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RESEARCH

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Patient's experiences of endotracheal tubes and suction following cardiac surgery

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Abstract

Background: There is a growing body of evidence addressing the patient experience of intensive care, including patient reports that the presence of an endotracheal tube is bothersome and distressing, and that endotracheal suction is moderately to extremely painful. Yet there remains little information about the patient experience of the endotracheal tube and suction in those patients receiving planned short-term mechanical ventilation.

Aims and objectives: This study aimed to describe the patient experience of the endotracheal tube and suction, following mechanical ventilation in post-operative cardiac surgical patients.

Design: This qualitative study used inductive thematic analysis. Participants having planned cardiac surgery, anticipated to receive less than 12-hours mechanical ventilation, were approached pre-operatively and written consent provided.

Methods: Ten participants were recruited using purposive sampling. Semi-structured interviews were conducted between days four and six post-operatively. One researcher interviewed all participants; two researchers independently read, coded, and agreed themes.

Findings: None of the participants recalled endotracheal suction, while half had no recollection of the endotracheal tube. Three themes were identified; the experience of the endotracheal tube and extubation, the experience of emerging from sedation, and participants concerns about the future. The presence of the endotracheal tube was described as bothersome, whilst breathing through the tube and extubation were described as 'weird' and 'strange' but not painful.

Conclusions: Knowledge of the patient experience can help inform nursing practice by improving pre and post-operative care planning.

Relevance to clinical practice: This study adds to the body of knowledge about the patient experience of the endotracheal tube and extubation.

Trial registration: Prospective registration with the Australian New Zealand Clinical Trials Registry. www.anzctr.org.au (ACTRN12616001515482).

KEYWORDS
cardiac surgery, endotracheal suction, intensive care, patient experience, qualitative study

1 | INTRODUCTION

Post-operative recovery after cardiac surgery requires admission to an intensive care unit (ICU),[1] for a period of haemodynamic monitoring, mechanical ventilation (MV), and organ support until the patient is assessed as ready for extubation.[1] To facilitate MV an endotracheal tube (ETT) is in situ. Airway management strategies include endotracheal suction (ETS) as required,[2-4] and minimizing the duration of MV.[5] This study explored the patient experience of the endotracheal tube and endotracheal suction.

What is known about this topic?

- Endotracheal suction is painful and distressing for patients.
- There is minimal published data describing the patient experience of the endotracheal tube and endotracheal suction in patients receiving short-term mechanical ventilation.
- This patient cohort is underrepresented in the literature.

What this paper adds?

- This study describes participants experience of the endotracheal tube and extubation, in those receiving short-term mechanical ventilation, adding to the body of knowledge.
- The study raises awareness of challenges and anxieties faced by post-operative cardiac surgical patients.
- The findings reinforce the importance of good communication with patients, and the positive effect the presence of a nurse can have upon patient's recovery.

2 | BACKGROUND

Tracheal intubation, although essential to maintain a patent airway during mechanical ventilation, has potential side effects, including tissue trauma resulting from inflammatory reactions within the airway,[6] sore throat, and vocal cord injury.[7] Up to 50% of patients have reported ETT associated sore throat,[7] contributory factors include ETT size, female gender, and ETT cuff pressure.[8] Not being able to talk has been reported as 'horrid',[9] with communication difficulties adding to feelings of loneliness and isolation[10,11] and loss of control.[12]

The presence of the ETT contributes to pain and discomfort, and has been reported as one of the primary causes of ETT related distress.[13] Cardiac surgical patients have reported the ETT as bothersome, with discomfort reported in the throat and chest,[14] while 88% of general ICU patients receiving over 24-hours mechanical ventilation reported the ETT as moderately to extremely stressful.[15] Although evidence suggests that endotracheal suction is painful and distressing,[14-17] there continues to be infrequent use of prophylactic analgesia prior to nociceptive procedures, including ETS.[17-19] In an effort to improve pain management in ICU, behavioural pain assessment tools have been developed to facilitate pain assessment in those unable to self-report pain,[20,21] and are included in the current pain, analgesia, and delirium guidelines.[22] Despite a growing body of evidence about ETS associated pain,[15,23,24] there is limited data describing the patient experience of the ETT, ETS, and associated pain in those exposed to planned, short-term MV.

3 | METHODS

3.1 | Study aims

This study aimed to describe the patient experience of the ETT and ETS in those receiving planned, short-term MV. The research question was; what did participants recall about the ETT and ETS? Objectives included: interviewing participants post-operatively to explore their experience of the ETT and ETS, identify and describing themes to inform nursing practice.

The primary researcher, (EG) is an experienced ICU nurse, novice qualitative researcher, and PhD candidate, working in the cardiothoracic surgical unit where the study took place. JS is an experienced qualitative researcher and independently reviewed the study protocol, interview questions and transcripts. EG and JS agreed the final themes.

3.2 | Study design

A qualitative study using inductive thematic analysis (TA). TA is considered a core qualitative method, accessible for novice qualitative researchers, suitable for most small projects (e.g., 6-10 interview participants), and all sampling approaches.[25]

Ten participants were interviewed between post-operative days four and six, using a semi-structured interview. No previous qualitative research had been conducted in our unit, and the sample size was considered sufficient to provide insight into the experience of the patient population while being manageable for a novice qualitative researcher.

3.3 | Setting and participants

This study was conducted in a cardiothoracic and vascular surgical unit in a metropolitan, tertiary, teaching hospital in New Zealand. The unit undertakes approximately 1200 planned cardiac surgical cases per year. Purposive sampling ensured participants reflected the population of interest with participants screened and recruited from operating theatre lists. We screened patients who were listed for planned cardiac surgery, and anticipated to receive less than

12-hours post-operative MV. Surgery included coronary artery bypass grafting and cardiac valve repair or replacement. The study inclusion criteria were: age ≥ 16 years, planned cardiac surgery with cardiopulmonary bypass, anticipated extubation within 12 hours of admission to ICU. Patients were excluded if they did not speak English, were ventilated for more than 24-hours, or were documented as having chronic pain.

3.4 | Data collection

Interviews took place in March 2017, and were conducted in a side room on the cardiothoracic ward, at a time convenient to the participant. The side room provided privacy, avoided interruptions, and allowed participants to talk freely. Before the interview participants were reminded about the reasons for the study, and verbal consent was obtained to continue in the study. Family/whānau members were invited at the participant's request; none took up the offer. The interviews took between 10 and 30 minutes. Any non-study concerns raised by the participants were escalated immediately to the ward Charge Nurse. The interview was recorded onto a Dictaphone and transcribed within a week using a professional transcription service.

The semi-structured interview focused on the experience of the ETT and ETS. Participants were asked:

1. Can you tell me about your experience of the breathing tube?
2. Can you tell me about your experience of having suction through the breathing tube?
3. Can you describe how it feels to breathe through the breathing tube?

If necessary, clarification questions were used (Table 1). Although patients were able to share their broader intensive care experience, the study had not intended to describe the intensive care and post-operative recovery experience. There were no repeat interviews; transcripts were not returned to participants. Data were de-identified and stored on a secure, password-protected computer system. De-identified transcripts were uploaded onto NVivo software (NVivo qualitative data analysis software; QSR International Pty Ltd. Version 12, 2018).

3.5 | Data analysis

Data analysis was conducted using inductive thematic analysis, a qualitative method that provides flexibility.[26] Braun and Clarke argue that TA "can be a method that works both to reflect reality and to unpick or unravel the surface of 'reality'" (p. 81).[26] Given the limited evidence about the patient experience of the ETT and ETS in this patient cohort, and as recommended by Braun and Clarke,[26] the analysis aimed to reflect the themes identified from the complete data set. Inductive analysis aims to identify the themes linked to the data,[25] and as themes are data driven "the themes may bear little relation to the specific questions that were asked of the participants" (p. 83). The findings describe participants reality, focusing upon how participants experience, and make sense of their world.[25] Unanticipated themes may become apparent during data coding; consequently, the research question may evolve and expand as themes are identified.[26]

TABLE 1 Clarifying questions

Clarifying questions will be used as required and will include
1. Were you awake during suction and can you describe what happened?
2. Can you describe how much control you thought you had while in intensive care?
3. Tell me how comfortable you were while in intensive care?
4. How would you describe your experience of the breathing tube?
5. How would describe the feeling of the breathing tube?
6. How much information were you given about the breathing tube?
7. How would you describe your experience of having suction?
8. How much information were you given about being suctioned?
9. How would you describe the feeling of having suction?

3.6 | Trustworthiness and credibility

To minimize bias, EG was not involved in the recruitment of participants or providing any direct patient care, and had not met the participants before the interview. Researcher independence can prevent a perceived conflict of interest, allowing participants to talk freely about their experience, both positive and negative.[27] EG is an experienced ICU nurse, and has seen both the benefits and apparent distress resulting from ETS. Seeking understanding and insight into the patient experience of the ETT and ETS, in those receiving short-term MV was the catalyst for this research study.

To check the accuracy of transcription EG listened to the audio recording while reading the transcripts. As recommended, the first step of data analysis is coding the data.[25,28] To ensure study rigour and trustworthiness, two of the investigators, EG and JS, independently reviewed and coded the transcripts. Although potential themes can either be identified in advance or derived directly from the data,[25] it was agreed to identify themes from the data. Both investigators discussed the themes arising from the codes and agreed on the findings.

3.7 | Ethics

Full ethics approval (16/STH/159), and local approval was in place before commencing the study. All participants provided written informed consent pre-operatively, consent was obtained by trained research nurses.

3.8 | Findings

Findings are reported following the Consolidated Criteria for Reporting Qualitative Research.[27] In total 21 patients were

screened, two consented participants received over 24-hours MV and were not interviewed. Ten participants were interviewed, eight male, two female, one New Zealand Māori, nine New Zealand European. The main reason for declining to participate in the study was pre-operative anxiety. Participant baseline demographics are described in Table 2, and reflect the local cardiac surgical population.[29]

The median duration of MV was 6.3 hours (range 4.1-17.4) and the median intensive care length of stay was 24.5 hours (range 17-72 hours). None of the participants recalled ETS, while half had no recollection of the ETT. On average, participants received two suction episodes (range 0-5). We identified three main themes; experience of the ETT, emerging from the fog, and anxiety and concerns (Figure 1). Sub-themes included participants concerns about their family, lifestyle choices, the slow passage of time, the effect of drugs, and the challenges of recovery. Although two of the main themes are not related to the ETT, as previously described, TA allows the research question to expand during data analysis.

3.9 | Experience of the ETT

Participants provided examples of their experience of the ETT, including memories of the ETT, breathing through the ETT, and extubation.

TABLE 2 Participant baseline characteristics

Baseline characteristics	
Age, mean (years, range)	64.1 (26-84)
Male sex, *n* (%)	8 (80)
Weight, (kg) mean (range)	84.4 (63-147)
Ethnicity, *n* (%)	
NZ European	9 (90)
NZ Maori	1 (10)
EuroSCORE II, median (range)	1.13 (0.50-3.29)
Co-morbidities	
Recent MI, *n* (%)	3 (30%)
IHD, n (%)	5 (50%)
Current smoker, *n* (%)	2 (20%)
Type of surgery, *n* (%)	
CABG	6 (60)
Single valve	2 (20)
Valve and CABG	1 (10)
Multiple valve	1 (10)
Duration of mechanical ventilation (hours), median (range)	6.34 (4.1-17.4)
Length of ICU stay (hours), median (range)	24.5 (17-72)

Abbreviations: ICU, intensive care unit; CABG, coronary artery bypass graft; EuroSCORE, european system for cardiac operative risk evaluation; mg, milligram; mcg, microgram; MI, myocardial infarction; IHD, Ischaemic heart disease; kg, kilograms; ETS, endotracheal suction.

3.10 | Memories of the ETT

Five patients remembered the ETT; none reported it as painful. It was described as "A little bit of pressure on the throat" (P2) and causing a "scratchy throat" (P5) while one participant described it as "a pretty weird experience" (P4). Three participants described the effect of the ETT upon their throat and lips. Memories varied and ranged from vague personal recall, "I think I noticed it on the lip; a bit numb on the lip" (P8) to relying upon what they had been told by others, "something about my big lip" (P7). This participant went on to say he had not seen his lip and that he did not know what they were talking about. One female participant described how she felt her tongue was thick, "My tongue and my mouth was very bruised, and it was thick and I couldn't talk." (P9). She did not report a sore throat and had no recollection of the ETT. Potentially, this memory could be related to tracheal intubation, although this is unclear. Unlike other studies, where movement of the ETT was described as adding to ETT discomfort,[14] no participants in our study described movement of the ETT.

3.11 | Breathing through the ETT

Three participants recalled breathing through the ETT. Two did not find it stressful, saying, "I didn't have any particular problems breathing through the tube" (P1) "I seemed to be breathing easily" (P5). The third participant recalled being panicky, biting the tube, trying to pull the tube out, and being re-sedated, saying "I couldn't breathe sort of thing…. I was like kicking the bed and; **** - pull this thing out." He described breathing through the ETT "like diving on 10 Barr when you know you shouldn't be diving" and "like sucking through a straw" (P4).

3.12 | Extubation

Five participants recalled extubation, two describing how the nurses talked them through the procedure, one participant recalled "when I was waking up somebody was talking to me. It [the ETT] was there, they were going to remove it, and I felt it come out." (P2). This participant described extubation as "a bit of a weird sensation." None described extubation as painful or distressing, descriptions included "it was a strange sensation" (P1) but that "they did it gently" (P8).

Preparation for extubation was clearly described by participant number five saying,

> "when I came round they said to me you've got a breathing tube in…that was the ICU nurse…then she told me this is what's going to happen…it went like clockwork." (P5).

3.13 | Emerging from the fog

Memories of waking up included panic as a result of the presence of the ETT (P4), being aware of coming round (P5), and "feeling

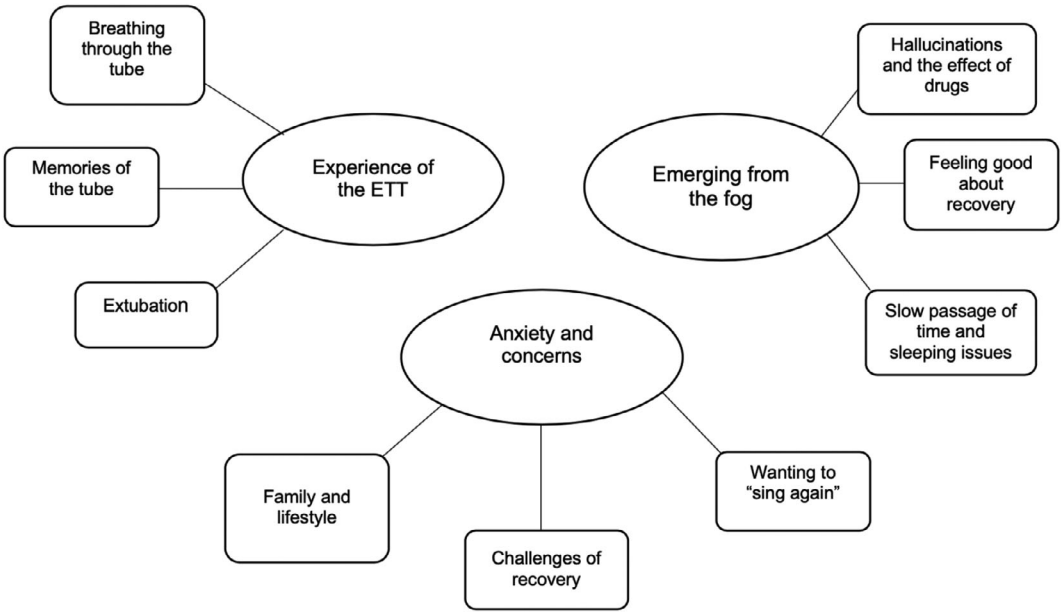

FIGURE 1 Themes and sub-themes

damned happy that I woke up" (P12). Six participants described the effects of the drugs, one saying, "I asked them to stop giving me the thing through the IV line, because it was making me dopey as. Yeah I didn't like it." (P4), others saying "I was so doped up on drugs…it's all a blur to me" (P1) and "your brain sort of shuts things down" (P7). Two participants described hallucinations; descriptions included "they were giving me bad dreams and stuff" (P11), and

> "if I close my eyes, I look at a wall I see the architectural surface with patterns on it, maybe blue or pink… floating round over the wall…with curved corners rather than sharp corners…sometimes I have tried to keep my eyes open so that I don't have sleep and have those hallucinations" (P1).

Recovery was associated with feeling good about being able to walk around, "walking around is pretty sweet" (P4), and "I can walk around the ward, so I think I'm on the mend" (P1). Feelings of progress were tempered by the tiredness of early recovery, one participant commenting that day one was "not as complex or painful as day two and three…those were really heavy" (P5), while another said, "I've got more pain now that I'm more conscious" (P1). One participant felt "marvellous", but also commented, "you feel knackered for sure" (P12).

3.14 | Anxiety and concerns

Participants described anxieties and concerns about cardiac surgery, both pre-operative fears, and worries and concerns about their future. One participant said her main concern pre-operatively was about the ETT and the possibility that she may not be able to sing again. She recalled, "I remember asking the anaesthetist to be very careful….my throat's quite narrow" (P9). The youngest participant said he became very frightened after reading the patient information literature. He had stopped smoking 3 weeks before surgery, then read the recommendation to stop 6 months before surgery. He said he did not know an ETT would be in place when he woke up. However, he recognized that the drugs he had received may have affected his recall,

> "if they told me, oh you're going to have a tube in there, so when you wake up don't stress out - or something like that, but yeah because I was on drugs and shit, they might have – [I] might not have even remembered everything they said" (P4).

Participants described their concerns about the future, including wanting to see their family grow up and making lifestyle changes that would have a positive impact upon their health in the future. At this stage, participants appeared keen to adopt and maintain healthy lifestyle changes.

4 | DISCUSSION

Although this study intended to focus upon the participant's experience of the ETT and ETS, inductive thematic analysis identified additional information that included participants pre-operative concerns, the experience of early post-operative recovery following cardiac surgery, and concerns about the future. An early study, conducted in 1979, investigated cardiac surgical patient's experience of intubation, and interviewed 100 patients on post-operative day five or six.[30] At

that time, usual post-operative management included benzodiazepines for both anaesthesia and sedation, while weaning from MV did not start until the following day. Five participants remembered the ETT, describing it as difficult to tolerate, while two mentioned ETS and sore throat. Benzodiazepines all result in some degree of amnesia,[22] these results suggest that sedation agents, sedation levels, and duration of MV may influence patient recall. Post-operative management of cardiac surgical patients has changed over time; short-acting sedation is in common use, with the aim of extubating patients within 6 hours of admission to intensive care.[1] In our study, the median duration of MV was 6.3 hours and all participants received short-acting sedation. That 50% of the participants in our study recalled the ETT may be reflective of changes in sedation practice, and suggests that while some studies have excluded those who were intubated for less than 6 hours,[14] more of this patient cohort may remember the ETT than previously anticipated. Our findings are similar to those reported by others in a similar patient population,[17] where 52% of patients remembered the ETT. Despite evidence that those exposed to a longer duration of MV have increased recall,[31] it remains unclear to what extent the duration of MV, and amount of sedation and analgesia, affected participants recall in our study.

Unlike others who have reported the presence of an ETT as a negative experience,[14] including that the ETT was moderately to extremely bothersome,[31-33] only one participant in our study described the ETT as causing feelings of panic, resulting in difficulty breathing. Our findings are similar to others who have reported that up to 80% of participants had no trouble breathing through the ETT,[15] and that the ETT was bothersome rather than painful.[11] No participants in our study reported a sore throat or hoarse voice, although one described pressure in his throat. This is in contrast to findings in those who received over 24-hours MV, where 40% remembered ETT associated discomfort, describing sore throat, hoarseness, and communication difficulties contributing to ETT related discomfort.[15] The short duration of MV and small sample size may have influenced our findings.

It was surprising that none of the participants in our study recalled ETS as this has been reported as a painful nociceptive ICU intervention.[16,17,19,34] Our findings differ from others[35] who reported that in a similar population, 6.5% of patients recalled receiving ETS, although participants had a longer mean duration of MV (9.5 hours) and the study had a larger sample size. In our study, two participants did not receive ETS, the duration of MV was 6.3 hours, and standard care in our unit is suction 'as required', all potentially affecting participant recall.

Post-operative ICU management following cardiac surgery is complex[36] and remains a challenge because of the use of sedation and analgesia, and communication difficulties because of the presence of the ETT. Participants in our study described the effects of analgesia making them feel dopey, two participants described hallucinations. One tried to avoid going to sleep, and another asked to have intravenous analgesia stopped. Hallucinations have been well described by others,[13,32,37] and have been reported as the second most frequent source of ICU discomfort reported by patients,[13] and can be exacerbated by poor pain management, for example, when the dose of analgesia is too high, in turn affecting the sleep cycle.[32] Participants in our study had what was considered an uncomplicated post-operative recovery, and these findings confirm the complexity and challenges of post-operative management and recovery. Effective analgesia, mobilization, and maintaining a day night routine reduce the incidence of hallucinations and delirium.[22] Increasing nursing staff awareness about the effects of analgesia, the presence of hallucinations, benefits of mobilization, and optimizing the patient environment to support sleep and rest, if included in post-operative care planning, have the potential to enhance patients post-operative recovery.

Currently, there is very little literature about the patient experience of extubation, and our findings differ from others who have reported that 41% of participants remembered extubation as moderately to extremely bothersome.[15] None of the participants in our study reported extubation as distressing, rather describing the procedure as weird and strange. Further research describing the experience of extubation would help address this gap in the literature. Some participants recalled being spoken to during extubation, with the nurse describing the procedure in advance. Given the evidence about patients' feelings of isolation and loneliness,[11] the descriptions of nursing staff talking to participants during extubation highlighted the positive effect nurses can have upon a patient's experience. Nurses being present and engaged increases patients feelings of being safe, respected, and treated as a person.[37,38] However it should be acknowledged that nurses do not always deliver compassionate care, and that this can increase patients feelings of stress and anxiety.[15,32,33,38] Nursing interventions and management in ICU is complex and varied,[39] however, nurses are well placed to improve patient's experience while in ICU. Understanding and awareness of the patient experience can help inform and improve nursing practice.

The effect of time upon recall and memory of the ICU experience remains unclear. Others have reported that memories of ICU include the presence of the ETT, hallucinations, and pain,[40] and can have an effect upon quality of life.[41] ICU patients have been shown to have lower scores for factual recollection when compared with a reference group.[13] In health, memories may not be recalled in detail, details are reconstructed rather than remembered, with both pleasant and unpleasant emotions fading over time.[42] Puntillo et al[40] interviewed participants between three and 16 months after ICU discharge, and found that those who were interviewed closer to ICU discharge recalled lower procedural pain intensity when compared with those interviewed later. Unlike our study, the participants had a median ICU length of stay of 7 days. Others have interviewed participants between 24-hours and 6 months after ICU discharge.[14,38,43,44] Although half the participants in our study had no recollection of the ETT, and none recalled ETS, these findings highlight the complexity of memory and recall in the ICU population. Follow-up interviews after hospital discharge could elucidate this further, and should be considered for future research.

These findings have implications for patient education as cardiac surgery is a stressful event for many patients. Anxiety may affect the patient's ability to focus upon the information they receive. As seen in

this study, one participant reported being unaware that an ETT would be in place when waking up in ICU, although he had given pre-operative consent to participate in the study, and the information sheet described both the ETT and ETS. Checking the patient's understanding of pre-operative and post-operative information is essential, as is asking the patient about their main concerns, for example, the main concern for one participant was being able to sing again following intubation. Unexpectedly, the findings also revealed the participant's experience of intensive care and early recovery, and although not directly addressing the research question, have been included as these findings appear important to the participants, and relevant for nursing. As previously discussed, when using TA, the findings may digress from the research question.[25,45] Raising awareness of these experiences can be useful for clinicians, knowledge of early post-operative recovery following cardiac surgery, including the patient's experience of the ETT, extubation, ICU, hallucinations, and early days on the ward, can inform nursing practice. Understanding patients concerns can help staff provide patient centred information, delivering appropriate support and education for patients whilst in hospital, and facilitate suitable discharge planning.

5 | LIMITATIONS

This study has some limitations that need to be acknowledged. First, the small sample size may limit the applicability of the findings. That being said, the results are similar to other studies with larger sample sizes, and a similar patient population, that reported half the participants have no recollection of ICU.[15,17] Second, the effect of recall bias is unknown, and it remains unclear when is the most appropriate time to interview patients post-operatively.[40] Interviewing participants has to accommodate the stage of post-operative recovery and avoid tiring participants. Interviewing participants after hospital discharge may lead to recall being influenced by family descriptions of ICU and thus not reflect the participant's own experience. Advantages of pre-discharge interviews include minimizing loss to follow up, and participants having recent recall about ICU.

The brevity of the interviews may be considered a limitation; however, the interview aimed to elicit the patient experience without exhausting participants during their early recovery. The findings provided additional insight into the experience of early recovery, and for trustworthiness, these themes have been included.

6 | IMPLICATIONS FOR CLINICAL PRACTICE

This patient cohort is underrepresented in the literature. Care planning should include assessing patients' understanding of pre-operative information, post-operative pain management, and how to support patients making healthy lifestyle changes. The findings reinforce the importance of good communication, and provide insight for all nurses working with cardiac surgical patients, both in ICU and on the ward.

7 | CONCLUSIONS

At present, there is limited data about the patient experience of the ETT and ETS in those receiving short-term MV, this study updates the evidence and provides new data about the experience of extubation. The findings report the challenges and anxieties faced by post-operative cardiac surgical patients, and the positive influence nurses can have upon the patient's recovery.

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DATA AVAILABILITY

Data sharing is unavailable as it was not part of ethics and local approvals.

AUTHOR CONTRIBUTIONS

Study Design: Eileen Gilder, Andrew Jull, Rachael L. Parke; data analysis: Eileen Gilder, Julia Slark; and manuscript preparation: Eileen Gilder, Andrew Jull, Julia Slark, Rachael L. Parke.

ETHICS STATEMENT

Ethics approval was in place before the start of study. Approval was granted form the New Zealand Health and Disability Ethics Committee (16/STH/159). All patients gave prior, written, informed consent.

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