_2$ trace, high airway pressure, false reassurance of high oxygen saturations.
3. The events of Mrs A's previous anaesthetics meant that the anaesthesia team's thinking was strongly formed about successful intubation being achievable and bronchospasm re-occurring as a significant problem. Therefore, when high airway pressure and absent capnography occurred post intubation, the first diagnosis considered was the one the team expected. This phenomenon is known as confirmation bias, the tendency to favour signs that support one's prior beliefs.
4. Crisis checklists were not used.

126. The AER report states that crisis checklists are cognitive aids that outline important steps to take in an anaesthetic crisis. They are attached to the wall of the operating room as a visual reminder for their use. However, they were not used or mentioned in this event. Using the checklists before the emergency bell may have interrupted the trajectory of the crisis by prompting a recap and a shared systematic approach to the problem. However, the AER report acknowledged that oesophageal intubation as a differential diagnosis was not prominent in the crisis checklists.

127. The AER report states that the emergency bell acts to declare an emergency and bring more help. The aim of this help is to provide more team members to assist in physical tasks but also to provide new insights and ideas for diagnosis and management. In this event, the additional team members were initially drawn into the fixated thinking of the treating team. Several factors may have influenced this:

1. No hands-off leader

Although Dr C assumed the leader role, assigning tasks and standing to the side, he was still squeezing the ventilation bag. The intention for a truly hands-off leader is that they can stop concentrating on the physical tasks they are doing and therefore be able to allocate their attention wisely, and 'step back' and see the bigger picture. This may involve inviting others' thoughts, utilising checklists, distributing the workload, and sharing the mental model. Sometimes the best person to be the hands-off leader is the anaesthetist originally in the room, and at other times it is better for an arriving anaesthetist to take

over. Active followers should support the hands-off leader by explicitly asking, 'Who is the hands-off leader?' and offloading tasks to enable that person to be hands off.

2. Recap was not completed and did not interrupt the fixated thinking

The response to the cardiac collapse (giving medications and chest compressions and checking monitor data) interrupted the recap and further delayed the recognition of the oesophageal intubation.

3. No use of crisis checklists after the emergency bell

4. No standardised response to the emergency bell

   a. Too many staff entered the OR

   A large number of staff entered the OR to help and there was no control of the number of staff responding. Comments were made that the environment was noisy and that the recap could not be heard easily. That may have hindered clear thinking and prevented staff speaking up.

   b. Limited role allocation

   The assigning of staff to key tasks or roles during a crisis is not practised routinely in the Perioperative Directorate, compared to, for example, the clear roles assigned in the Emergency Department when a trauma patient arrives. Roles such as 'hands-off leader' and 'crisis checklist reader' may not be allocated explicitly.

Responses to provisional opinion

128. Responses were received from Miss B, Dr C, and Health NZ. These have been incorporated into the 'information gathered' section where relevant. In addition, the following responses were received:

Miss B

129. Miss B said that Mrs A's family appreciate the length of time taken to properly investigate their complaint, and the reassurance that better procedures are in place to prevent such a mistake from happening again.

130. Miss B stated that Mrs A's family believe that Dr C was not mentally and physically prepared for Mrs A's operation on that day as he may have been rushing and did not provide appropriate care and critical decision-making prior to and during Mrs A's anaesthetic. Miss B said that Mrs A's family believe that Dr C continued to ignore obvious signs and concerns from others involved, including the poor $EtCO_2$ trace, and he should have rechecked the ETT placement.

Dr C

131. Dr C noted that it seems clear to him that HDC has gone to some trouble to produce a fair report about a complex case. He continues to disagree with some of the strong views of my independent advisor, Dr Jones, and does not believe that Dr Jones fully appreciates the potential for the preceding events in Mrs A's case to create a potent cognitive trap.

132. Dr C stated that he sought help early in the crisis, and throughout that process it never seemed anything other than collective decision-making.

133. Dr C contended that when referring to the accepted procedure (removing the ETT), Dr Jones gave inadequate weight to the substantial expectation for bronchospasm (with complete loss of CO_2) created by the prominently documented previous crisis event, and the initial appearance then subsequent loss of CO_2 after intubation shown in the automatically recorded anaesthetic record in their event. Dr C stated that these factors created a potent cognitive trap for misdiagnosing an oesophageal intubation as bronchospasm.

134. Dr C accepted the criticism about a 17-minute delay but contended that it is more understandable if it is remembered that once things deteriorated into a suspected cardiac arrest/CPR situation, a new set of considerations came into play. He said that the suspected cardiac arrest happened within a *much* shorter time frame (seven or eight minutes) than 17 minutes and, especially in a suspected bronchospasm situation where there were occasional blips of CO_2 appearing and oximetry evidence of achieving some oxygenation, it was even harder to break out of the mindset because a substantial pause in CPR to check the tube in a partial oxygenation during a bronchospasm scenario could have been fatal if they were right about the bronchospasm diagnosis.

135. Dr C stated that this event occurred in 2021 prior to release of the 2022 PUMA guideline and its world-wide promotion that brought these issues to everyone's attention.

Health NZ

136. Health NZ questioned Dr D's reference to having a 2B view, which is a modification of the Cormack-Lehane view of the glottis (or laryngeal aperture) at intubation, and stated that while video laryngoscopy generally offers better visualisation of the glottis compared to direct laryngoscopy, the traditional Cormack-Lehane grades do not always accurately reflect the ease of intubation with video devices, particularly if a hyper-angulated laryngoscope blade is used. Based on that, Health NZ is uncertain of the relevance to the events of describing the glottic view using a modified Cormack-Lehane score because of the indirect relationship between glottic view and intubation with video laryngoscopy.

137. Health NZ noted the differences between the recall of events by the people involved. It stated that during its detailed assessment of Mrs A's care soon after these events, it was unable to determine exactly what the individuals involved did or said. It did not consider further pursuit of this to be helpful in understanding the event, and it considers HDC's reliance on written statements by those involved to be problematic.

138. Health NZ accepted that it breached Right 4(1) of the Code of Health and Disability Services Consumers' Rights (the Code) and maintained that the complication of unrecognised oesophageal intubation was a team- and system-based problem, not an individual practitioner failing.

Opinion: Introduction

139. At the outset I express my condolences to Mrs A's family for their loss in such circumstances. I acknowledge the significant impact that these events and Mrs A's death have had on her family.

140. As a healthcare provider, Health NZ is responsible for providing services in accordance with the Code. Health NZ had a responsibility to ensure that its staff were trained and aware of what to do in circumstances such as these, and that Mrs A received services of an appropriate standard.

141. Health NZ Te Toka Tumai Auckland views the complication of unrecognised oesophageal intubation as a system-based complication, not as an individual practitioner failing. Although I consider that systems issues were at play, I also consider that there was a level of individual responsibility, as discussed below. I have considered Health NZ's comments about the differences in recall of the various witnesses; however, I do not consider it unreasonable to analyse the evidence provided.

142. This report focuses on the delay in recognising that the ETT was misplaced. Mrs A had approximately 17 minutes of no sustained CO_2 trace following intubation, and the events resulted in a significant brain injury and death.

143. In considering the events that occurred, I have been guided by independent advice provided by anaesthetist Dr David Jones. I have also carefully considered the findings of the AER report.

Opinion: Dr C — breach

Introduction

144. To his credit, Dr C has accepted that he was the consultant in charge of Mrs A's case and that he was responsible for her care. He has pointed to several factors, including a lack of time to review Mrs A's history and the documented observation that her recent episode of bronchospasm had resulted in loss of CO_2/no CO_2 that resulted in the cognitive biases that predisposed him to believe that Mrs A had a bronchospasm. Health NZ stated:

> '[T]here is no doubt that 17 minutes of "no CO_2" was highly indicative of a misplaced tube and that cognitive biases influenced the decision-making during those 17 minutes … [I]nformation that was highly suggestive of misplacement of the tube was available to both the attending team and to the team that responded to the emergency call.'

145. I acknowledge this assessment, but in my view the cognitive biases are an explanation or description of events and do not ameliorate Dr C's responsibility to think critically when the

medication that he administered did not result in any improvement, and to take appropriate actions at an earlier stage.

Anaesthetic history

146. Mrs A's anaesthetic history included one failed intubation on 8 Month2 followed by three successful intubations. Although both Dr C and Dr Jones have opined that the event on 8 Month2 was likely not a bronchospasm but a misplaced ETT, it appears that this was not included in the differential diagnosis at the time.

147. Dr Jones advised that provided the ETT was confirmed to be in the trachea, then it was reasonable to include bronchospasm in a list of possible causes of ventilation and gas exchange difficulties, based on the documentation of Mrs A's previous anaesthetic events. He added:

> 'But I do not consider it was reasonable to hold onto it as the only working diagnosis, when continued deterioration was evident. This cognitive bias can be referred to as "anchoring", with resistance to consider what other causes could be giving ventilation and oxygenation difficulty.'

Time pressure

148. On 3 Month8 Dr C was expecting to work in the OR only in the morning, and consequently he had not perused Mrs A's records previously, as Mrs A's surgery was in the afternoon. He said that he knew very little about her prior to that day. Dr E had told him that during an anaesthetic five months earlier, Mrs A had experienced a bronchospasm that was so severe that the operation was abandoned.

149. Dr C remained in the OR for the whole day, with Mrs A's surgery last on the list. At around 12.30–1.30pm, senior registrar Dr D was allocated to the OR. Dr D had not worked with Dr C previously. She also had not had an opportunity to review Mrs A's records in advance.

150. Dr Jones advised that there was rather a lot of information from a variety of sources to access and consider in a short time space, and the preoperative anaesthesia assessment gave the impression of 'bronchospasm likely to airway manipulation' as the standout conclusion.

151. Regarding the limited time in which to review Mrs A's records, Dr Jones stated that although there was time pressure, any patient could present in an emergency without much opportunity to read all previous records and experiences. He noted: 'There was as much or little time as is commonly encountered.' In response to the provisional opinion, Dr C submitted that it was the limited time that caused them to focus their attention almost solely on the two consultant-level anaesthetic assessments readily available on the computer system, and which overwhelmingly emphasised that the recent anaesthetic crisis was thought to involve bronchospasm so severe that it forced abandonment of the anaesthetic and surgery.

Review in OR

152. Dr D and Dr C reviewed Mrs A's clinical records together in the OR while a patient on the afternoon list was on the operating table, and they discussed Mrs A's previous anaesthetic procedures.

153. Part way through the preoperative review, Dr C sent Dr D to undertake a preoperative assessment and consent for the third patient on the list, and so he completed the document review for Mrs A alone.

154. Although I consider that it was not ideal for Dr C to review Mrs A's records while in the OR with another patient, I note Dr Jones' comments:

> 'As a cancer case cancellation was undesirable. It was a balance of risks and benefits by being last case. This sequence of activities also illustrates the tight time pressures when concurrent care of one case can be distracted by the demands for assessing the next — in this case by a team who came to work that day not knowing this case was to be theirs. Not an excuse but a reality.'

155. Dr Jones stated that the lack of clinical history supportive of Mrs A having a tendency to asthma-like bronchospasm, coupled with the possible alternative explanation for the 8 Month2 event, should have weakened the belief in bronchospasm as the sole working diagnosis, especially as the plan was the use of sufficiently deep anaesthesia to reduce the response to tracheal stimulation. I accept this advice.

Intubation

156. Dr D performed the intubation using a video laryngoscope, and Dr C administered the anaesthetic drugs and monitored Mrs A's physiological responses during the induction and intubation.

157. Dr D said that the GlideScope screen was positioned so that they all saw the laryngoscopic view, and Dr C was watching the video screen while she inserted the ETT into Mrs A's mouth and oropharynx.

158. Dr D recalled that when she advanced the video laryngoscope to the pharynx just proximal to the epiglottis, she said, 'I've got a 2B view,' and Dr C said 'ok,' and she advanced the ETT towards the aperture that was visible. However, the view was completely obscured by the tube, and Dr C said: '[S]how me the view again.' Dr D said that she pulled back the tube so that Dr C could see the unobstructed laryngeal view once more, and said, '[T]hat's my view,' and Dr C said, 'ok,' so again she advanced the ETT under the epiglottis into what she believed was the trachea, as Dr C observed the procedure on the screen. Ms H stated that both she and Dr D saw a hole and Dr D placed the ETT in it, believing it to be the glottis. Ms H recalled that they 'saw the tube go in the hole on the screen' and that she connected the circuit to the ETT and Dr D began bagging.

159. In contrast, Dr C told the Coroner:

> 'I was not directly watching the intubation unfolding on the GlideScope screen, but was aware of the endotracheal tube being passed. I don't believe the registrar perceived any particular difficulty, though I remember her commenting as the tube was being secured that a size 3 blade might be easier in future.'

160. The extent to which Dr C oversaw the intubation is unclear. However, by his own account he did not watch the intubation. I accept that Dr D was a senior trainee and that it was appropriate for her to perform the intubation, with Dr C's oversight.

Checks that ETT was within trachea

161. Dr D's evidence is that she saw none of the confirmatory signs to indicate that the ETT had been situated within the trachea correctly, so she told Dr C that she did not think they were ventilating Mrs A and that it did not seem right to her, and she wanted to check the placement of the ETT using the video laryngoscope to verify whether the tube was through the vocal cords. She stated that Dr C told her not to check the placement of the tube, as he believed that the issue was bronchospasm, and when she reiterated that she needed to confirm the endotracheal placement, Dr C again told her not to check the placement of the tube, explaining that by doing so she would dislodge the ETT.

162. Ms H recalled noting that Mrs A's stomach was rising (as usually occurs with successful intubation) and that there was mist in the ETT (suggesting exhaled gas and successful intubation) but there was no CO_2 trace on the capnography monitor. Ms H said, 'We kept bagging, we waited, I said "maybe we're in the stomach",' but she then saw 'little blips of CO_2 trace for a short time' so she said, '[N]ah, never mind.'

163. Dr C told HDC that Dr D did not repeatedly ask to check the placement of the ETT. However, he also told the Coroner that from the moment Dr D started hand ventilating through the ETT, she thought that something was wrong.

164. In response to the provisional opinion, Dr C said that the OR was quiet and all present would have heard what was said. However, neither RN G nor Ms H recall requests to check the ETT placement prior to the activation of the emergency bell. I acknowledge that three people cannot recall Dr D having asked to check the ETT placement prior to the activation of the emergency bell. I am unable to make factual findings on the extent to which Dr D expressed her concerns about the ETT to Dr C, although he stated that he did know that Dr D thought there was something wrong. In response to the provisional opinion, he clarified that he did perceive that Dr D thought something was wrong, but they *both* thought it was bronchospasm.

165. Notwithstanding that, Dr C was the consultant in charge of Mrs A's care and, in my view, he should have thought critically about his diagnosis of bronchospasm. Dr Jones advised:

> '[E]ven without a query the lack of a CO_2 trace should have at least triggered a question about correctness of ETT placement, and in my opinion at a higher priority than

bronchospasm. The reasoning for that priority order is that bronchospasm has little hope of being treated if the tube is in the oesophagus.'

166. I agree. Dr C said that some CO_2 came back initially, but this rapidly diminished to 'blips' on the monitor, and Mrs A's airway pressures were high (>40 centimetres of water — normal pressures to achieve an adequate breath would be 15–20 centimetres of water). Dr C stated that he asked to feel the bag for himself and attempted to give breaths, resulting in the same perception as Dr D.

167. Dr C said that Mrs A's oxygen saturation stayed stable for around two minutes after intubation, which would be unusual in a high BMI patient whose lungs are not being ventilated, even one who has been well pre-oxygenated. He said that initially this contributed to his impression that they must be moving at least some gas in and out of Mrs A's lungs, and that so long as they did not panic and continued ventilating and treating the bronchospasm, things would improve, as they almost always do.

168. Dr Jones advised that from the outset there was never confirmation that the ETT was placed correctly, and the anchoring to a bronchospasm diagnosis was mistaken. He said that even if only a small amount of lung ventilation was achieved via a correctly placed ETT in a patient with bronchospasm, some $EtCO_2$ trace would be expected if an adequate inspiratory pressure is used with allowance of enough time for to prevent or reduce gas trapping.

169. Dr Jones stated that the accepted practice at the time of these events was, 'if in doubt, take it out', although it would have been reasonable to have delayed that for a few minutes while attempting to treat the bronchospasm that they were primed to expect from the previous records. In response to the provisional opinion, Health NZ stated that is what did happen in the time prior to the declaration of an emergency. Dr C delayed for a few minutes while attempting to treat the bronchospasm, and when the treatment was not improving matters, he sought help by declaring an emergency. Following on from this, the whole team then took several minutes to diagnose the oesophageal intubation.

170. However, Dr Jones added that after a few minutes when attempting to treat the bronchospasm was not working, they needed to move on and think, '[W]hat else could it be?' He advised that the failure to rule out oesophageal intubation for as long as 17 +/-1 minutes after intubation was a serious error of omission. I accept this advice.

Crisis checklist

171. Dr Jones said that the use of checklists is intended to break out of being stuck on the same thing — ie, the human factors of mind set, tunnel vision, anchoring (to a single cause), or confirmation bias.

172. Dr C said there was a crisis checklist in the operating room on 3 Month8, but he did not use it. He said that had he done so, it is unlikely to have made any difference to the outcome because oesophageal intubation was not listed as a potential diagnosis in the relevant pathway. However, the AER report found that using the checklist before the emergency bell may have interrupted the trajectory of the crisis by prompting a recap and a shared

systematic approach to the problem, despite oesophageal intubation as a differential diagnosis not being prominent in the crisis checklist. In response to the provisional opinion, Health NZ stated that it disagrees with the AER report in this context as it is impossible to know what may have happened had a checklist been used, and speculating on the outcome of using a checklist that was not designed for the problem at hand is problematic. However, I remain of the view that the assessment in the AER report is reasonable.

173. Dr Jones also advised that a crisis checklist should have been used before the emergency bell was sounded. He stated:

> 'Our peers would recognise the human factor trap of a mind-set, in this case contributed to by the active team's evaluation of prior anaesthesia events. Crisis checklists are used to break out of such confirmation bias traps.'

174. However, Dr Jones also noted that the term 'oesophageal intubation' is not in the checklist, but he said that apart from the more immediate effect of no CO_2 trace to warn of this, the principal outcome of it was fairly rapidly developing hypoxia. He noted that the relevant checklist headed 'Hypoxia' reads: 'Confirm $ETCO_2$ Capnography and morphology (shape of its waveform).'

175. Dr Jones said that if that checklist had been used, either before or immediately after the emergency was declared, it should have forced the mind-set away from bronchospasm being the only explanation. He stated:

> 'My overall opinion is that our peers would recognise most of the human factor traps operating for this crisis situation. But failure to use cognitive aids to overcome these, either before or after the emergency call, would be viewed as a moderate departure from current standard of care.'

176. I agree with this conclusion.

Leader

177. Once the emergency bell was activated, approximately 20 people entered the room. The most senior clinician present was Dr F, but Dr C retained the role of leader. Dr C assigned tasks whilst still squeezing the ventilation bag with one hand and holding the ETT with the other hand. The AER report states that the intention is that a truly hands-off leader stops concentrating on the physical tasks they are doing and is able to allocate their attention wisely, and 'step back' and see the bigger picture. This may involve inviting others' thoughts, utilising checklists, distributing the workload, and sharing the mental model.

178. In response to the provisional opinion, Health NZ submitted that the reference in the AER report was with respect to team functioning and that in the absence of anyone else in the team taking the leadership role, Dr C was assumed to be the leader by default by those involved who entered the OR to provide assistance, and it was not an active decision by Dr C to assume leadership.

179. The AER report states that sometimes the best person to be the hands-off leader is the anaesthetist originally in the room, and at other times it is better for an arriving anaesthetist to take over. The report states that active followers should support the hands-off leader by explicitly asking, '[W]ho is the hands off leader?' and offloading tasks to enable that person to be hands off. In response to the provisional opinion, Health NZ stated that this was a problem of team function, and responsibility for that should not be borne solely by Dr C.

180. I remain of the view that a hands-off leader was required, and that Dr C should have either become hands off or allocated the leader role to someone else. I note that the anchored bronchospasm diagnosis initially came from Dr C, and Dr Jones advised that in effect it became 'contagious', which may have hindered other team members from challenging the diagnosis effectively.

Concerns raised by team in OR

181. There are varied accounts of events following the activation of the emergency bell, as follows.

182. Dr I said that when he arrived in the OR he asked Dr C whether the ETT had been confirmed to be in the correct position in the trachea. Dr I stated: '[After I had inserted the arterial line,] [m]ultiple people including myself re-raised the issue of checking endotracheal tube position.' Both Dr D and Dr C agreed that Dr I asked, '[I]s the tube in the right place?' after he arrived in the OR.

183. Mr J stated that he, Dr I, and Dr D all asked about 'tube positioning' and whether it needed to be checked. Mr J also said that after Mrs A's cardiac arrest, Dr I again asked about the positioning of the ETT.

184. Dr F stated that around 4.04–4.05pm, he 'then turned to Dr C and said in a firm clearly direct manner and making good eye contact "[Dr C] do we need to check the tube?",' and at 4.09pm, he 'pointed at the abdomen and said to Dr C "that is air you will check the tube" [and] this was said looking at [Dr C] in a clear direct manner'.

185. Dr C has disagreed with these accounts apart from that of Dr I. In response to the provisional opinion, Dr C stated that no witness verified Dr F's or Mr J's claims. Dr C stated that he does not recall either of them asking about tube position, and he reiterated that Dr F's announced *agreement* with the diagnosis of bronchospasm contributed significantly to the anchoring problem.

186. Having considered the evidence, I remain of the view that it is more likely than not that some queries about tube placement occurred before the re-assessment 17 minutes after induction.

187. Dr Jones advised that even without a query having been made, the lack of a CO_2 trace should have at least triggered a question about correctness of ETT placement. Dr Jones stated:

> 'Even if there was only 1 query, prompted by the lack of a CO_2 trace, the ETT should have been checked much earlier. The reports indicate that the response to queries

> remained the same, the anchored mind-set and confirmation bias of "bronchospasm". Faced with a zero CO_2 trace screaming tube in wrong place, a second look by an independent person should have taken place.'

188. I accept this advice.

Conclusion

189. I have carefully considered the mitigating factors raised by Dr C, including confirmation bias affecting his decision-making. I note that Dr Jones advised that anchoring onto the wrong bronchospasm conclusion does not take into account that previously there had been three reassuring satisfactory anaesthetics, meaning that confirmation bias and anchoring to bronchospasm should not be given much weight as a mitigating human factor.

190. I accept that there was some time pressure and acknowledge the comments made by Dr C in that regard, but Dr Jones advised that this is a common occurrence, and that it does not mitigate the 17 minutes of zero CO_2 trace in this case.

191. I have noted the comments made by Health NZ that the failings in this case were a team or system complication rather than an individual failing; however, having considered all the evidence, I remain of the view that Dr C failed to provide services to Mrs A with reasonable care and skill in that he failed to rule out oesophageal intubation for as long as 17 minutes, which was a serious error of omission, he failed to use the crisis checklist, he failed to take a hands-off leadership role or appoint someone else as leader, and he failed to respond sufficiently promptly to queries about the placement of the ETT by at least one other team member. Accordingly, I find that Dr C breached Right 4(1)[20] of the Code.

Opinion: Health NZ Te Toka Tumai Auckland — breach

192. Health NZ stated that it views the rare but well-recognised complication of unrecognised oesophageal intubation as a system-based complication, not as an individual practitioner failing. In my view, there were both individual clinician concerns and systemic issues at play.

193. The AER report states that the emergency bell acts to declare an emergency and bring more help. The aim of this help is to provide more team members to assist in physical tasks, and also to provide new insights and ideas for diagnosis and management. However, initially the additional team members were drawn into the fixated thinking of the treating team.

194. There was no hands-off leader, as although Dr C assumed the leader role and assigned tasks, he was still squeezing the ventilation bag and holding the ETT. The AER report states that the intention for a hands-off leader is that they can stop concentrating on the physical tasks they are doing and allocate their attention wisely, and 'step back' and see the bigger picture.

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

This may involve inviting others' thoughts, utilising checklists, distributing the workload, and sharing the mental model. Sometimes the best person to be the hands-off leader is the anaesthetist originally in the room, while at other times it is better for an arriving anaesthetist to take over.

195. There is no evidence that the clinicians who responded to the emergency bell explicitly asked, 'Who is the hands-off leader?' and took over tasks to enable Dr C to be hands off. In my view, the whole team had a responsibility to speak up and encourage the use of crisis management tools.

196. Dr C began a recap of events, but that was not completed and did not interrupt the fixated thinking. The response to the cardiac collapse, such as giving medications and chest compressions and checking monitor data, interrupted the recap and further delayed the recognition of the oesophageal intubation.

197. Crisis checklists were not used, and there was no standardised response to the emergency bell. Around 20 staff were in the OR, and there was no control of the number of staff responding. The environment was noisy, and the recap could not be heard easily because of this. The AER report noted that this may have hindered clear thinking and prevented staff speaking up.

198. The AER report also stated that assigning of staff to key tasks or roles during a crisis is not practised routinely in the Perioperative Directorate, and roles such as 'hands-off leader' and 'crisis checklist reader' may not be allocated explicitly.

199. These systems issues contributed to the failure to utilise crisis management principles. Crisis Resource Management (CRM) is a set of principles that help healthcare teams to improve patient outcomes by preventing errors and improving team performance across multiple domains. CRM is an approach to the management of complicated life-threatening medical situations that optimises the non-technical skills required during resuscitation. There are eight broad CRM principles:

1. Know your environment
2. Anticipate, share and review the plan
3. Provide effective leadership
4. Ensure role clarity and good teamwork
5. Communicate effectively
6. Call for help early
7. Allocate attention wisely — avoid fixation
8. Distribute the workload — monitor and support team members

200. The primary cause of the unrecognised oesophageal intubation was a failure of CRM across multiple domains, in that the leadership was ineffective, there was a lack of teamwork, and

at least one member of the team expressed concerns but was not heard because of the fixation on bronchospasm.

No CO_2 trace on capnography monitor

201. Dr C stated that the 'no trace — wrong place' mantra was not front-of-mind at the time of events, although that changed following publication of the PUMA (Project for Universal Management of Airways) guideline in 2022. I note Dr Jones' advice that although the PUMA guidelines did not exist at the time of this event, they re-articulated and consolidated understandings that had existed since the 1990s. Accordingly, I do not accept that at the time of these events the 'no trace — wrong place' mantra was not accepted practice.

202. Health NZ told HDC that while at the time of these events many professional groups worldwide had produced airway management guidelines that refer to techniques to confirm tracheal intubation, none of those had a focus specifically on preventing unrecognised oesophageal intubation. Health NZ said that the guidance published in 2022 addresses the specific clinical scenario that occurred with Mrs A and provides comprehensive and systemic guidance to mitigate the risk of unrecognised oesophageal intubation.

203. This is not the first time HDC has considered the circumstances surrounding a misplaced ETT. In case 21HDC02785,[21] relating to events that occurred in 2017, the root cause analysis stated that even at that time, the standard practice in emergency airway management was that if there is any ambiguity or doubt around ETT placement and subsequent positioning following intubation, the tube should be removed — 'when in doubt take it out'.

204. The AER report stated that oesophageal intubation or accidental intubation is a primary cause of no $EtCO_2$. The AER report also stated that the absence of a recognisable waveform CO_2 trace indicates failed intubation unless proven otherwise.

205. I accept and adopt the AER report findings that correct placement of the ETT must be confirmed immediately following intubation, and that at the time of these events the accepted standard for confirming tracheal intubation was the on-going presence of $EtCO_2$.

Conclusion

206. In light of the above systemic issues, I find that Health NZ Te Toka Tumai Auckland failed to provide services to Mrs A with reasonable care and skill and breached Right 4(1) of the Code.

Changes made

207. Health NZ Te Toka Tumai Auckland told HDC that it has completed all the recommendations from the AER report, including the following:

- Disseminating the learning from the review to all anaesthetic services, the Health Quality and Safety Commission, and the training body for anaesthetists (ANZCA[22]), to emphasise

[21] See 21hdc02785.pdf.
[22] Australian and New Zealand College of Anaesthetists.

'the limitation of clinical signs', features suggestive of oesophageal intubation, and alternatives to removal of an ETT;

- Providing the findings of the review to ANZCA and asking it to consider whether any measures are required to address a possible gap in recognising oesophageal intubation in complex situations, and team training for a systematic approach to operating room crises;
- Updating crisis checklists to include examining the possibility of oesophageal intubation, with emphasis on the need to be certain that the ETT is in the trachea when necessary;
- Reviewing and updating the Standard Operating Procedures for emergency response, including role allocation, checklist use, recap, and 'crowd control';
- Reviewing team training as part of a systematic approach to operating room crises within Health NZ Te Toka Tumai Auckland;
- Reviewing the support provided to family/whānau at times of grief;
- Educating relevant clinical staff on appropriate and consistent use of the COVID screening tool;
- Encouraging DCCM staff to ask families whether they would like an interpreter and engaging a cultural navigator upon admission; and
- Raising awareness among perioperative and nuclear medicine staff about the availability of cultural support for patients.

208. Health NZ Te Toka Tumai Auckland also noted:

> 'The airway committee is currently developing a unified airway algorithm, intended to standardise airway management across all disciplines. Once available the peri-operative directorate will need to undertake a reconciliation process with existing checklists and SOPs.'

209. Dr C said that he made the following changes:

- He now always removes the tube if there is no CO_2.
- He has participated in two airway emergencies immersive simulation courses offered by the college.

Recommendations

210. Considering the changes made by Health NZ Te Toka Tumai Auckland since the events, I recommend that in addition, Health NZ Te Toka Tumai Auckland:

a) Provide a written apology to Mrs A's family for the deficiencies identified in this report. The apology is to be sent to HDC, for forwarding to Mrs A's family, within three weeks of the date of this report.

b) Provide HDC with a copy of the unified airway algorithm, and evidence of staff training in its use, within three months of the date of this report.

c) Provide an update to HDC, within three months of the date of this report, on measures implemented to update anaesthesia staff on recognising oesophageal intubation in complex situations, and team training conducted regarding the systematic approach to operating room crises, including refresher training.

211. I recommend that Dr C provide a written apology to Mrs A's family for his breach of the Code. The apology is to be sent to HDC, for forwarding to Mrs A's family, within three weeks of the date of this report.

Follow-up actions

212. A copy of the sections of this report that relate to Dr C will be sent to the Medical Council of New Zealand.

213. A copy of this report with details identifying the parties removed, except Health NZ|Te Whatu Ora Te Toka Tumai Auckland and the independent advisor on this case, will be sent to the Health Quality and Safety Commission, the Australian and New Zealand College of Anaesthetists, and the Medical Council of New Zealand and placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.

214. A full copy of this report will be sent to the Coroner.

Appendix A: Independent clinical advice to Commissioner

The following independent advice was obtained from anaesthetist Dr David Jones:

'Complaint: Te Whatu Ora Te Toka Tumai Auckland Your ref: 21HDC00620

Thank you for your letter 20 March 2023 inviting independent expert advice on this case. I do not personally know the 2 direct treating parties. I do know [Dr F], … who responded to the event along with others after the emergency bell. Our mutual professional contact has been through non-anaesthesia roles ... I do not have any conflicts of interest in respect of the case. I have read and agree to follow the Health and Disability Commissioner's guidelines for independent advisers dated March 2019. My qualifications and relevant experience are attached at end of this report in Appendix 1.

Documents supplied to me: Letter of complaint dated 17 [Month8], Te Whatu Ora's response dated … and further response dated … Relevant clinical records from 3 [Month8] onwards and post-mortem report. This included ADHB Adverse Event Report (AER) in 3 parts. Statements from clinicians involved in [Mrs A's] procedure on 3 [Month8]. Adverse event report dated … The above documents were supplied as a single pdf scan with pages numbered 1–337. Page references have been used as they appear within this "bundle".

Background you provided to me:

On 3 [Month8], [Mrs A] (a 73 year old woman) presented at [Public Hospital 1] for a right mastectomy and sentinel node biopsy procedure, and was anaesthetised in preparation. [Dr C] was the anaesthetist consultant with overall responsibility for [Mrs A's] anaesthetic care. Following [Mrs A's] intubation during the anaesthetic procedure, she experienced poor $ETCO_2$ return, high airway pressures, and had low O_2 saturation levels. [Dr C] believed this was due to bronchospasm (tight airways, like in asthma), which he understood that [Mrs A] had also experienced when intubated during a previous procedure in [Month2]. [Mrs A] continued to deteriorate to the point where an emergency was declared, after which it was discovered that the endotracheal tube (through which lung ventilation is normally carried out during anaesthesia) was in the oesophagus (gullet). [Mrs A] suffered non-survivable hypoxic brain injury, and she passed away on … Te Whatu Ora submitted that "there was a strong confirmation bias in determining that the problem was bronchospasm", and that the complex, ambiguous and rapidly evolving situation contributed to the failure to diagnose the real problem. Te Whatu Ora further stated its view that in this case: "The issue is not the departure from standard intubating procedure, but whether there was a departure from accepted procedure of managing an intubated patient who became hypoxic and had high airway pressures." [Dr C] submitted: "Not surprisingly, the history of the bronchospasm event and the consequent investigations figured extremely prominently and unfortunately … created a very strong expectation of a potential problem with bronchospasm. … It is also known that the misdiagnosis of oesophageal intubation is common, even among

experienced anaesthetists, and almost always occur in situations considerably less contaminated by the very strong grounds for expecting bronchospasm that prevailed in [Mrs A's] case." [Dr C] believes that "many, if not most, of [his] colleagues would have also been impeded to at least some extent in coming to a quick diagnosis by the very unfortunate circumstances that prevailed."

In providing your advice, we would rather comments focus on the actual treatment that was provided, and what if anything should have been done differently.

Expert advice requested: *Please review the enclosed documentation and advise whether you consider the care provided to [Mrs A] by Te Whatu Ora relating to the 3 [Month8] procedure was reasonable in the circumstances, and why?*

Global Answer: Putting aside the adverse event now known in hindsight, in my opinion there was overall a good standard of care for the 3 [Month8] procedure in all areas *except* the failed recognition of oesophageal intubation early enough to prevent severe hypoxic brain injury. This included preoperative workup both prior to and on the day of the event, which in turn relied on good documentation of prior anaesthesia events as set out in the DHB response documents. Included were further appropriate investigations (eg ORL assessment of airway) after problems arising in the first 8 [Month2] anaesthesia for planned laparoscopic cholecystectomy. That procedure was abandoned, a good choice in the circumstances, pending further investigations. So the prior events assessable for the 3 [Month8] presentation included that one requiring a "bale out", followed by three others followed with comparatively satisfactory achievement of laryngeal intubation and continuation of the intended operation. Noteworthy though is the post hoc analysis, shown in Table 1 on page 218 of the bundle, where they ALL involved difficult bag mask ventilation (BMV). There was recognition before each event through normal preoperative assessment that [Mrs A] was likely to be a difficult airway case. At no previous time was the airway deemed other than challenging before the actual achievement of tracheal intubation. At the briefing on 3 [Month8] a shared mental model was put forward, albeit with bronchospasm being the significant contingency they planned for. From the graph in AER report Part B Section 5 page 12 (page 224 in bundle) one can observe the resuscitation was efficient in achieving a circulation with an oxygen saturation of 70% initially and back to 100% within 5 min of the reintubation into the trachea. Failure of timely detection of oesophageal intubation is covered in answers to your specific questions below. I have not considered in detail the DCCM intensive care, except to observe recorded vital signs from that [Mrs A] was well monitored and cared for during that time.

Your specific questions:

Question 1.

Whether [Dr C's] working diagnosis of bronchospasm was reasonable?
The short answer is that **provided endotracheal tube (ETT) was confirmed in the trachea**, then bronchospasm was reasonable to *include* in a list of possible causes of ventilation and gas exchange difficulties, based on previous anaesthetic events'

documentation. But I do not consider it was reasonable to hold onto it as the only working diagnosis, when continued deterioration was evident. This cognitive bias can be referred to as "anchoring", with resistance to consider what other causes could be giving ventilation and oxygenation difficulty. The objective forensic printout record of gas measurement shows 17 +/- 1 minutes of no (sustained) CO_2 trace following intubation. There are also a few throwaway lines in the Respiratory consultations (eg 9 [Month2]) looking into the first anaesthesia event which was abandoned ("bronchospasm"): "*bronchospasm … consider pre-treatment … (however clinical hx not overly supportive of this)"*, and "*… could consider … reversibility testing +/- broncho-provocation testing if concerns about underlying reactive airways disease (again clinical hx not really suggestive) …*", and elsewhere reference to [Mrs A] not having other asthmatic events. I suggest the first abandoned event was highly probable also an oesophageal intubation, because "No CO_2" was reported. It was an intended rapid sequence induction (RSI) which puts more time pressure on the intubation procedure. This first event anaesthesia ventilation difficulty was solved by the correct action removal of ETT, supra-glottic airway and waking up to abandon. The investigations requested from anaesthetic allergy specialist, ORL, CT scan, and respiratory assessments were all negative for airway and lung problems. In the absence of alerts from these other specialties she underwent 3 more for the most part satisfactory anaesthesia events including one where a good glidescope view (Gd1) of larynx was reported. Therefore, in my opinion the lack of clinical history supportive of [Mrs A] having a tendency to asthma-like bronchospasm, coupled with the above suggested alternative explanation for the first event, should have *weakened* the belief in bronchospasm as sole working diagnosis, especially with plan of deep enough anaesthesia to reduce response to tracheal stimulation. In mitigation the anaesthesia team would have had to search across a wide range of handwritten notes (reproduced in letter to Deputy Commissioner … pages 248–252 in supplied bundle) for some of these comments, rather than the typically relied upon typed electronically available records. There was rather a lot of information from a variety of sources to access and consider in a short time space. The preoperative anaesthesia assessment 22 [Month7 in summary form was typed (page 253 in bundle), probably electronically available, and leaves me with the impression of "bronchospasm likely to airway manipulation" as the standout conclusion. There is no mention in that anaesthesia pre-assessment for this planned surgery of the lack of CO_2 trace in the first event, and therefore no hint that that first event was a highly probably an oesophageal intubation. I suggest incorrect interpreting "bronchospasm" as cause of the initial event problem, for whatever reason, rather than oesophageal intubation with no CO_2 trace. See answers to Question 1. f–g for more analysis of that. Taken together, a positive mention for one possible cause and lack of mention of what I think is the most likely explanation probably had a powerful role in the mind-set for bronchospasm. While the statements provided are variant on it, the anaesthetic technician's statement included: "*I saw stomach move and mist in the ETT, and then Co2 trace on anaesthetic machine screen, SMO switched on the ventilator and the Co2 trace disappeared."* This statement reflects the belief of that team member that the first two of these items confirmed correct placement. That would have been in accord with what the AER Part A page 3, Section 4, second

paragraph (bundle page 207) described as adjuncts in confirming tracheal intubation. But it probably comes as a surprise to many anaesthetists and airway practitioners that the recent PUMA guideline (Fig 3, page 1404) specifically discourages reliance on these traditional methods, namely: "DO NOT USE Tube misting DO NOT USE Chest rise/fall DO NOT USE Lung/epigastric auscultation (ie stethoscope) [and one other which is out of scope for this inquiry] … TO EXCLUDE OESOPHAGEAL INTUBATION". So, if the Anaesthetic Technician statement is excluded because it relied on some of the above unreliable signs, **there was never confirmation of correct ETT placement from the outset,** and the anchoring to a bronchospasm diagnosis was mistaken. Further, even if only a small amount of lung ventilation was achieved via a correctly placed endotracheal tube (ETT) in a patient with bronchospasm *some* $ETCO_2$ trace is expected if an adequate (high) inspiratory pressure is used with allowance of enough time for expiration (ie allow longer interval between breaths) to prevent or reduce gas trapping. The DHB report to this inquiry includes the pictorial of "shark fin" pattern (Part A, page 6; p211 of bundle). This can occur in other forms of respiratory tract obstructions but where the ETT is confirmed in the trachea eg mucous, foreign body, tube kinking, overinflated cuff imploding the tube before cuff pressure measuring was introduced. But that does not negate the rule: "No CO_2 trace = wrong place". Former standard methods to exclude obstructions in the airway equipment and larger airways have evolved over time to favour quickly passing a flexible bronchoscope, which in addition visually confirms whether ETT is in trachea or not. This quickly rules out most other obstruction and tube misplacement causes *except bronchospasm*. ANZCA Professional document PG56[1] includes having a flexible bronchoscope on the difficult intubation/difficult airway trolley. As it happens the Anaesthetic Technician's statement indicated they inquired of the SMO whether that trolley was required and was answered in the negative. Therefore, because ETT placement *had not been positively confirmed* by either CO_2 trace or flexible bronchoscope, bronchospasm was not yet a reasonable differential diagnosis for ventilation and oxygenation difficulty. Based on the reasons cited above, in my opinion peers would deem failure to rule out oesophageal intubation for as long as 17 +/-1 minutes after intubation to be a serious error of omission. The "rapidly evolving situation" as stated in DHB AER need not have stretched to 17 +/- 1 minutes before re-checking.

Question 2. *Whether the actions taken in response to [Mrs A's] deteriorating condition were appropriate, including*: **Question 2a.** *Whether there was any time prior to the Emergency alarm being raised when it was not reasonable for bronchospasm to continue being the working diagnosis?* **Question 2b**. *Whether the placement of the endotracheal tube should have been checked at an earlier time to be certain of its positioning?*

Answer: YES — and the answer to both these very similar questions overlap to such an extent that I have dealt with them as a continuum. There is also considerable overlap

[1] ANZCA PG56 (A) Guideline on equipment to manage difficult airways Aug 2021. Please note this current document is dated after this event. It was rebadged/republished from the 2012 version but with essentially the same recommendations.

with the answer to Question 1 already given above. Immediately after "intubation" there was no sustained CO_2 return. So even if [Mrs A] did have bronchospasm as well, the correct treatments for that would have been useless without a correct ETT placement. I cannot reconcile the variant recollections in statements regarding the presence or absence of a CO_2 trace. I have preferred the accurate forensic printout and timescale graphs of data for [Mrs A's] oxygen saturation (SpO_2) and end tidal carbon dioxide ($ETCO_2$) levels collected and stored by the monitoring devices over the narrative statements. This graph appears within the AER Part B, page 12, Section 5, page 224 in bundle. The timing of intubation was c.15:50:19[2] after which there is no CO_2 detection shown, apart from a tiny blip at c.15:55:19 of uncertain origin. This zero $ETCO_2$ trace extended until immediately after re-intubation at c.16:07:19. In contrast to the SMO's stated belief that oxygen saturation stayed up for longer than he would have expected, that graph shows it lasted from c.15:51:19 till c.15:53:19, or around 2 minutes, which is what pre-oxygenation could achieve without any further oxygen delivery to the lungs. It is unclear how the timing of the 3 treatments for bronchospasm annotated on that graph were entered, but I have inferred they were manually added post-hoc because of the different font and horizontal format contrasting with the remaining annotations, they are therefore not necessarily precise timings. Otherwise, what shows there would suggest the treatments were given before the graphs showed there was a real problem with oxygenation. In addition they did have the tight bag feel which "did not feel right" as extra information. From that analysis I concluded the "No trace = wrong place" rule kicked in from the outset. Given expert international appraisal of fatal cases of oesophageal intubation now advises that listening with a stethoscope is unreliable in oesophageal intubation, I note in this case the number of repeated checks with stethoscope attempting to ascertain lung ventilation sounds. It is instinctive for all types of health care practitioners to reach for a stethoscope, but times have moved on and $ETCO_2$ trace has supplanted this with better technology for confirming tracheal placement of an ETT. What they heard with stethoscope simply added to the confirmation bias. After the emergency bell but before re-intubation there were about 20 persons in the room, as is typical of such events. The important human factor was that the fresh eyes are brought to bear on the problem, with task delegation. In this case, it would have been better for the lead SMO to invite the new person(s) to check if there were alternative causes instead of continuing the confirmation bias regarding bronchospasm for quite some time. Use of the "Hypoxia" checklist either before or after the emergency bell should have led to proving correct tube placement. From the statements I read there were at least 3 persons who were in a good position to, and did, ask if the tube had been checked for correct position? Once help was present the lead SMO could have invited another appropriately skilled person to check the ETT independently — getting further away from confirmation bias. So even without the hypoxia checklist, there were several skilled persons who questioned the tube placement as a "memory item"[3]. When the co-ordinator felt the bag, they encountered

[2] c. hh:mm:ss means a reading from the timescale on the graph. I estimate a reading error of +/- 30 seconds in the values quoted here.

[3] In some crises situations, immediate actions from memory are required, then checklist used to ensure each step has been completed.

a feel they had not previously experienced. Coupled with better exposure by the nurse(s) the inflated stomach was noted, the imperative demand was given by the co-ordinator that the tube *must* be checked. That did break the mind-set/perseveration problem but regrettably late. I could not see good reasons why the questions raised about tube position by other parties responding to the red-bell were not heeded sooner. The "No trace = wrong place" situation was still operative[4]. The afternoon Fellow anaesthetist is noted in several of the statements to have raised this question early after the bell. At any time, even before the emergency bell was sounded, with ventilation and oxygenation out of control a crisis checklist cognitive aid card should have been used. Our peers would recognise the human factor trap of a mind-set, in this case contributed to by the active team's evaluation of prior anaesthesia events. Crisis checklists are used to break out of such confirmation bias traps. The crisis checklists in our theatres include the DHB relevant to this enquiry credited as a major source, but I cannot claim without further enquiry if the same are used in all other DHBs. Of note the term oesophageal intubation does not exist in these checklists. But the checklist headed "Hypoxia" (low oxygen saturation via pulse oximetry, or cyanosis) is the one relevant to the problem of this case. The checklist item reads: "Confirm $ETCO_2$ Capnography and morphology (shape of its waveform)". If that cognitive aid checklist had been used, either before or immediately after the emergency was declared, it should have forced the mind-set away from only bronchospasm as an explanation. Considering all the above, my overall opinion is that our peers would recognise most of the human factor traps operating for this crisis situation. But failure to use cognitive aids to overcome these, either before or after the emergency call, would be viewed as a moderate departure from current standard of care.

Question 3. *Whether the documentation of the anaesthetic procedure was of an acceptable standard? Noting [Dr C's] comment on pg 6 of his statement dated 3 [Month8] that he has found the anaesthetic record "difficult to interpret with certainty"*. **Answer**: Yes. The anaesthetic record has been produced by an automatic recording apparatus (SaferSleep) in the background. Barcoded drug syringes caused drug identity and time to be added automatically. So the timing of vital signs, drug administrations and recorded gas values can be taken as accurate. The narrative part of the record includes preoperative assessment of airway information, amongst others. In addition, it contains a statement that once the crisis developed the narrative part of the sequence of events was completed in retrospect. In any crisis event the treatment of the patient takes precedence, and documentation is caught up with in retrospect. This is all reasonable and expected.

Question 4. Whether the planning and consenting process undertaken for [Mrs A's] procedure was adequate.

Answer on planning: Yes, it was adequate. A thorough preoperative assessment and briefing about the case before [Mrs A] entered the operation room is consistently indicated through the statements. Especially this took into account previous

[4] Even in cardiac massage there is expected to be some measured $ETCO_2$ on trace.

anaesthesia encounters including the abandonment due to problems, as well as two relatively recent anaesthetics with recorded easy intubation, an ORL assessment of a normal airway, backed up by CT scan, and opinion from the anaphylaxis specialist concluding unlikely drug allergy causation. These are detailed in answer to Question 1, section (i) above. I agree with [Dr C's] statement to the Coroner … item 3.6 that insertion of an endotracheal tube into the trachea is a powerful provocative stimulus which can result in bronchospasm, especially in lightly anaesthetised cases and in particular with speedy intubations as in "rapid sequence inductions" (RSI) where little time is given for IV drugs to fully work nor inhalation agents to reach adequate suppressive levels. On that basis they wisely planned to use a deeply suppressing anaesthetic to minimise responses to airways manipulations.

Answer on Consent: Hard to judge from the records, but I concluded it looked adequate as far as the formal signed agreement reads. The DHB AER narrative describes an interpreter being present, whose co-signature appears on that consent form. The formal signed consent for this event (page 253 in the bundle) records more items than did those for previous events, so cannot be deemed inferior to those: "*Discussion: GA, PONV (postoperative nausea and vomiting), sore throat, dental damage, reaction to meds, difficult airway, bronchospasm*" which are standard common anaesthesia consent items PLUS discussion on difficult airway/bronchospasm which are found typically in more complicated cases. Further information that was discussed somewhere in the processes is revealed post hoc eg via relative questions, and [Dr D's] statement. I note [Dr D] (who did the consent) commented in her statement about possible confusion as to who told [Mrs A], probably in presence of a daughter, about the possibility of a front of neck access (FONA). Such a measure is very rare, and a last resort measure if the airway could not be intubated with inability to oxygenate. As there was no belief that [Mrs A] was not intubated in this case, this procedure was never necessary. But I would not expect to find that kind of (scary!) detail to have come from other sources than an anaesthetic consent discussion. It is always applicable as a last resort action that anaesthetists are trained to do in one rare situation. The fact that [Dr D] is reported to have rescued a case by that method may explain a bias towards discussing it, but is going above and beyond. I have never encountered a patient reporting that they were informed that their "throat could be slit"; so maybe that was a bit too graphic detail in the face of 3 previous successful ETT placements, unless patient specifically asked what might happen if (some problem arose)?

Question 5. *Whether it was acceptable that [Mrs A's] procedure was scheduled last on the afternoon list?*

Answer: In my opinion, YES. A reality is there always needs to be a last case on a list. As a general issue we prefer more complex cases first, but it often does not work that way if there are competing factors. In this case, my understanding from the material provided was that a covid border connection led initially to putting her last as a precaution, as is done for other non-covid, "infection" related cases. I do not totally dismiss fatigue as a contribution to the outcome, but point out that many anaesthetists' contracts involve 10 hr or even 12 hr work days, including voluntarily. So I did not

conclude the duty hours were out of the ordinary in that regard. I don't entirely agree with [Dr C's] suggestion that earlier would necessarily have been better *in this case*, because as late ring-ins to do this case they would not have had as much time to fully assess the past records etc. If it is accepted that the more information gathered in cases of this complexity the better, then longer to do so was an advantage. It was only through serendipity that [Dr C] first learned [Mrs A] was coming later that day via a discussion with the Anaesthetic Allergy clinician-colleague, whose opinion was that the previous problem was unlikely due to an allergic explanation. The detailed examination of past records etc. that was done utilised [Dr D] to assess and report back during the conduct of the third (preceding) case. Had the case been earlier, less information would have been gathered and/or case delayed or cancelled. As a cancer case cancellation was undesirable. It was a balance of risks and benefits by being last case. This sequence of activities also illustrates the tight time pressures when concurrent care of one case can be distracted by the demands for assessing the next — in this case by a team who came to work that day not knowing this case was to be theirs. Not an excuse but a reality.

Question 6. *The adequacy of the care provided to [Mrs A] after she was re-intubated following the emergency call bell?*

Answer: There is nothing to indicate other than good normal care for someone who has suffered a hypoxic event, with transfer to supportive intensive care to await assessment of recovery potential. The various additional lines inserted eg arterial, femoral, were routine for that situation.

Question 7. *The adequacy of communication with [Mrs A's] family after the events?*

Answer: In my opinion it was adequate. There was immediate open disclosure with explanation of the event, follow-up next day by the responsible SMO answering further family questions. There were documented meetings of staff with the family while [Mrs A] was being cared for by the DCCM team. And the DHB continued feedback of information and answered written questions as it became available. For the future, a cultural factor: an important concern was raised by family flagging a possible sign of disrespect when staff withdrew to allow them time to grieve in private. The family view for [Mrs A] in this case was also something I did not know myself a learning point is that we should ask family about their wishes on whether they want "us" present with them when their loved one passes away.

Question 8. *The adequacy of **Auckland DHB's policies and procedures** at the time of these events relating to this kind of procedure and the complications encountered?*

Answer: In my opinion this is immaterial as individual DHBs' policies should not be needed in textbook-like manual for healthcare professionals. It would be replicating the training resources and recommendations of the relevant professional bodies, and their continuing professional development requirements. The DHB AER Part A page 3, Section "**4. Confirmation of tracheal intubation**" (page 208 of bundle) defines the gold standard for confirming tracheal intubation as "the ongoing presence of CO_2 in the exhaled gas ($ETCO_2$)". This of course reflects post event reporting in that document, and

they do not describe it as a DHB policy. For airway management there is a need, and a thrust, for universal measures rather than individual variants in policies. **Relevant standards** the ADHB refers to in their AER report derive from, and are good educational resources, publications from specialist airway groups: NAP4 [5] DAS [6] intubation guidelines [DAS = Difficult Airway Society] PUMA [7] Project for Universal Management of Airways Capnography: No trace = wrong place [7 min YouTube video] [8]. Please note these are inter-related with some common authors across them. The PUMA resource was published 5 months after [Mrs A's] case, but included previous recommendations relevant at the time of [Mrs A's] event. The message arising from international expert airway group's ongoing review of known oesophageal intubation cases remains: "**No trace — wrong place**".

I note the AER Part A page 3, Section 4, second paragraph (page 207) quotes "*Other adjuncts … misting of the tracheal tube, rise and fall of the chest and auscultation of breath sounds over the chest*" for confirming tracheal intubation. While these have been ingrained traditional learnings and habits, the new advice is not to use them. **This case adds to the evidence that these clinical signs and stethoscope checks were misleading to confirm correct ETT placement.** NB: that does not negate their value in detecting inadvertent one lung ventilation if a correctly inserted ETT is advanced too far. Later in the same report, page 5, Section **7.2 Oesophageal intubation** includes: "… *and the capnograph is the only test that reassures the clinician that tracheal intubation has taken place*". So there needs to be an adjustment by deletion of the advice in Section 4 of the AER: "*… misting of the tracheal tube, rise and fall of the chest and auscultation of breath sounds over the chest*", and retain only the advice of Section 7.2. AND ensure training emphasis shifts in the same direction. This case illustrates another human factor whereby for rare crises (which this event was) earlier training, knowledge and beliefs can need unlearning and replacing. A prominent author in some of the above referenced standards and a contributor to international airways efforts is also a member in the same department as the SMO in charge of this case. So there should be little doubt that learnings from this case will spread beyond this particular DHB.

Question 9. *Any other matters in this case that you consider warrants comment*? There are powerful lessons from this case about evolving knowledge and practice, informing learning and training of future anaesthetists and some other airway practitioners: Gold standard for correct ETT placement is "No (CO_2) trace = wrong place". If in doubt pull it out, and use a supraglottic airway measure. Human factors and the traps they pose. Use of cognitive aids, eg crisis checklists to help get out of the traps. In this case stethoscope listening was misleading and did not confirm tube in right place, but added to confirmation bias. These are now recommended not to be used for this purpose. When SMO did re-intubate, the bougie method was successful. Although not infallible, the feel of tracheal rings with it is another feedback in the picture. ANZCA PG56

[5] NAP4 Report and findings of the 4th National Audit Project of The Royal College of Anaesthetists, 2011
[6] https://das.uk.com/guidelines/das intubation guidelines [DAS = Difficult Airway Society]
[7] https://www.universalairway.org [PUMA = Project for Universal Management of Airways]
OR: https://doi.org/10.1111/anae.15817 [17 Aug 2021]
[8] Capnography: No Trace = Wrong Place - YouTube [25/07/2018 Dr Tim Cook 7:41 min video]

recommendations include a flexible fibre optic scope on difficult airway trolley. It can quickly help also confirm tracheal placement (or not).

I would like to finish by acknowledging their profound loss and add my condolences to [Mrs A's] family for that.

Signed:

Dated: 17 April 2023

David Jones FANZCA FFPMANZCA Specialist Anaesthetist

Appendix 1

Brief Biograph: David Jones I qualified Fellow of Faculty of Anaesthetists, Royal Australasian College of Surgeons (FFARACS) in 1980; Fellow of Australian and New Zealand College of Anaesthetists (FANZCA) 1992. Foundation Fellow, Faculty of Pain Medicine (FFPMANZCA) 1999. I have practised at Dunedin Hospital as a specialist in Anaesthesia 1983–current, and Pain Medicine 1983–2021. MCNZ Registration #8041, practising certificate valid to Nov 2023. My current practice experience regularly includes surgical cases of similar type to the one under consideration here.'

Addendum 7 August 2023

'A further question was raised for clarification by Senior Investigator for the Commissioner:

> "*could it be made clearer … that your advice is founded on guidance/standards that pre-dated PUMA and existed at the time of the events (and that PUMA has emphasised and brought together the collective knowledge)*"

Answer: I have included here an additional literature report from 1986[9] which describes as unreliable the three "traditional" measures that were referred to in the various statements to this case:

(a) Condensation (misting) in the ETT

(b) Stomach (actually epigastrium) rise and fall

(c) Chest auscultation with stethoscope for breath sounds

Those authors also point out some of these may contribute to confirmation bias.

ii) I confirm that although the simple memory item/cognitive aid, "no trace — wrong place" was continued in PUMA, the principle behind it was known at the time of

[9] Birmingham PK, Cheney FW, Ward RJ. Review Article. Esophageal Intubation: A review of Detection Techniques. Anesth Analg 1986; 65:886–91

[Mrs A's] procedure and would have been the accepted practice standard in [Month8].

iii) That same wording was in the title of the YouTube video dated July 2018 referenced in the main report[10]. While made on behalf of Royal College of Anaesthetists in UK, it forms part of the effort to get a universal non-territorial message spread wide to counter the serious outcome from unrecognised oesophageal intubation.

iv) ANZCA PG18(A) Guideline on monitoring during anaesthesia 2017 states:

"*6.2.2 … a monitor of carbon dioxide level in inhaled and exhaled gases should be in use for every patient undergoing general anaesthesia and …*"

Because that does not specify how to interpret it, which is highly important to the case in question, other sources such as quoted above supplement on how to interpret it.

Supplement to Report dated 17 April 2023
This addresses these further documents supplied to me:

1. Response to initial report by … Te Toka Tumai Auckland, dated 19 May 2023.
2. Response to initial report by [Dr C], dated 19 May 2023.

I have been requested to consider and comment on these responses.

1) Human factors

a. Time pressure — yes, there was some, which was referred to on Page 4, (j). But to repeat, this or any other patient could have presented in an emergency without much opportunity to read all previous records and experiences. But in all cases lack of sustained $ETCO_2$ waveform for early recognition of oesophageal intubation has been the accepted standard since at least the beginning of this century in New Zealand. There was as much or little time as is commonly encountered.

b. [Dr C's] response Page 1 item 2. "… as someone with an interest in human factors and the processes that lead to adverse events" suggests he might have been even more aware of the human factor traps at play in this crisis — such as situational awareness, fixation, anchoring, and confirmation bias traps.

c. In particular, there are also protective human factors described to mitigate the known degradation of performance and memory of how to respond in stressful situations, to which we are all vulnerable. They include team work, communication and cognitive aids like crisis checklists.

d. [Dr C] asserts there was no useful checklist for oesophageal intubation. That is partly true, as there is no checklist with that heading. Apart from the more immediate effect of no CO_2 trace to warn of this, the principal outcome of it was

[10] Capnography: No Trace = Wrong Place - YouTube [July 2018 Dr Tim Cook for RCoA 7:41 min]

fairly rapidly developing [11] HYPOXIA, for which there is a checklist with item "4. Confirm $ETCO_2$ Capnography and morphology" [12] . There are possible improvements that could be made to checklists around this topic, but meanwhile what we do have still cover sufficiently the hypoxia outcome from oesophageal intubation.

e. Checklist use was covered in the original report, Question 2, items k–x, pages 8–9, and I do not consider any of that needs retracting. But I could add that the CARDIAC ARREST checklists (there are 2) also have the items "confirm Capnography". Both hypoxia and cardiac arrest occurred in this case *early after intubation* so either checklist would have demanded "confirm Capnography".

f. [Dr C] is correct that hindsight is of course on our side now in reporting, but this would be true of all such enquiries.

g. While considering human factors, which [Dr C] repeatedly raises, I would like to draw attention to the further human factor of the severe duress that he has expressed and will continue to live under as a result of this event. The records show he accepted full responsibility for the outcome, having told [Mrs A] he intended to look after her and was therefore not treating this lightly. Even his anchoring to one albeit incorrect diagnosis appears to have the intent to treat [Mrs A] well and fix the problem. There was also a support team summonsed by the emergency bell. He too has re-examined the implausibility of the misleading diagnosis from [Month2] (see 2 below). Whatever else happens there are significant lessons to pass on, including those of a growing cohort of protective human factors.

2) Unrecognised oesophageal intubation 8 [Month2]:

First [Public Hospital 2] Anaesthetic

a. I must apologise to [Dr C] for not having read his items 72 and 73 as thoroughly as I should have; being at page 13 of his report to [Te Toka Tumai Auckland], there was a degree of fatigue over reading what appeared to be repeating messages.

b. We agree both that it is "highly probable" that the first [Public Hospital 2] event was an unrecognised oesophageal intubation, not bronchospasm. Especially they reported "post intubation *there was no* CO_2". I came to that conclusion quickly and independent of item 73 in [Dr C's] report to [Te Toka Tumai Auckland].

c. We also both agree it is "implausible" that with an endotracheal tube correctly placed severe bronchospasm could be resolved (twice) after replacing it with a supraglottic airway (laryngeal mask airway, LMA). If it had been severe bronchospasm both airway types would deliver as equally problematic to achieve lung ventilation.

[11] The time till start of reduced oxygen saturation from the graphs was only 3 min (see Fig A and B at end)
[12] As the checklists we use are derived from those of the DHB concerned here, same numbering is used here; it is possible they have slight format variations but they still have to cover the hypoxia problem here.

d. The fact that there was no appreciable sustained hypoxia reported on that occasion, no clinical indicators of anaphylaxis as an alternative differential diagnosis, plus implausible rescue by a simple LMA manoeuvre virtually proves the tube and its placement was the cause of the ventilation difficulty. That is a simple logical deduction, not speculation.

e. There are many reports, with hindsight diagnosis of oesophageal intubation, which bring out how often assumed bronchospasm overrides the meaning of "No sustained CO_2 trace".[13] An important lesson.

3) Inclusion of post-hoc PUMA guidelines being unfair:

[Te Toka Tumai Auckland] page 1, item 3, and [Dr C's] response Page 3, item 11.

a. It is agreed that it would be unfair to judge the current case based on guidelines and recommendations that did not exist at the time of this event.

b. The initial report confirmed, in response to an additional question by the Investigator, that the PUMA guidelines of 17 Aug 2021 did not exist at the time of this event.

c. But they did rearticulate and consolidate understandings that have been around for a long time — since the 1990s. Earlier understandings and supporting literature were listed on page 18 of the original report.

   i) "If in doubt, pull it out" refers to uncertainty about ETT placement or patency. That advice existed and was taught long before $ETCO_2$ arrived in the 1990s. The [Public Hospital 2's] team for the 8 [Month2] event put that understanding into practice.

   ii) The most important message after 30 years of $ETCO_2$ availability was expressed in an editorial in 2019[14]: "The continuously detectable presence of carbon dioxide in exhaled breath is widely accepted as the best method for confirming that a tracheal tube is correctly placed".

   iii) The above reference also had a prominent subtitle: "No trace = wrong place".

   iv) Educational Video of 2018: Capnography: No Trace = Wrong Place - YouTube [July 2018 Dr Tim Cook for RCoA 7:41 min].

   v) The DHB AER report (Page 208 of bundle: Part A page 3, Section 4.) forwarded by [Te Toka Tumai Auckland] stated:

[13] Honardar MR, Posner KL, Domino KB. Delayed Detection of Esophageal Intubation in Anesthesia Malpractice Claims: Brief Report of a Case Series Anesth Analg. 2017 December; 125(6): 1948–1951. doi:10.1213/ANE.0000000000001795

[14] Cook TM, Harrop-Griffiths W. Capnography prevents avoidable deaths. *British Medical Journal* 2019; 364: l439

"Confirmation of tracheal intubation", which defines the gold standard for confirming tracheal intubation is "the ongoing presence of CO_2 in the exhaled gas ($ETCO_2$)".

vi) The definition of what constitutes "ongoing presence of" sustained exhaled CO_2 waveform trace has been refined: over 7 or more breaths[15], and above 1kPa (7.5mmHg).

vii) Therefore, I do not agree that any new standard or understanding has been submitted in the initial report as alleged in [Te Toka Tumai Auckland's] response, and the SMO response dated 19 May 2023, page 3 item 11.

4) Unreliable measures of establishing the position of an endotracheal tube:

[Te Toka Tumai Auckland's] response Page 1, item 3

a. The assertion: "Dr Jones appears to diminish the importance of the ways of establishing the position of an endotracheal tube that were and are still in common use by our peer group throughout the country and around the world" demands further comment.

b. The measures referred to are 1. condensation ("misting") in the ETT, 2. *apparent* breath sounds on chest auscultation, and 3. observing (stomach) rise and fall.

c. Even if they are used commonly, they are used inappropriately in that context given they are known to be unreliable for detection of oesophageal intubation, and give false positives.[16]

d. "Auscultation routinely gave false indications … clinical signs are unreliable in these circumstances … oesophageal intubation may present both after apparent normal auscultation of the lungs and …". This fact was referenced in the initial report, and similar reports dated 1983, 1986 [17, 18,19.]

e. So this message is far from new, and is in need of promulgation.

f. The newer recommendations[20] *specifically discourage* reliance on those traditional measures.

[15] This recommendation gets around reports of initial small CO_2 "blips", even when ETT is in the oesophagus. Note the "blip" of CO_2 referred to in this case was FIVE minutes after intubation.

[16] Klepper ID, Webb RK, Van der Walt JH, Ludbrook GL. The Australian Incident Monitoring Study. The stethoscope: applications and limitations—an analysis of 2000 incident reports. Anaesth Intensive Care. 1993 Oct;21(5):575–8.

[17] Cook T, Woodall N, Frerk C (Eds). March 2001: NAP4 Report and findings of the 4th National Audit Project of The Royal College of Anaesthetists and Difficult Airway Society.

[18] Birmingham PK, Cheney FW, Ward RJ. Review Article. Esophageal Intubation: A review of Detection Techniques. Anesth Analg 1986; 65:886–91

[19] Linko K, Paloheimo M, Tammisto T. Capnography for detection of accidental oesophageal intubation. *Acta Anaesthesiologica Scandinavica* 1983; 27: 199–202

[20] Chrimes N, Higgs A, Cook T. Clinical examination may increase, but not decrease, suspicion of oesophageal intubation. Anaesthesia 2023,78:125–134.

g. To be fair, the stethoscope has its place *after* an ongoing CO_2 trace is confirmed. Auscultation *can be* helpful in assessing wheeze/bronchospasm then.

5) "Does not mention glottic impersonation" ([Te Toka Tumai Auckland], page 2, item 4).

a. There is no need to mention it, as it is only one of several possible reasons why a tracheal tube might be misplaced into the oesophagus.

The critical issue of the case (and others appearing in coroner reports) is non-recognition of oesophageal tube placement.

6) About tracheal rings feel ([Te Toka Tumai Auckland], page 2, item 4)

a. It is agreed that it is not a method to detect oesophageal tube placement.

b. Bougie use does however contribute to better view of glottis and seeing the bougie going through the cords, as it is only 3mm diameter, whereas the 7–8 mm ETTs obscure the view more.

c. From long experience of inserting many flexible-reinforced ETTs, which *must* go over a bougie into the larynx, the impressive feel of tracheal rings gives feedback for a *temporary* reassurance of bougie *more likely* in the trachea, rather than in a glottic impersonation of it. It is agreed that it does not replace the critical CO_2 trace confirmation criteria.

Nobody else suggested check tube placement ([Dr C])

Unsurprisingly the DHB AER report notes that memories of events varied. The following can be found in the individual statements supplied to H&DC:

d. **[Dr I] (15 Sept 2022):** "At this point I asked [Dr C] whether if the endotracheal tube had been confirmed in the correct position in the trachea"

[Dr I] states that **after** he had inserted arterial line: "Multiple people including myself re-raised the issue of checking endotracheal tube position."

e. [Mr J] — … (29 Sept 2022): "At 15H55[21] … There was no CO_2 visible on the patient monitor, … The question was raised by [Dr I], [Dr D] and myself about 'tube positioning' and did that need to be checked?"

f. After the cardiac arrest: "At this time [Dr I] again asked about tube positioning of the E.T. tube?" At 1610[22], we paused C.P.R to check output, … at this time [Dr I] had said he wanted to see the tube position".

[21] This time was not considered accurate, but approximate, given collateral information

[22] This time is incorrect — see graph for timing of reintubation, 16:07. Otherwise this would have been after the 17min period before reintubation occurred.

[Mr J] therefore corroborates both of [Dr I's] statements.

g. **[Dr F] (3/Oct 2022):** 16:04–16:05 "I then turned to [Dr C] and said in a firm clearly direct manner and making good eye contact '[D]o we need to check the tube?'"

AND 16:09: "I pointed at the abdomen and said to [Dr C] 'that is air you will check the tube'; this was said looking at [Dr C] in a clear direct manner".

h. **[Ms H]** … (20 Sept 2022): before red bell came on "None of the clinicians named above, during complication, … had vocally requested to check the placement of Endotracheal Tube".

In addition, her own report was of some initial hesitation but later acceptance that all was well with the tube. She was in fact one of the clinicians present also.

i. I concluded from the above reports that until help was summoned by the emergency bell, there was no chorus of requests to check ETT position.

j. However, even without a query the lack of a CO_2 trace should have at least triggered a question about correctness of ETT placement, and in my opinion at a higher priority than bronchospasm. The reasoning for that priority order is that bronchospasm has little hope of being treated if the tube is in the oesophagus.

k. Then after help arrived, the above statements from involved parties indicate that at least some queries about tube placement occurred before the re-look at 17 min after induction.

l. Even if there was only 1 query, prompted by the lack of a CO_2 trace, the ETT should have been checked much earlier. The reports indicate that the response to queries remained the same, the anchored mind-set and confirmation bias of "bronchospasm". Faced with a zero CO_2 trace screaming tube in wrong place, a second look by an independent person should have taken place.

m. This was a human factor turning point of this case which training, cognitive aids like memory items (= "mantra") and checklists are intended to mitigate.

n. From the team that arrived, it is not clear that there was a hands off leader getting the overall situational awareness picture, delegating tasks etc. I assumed it was [Dr F] as the floor co-ordinator, but [Dr I] as the most recently and intensively trained and tested would have been one to have listened to most here.

o. One might infer a hierarchy barrier could have operated in this case, but nobody's statements mentioned this as a problem; only that the anchored "bronchospasm" diagnosis came from the most senior clinician in the room and in effect became "contagious" which may have hindered other team members from effective challenge.

p. A note about the second look at ETT placement: when this was finally done, it was only by chance that [Dr I] looking over [Dr C's] shoulder noticed the tube was not in the larynx.

q. This at about the time the video laryngoscope was about to be withdrawn and tube declared satisfactory. This comment is included because it illustrates the degree of difficulty, plus the value of an independent second pair of eyes. There was a risk that the person with the anchored diagnosis was not the best person in the room to confirm tube position.

r. The "if in doubt, take it out" idea clashed with [Dr C's] perceived danger from removing the tube if bronchospasm was the cause. That was a real enough concern.

s. But it remains my opinion that with the flexible bronchoscope being close ("10m away", [Dr C's] response Page 4, item 14, lines 7–10) could have got round that objection after being slipped down the ETT by any one of the medical attendants for rapid confirmation within only seconds to a minute if it was felt imperative to preserve the tube for other reasons.

Comment on knowing [Dr F]:

i) It was declared to the investigator before receiving material for this case that I know [Dr F] through his roles in ...

ii) That was further checked and cleared by the investigator for this case.

iii) In answer to [Dr C's] item 23: This was declared in the opening of the report: "Our mutual professional contact has been through non-anaesthesia roles …".

iv) I have no knowledge of [Dr F's] anaesthesia practice.

v) I quoted from [Dr F's] statement to the Associate Commissioner dated 3 Oct 2022 the descriptions in the initial report.

vi) As both parties have positions to protect, I came to no conclusion of preference about whose statements were given priority.

vii) The dissenting view from [Dr C] came with the responses, but I did not notice that as a discrepancy until the responses were forwarded.

7) There was no sustained CO_2 trace after ETT placement.

Refuted in [Dr C's] 19 May 2023 response (page 3, item 12).

a. The initial report regarding lack of CO_2 trace focused mainly on statements made by relevant parties, admitting they were in retrospect, and summarised here:

i) Bundle Page 221, Item 5. Para 4: "The AT recalls … no CO_2 trace on machine. We kept bagging, we waited, I said quietly "maybe we're in the stomach". She then recalled seeing "little blips of CO_2 trace for a short time" (Page 11 $ETCO_2$ graph, 1554–1556 hrs)[23] and then saying "nah, never mind".

ii) Bundle Page 301, Para 4. [Mr J] (29 Sept 2022): "At 15H55 … There was no CO_2 visible on the patient monitor …" Note this was 4–5min after intubation.

[23] Note that the "blip" was 5min +/- 30 sec after intubation. A correct CO_2 trace needs to be almost immediate.

iii) Bundle Page 305, Para 5 [Ms H] Statement: "… No CO_2 tracing, still on the baseline, SMO manually ventilated patient, SMO asked Fellow to auscultate, Fellow vocalised "air entry heard but also a wheeze in left lung", … SMO manually ventilated. No CO_2 trace still, SMO vocalised it could be Bronchospasm, O_2 saturations dropping, SMO kept flushing the O_2 button on machine to fill up the bag as all of a sudden it started collapsing and had no resistance.

iv) Note also that collectively 1. "flushing the O_2", 2. "bag collapsing" and 3. with "no resistance" are also 3 factors *inconsistent* with bronchospasm if a tube is correctly placed in trachea. They are clues that together should have nullified the "mind-set" thinking process anchored to bronchospasm.

b. To be more certain about the disputed lack of CO_2, a closer analysis was made of the "SaferSleep record forensically reproduced in the AERC report" [24] as described by [Dr C].

c. It is important to understand the name of the system is a commercial description, and that as far as airway management and ventilation is concerned it does not make the anaesthesia any safer *per se* [25]. It is simply one brand of electronic anaesthetic record keeping for parameters and events, especially useful *post hoc* for review of a case like this.

d. The airway gas printout image was enlarged to show better resolution of its time scale from preoxygenation to immediately after intubation, including the CPR.

e. The analysis is attached here as Appendix **2.**

f. **In conclusion, having regard to that re-analysis**, I stand by the statement in the initial report (Page 5, section q and r), noting this is refuted in [Dr C's] 19 May 2023 response (page 3, item 12):

"The timing of intubation was c.15:50:19[26] after which there is no CO_2 detection shown, apart from a tiny blip of uncertain origin at c.15:55:19. This zero $ETCO_2$ trace extended until immediately after re-intubation at c.16:07:19".

Signed:

7 Aug 2023

David Jones

[24] Auckland District Health Board Adverse Event Review Committee. Report on Adverse Event Review. ID 77269, Part B. p.12.
[25] A possible variant to that description is that it may warn about impending wrong drug injection.
[26] With possible error of +/- 30sec

Addendum 28 November 2023

I was forwarded [Dr C's] 27 September 2023 response to my previous reports by [HDC] for further comment.

I have considered carefully those comments and respond as follows, keeping his paragraph numbering sequence:

3. The **increased risk factors** for [Mrs A], as she presented to this procedure, and as outlined by [Dr C] were:
   a. complex patient
   b. time pressured and distracted evaluation of clinical notes
   c. "end-of-day scheduling" with "related fatigue"

These are of course common in our daily practice. For clarification I respond to his comments:

a. True, [Mrs A] was a complex patient, with higher *potential* risks, but the same ASA 3 for *each* of her 5 procedures, 4 of which she recovered from satisfactorily. She had undergone 3 *satisfactory* anaesthetics, with *relatively* straight forward airway-ventilation, one of them not long before the one under consideration now.

   (i) Although in retrospect, if the preoperative assessment for the event under consideration now had checked the first anaesthetic record for *how they had safety retreated, rather than what it was put down to*, the last problem would have likely been rectified again this time. In the first anaesthetic event, with inability to ventilate and achieve a sustained End Tidal CO_2 ($ETCO_2$) trace via endotracheal tube, a safe retreat was achieved by removing the endotracheal tube and reverting to a simpler airway method, until they awoke [Mrs A].

   (ii) That is the *accepted management* for that situation. Prior to introduction of $ETCO_2$ monitoring into our practice, which helps facilitate even safer decision making, the *accepted management* went like this: "if in doubt, pull it out" (the ET Tube, or ETT).

   (iii) In retrospect, through applying simple logic, both [Dr C] and I believe the cause of ventilation difficulty in that first abandoned anaesthetic was also an oesophageal intubation. For some reason a series of expert reviewers did not cotton on to that, and wrongly concluded it was due to bronchospasm.

   In this regard I would add to my previous advice that some mitigating concession is afforded to [Dr C] because others (he calls them experts) accepted the bronchospasm conclusion for the first anaesthetic despite its implausibility. On re-reading the file, these experts appear to be all those who in the interim had cause to carry out preoperative assessments for the subsequent 3 anaesthetics. These are documented in [Te Toka Tumai

Auckland's] responses (bundle p248 — through to anaesthetic allergy clinic letter page 256).

(iv) A focus on that perpetuated, unquestioned wrong conclusion is presented as the mitigating reason for "confirmation bias" affecting the SMO decision making in the final anaesthetic now being considered; that "anchoring" onto the wrong bronchospasm conclusion does not take into account there were the subsequent 3 reassuring satisfactory anaesthetics.

(v) Even though there was some time pressure, the material I was provided indicated they had some cognisance during the preoperative assessment of the other 3 satisfactory anaesthetics. eg Glideslope was used for airway management in the 3rd and 4th anaesthetics, which informed their decision to use it again in the final one.

(vi) IF 3 subsequent anaesthetics progressed without *major* adverse events[27] THEN "confirmation bias" and anchoring to bronchospasm should not be given much weight as a mitigating human factor.

(vii) For reference: the DHB AER report Part B page 6 (or page 218 of bundle) tabulates the experiences at all 5 anaesthetics for [Mrs A].

b. "**Time pressure**" is true to some extent, it is a common occurrence, and we rarely get to read ALL prior records for the very many acute cases we deal with daily. However, I do not think that mitigates the 17 minutes of zero CO_2 trace in this case.

c. … "**related fatigue**": approx. 15:35 in the afternoon can hardly be called a fatigued end of the day if seen against the norms of theatre operating work patterns/hours around the country. In my previous advice I pointed out that plenty of anaesthetists voluntarily contract to work 12hr days.

In a broad sense, [Dr C] has put forward "human factors" as if they mitigate or exonerate what happened (or, did not happen) in this case.

Elsewhere in his responses[28] he refers to Instructor Manual for the ANZCA EMAC[29] course. I have since studied a version of this manual further. Regarding **human factors** in connection with oesophageal endotracheal tube, that scenario is about having a systematic way of dealing with the crisis as presented. Wherever I have previously, and in this response, referred to **checklists** (especially **HYPOXIA Checklist**, but also for what subsequently happened in this case: Cardiac Arrest) — they are powerful cognitive aids to guide a systematic response to a crisis such as in this case, and overcome unhelpful human factors like anchoring, tunnel vision and incorrect mind-set. To be fair, checklist use is not yet as ingrained into our practice as it is in aviation where they are a mainstay

[27] I assessed the manageable event in the 3rd anaesthetic, most likely due to a mucous plug temporarily causing the $ETCO_2$ trace to diminish or disappear, to be within common experiences.
[28] See Item 11 d. below
[29] Effective Management of Anaesthesia Crises

of sorting out problems — typically with immediate memory items followed up with the checklist to quickly check what has been missed.

My previous advice *did consider all these human factors carefully*, in the context of our normal practices. [Dr C's] response to those reports gives human factors strong weighting as mitigations to exonerate the outcome in this case, which I do not. I therefore have no reason to change from the earlier opinion/advice on those factors, and must leave it to the Commissioner to decide what weighting to put on our divergent views of them.

4. Lack of "Oesophageal Intubation" as an item on the **emergency checklists for hypoxia and cardiac arrest**

    a. The DHB Adverse Event Review Committee findings were redacted in documents sent to me. The reference given by [Dr C] in his latest response does not in my material lead to the item he mentions (Part B, page 12). There was mention by [Dr C] of checklists "unlikely to have made any difference to the outcome because oesophageal intubation was not listed as a potential diagnosis" (Question 7 from H&DC initial enquiry). I beg to differ on the basis that if continued with no $ETCO_2$ trace, hypoxia evolves, for which early checklist items are set out below:

    b. **HYPOXIA CHECKLIST**:

        i. **Item 4**. reads "Confirm $ETCO_2$ Capnography and morphology (=shape of waveform)" which *de ipso facto* is asking to confirm the tube is correctly placed in trachea (or maybe one bronchus, but still in an airway rather than oesophageal location).

        And further down:

        ii. **Item 7.** reads "Airway — examine device, +/- suction tube/laryngoscopy" which means look with laryngoscope to confirm the tube is between the vocal cords, and check with a suction catheter down it to confirm it is not obstructed [30].

If there was an airway problem causing hypoxia in this case, then ventilation would appear as if blocked or obstructed by any one of:

— **wrong tube placement**
— kinking or biting on tube
— tube blocked by mucous

As items appearing in the checklist they cover *normal accepted practice* "rules" taught in the days before Capnography ($ETCO_2$) came on our scene, but are still relevant.

[30] A flexible bronchoscope would be better still in modern times

The **HYPOXIA CHECKLIST** (Attached, Appendix 1) rapidly takes one through several equipment problems which need to be excluded ***before*** attributing the problem to something happening in the patient — ie bronchospasm in this case.

c. The purpose of the checklists is to systematically overcome human factors such as "confirmation bias", or tunnel vision with a mind-set as occurred in this case. One could say they raise questions of "what else could it be?" All are possibilities that need to be rapidly identified or eliminated.

   In this case, the main contributor to the wrong mind-set (or "confirmation bias") for the lead SMO was a prior implausible label of bronchospasm derived from the first abandoned anaesthetic. **[Dr C] and I both agree on the implausibility of bronchospasm as an explanation for the problem in that abandoned first anaesthetic**, despite its perpetuation by "multiple senior clinicians".

   Also note the **HYPOXIA CHECKLIST**, and multiple others, start with:

   "2. Identify a hands off leader and delegate roles". This is also to prevent mind-set, anchoring, tunnel-vision or "confirmation bias" from perpetuating.

   Therefore, I consider the previous report's advice does not need altering regarding the non-use of checklists, in this case the **HYPOXIA CHECKLIST**. This is relevant for the whole team, not just the lead clinician/SMO.

   To be fair the anaesthetising team in the anaesthetic under consideration here did not know or think about the *implausibility of bronchospasm* to explain the first anaesthetic's problem. That is a hindsight conclusion of both [Dr C] and myself.

5. "… **loss of the CO_2 trace in a very recent anaesthetic**" is put forward by [Dr C] as further support for "confirmation bias" as a mitigation.

However, that was not the same type of event as a lack of sustained $ETCO_2$ trace from the outset immediately after placing an ET tube. In that previous case the ET tube functioned satisfactorily for one hour before a problem arose, meaning it was correctly positioned at the outset. Steps taken by that team in response to that problem included suctioning, mentioned on the **HYPOXIA CHECKLIST**, to deal with what most likely was a plug of mucous blocking the ETT.

a. [Dr C] submits two literature references in his responses about a fine-point debate/controversy over the PUMA guidelines. But he has also submitted that the PUMA guideline should be disqualified from consideration at all in this report because it was published 6 months after this event. Realistically that position can't be had both ways!

b. However, if we do agree to have it both ways, in what [Dr C] submits there is also advice to use a fibreoptic bronchoscope down the ETT. This is the quickest way to demonstrate if it was in the right place, or not. That assumes one can obtain it

quickly. Fibreoptic scopes are now commonplace[31], and [Dr C] previously advised one was only a few meters away in this case. In practice they could substitute for suction as an item in the **HYPOXIA CHECKLIST**[32] to exclude ET tube blockage. That point was advised in the first report.

6. "**determination to treat this case as a 'generic' case of oesophageal intubation**" — is pretty much a repeat of the submissions already covered above. It was proven to be unrecognised oesophageal intubation, but too late to prevent harm. Lack of $ETCO_2$ trace is the current main accepted practice for diagnosing it. Whether it is "generic" or a special case because it is mitigated by "confirmation bias" is semantics. I previously reported that coroner cases from this cause often reveal it goes unrecognised because of a wrong belief of bronchospasm — that is the learning message.

7. "**to (confidently) characterize failure to remove the tube as a bad choice" and "hindsight bias"**.

   The first anaesthetic team following *accepted practice* removed the tube, with a successful outcome. Patient characteristics were the same as in the anaesthetic now under consideration — high BMI, similar airway and risk assessment but with added information of 3 intervening satisfactory intubations.

   I reaffirm the previous advice that *accepted practice* before PUMA refined it was: "if in doubt, take it out". It would have been reasonable to have delayed that for a few minutes while attempting to treat what they were primed to expect from the prior label of bronchospasm. BUT when that was not working they needed to move on and think "what else could it be?" — which comes back to the checklists intended to break out of being stuck on the same thing — ie the human factors of mind set, tunnel vision, anchoring (to a single cause) or "confirmation bias".

   RE: "**hindsight bias":** I can only add that instead of using this term as a redeeming factor for this case, the lessons from the hindsight need to be promulgated.

8. "Unrecognised oesophageal intubation 8 [Month2]: was at [Public Hospital 1], not [Public Hospital 2]". I accept that the wrong hospital for that event was mentioned, but it makes no material difference to the conclusions.

"Inclusion of post-(this event) PUMA guidelines being unfair":

9. …
10. …
11. … and …

[31] ANZCA recommendations were covered in previous report
[32] The checklist could be updated to this modern practice

12. These 4 items in [Dr C's] response to the previous report are addressed together here as they relate to the same theme:

    a. If the PUMA guidelines already referred to are ignored completely, then the message learned early by trainees has been that a suspect endotracheal tube should be pulled out, or at the very least should be visually inspected to check that it is between the vocal cords. In modern times video laryngoscope is preferred so the view can be shared and confirmed by others in the room.

    b. The common understanding of our profession, well before the PUMA guidelines emerged, is that a sustained $ETCO_2$ trace on routine monitoring is the most reliable way to ensure lungs were being ventilated, not the stomach[33].

    c. [Dr C's] Item 10. states: "aggressively resurrected and promoted *in parts of the world* where it hitherto had little impact", which I agree with. I take that to mean in the less developed world, in less sophisticated and less well equipped locations — but not a major teaching hospital in NZ where this event occurred.

    d. The references [Dr C] makes to EMAC[34] do not diminish any of the above. I agree with [Dr C] that the EMAC manual is not available in public domain, being a proprietary copyrighted item supplied to course participants. The copy in my possession is unsatisfactory being too wordy to provide a quick simple language guidance on this subject; with difficulty a search in it for "Hypoxia" in that manual does reveal the need to ensure the ET Tube is correct.[35] It is not satisfactory for use in the theatre, but …

    e. … I draw attention again to **HYPOXIA Checklist**

    Item 4. "Confirm $ETCO_2$, capnography and morphology" as being most relevant in this case.

    f. I am assured there is explicit inclusion of an oesophageal intubation scenario, or endotracheal obstruction with no $ETCO_2$ trace, in the EMAC course. There was one in my course. The standard accepted is for the participant to have a systematic method to resolve it.

    g. The DHB Adverse Event Review, ID 77269, Part A did not specifically include the updated PUMA "mantra", but instead [Te Toka Tumai Auckland] provided elsewhere (bundle page 258) the new proposed guidance reference to them[36] published subsequent to this event.

[33] There are some rare other conditions, but not applicable in this case.
[34] Effective Management of Anaesthesia Crises
[35] Although it places more emphasis on ensuring it is not too far down and into only one lung instead of both, although almost the opposite to this case's problem.
[36] https://www.universalairway.org/

What the AER did however specifically include (page 3, or bundle page 207) has the same meaning:

"**4. Confirmation of tracheal intubation**
Correct placement of the ET tube must be confirmed immediately following intubation.

The gold standard [37] for confirming tracheal intubation is the on-going presence of carbon dioxide in exhaled gas ($ETCO_2$)".

[That report then unfortunately included several proven *unreliable* measures, which I would hope get corrected in future iterations of that advisory material] … then it ended with:

"Passing a bronchoscope down the ET Tube can be used to visually confirm tracheal placement if other measures are not diagnostic".

Additional relevant detail appeared in Section 7.2 of that same DHB AER report, describing actions the first anaesthesia team for [Mrs A] on 8 [Month2] responded with when they encountered essentially the same problem as is now under consideration, and "rescued" [Mrs A] from it that time. Waveforms typically encountered in Airways Obstruction (read bronchospasm for this purpose) were pictured at the end of that DHB AER report. So that sets out what that DHB policy was at the time of this event.

I agree with [Dr C] that it would be "grossly unfair" if the PUMA report published after this case under consideration was the first and only promulgation of accepted practice to use $ETCO_2$ to assure correct placement of an ET Tube.

If all reference to the PUMA report is to be redacted in this assessment, then we could substitute with what the anaesthesia community in NZ understood at the actual date of the event in [Month8]. Just as on 8 [Month2], the answer would be essentially the same, only worded differently.

Namely: "The gold standard[10] for confirming tracheal intubation is the on-going presence of carbon dioxide in exhaled gas ($ETCO_2$)", as presented in the DHB AEC report. Or, as was understood for a long time before $ETCO_2$ emerged: "if in doubt, take it out" and revert to a simpler airway management.

…

[37] A term probably best avoided, to be replaced by *accepted practice*

13. "**Most senior clinician in the room**": I had no specific knowledge about their relative longevity in the specialty. I was referring to appointed position title when using that description, so I am corrected and apologise for that error.

    At this point I can share for the commissioner's consideration the following up-to-the minute item from ANZCA Spring Bulletin 2023, page 8, again emphasising that it comes after the event under consideration, but which conveys the expectations in our craft group:

    Letters to Editor: **Teamwork Important in Airway management**

    "*… Many needless deaths from unrecognised oesophageal intubation continue to occur across the world because of individual (…)*[38] *practitioners wrongly insisting that the tube is correctly placed. The use of a video-laryngoscope and screen that can be seen by all members of the team allows the maintenance of a shared mental model and situation awareness that counteracts an 'inhibitory hierarchical structure' to promote open communication. While ultimate responsibility for the airway lies with the airway operator, this does not diminish the importance of teamwork*."

14. …
15. Non-disclosure to the respondent is clearly of concern, but not within my remit.
16. ditto
17. …
18. …
19. …
20. …
21. …
22. …
23. ...

24. Regarding who to believe in the case of conflicting statements, and why: I studied carefully the various persons' statements to look for consistent threads across them. The senior investigator warned me regarding conflicts over the registrar's statements. [Dr C] explained what transpired, so I did not place any weighting on them for the sake of safety in conclusions. … see also 27. Below.

    The strongest signal I discerned across all the statements coupled with the respiratory gas printout was that [Dr I] queried if the tube was in the right place soon after he arrived in response to the emergency bell (15:55–16:00). [Dr C] also acknowledged that early on. It fitted with what I expect from a Provisional Fellow

[38] Two adjectives are deleted from the original, as I have no evidence they apply to [Dr C].

as the most recently trained and tested practitioner, so I had little doubt (although no proof) that a lack of CO_2 trace would immediately cause him to make that query.

That would also have been the best time to enlist [Dr I's] aid with either video laryngoscopy or placing a flexible bronchoscope down the ET tube to prove its integrity while at the same time the ongoing efforts to correct the putative diagnosis of bronchospasm continued. Although again that is with benefit of hindsight, it is a major learning from this case.

[Dr I] was instead delegated to insert an arterial line, which is reported to have taken a while. He then raised the same query about the tube *a further time*. I considered there were enough believable statements to support that sequence of events, with a *second* query about the tube from him.

It would be no surprise if [Dr I's] *two* queries about the ET tube went unnoticed by [Dr C] in the flurry of activity that accompanies these events. [Dr I] was also the one who spotted the tube's wrong placement during relook video laryngoscope withdrawal. The first CO_2 return after reintubation shows at 16:09.

25. …

26. I concur with [Dr C's] concern regarding his first learning of some statements by others coming to his notice through my report. However, disclosure is not in my remit.

27. [Dr D's] statements/claims were disregarded entirely, in the interests of safety of conclusions. [Dr C's] earlier statements regarding her involvement and his concerns about her mental health soon after this event were noted.

28. … ditto
29. … ditto
30. … ditto
31. … ditto
32. … ditto
33. … ditto

34. [Dr C's] explanations for the bag not refilling are reasonable alternatives. Although I have some reservations due to the description "feel of the bag" as reported by [Dr F], I suggest disregard it from the list of clues I referred to.

35. The "forensically reproduced" SaferSleep® gas analysis record is familiar enough to me; I have encountered them before, and even though we do not use that system I have been adequately informed/briefed by others who have.

The reason for a closer look at it (*as supplied to the H&DC enquiry*)[39] is its depiction of parameters at 1 min intervals, in a forensically derived graph[40], was to correlate its objective timescale against the subjective statements by various parties (8 days or more later) where we have seen there are memory variations for timing of events, as expected.

If the labels were correctly placed on that graph (and if not, then it could not legitimately be referred to as "forensically reproduced"), then there was only a single 1-minutely point which showed a CO_2 that *might be claimed* to have occurred after intubation. I say "might be claimed" in order to give benefit of any doubt, because there were no other visible changes to account for the mask and bag operators changing hands, the reasons reported for them doing that, and with placement of the intubation line on the supplied graph at 30 seconds after that peak.

36. … that described a good planned sequence, indirect evidence it was not entered into haphazardly.

37. … I refer again back to the enlarged portion of the forensically derived data set as graphed:

    a. 15:46 labelled as induction, where Vecuronium takes c.4min to fully relax
    b. 15:49 Further Propofol is administered; elsewhere this was reported as BEFORE intubation
    c. 15:50 the CO_2 peak was quite a bit higher than that at 15:48, which I concluded fits with [Dr C's] description of improvement from 200mls per breath to "tidal volumes of >400mls" after changing operators.
    d. After 15:50 but before 15:51 the purple arrow subtends from the original line for intubation; there is no CO_2 showing 1 minute after this time.

    Certainly there was "no sustained CO_2 trace after ETT placement", even if the above analysis is out by 30sec.

38. Even if that analysis is incorrect by 30 secs, for when the operators changed hands, there still was no sustained CO_2 trace, and [Dr C] accepts that.

    So that conclusion in the original report still stands.

39. …
40. …
41. In response to [Dr C's] final comments in this paragraph:

[39] The SpO_2 and $ETCO_2$ graph provided was described "does not reflect the real time situation" on Page 12 of the AER report. It contains 1-minutely time stamps along the X-axis. Some labels have obviously been added to the forensic dump out — eg the 3 horizontal blue bars and the "15.50-15.52" text box using different time punctuation.
[40] [Dr C] labelled Fig 1 (same graph) as such in his 5 October 2022 report via Te Toka Tumai Auckland.

a. Although I am not his advocate, I draw attention to there being "2nd victims" in tragedies like this.

b. There are learnings covering the team's collective involvement that need to be drawn out from this case, even if anonymously.

I trust these responses and clarifications will assist going forward to decisions.

David Jones
28 November 2023
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Appendix B: Summarised data from AER report

Note that the SER report states that the figure below is summarised data presented for explanatory purposes (and does not reflect the real time situation). The timing of medication administration in the text is approximate and as accurate as possible based on the information available.