



A Decision by the Deputy Health and Disability Commissioner (Case 20HDC00617)

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Introduction

1. This report is the opinion of Deputy Health and Disability Commissioner Carolyn Cooper, and is made in accordance with the power delegated to her by the Commissioner.
2. The report discusses the care provided to Mr A by Dr B, an otolaryngologist¹/head and neck surgeon, and a district health board (DHB) (now Te Whatu Ora).²
3. Mr A (aged in his seventies at the time of events) was diagnosed with squamous papilloma³ in 2012. On 17 February 2020, Mr A underwent surgery for recurrent laryngeal⁴ hyperkeratosis⁵ caused by squamous papilloma. When the surgery was almost at an end, a fire occurred in the operating theatre, which ignited a portion of Mr A's airway circuit. As a result, Mr A sustained burns to the left side of his face and shoulder and was transferred to the Intensive Care Unit for postoperative management.
4. Subsequently, Mr A developed laryngeal cancer and, sadly, he died in 2022.

¹ Specialised doctors who deal with medical and surgical treatment of conditions of the ears, nose, throat, and structures of the head and neck.

² On 1 July 2022, the Pae Ora (Healthy Futures) Act 2022 came into force, which disestablished all district health boards. Their functions and liabilities were merged into Te Whatu Ora|Health New Zealand. All references in this report to the DHB now refer to Te Whatu Ora.

³ Benign (non-cancerous) growths that occur mostly on the tonsils and on the base of the tongue, and to a lesser extent on the hard palate, tip of the tongue, gums, epiglottis, pharynx, and uvula. It is associated with human papillomavirus infection (HPV).

⁴ Concerning the larynx (voice box), an organ in the top of the neck involved in breathing, producing sound and protecting the trachea against food aspiration.

⁵ A layered build-up of keratinised cell tissue.

5. Mr A's daughter raised concerns about the care provided to Mr A.
6. I express my sincere condolences to Mr A's family. I acknowledge the significant challenges that Mr A's family experienced after his surgery in 2020, and that this event had a significant impact on the quality of Mr A's life in the remaining years before his passing.
7. The following issues were identified for investigation:
 - *Whether Dr B provided Mr A with an appropriate standard of care between 17 February and 22 March 2020.*
 - *Whether the DHB provided Mr A with an appropriate standard of care between 17 February and 22 March 2020.*

How matter arose

Plan for ventilation and oxygenation during surgery

8. Prior to his surgery in February 2020, Mr A had undergone approximately 10 surgeries for squamous papilloma.
9. Mr A was well known to Dr B and the primary anaesthetist, Dr C. Dr B had performed eight of Mr A's previous surgeries, and Dr C was the primary anaesthetist for at least two of Mr A's previous surgeries.
10. Dr B stated that Mr A's disease, while benign, was challenging as it re-occurred on a regular basis. As a result of the disease and scarring from the previous surgeries, there was a progressive decline in the quality of Mr A's voice, and he also had breathing difficulties.
11. Dr C was aware that during a previous surgical procedure, Mr A had experienced laryngospasm⁶ and his oxygen levels had dropped. As a result, for Mr A's surgery on 17 February 2020, Dr C decided that the best course of action would be to manage his airway using Transnasal Humidified Rapid Insufflation Ventilatory Exchange (THRIVE)⁷ as the primary ventilation⁸ and oxygenation⁹ option. A device delivers THRIVE therapy.
12. A secondary ventilation and oxygenation plan was also in place, which included the use of intermittent manual supraglottic¹⁰ jet ventilation,¹¹ and intubation¹² and ventilation with a Laser Flex endotracheal tube.

⁶ A spasm of the vocal cords that temporarily makes it difficult to speak or breathe.

⁷ THRIVE is a technique for delivery of high-flow oxygen via nasal tubes.

⁸ The process of inhaling and exhaling.

⁹ The delivery of oxygen to the tissues to maintain cellular activity.

¹⁰ The supraglottis is the part of the larynx above the true vocal cords.

¹¹ Jet ventilation is often used for airway surgery in order to provide continuous ventilation with no obstruction of the surgical field. It utilises a high-pressure jet of gas at either low or high frequency.

¹² Placement of a flexible plastic tube into the mouth or nose, then into the trachea (airway/windpipe) to maintain an open airway. The tube can connect to a machine that delivers air or oxygen.

13. The plan for ventilation and oxygenation was communicated to the surgical team prior to Mr A's surgery on 17 February 2020.

Fire in operating theatre on 17 February 2020

14. On 17 February 2020, Dr B performed Mr A's surgery, with Dr C as the primary anaesthetist. The operating procedure was documented as "microlaryngoscopy,¹³ with possible coblation,¹⁴ laser¹⁵ and micro-debridement¹⁶".
15. Te Whatu Ora's Laser Safety Policy at the time of events (dated 2 April 2014) stated that the laser should be in standby mode when not in use to prevent any inadvertent activation. Fire is one of the most significant hazards with laser use, as lasers can ignite patient drapes and any other flammable agents.
16. Each time before the laser was used during Mr A's surgery, a "laser time out" procedure was undertaken. This involved Dr C reducing the oxygen concentration on the device to 30% before the laser was used. Dr C stated that this was verbally confirmed by the laser nurse performing the "laser time out" procedure. Dr C stated that it was clearly communicated when the laser was on standby and the oxygen could be turned up to 100%.
17. The laser was used approximately three times during surgery. At all other times, Mr A's ventilation and oxygenation was maintained using THRIVE (the device) running with an oxygen concentration of 100% (and not reduced to 30%).
18. At approximately 3.45pm, Dr B indicated that he had finished the surgery. As Dr B withdrew the laryngoscope,¹⁷ he noticed a small area of disease hidden underneath one of the retracting blades of the laryngoscope.
19. At this point, Dr C was preparing to take over Mr A's airway management and had turned to face the drug trolley and infusion pumps to turn off the propofol¹⁸ and give some antiemetic,¹⁹ and to chart these on the electronic prescription chart.
20. As it appeared to the team that the surgery was coming to an end, the laser was turned off and the THRIVE setting was at 100% oxygen at a high flow (70 litres per minute²⁰).

¹³ A surgical procedure that allows a provider to view the vocal cords with a microscope. During this procedure, a provider may also remove lesions (growths) from the vocal folds, or correct movement disorders of the larynx (voice box).

¹⁴ Using low-temperature radiofrequency and a saline solution to gently and precisely remove tissue.

¹⁵ Light amplification by stimulated emission of radiation. Lasers provide a source of focused, coherent light capable of transmitting intense energy to a precise location.

¹⁶ A procedure that helps wounds to heal by removing dead or infected tissue.

¹⁷ A medical instrument used to visualise the larynx for various purposes.

¹⁸ An intravenous anaesthetic used for procedural sedation during monitored anaesthesia care, or as an induction agent for general anaesthesia.

¹⁹ Medications to prevent or treat nausea and vomiting.

²⁰ The normal flow rate of oxygen is usually six to 10 litres per minute.

21. While the THRIVE settings remained at 100% oxygen and high oxygen flow, Dr B used monopolar suction²¹ diathermy²² to remove the small piece of remaining diseased tissue. Dr B stated that “unfortunately, as can happen”, the monopolar suction diathermy produced a high temperature electrical arc.²³ This electrical arc is thought to have connected with some surgical plume,²⁴ which can contain combustible material. This, combined with the 100% oxygen environment (produced by THRIVE), led to the ignition of the surgical plume. This ignited the plastic breathing circuit, resulting in the fire.

Events following fire

22. As soon as the fire ignited, Dr B yelled “fire!” and smothered the flames with wet towels that had been placed around Mr A’s face. Dr C turned around and saw the flames emerging from what appeared to be Mr A’s mouth. Dr C immediately turned off the oxygen supply to the device’s circuit. At the same time, a number of staff called for water and saline.²⁵ Saline was poured directly onto Mr A’s face and shoulder. The overall response for the fire to be extinguished occurred within seconds.
23. The on-call plastic surgery team was asked to attend the operating theatre to assess Mr A’s injuries, while the ENT²⁶ team arranged for the appropriate examination of Mr A’s oral cavity, oropharynx,²⁷ and larynx. On examination with a laryngoscope, Mr A’s airway was found to be normal. Mr A was intubated to manage his airway in the emergency setting.
24. There were obvious burns to Mr A’s head, nose, lips, and left shoulder, but no airway burns were identified. The burns sustained by Mr A were estimated to be three to four percent of his total body area, which is classified as a minor burn. Due to the potential for airway swelling, the decision was made to keep Mr A intubated and sedated. Mr A was transferred to the Intensive Care Unit (ICU) for postoperative management.
25. On 5 March 2020, Mr A was discharged from ICU to the ENT ward. Subsequently, Mr A developed acute respiratory distress and was re-admitted to ICU.
26. On 11 March 2020, Mr A was discharged from ICU to the ENT ward.
27. On 23 March 2020, due to his ongoing needs, Mr A was transferred to another hospital for further rehabilitation.

²¹ Allows for precise incisions to be made with limited blood loss and is used in nearly all surgical disciplines.

²² The use of a high frequency alternate polarity radio-wave electrical current to cut or coagulate tissue during surgery.

²³ A luminous electrical discharge between two electrodes or other points.

²⁴ Smoke or vapour resulting from surgical intervention with tissue. It is a by-product produced by electrosurgery, laser tissue ablation, or other surgical techniques.

²⁵ A mixture of salt and water.

²⁶ Ear, nose and throat service (also referred to as the Otolaryngology service).

²⁷ The part of the throat at the back of the mouth behind the oral cavity.

28. Dr B stated that Mr A's medical background was "extremely complicated" as he also had chronic obstructive pulmonary disease²⁸ and obstructive sleep apnoea,²⁹ he was pre-diabetic, and he had a history of depression. Dr B stated that Mr A's complex medical issues "almost certainly" contributed to his prolonged stay in ICU.

Possible cause of fire

29. The cause of the fire is unknown, and there is uncertainty about the manner in which the fire developed.
30. Te Whatu Ora explained that three elements are required to promote a fire: an ignition source, an oxidiser (oxygen), and a fuel source. This is commonly referred to as the "fire triangle". The removal of any of the three elements in the fire triangle nullifies the risk of a fire.
31. Te Whatu Ora told HDC that while this cannot be proved conclusively, it is likely that the fire was caused by the monopolar suction diathermy (ignition source), combined with the higher oxygen concentration around Mr A's face from the THRIVE (oxidiser), fed by a surgical plume (fuel source). The fire then came into contact with the airway circuit.
32. Te Whatu Ora concluded that "the fire was caused by the use of monopolar diathermy in the setting of a high oxygen environment".
33. Dr B disagreed with Te Whatu Ora's conclusion about the likely cause of the fire. Dr B said that it is unlikely that a surgical plume could have been ignited. Dr B explained that this is because the monopolar suction diathermy device has a central suction core, designed to remove the plume, as it is being produced.
34. Dr B also explained that the amount of particulate material would have been extremely low, otherwise it would have been visible to him through the high-power microscope. Further, Dr B said that the device's oxygen setting was at 70 litres per minute. He explained: "[T]herefore there would have been a significant amount of turbulence in the pharynx and any particulate material would have been widely dispersed i.e. extremely dilute."
35. Dr B said that for these reasons, there is no evidence to support that the fire was caused by the monopolar suction diathermy combined with the higher oxygen concentration around Mr A's face from the THRIVE. Dr B told HDC:

"It is not a logical and conjoint explanation of how the fire could have developed. In my opinion, given there was no evidence of thermal injury in the pharynx or larynx, I believe that the fire originated externally and directly at the nasal interface.

²⁸ A group of lung diseases that cause airflow blockage and make it difficult to breathe.

²⁹ A potentially serious sleep disorder in which breathing repeatedly stops and starts.

The fire triangle requires an ignition source, oxygen agent and a fuel. There is no doubt in my mind that there was never any fuel in the operating field and therefore there was no reason for me to be concerned about the use of the monopolar device at that time.

I recognise that my lack of communication with the anaesthetic team before I used the diathermy contributed to the oxygen concentration levels being elevated during the time of ignition, however in the absence of a fuel there is still no physical way for the fire to have been generated within reasonable limits of knowledge.”

THRIVE

36. THRIVE was first introduced at the DHB in 2018.
37. The DHB’s guidelines on the use of THRIVE to facilitate laser airway surgery, approved in December 2018 (THRIVE guidelines), state that practitioners, including surgeons, anaesthetists, nurses, and anaesthetic technicians, must be trained in using THRIVE for airway laser cases, and be aware of the associated risks, benefits and limitations.
38. The THRIVE guidelines state that because the number of cases is small and the cases are complex with high risks, there will be a named group of surgeons and anaesthetists who are considered the credentialled user group. The credentialled user group is signed off by the Airway Lead Anaesthetist and the Otolaryngology Laser Committee representative after confirmation of having read the full guidelines.
39. Both Dr B and Dr C are named as credentialled users in the THRIVE guidelines.
40. The THRIVE guidelines state that there are specific instances where the use of THRIVE is inappropriate. One of the “absolute contraindications³⁰” to THRIVE is the “use of diathermy within the larynx, pharynx, oral cavity or face”.
41. Some of the “relative contraindications” to THRIVE are the “use of laser during the use of THRIVE”, and “patients with contagious pulmonary infections, especially patients with respiratory papilloma where there may be excessive exposure to potential infectious smoke plume”.
42. The THRIVE guidelines were signed and approved by Dr B as the Clinical Director Otolaryngology Head and Neck Surgery, and the Clinical Director Anaesthesia.

Use of THRIVE in conjunction with monopolar suction diathermy

43. The surgical team and the anaesthetic team presented differing accounts as to whether or not the anaesthetic team was aware that monopolar suction³¹ diathermy³² would be used in conjunction with THRIVE during Mr A’s surgery. The operation note states:

³⁰ A specific situation in which a drug, procedure, or surgery should not be used because it may be harmful to a person.

³¹ Allows for precise incisions to be made with limited blood loss, and is used in nearly all surgical disciplines.

³² The use of a high frequency alternate polarity radio-wave electrical current to cut or coagulate tissue during surgery.

“Debulking of left [arytenoid³³] and left [vocal] squamous papillomas using sharp dissection with scissors, then microdebrider and monopolar suction diathermy. Laser used on right vocal fold papilloma. Monopolar suction diathermy used for last bit of disease ...”

44. Dr B stated that no specific advice was available internationally regarding the use of many devices and THRIVE simultaneously, and that it was at the surgeon’s discretion to use the tool that best suited the purpose. Dr B stated that he had used this method of ventilation and surgical tool on previous occasions, including during Mr A’s surgery on 19 April 2018, where he documented that THRIVE and monopolar suction diathermy were used concurrently.
45. Dr B told HDC that there was no indication that an injury would be caused by using the same technique he had used previously.

46. Dr B stated:

“The anaesthetic team were involved with the procedure throughout and were aware that monopolar [diathermy] was being used intermittently during the surgery ... At all stages, there was no concerns about the techniques that were being applied ... suction monopolar [diathermy] was being used regularly throughout the procedure and had been used in multiple other procedures with no concerns. Therefore overall, there was no particular reason why the anaesthetist team would have been unaware of any of the actions that were undertaken on that day.”

47. On the other hand, Dr C stated that monopolar suction diathermy was not anticipated, nor was it explicitly communicated to the anaesthetic team when used in this case. Dr C told HDC:

“Airway management was discussed prior to the procedure and the plan was clearly stated to use [THRIVE] using [the device]. Departmental guidelines were developed to guide the use of THRIVE, in particular, in conjunction with laser. These guidelines state that the use of diathermy is contraindicated with THRIVE ...

Diathermy is an integral piece of equipment in almost all surgical operating theatres and has been in use for many decades. Most theatres would contain a diathermy machine. Its use is so universal in surgical procedures that it is rarely stated as an individual procedure on an operating list or consent form. In contrast to laser, diathermy is not associated with a time out procedure prior to use.

... [T]he use of diathermy is contraindicated with THRIVE. Diathermy use was not anticipated, nor was it explicitly communicated to the anaesthetic team when used during this case. If diathermy use was signalled, I would have emphasised that this cannot be used.”

³³ Cartilage at the back of the larynx.

48. Following the incident, Te Whatu Ora conducted an internal investigation and completed a serious adverse event review report (SAER).
49. The SAER states that surgery of the airway presents unique challenges to the anaesthetist, as this surgical field involves one of the prime concerns of the anaesthetist, which is to establish and maintain a patent airway. The SAER states that these concerns include controlling ventilation and maximising surgical exposure, while minimising the risk of airway fires during laser use. The SAER states that this conflict requires very close cooperation between the surgeon and the anaesthetist.
50. The SAER states:

“The surgical team were experienced in the type of surgery being undertaken and had worked with the THRIVE oxygen system and Laser in the past. What the Anaesthetic team was not aware of was that monopolar suction (electrosurgical) was also being used intermittently during the surgery along with the microdebrider (uses suction to pull tissue onto the blade, which cuts the tissue) ...

THRIVE massively increased the delivery of oxygen per unit time, usually by both of these mechanisms: increased oxygen concentration and increased delivery of oxygen. Lowering the oxygen concentration with an oxygen blender whilst actively treating with laser will decrease the risk of fire ...

Monopolar suction is a commonly used and well-established tool used in ENT surgery ... When the Laser is in use there is a heightened awareness of the risks by all members of the team and established protocols and roles to follow. Monopolar suction had been used earlier in the surgery without any issues, and many times in previous surgery with [Mr A]. What was different this time was the use of THRIVE ...

The surgical plan as placed on the operating list had been to *possibly use Laser, coblation and microdebridement*. The surgeon described afterwards having a false sense of security when using the monopolar in a THRIVE environment compared to the well-known risks of THRIVE and Laser.”

51. Te Whatu Ora found:

“The Operating Theatre Team had a good academic understanding of the factors that create risk of fire, and were diligently applying appropriate risk management strategies when using the laser. However, there was a practical ‘blind spot’ related to the risk posed by monopolar diathermy in a high oxygen environment, which was probably related to the commonplace usage of monopolar in surgery of the nose and throat.

The use of THRIVE has been an important improvement in Anaesthesia for surgery of the larynx. It has allowed improved surgical access and therefore is a benefit to the patient in terms of more complete surgery and less risk of complications. The range of cases where THRIVE is used has grown and so the original limits around use of THRIVE have been outgrown by clinical necessity. The active consideration about risks posed by

THRIVE when first introduced was possibly not carried forward as its clinical use increased in volume and scope. In essence clinical practice outgrew policy.”

Training

52. Te Whatu Ora provided HDC with an example of its formal laser training for staff. Te Whatu Ora said that other training was available on its online training platform.
53. Dr B told HDC that the district health boards were generally not in a position to advise clinical departments on any training, guidance, or documentation around a particular instrument or surgical technique, and that this was generally provided by the product representatives who introduced these instruments.
54. Dr B stated that there is a general process for the introduction of new or novel instruments or equipment, “and this goes through a very defined pathway”. Dr B noted that this involves significant in-service training for all those involved in using the instrument.
55. Dr B said that he has had a significant amount of experience in using the monopolar suction diathermy device “at many levels and in many clinical situations”. He stated: “I do not rely on [the DHB] to inform me on how to use these devices as that is part of my own professional development.”

Further information

56. Dr B stated that the entire team involved on the day of Mr A’s surgery were “incredibly professional”, and applied all of the training they had received regarding patient safety and a theatre fire. Dr B said that there was no doubt that the team’s rapid response led to a mitigation of injury to Mr A. Dr B considers that this showed that the protocols that were in place for laser procedures in general were “sound”.
57. Dr B told HDC:

“I have found this process extremely distressing, especially as I acknowledge that serious harm has been caused to [Mr A] and resulted in both psychological and physical challenges for him. I am also aware of the challenges that this has caused to his family, given the distance they live from the public hospital. The overall intent of my treatment on that day was to improve [Mr A’s] quality of life and I only acted with his best interests in mind at all times and with the sole intention to improve his quality of life. I certainly never wished to cause him any harm. The fact that [Mr A] was harmed, whilst completely accidentally, has been very difficult for [me] to come to terms with.”

Responses to provisional opinion

Mr A’s daughter

58. Mr A’s daughter was given an opportunity to respond to the “Introduction”, “How matter arose”, and “Actions taken and changes made since events” sections of the provisional opinion.

59. She told HDC:

“This process has taken such [a long] time, it has been hard for my family physically and emotional to deal with my [father’s] death and the trauma he went through leading up to it. The stress on us all as a family has taken its toll as you could imagine. The memories of his burnt face still haunts us.

We firmly believe that the actions of those involved in this horrific event which put dad in a [medically] induced coma for 8 weeks shorten[ed] his life and dramatically changed the quality of it.

To the medical community this is just a [‘what will we do better next time’ but] to us it is devastating.”

Dr B

60. Dr B was given an opportunity to respond to the sections of the provisional opinion that relate to the care he provided.

61. Dr B’s comments have been incorporated into this opinion where relevant and appropriate.

62. Dr B said that this was an exceptionally rare event with the cause of the fire still unexplained. Dr B stated:

“The fire that occurred on the day was totally unexpected and given the safety of the procedures that we had undertaken previously, using identical techniques, there was no reason to believe we were operating outside of any clinical norms. I had complete confidence that we were operating within the expected parameters for patient safety.”

63. Dr B told HDC:

“In the three years that have passed since this event, I have carefully reflected on this case and the criticism of my care and made changes to my personal practice. There have also been multiple changes to our working practices which has significantly improved the [safety] of all procedures that use any device that could allow ignition of oxygen in the airway.”

Te Whatu Ora

64. Te Whatu Ora was given an opportunity to respond to the provisional opinion.

65. Te Whatu Ora’s comments have been incorporated into this opinion where relevant and appropriate.

Opinion: Dr B — breach

66. This case highlights the importance of the need to minimise the risk of fires in operating theatres and of following established policy for minimising this risk, and the requirement for extreme vigilance and caution in high-risk settings. This was an extraordinary case, as a surgical fire in an operating theatre is a rare event.

67. Mr A's surgery was complex. The surgery was performed by specialist teams using multiple pieces of large equipment (such as a large microscope, laryngoscope, laser machine, the device, and the anaesthetic machine), in an inaccessible area (Mr A's airway).
68. With respect to the use of the laser during surgery, I accept that all precautions were taken during surgery and that Dr B diligently applied the appropriate risk management strategies. However, it appears that Dr B did not apply the same precautions during the use of monopolar suction diathermy in a high oxygen environment (produced by THRIVE).
69. The THRIVE guidelines in effect at the time of events clearly state that the use of diathermy within the larynx, pharynx, oral cavity or face is an absolute contraindication to THRIVE.
70. As noted in the SAER, THRIVE produces a high oxygen concentration, which increases both the risk and intensity of a fire. Also, the increased delivery of oxygen at low concentrations but high flow will increase the risk of a fire. The SAER states:
- "THRIVE massively increased the delivery of oxygen per unit time, usually by both of these mechanisms: increased oxygen concentration and increased delivery of oxygen. Lowering the oxygen concentration with an oxygen blender whilst actively treating with laser will decrease the risk of fire."
71. While Dr B had used monopolar suction diathermy in conjunction with THRIVE previously, this was contrary to the THRIVE guidelines.
72. The THRIVE guidelines state that practitioners, including surgeons and anaesthetists, who are going to use THRIVE for airway laser cases must be aware of the associated risks, benefits and limitations. Therefore, it was the responsibility of both Dr B and Dr C to be familiar with the indications, contraindications, and the appropriate process for the use of THRIVE.
73. I am concerned that Dr B did not communicate with the anaesthetic team adequately before he used the monopolar suction diathermy when the surgery was almost at an end.
74. Dr B and Dr C presented different accounts as to whether or not the anaesthetic team was aware that monopolar suction diathermy would be used in conjunction with THRIVE during Mr A's surgery.
75. Dr B stated that the anaesthetic team was aware that monopolar suction diathermy was being used in conjunction with THRIVE, whereas Dr C stated that the use of monopolar suction diathermy was not explicitly communicated to the anaesthetic team when it was used. Dr C said that if monopolar suction diathermy use had been signalled, it would have emphasised that this cannot be used, as it is contraindicated with THRIVE.
76. Having considered the matter, I accept that at the time Dr B began using monopolar suction diathermy, he had indicated to Dr C that the surgery had been completed, and consequently Dr C had turned away towards the drug trolley and infusion pumps to commence the next steps. In those circumstances, I consider it is more likely than not that Dr C was unaware

that Dr B had noticed additional disease and decided to remove it using monopolar suction diathermy.

77. Dr B should have explicitly communicated with Dr C and the anaesthetic team before he used the monopolar suction diathermy when the surgery was almost at an end. Had he done so, the anaesthetic team would have had the opportunity to emphasise that this could not be used as it is contraindicated with THRIVE. This was also an opportunity for the high oxygen concentration and high oxygen flow from the device to be reduced, which at that point was running 100% oxygen at 70 litres per minute. The reduced oxygen concentration and reduced oxygen flow may have reduced the risk of the fire occurring.
78. As noted in the SAER, surgery of the airway presents unique challenges to the anaesthetist and requires close cooperation between the surgeon and the anaesthetist. I consider it was Dr B's responsibility to communicate what he was doing to the anaesthetic team clearly.
79. I find that by failing to communicate with Dr C adequately, and to comply with the THRIVE guidelines, Dr B failed to provide Mr A services of an appropriate standard, in breach of Right 4(1) of the Code of Health and Disability Services Consumers' Rights (the Code).³⁴
80. Notwithstanding the above, I commend Dr B for his rapid response and the actions he took once the fire ignited. I also accept that it was Dr B's intention to improve Mr A's quality of life, and that he did not intend to cause Mr A any harm. I note that Dr B has made several changes to his practice since events (discussed further below), which were appropriate.

Opinion: Te Whatu Ora — no breach

81. As a healthcare provider, Te Whatu Ora is responsible for providing services in accordance with the Code. I have considered Te Whatu Ora's role and the policies and procedures it had in place at the time of events.
82. I consider that overall, clinical staff had a good understanding of the factors that may cause a fire, and all precautions were taken when the laser was being used during surgery. As noted in the SAER, "there was a well-entrenched culture of safety in the Operating Theatre when using laser".
83. I also note that this type of surgery and procedure is relatively limited in the ENT community, and that only a small number of surgeons perform this technique.
84. In my view, the issue in this case, including the issues relating to communication between the surgical and anaesthetic teams, related to the clinical decision-making by an individual (Dr B). There was no indication of any broader systems or organisational issues at Te Whatu Ora. Accordingly, I consider that Te Whatu Ora did not breach the Code.

³⁴ Every consumer has the right to have services provided that comply with legal, professional, ethical, and other relevant standards.

Actions taken and changes made since events

Te Whatu Ora

85. Te Whatu Ora stated that the following actions were taken immediately after the fire occurred:
- The Department of Anaesthesia was informed of the event and advised to cease using the device with laser, diathermy, or any source of ignition;³⁵
 - The case was presented at a multi-speciality Mortality and Morbidity session, including the Otolaryngology Department (also referred to as the ENT Department), and the Department of Anaesthesia;
 - An incident report of the event was submitted to the Australasian College of Anaesthetists (ANZCA) incident reporting scheme;
 - The Department of Anaesthesia airway lead clinician contacted all the airway leads in other departments in New Zealand to inform them of the event, as well as the manufacturer of the device; and
 - Dr C prepared a case report, with the intent of having it published, to further inform the ongoing use of THRIVE.
86. The recommendations arising from the SAER were:
- That the Department of Otolaryngology and the Department of Anaesthesia issue a formal practice statement clarifying the use of the device and sources of ignition. This was the responsibility of the Clinical Directors of Otolaryngology and Anaesthesia; and
 - That the Department of Anaesthesia proceed with the plan to have an academic paper published to contribute to the ongoing safe use of THRIVE.
87. Te Whatu Ora told HDC that as recommended, the Department of Otolaryngology and the Department of Anaesthesia issued the following formal practice statement, and communicated to all relevant staff to clarify the use of the device and sources of ignition:
- “The risk of airway fire exists with all methods but is greatly increased where the method leads to enriched oxygen environments. This is especially the case with the open circuit Anaesthesia and especially use of THRIVE and its use has been associated with airway fire including at this institution. Given this risk THRIVE should not be used when an ignition source is being [utilised] for airway surgery.”
88. Te Whatu Ora also told HDC that the Department of Anaesthesia is in the process of writing an academic paper to contribute to the ongoing safe use of THRIVE. The paper will be submitted to a journal for publication on conclusion of the investigation by HDC.

³⁵ The THRIVE guidelines state that the use of laser is a relative contraindication to THRIVE, and that the laser acts as the ignition source.

89. Te Whatu Ora also said that since events, it has updated its Laser Policy, and has discussed and reviewed its safety protocols in depth. Te Whatu Ora stated that it now has clear signage³⁶ on all these devices to highlight fire safety and the use of monopolar suction diathermy. The signage prompts the user to consider removing or unplugging the diathermy machine.
90. Te Whatu Ora has developed and implemented new guidelines for airway surgery,³⁷ which state that it acknowledges the complexity of these treatments, and aims to specifically reduce the risks of airway fire. The guidelines for airway surgery apply to the set-up and clinical use of ignition sources for airway surgery cases and measures to mitigate fire risk.
91. The guidelines for airway surgery also state that aspects of this type of surgery and the anaesthesia associated with it are complex and require teamwork, experience, and planning.
92. Te Whatu Ora told HDC that for new staff, the risk of fire and/or patient burns is now part of the safety discussion around the theatre environment, and this has been integrated into various parts of staff training.

Dr B

93. Dr B is involved in the ENT training programme. He said that he is passing on his knowledge, and that these events have led to changes in his personal practice, as well as Te Whatu Ora's practice.
94. As advised by Te Whatu Ora, Dr B confirmed that a regional "airway surgery guide" has been developed using a consensus of opinion from all of the groups that perform this type of surgery, in particular the Anaesthesia Department, Otolaryngology Department, and the nursing sub-specialty group. Dr B stated that this has led to specific changes in practice for all surgery that may involve an ignition source, as previously they "only really focused on these safety guidelines when a laser was specifically used". Dr B said that he believes the development of the "airway surgery guide" has led to an improvement in patient safety throughout Te Whatu Ora. He said that this is because the "airway surgery guide" is applicable to other services that also use ignition devices, and that other theatre fires can occur if these guidelines are not being followed.
95. Dr B told HDC that in relation to separating the THRIVE device (or any other flammable tubing) from the patient's skin, a layering of protective saline-soaked coverings is now applied directly onto the patient, with the device on top, with a further layer of saline-soaked coverings over the tubing. Dr B said that this means that in the event of the inadvertent ignition of a device, it would occur only in an area that is not in contact with the patient so as not to cause a burn.

³⁶ The signage reads: "[The device] should NOT be used with any source of ignition such as Diathermy or Laser. Ensure careful discussion of diathermy use above xiphisternum in terms of fire hazard. Consider unplugging or removing Diathermy machine."

³⁷ Issued in November 2022.

Recommendations

96. As recommended in my provisional opinion, Dr B has provided a formal written apology to Mr A's family for the deficiencies in the care provided, as outlined in this report. Taking into account the apology provided and the changes made by Dr B since events, I do not consider that any other recommendations are necessary.
97. Taking into account the changes made since events, I recommend that Te Whatu Ora:
 - a) Provide HDC with an update on the Department of Anaesthesia's paper that will be submitted for publication. This update is to be provided to HDC within six months of the date of this decision.
 - b) Use this report, as well as the airway surgery guide, as a basis for staff learning at Te Whatu Ora, and provide HDC with evidence that this has been completed within six months of the date of this decision.

Follow-up actions

98. A copy of this report with details identifying the parties removed will be sent to the Medical Council of New Zealand, and it will be advised of Dr B's name in the cover letter.
99. A copy of this report with details identifying the parties removed will be sent to Te Tāhū Hauora|Health Quality & Safety Commission and placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.