Te Pūrongo Rēhita o te Arahau Ohotata o Hato Hone St John

Hato Hone St John Emergency Airway Registry Report

Aotearoa New Zealand 2024–25

Hato Hone St John

Clinical Evaluation, Research, and Insights
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List of abbreviations

EMT	Emergency Medical Technician
ePRF	Electronic Patient Report Form
HHStJ	Hato Hone St John
LMA	Laryngeal Mask Airway
NDA-TI	Non-Drug-Assisted Tracheal Intubation
OHCA	Out-of-Hospital Cardiac Arrest
ROSC	Return of Spontaneous Circulation
RSI	Rapid Sequence Intubation
SGA	Supraglottic Airway
TI	Tracheal Intubation

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Welcome to the

2024/25 Hato Hone St John inaugural emergency airway registry report

Whakatakinga
Introduction

Airway management sits at the heart of pre-hosptital practice. For clinicians, maintaining a patent airway and ensuring effective ventilation are among the first priorities when assessing and treating a critically unwell patient. When airway patency or breathing is compromised, oxygen delivery to vital organs rapidly deteriorates, placing the brain and other tissues at risk of irreversible injury within minutes. In these moments, clinicians must rapidly recognise airway compromise and apply the most appropriate intervention, progressing from basic manoeuvres to more advanced techniques as the patient's condition requires. In the out-of-hospital environment in particular where diagnostic information may be limited and conditions are often dynamic, the ability to assess airway patency and ventilatory adequacy, and intervene decisively, is a defining component of effective paramedic care.

Hato Hone St John (HHStJ) is Aotearoa New Zealand largest emergency road ambulance provider, servicing 90% of the population, attending approximately 400,000 incidents annually. All emergency ambulance personnel are trained in a wide range of airway management techniques, which can be performed autonomously following national clinical practice guidelines.

Mō tēnei pūrongorongo
About this report

This inaugural HHStJ Emergency Airway Registry Report presents an overview of airway management practice within our service, including the frequency, types, and key performance indicators of airway interventions undertaken. The registry establishes a baseline for ongoing monitoring and comparison, informs evidence-based practice, supports education and quality improvement, and ultimately enhances patient outcomes through the structured collection, analysis, and review of airway management data.

Case selection

All cases in which an airway intervention was documented by HHStJ personnel in the electronic patient report form (ePRF) between 1 July 2024 and 30 June 2025 were included.

Success measures

For advanced airway procedures, crews must document the number of attempts to place a device and whether placement was successful. Cases with non-standard documentation were manually reviewed to determine success and number of attempts.

When multiple single-attempt interventions were recorded, they were considered a single intervention with multiple attempts unless the intubation methodology differed. If both a non–drug–assisted tracheal intubation (NDA-TI) and a rapid sequence intubation (RSI) occurred, each was measured separately.

Example: A patient with an unsuccessful two-attempt intra-arrest NDA-TI, followed by a successful single-attempt RSI during ROSC, was recorded as two distinct procedures:

NDA-TI: unsuccessful after two attempts.

RSI: successful on the first attempt.

NZ socio-economic deprivation measures

Socio-economic deprivation was measured using the NZDep2018 quintiles, which range from Q1–Q5. The NZDep2018 is an area-level measure of socio-economic deprivation calculated using census data. The least deprived 20% of areas are scored as Q1, and the most deprived 20% are scored as Q5. Higher levels of socio-economic deprivation are widely associated with poorer access to care and worse health outcomes.[1] Some of the factors used to indicate higher deprivation are:


Access to the internet


Receiving a means tested benefit


Household income


Employment (18–64 years age group)


Qualifications (18–64 years age group)


Not living in own home


A single parent family


Household bedrooms in relation to occupancy threshold

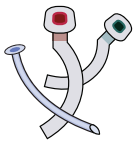

Access to a car

Rurality and the geographical classification for health

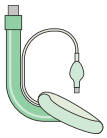
Rurality was defined using the Geographic Classification for Health (GCH), a purpose-built, five-level rurality system for health research and policy in Aotearoa New Zealand. It classifies areas into two urban categories (U1, U2) and three rural categories (R1, R2, R3) using population size and drive-time criteria. Developed through mixed quantitative and qualitative methods, the GCH provides a technically robust, locally validated framework designed to better monitor rural-urban health disparities and support health outcome analysis and policy planning.[2]

Tuhinga whakarāpopoto nui
Executive summary

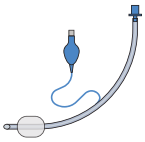
4,409 patients with documented airway interventions



2,133
cases required only basic airway interventions



765
cases where the highest airway intervention was a supraglottic airway



1,511
cases involved tracheal intubation

Female **38%**

Male **62%**

The median patient age was **58 years**

Urban **79%**

Rural **21%**

Home **69%**

Health care facility **6%**

Other **25%**

Tracheal intubation success rates

Non-drug-assisted tracheal intubation

Overall success	First pass success	Success within 2 attempts
94.5%	80.4%	92.7%

Rapid sequence intubation

Overall success	First pass success	Success within 2 attempts
98.9%	92.2%	98.4%

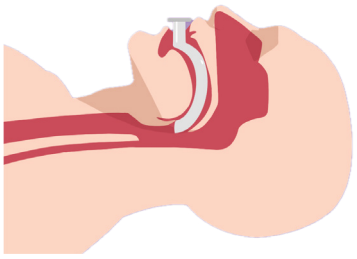
Te arahau ohotata e mahia ana
Emergency airway in practice

Airway interventions are classified into three main groups according to the type of procedure and the level of clinical practice required (Table 1). In this report, airway management cases were grouped according to the highest level of airway intervention performed.

		Clinical practice level			
Airway grouping	**Airway management techniques**	**First Responder** (Certificate in emergency care)	**EMT** (Diploma) **Paramedics** (Degree) **Extended Care Paramedics** (Postgraduate diploma)	**Intensive Care Paramedics** (Postgraduate certificate)	**Critical Care Paramedics** (Postgraduate diploma)
Basic manoeuvres	Positioning, suctioning	✓	✓	✓	✓
	Oral/nasal pharyngeal adjuncts	✓	✓	✓	✓
	Foreign body laryngoscopy		✓	✓	✓
Supraglottic airway	Laryngeal mask airway		✓	✓	✓
Tracheal intubation	Non-drug-assisted-tracheal intubation			✓	✓
	Rapid sequence intubation				✓
	Cricothyroidotomy			✓	✓

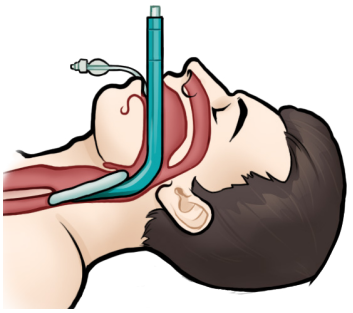
Table 1. Airway intervention groups across clinical practice level.

Basic manoeuvres



This group describes the least invasive airway procedures such as oropharyngeal and nasopharyngeal airways adjuncts, suctioning of the oropharynx, and patient positioning. Laryngoscopy for the purposes of removing a foreign airway obstruction is also included in the basic group. Given the variability in how basic airway management is documented in ePRFs, the volumes reported in this report likely underestimate the true frequency of basic airway interventions. We assume all cases where advanced airways were used most likely included basic airway interventions as these are intrinsic components of advanced airway management. Therefore, basic interventions are only reported when they occurred in isolation.

Supraglottic airway



Supraglottic airway (SGA) describes a device that sits between the pharynx and the glottic opening. HHStJ ambulance currently uses a second-generation inflatable cuff laryngeal mask airway device (LMA). LMAs are most often used as the primary airway during out of hospital cardiac arrest (OHCA). SGAs are commonly replaced with endotracheal intubation under conditions where their effectiveness may be limited, such as a soiled airway or high airway pressures.

Tracheal intubation

Tracheal intubation (TI) involves placing a flexible plastic tube directly into the trachea under visualisation of the glottic opening using a laryngoscope. Depending on the clinical context, tracheal intubation may be performed without medications or facilitated by medications.

Non-drug-assisted intubation (NDA-TI) is only performed in fully unconscious patients, almost exclusively during cardiac arrest. Outside of this context, optimal intubating conditions generally cannot be achieved without pharmacological support.

In contrast to NDA-TI, where no medications are used to optimise airway conditions, Drug-assisted tracheal intubation, or rapid sequence intubation (RSI) as it is better known in our service, involves the administration of deep sedation and a neuromuscular blocker in rapid sequence prior to placement of the tracheal tube. The use of medications optimises intubating conditions, improves the likelihood of success, and eliminates the procedure's noxious stimulus for the patient.

In Aotearoa New Zealand, RSI is used in the out-of-hospital setting within a tightly defined set of indications to ensure the procedure remains patient-centred, maintaining a favourable balance of risk where the risk of inaction outweighs the risk of intervention.

In extreme airway emergencies where standard ventilation and oxygenation techniques fail, a surgical airway can be established via an incision through the cricothyroid membrane at the front of the neck, a procedure referred to as cricothyroidotomy in this report.

Tracheal intubation in Aotearoa New Zealand

In Aotearoa New Zealand, tracheal intubation was first incorporated into the paramedic scope of practice in the 1980s, with systematic implementation of RSI beginning in 2006. Since then, the procedure has undergone substantial evolution driven by advances in training, technology, and clinical philosophy. Today, tracheal intubation is performed exclusively by postgraduate-trained registered specialist paramedics and qualified doctors, most commonly using video laryngoscopy. Its primary objective in the out-of-hospital environment is to secure an at-risk airway and correct abnormal oxygen or carbon dioxide levels in patients with ineffective breathing – particularly those with severe traumatic brain injury or post-cardiac arrest. RSI using both sedatives and neuromuscular blockers is now standard practice, while non-drug-assisted intubation outside of cardiac arrest has been largely de-emphasised.

Overview of airway intervention cases

	Total	%	Airway in primary OHCA	%	Airway outside primary OHCA	%
Basics manoeuvres only	2,133	48.4%	195	11.9%	1,938	69.9%
Supraglottic airway	765	17.3%	573	35.0%	192	6.9%
Tracheal intubation	1,512	34.4%	867	53.1%	644	23.2%
Both RSI and NDA TI	7	0.2%	6	0.4%	1	0.0%
NDA-TI	931	21.1%	718	43.9%	212	7.6%
RSI	567	12.9%	141	8.6%	426	15.4%
Primary Cricothyroidotomy	4	0.1%	1	0.1%	3	0.1%
Rescue Cricothyroidotomy	3	0.1%	1	0.1%	2	0.1%
Total	**4410**	**100.0%**	**1,635**	**100.0%**	**2,774**	**100.0%**

Table 2. All total cases across airway groups and for primary and secondary OHCA cohorts.

Physiologic basis for airway management in the out-of-hospital setting

Effective airway management lies at the intersection of two physiological continuums: airway patency and ventilation adequacy. A patent airway alone does not guarantee effective ventilation, nor does adequate respiratory effort ensure an patent airway. In the dynamic out-of-hospital environment, clinicians continuously assess and intervene along these axes progressing from basic to advanced techniques as the patient's condition demands.

At the furthest extreme of this continuum lie patients in cardiac arrest, who have neither a patent airway nor spontaneous breathing.

Out-of-hospital cardiac arrest (OHCA) patients can be subdivided into primary and secondary OHCA (Sidebox). Primary cardiac arrest refers to cases where the arrest results directly from a sudden cardiac event, such as ventricular fibrillation or pulseless ventricular tachycardia, typically stemming from an acute coronary syndrome or other intrinsic cardiac pathology. In contrast, secondary cardiac arrest occurs because of non-cardiac causes. For example: hypoxia, trauma, drowning, or drug overdose – where the heart stops due to a systemic or external precipitating factor.

Primary and secondary OHCA: Distinct treatment paradigms for distinct patient cohorts

Airway management principles differ between primary and secondary OHCA. In primary cardiac arrest, airway management, particularly advanced procedures such as tracheal intubation, is generally considered a lower priority during the intra-arrest period, as the immediate focus remains on high-quality, uninterrupted chest compressions and timely defibrillation. In contrast, secondary cardiac arrest and other critically unwell non-arrest patients follow airway management principles more aligned with general critical care practice. In these cases, achieving and maintaining an advanced or definitive airway is often a high priority, particularly when the underlying aetiology is respiratory. Here, airway control directly supports oxygenation, ventilation, and cerebral protection, forming a central component of resuscitative and stabilisation efforts.

As a result, data in this report are analysed separately for primary and secondary OHCA. This distinction allows airway management practices to be assessed within the appropriate clinical context, acknowledging the differing priorities, indications, and expected benefits of advanced airway interventions across these two patient groups.

Te whakahaeretanga ohotata o te arahau nā te Manawa-hē i Waho i te Hōhipera
Emergency airway management in primary out of hospital cardiac arrest

During this reporting year, ambulance crews documented airway management for over 1,600 patients for primary cardiac arrest. Primary cardiac arrest cases account for 37.1% of airway interventions. Basic airway techniques and supraglottic airway (SGA) devices remain the most employed in the early stages of cardiac arrest.

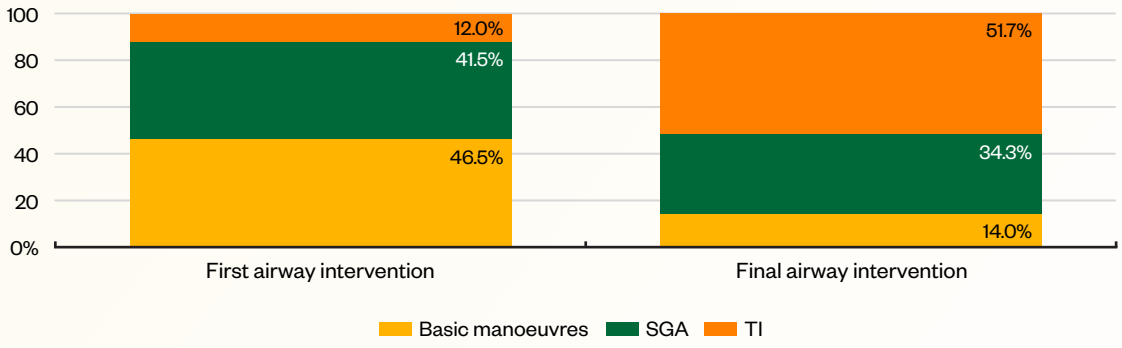


Figure 1. Initial and final airway interventions in primary cardiac arrest incidents

SGA in primary OHCA

Among cases where an SGA was used during primary cardiac arrest, the following success rates were measured:

Overall success rate	**86.5%**

Why can SGAs be challenging in OHCA?

Although SGAs are generally simpler to insert than tracheal tubes, their placement and maintenance can be challenging in the arrest setting. Restricted mouth opening, distorted airway anatomy, or contamination with fluids may complicate insertion. Even after successful placement, SGAs can become ineffective when the airway is soiled or there are high ventilation pressures.

A 2024 internal audit of 234 OHCA cases identified a relatively high rate of SGA complications, with poor seals and soiled airways being the most common reasons for replacing an SGA with tracheal intubation during resuscitation.

Airway interventions in OHCA: 2024 internal audit

A total of 234 cases reviewed.

SGA was the most frequently used airway type, accounting for 45.3% of cases.

SGA were replaced with ETT in 32.1% of patients.

Documented rational for SGA replacement

39%	Unable to obtain good seal
33%	Soiled airway
8%	Progression to definitive airway
3%	High airway pressures
17%	Unclear/other

Tracheal intubation in primary OHCA

A substantial proportion of cardiac arrest cases ultimately progressed to TI, most commonly late in the arrest phase. Nearly all were non-drug-assisted (NDA-TI), reflecting their performance during ongoing resuscitation rather than in the post return of spontaneous circulation (ROSC) phase.

Across non-drug-assisted intubations, the following success rates were measured:

Overall success rate	**94.8%**
First pass success rate	**79.6%**
Second pass success rate	**93.0%**

Performing tracheal intubation under active cardiopulmonary resuscitation is significantly more difficult than during standard medication-assisted (RSI) conditions, and the observed first-pass success rates reflect this challenge. Procedural difficulties in this group include limited patient accessibility and poor positioning, the need to maintain uninterrupted chest compressions, and the high likelihood of a contaminated or fluid-filled airway.

Tracheal intubation post return of spontaneous circulation in primary OHCA

While the main proportion of primary cardiac arrest patients receive tracheal intubation during the intra-arrest period, a smaller proportion of them undergo RSI in the post-ROSC phase. In the post-ROSC patient, RSI is indicated when the patient remains comatose and/or breathing remains ineffective.

There were 144 cases of RSIs post ROSC in primary OCHA.

Overall success rate	**98.6%**
First pass success rate	**93.6%**
Second pass success rate	**98.6%**

Success rates with RSI are noticeably higher than those in the non-drug-assisted group. This is likely due to the patient's better positioning, the lack of ongoing chest wall movement, and, most importantly, the use of medications to optimise the patient's airway for an improved view of the anatomical landmarks.

These results suggest that in primary cardiac arrest patients where SGA or basic manoeuvres are working effectively, tracheal intubation might be best delayed until after ROSC occurs to benefit from improved conditions associated with post-ROSC RSI.

Demographics in primary OHCA airways

While males are disproportionally represented in OHCA, representation across airway intervention groups remain similar across sexes with a slightly higher proportion of males undergoing tracheal intubation.

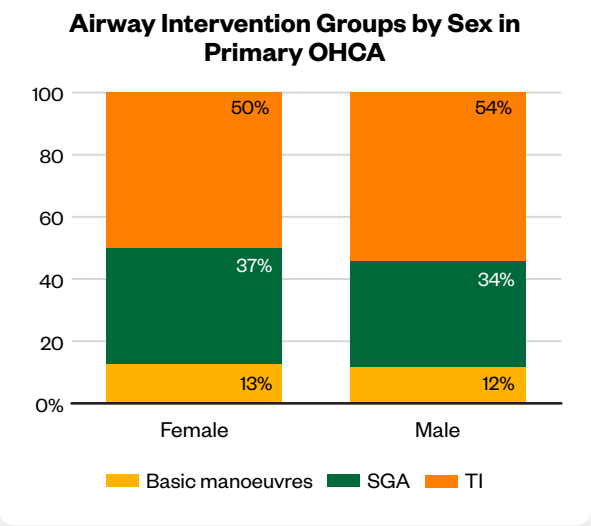


Figure 2. Airway interventions by sex in primary OHCA

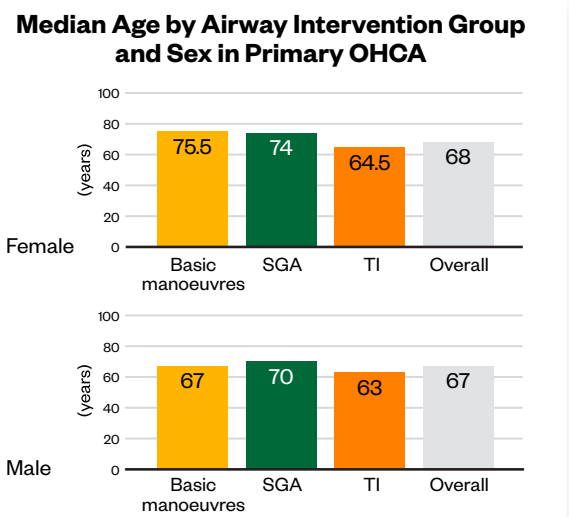


Figure 3. Distribution of median age across airway groups and sex in primary out-of-hospital cardiac arrest

In the primary OHCA group, tracheal intubation is the most common advanced airway intervention, while basic airway manoeuvres predominate in a minority of cases. Males are younger on average and slightly overrepresented in the TI group compared with females; the distribution of males and females across the SGA group is similar. Pacific and Asian patients undergo tracheal intubation at higher proportions than other ethnic groups, whereas Māori and European patients receive tracheal intubation at lower rates. This pattern likely reflects geographic variation in resource availability, with a greater proportion of cardiac arrests among Pacific and Asian patients occurring in urban areas where Critical Care Paramedics are routinely deployed.

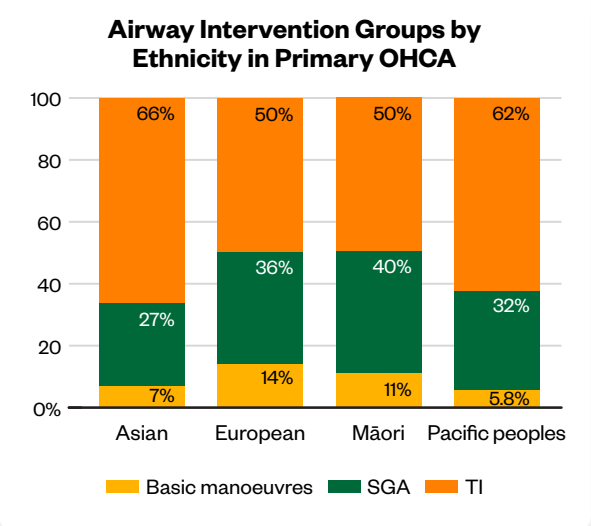


Figure 4. Airway interventions by ethnicity in primary OHCA

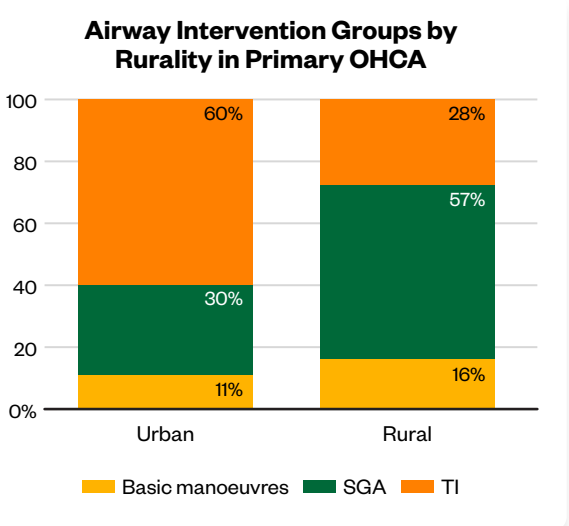


Figure 5. Airway interventions by rurality in primary OHCA

The distribution of airway interventions varied across deprivation quintiles, with a clear decline in the use of tracheal intubation (TI) as socio-economic deprivation increased. In Quintile 1 (least deprived areas), TI accounted for the largest proportion of airway management compared with other quintiles. The proportion of patients receiving TI decreased progressively from Quintile 1 through Quintile 5, where TI use was lowest.

In contrast, SGA use increases progressively across the quintiles, becoming the predominant advanced airway technique in the most deprived areas. Basic airway manoeuvres remain relatively consistent across all quintiles.

This pattern indicates that patients experiencing primary hospital cardiac arrest in more socio-economically deprived areas are less likely to receive tracheal intubation and more likely to receive SGA as their advanced airway intervention.

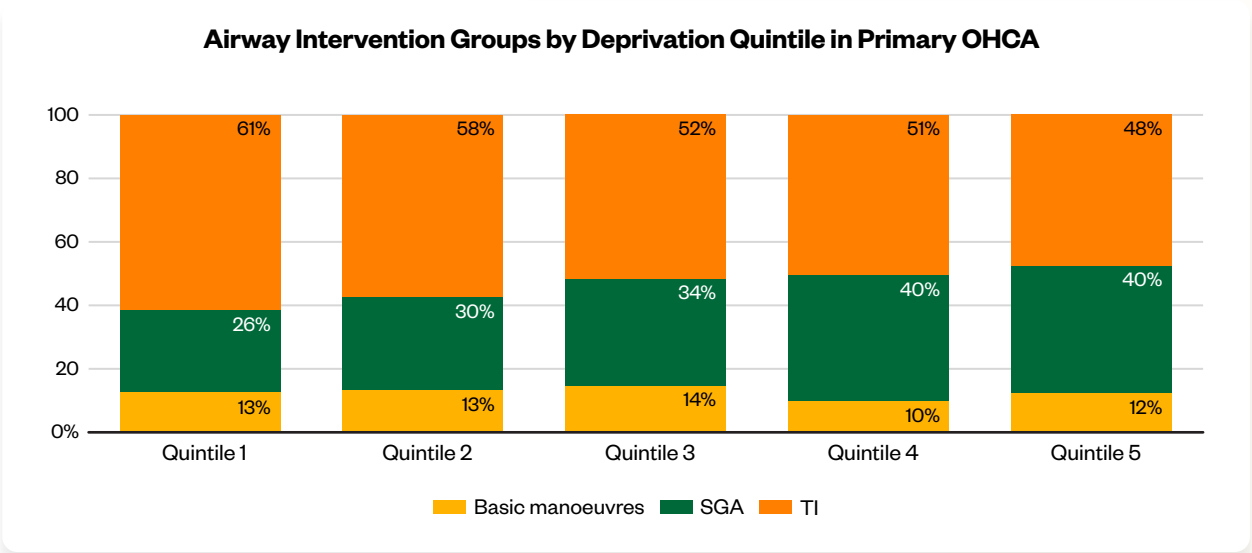
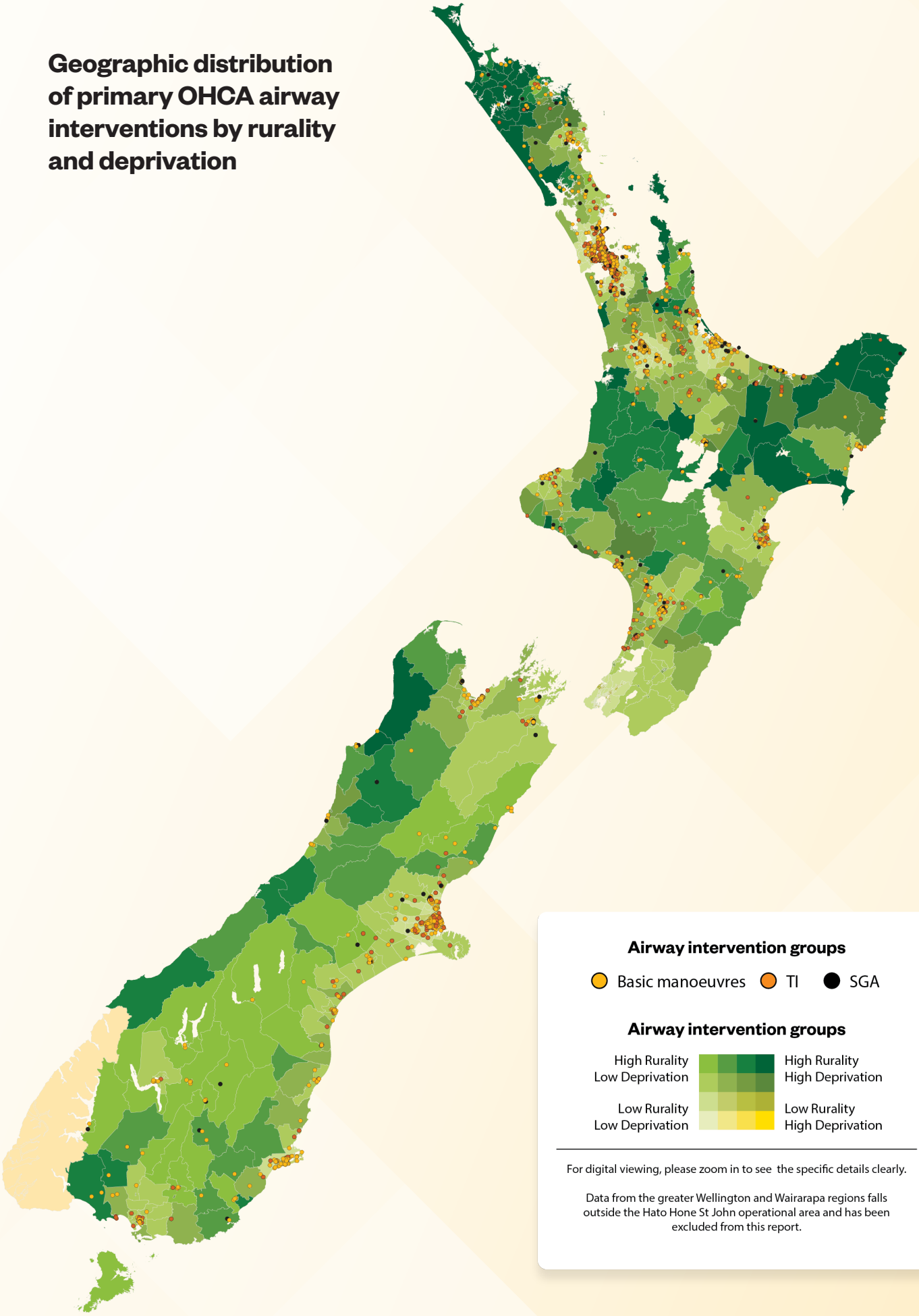


Figure 6. Airway interventions by deprivation quintiles in of primary OHCA

Geographic distribution of primary OHCA airway interventions by rurality and deprivation



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Data from the greater Wellington and Wairarapa regions falls outside the Hato Hone St John operational area and has been excluded from this report.

Te whakahaeretanga ohotata o te arahau atu i te Manawa-hē i Waho i te Hōhipera
Emergency airway management outside of primary out of hospital cardiac arrest

Airway management outside of primary cardiac arrest represents over half of airway management cases in this report. Cases in this cohort include both

- Secondary OHCA cases (480)
- Critically ill or injured patients not in cardiac arrest (2,447)

Basic airway techniques and supraglottic airways account for over 77% of airway interventions within this group. This likely reflects the effectiveness of these manoeuvres in patients with a favourable clinical trajectory, such as those experiencing seizures or poisonings where advanced airway interventions are less often required.

Identifying the underlying condition is often challenging in out-of-hospital cases due to diagnostic uncertainty and missing data. We examined peer review records and identified the most likely suspected pathologies for cases outside of the Primary OHCA group (table 3).

Case type	Principal clinical presentation	Basic manoeuvres	Supraglottic airway	Tracheal intubation	Row total
Secondary OHCA	Respiratory	31	74	93	198
	Asphyxia	8	32	58	98
	Trauma	16	30	48	94
	Other medical	10	9	27	46
	Poisoning	7	3	12	22
	Sudden unexpected infant death	2	8	0	10
	Drowning	2	2	5	9
	Anaphylaxis	1	0	1	2
	Electrocution	0	1	0	1
	Total	**77**	**159**	**244**	**480**
Critically ill or injured patients not in cardiac arrest	Traumatic brain injury	92	2	77	171
	Poisoning	308	2	72	382
	Altered level of consciousness (unknown cause)	296	5	51	352
	Seizure	486	5	50	541
	Collapse (unknown cause)	135	3	35	173
	Stroke	119	0	28	147
	Major trauma involving multiple body regions	30	2	28	60
	Asphyxia	29	3	20	52
	Respiratory	114	0	12	126
	Sepsis	29	1	1	31
	Total	**1,638**	**23**	**374**	**2,035***

Table 3. Airway management cases outside of primary cardiac arrest across airway intervention groups.

*Unable to determine for 12 cases due to incomplete records

Success rates

Success with SGA within this group remain the same as for primary OHCA:

Overall success rate	**86.5%**

Across non-drug-assisted intubations, the following success rates were recorded:

Overall success rate	**93.5%**
First pass success rate	**83.3%**
Second pass success rate	**91.2%**

Across RSIs, the following success rates were recorded

Overall success rate	**99.0%**
First pass success rate	**91.7%**
Second pass success rate	**98.3%**

Demographics outside of primary OHCA

Outside of the primary OHCA group, basic airway manoeuvres are more commonly used; however, the distribution of airway interventions broadly mirrors that observed in the primary OHCA cohort. Males are younger on average and slightly overrepresented in the TI group compared with females, with a similar distribution across the SGA group. Asian patients undergo tracheal intubation at higher proportions than other ethnic groups, whereas Māori and European patients receive tracheal intubation at lower rates. As observed in the primary OHCA cohort, this pattern likely reflects geographic variation in resource availability, with urban concentration of cardiac arrests among Asian patients increasing exposure to Critical Care Paramedic response.

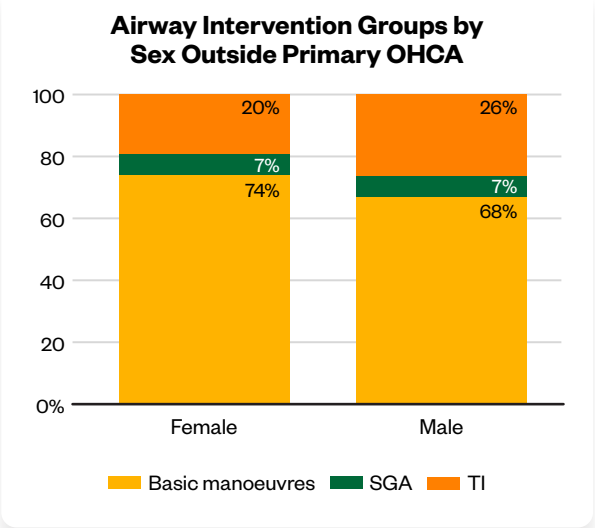


Figure 7. Airway interventions by sex outside primary OHCA

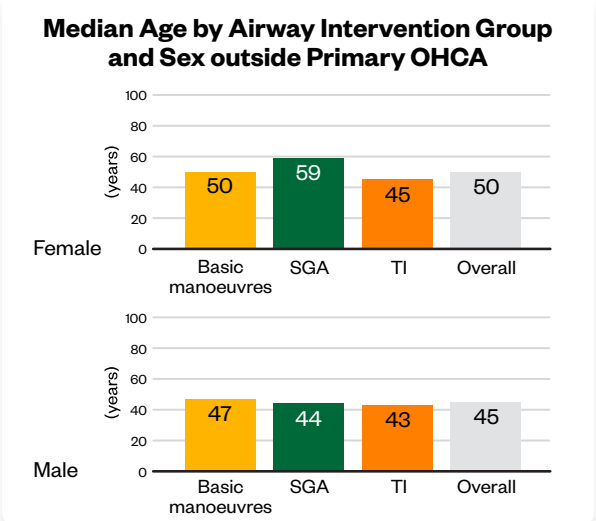


Figure 8. Distribution of median age across airway groups and sex in outside out-of-hospital cardiac arrest

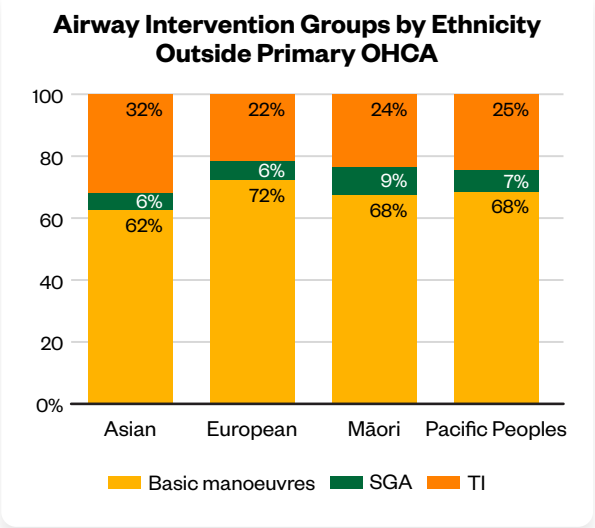


Figure 9. Airway interventions by ethnicity outside primary OHCA

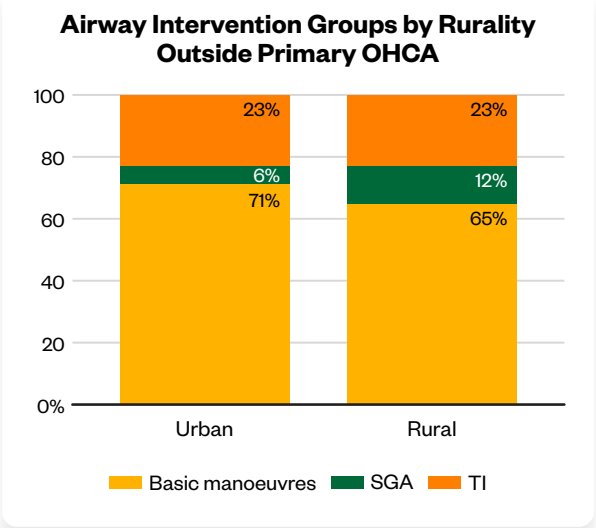


Figure 10. Airway interventions by rurality outside primary OHCA

As seen in the primary OHCA population, TI use declines with increasing deprivation. Although the higher prevalence of basic airway management influences the overall distribution, a similar geographic pattern – particularly the rural-urban interplay – likely remains a key driver of the observed variation.

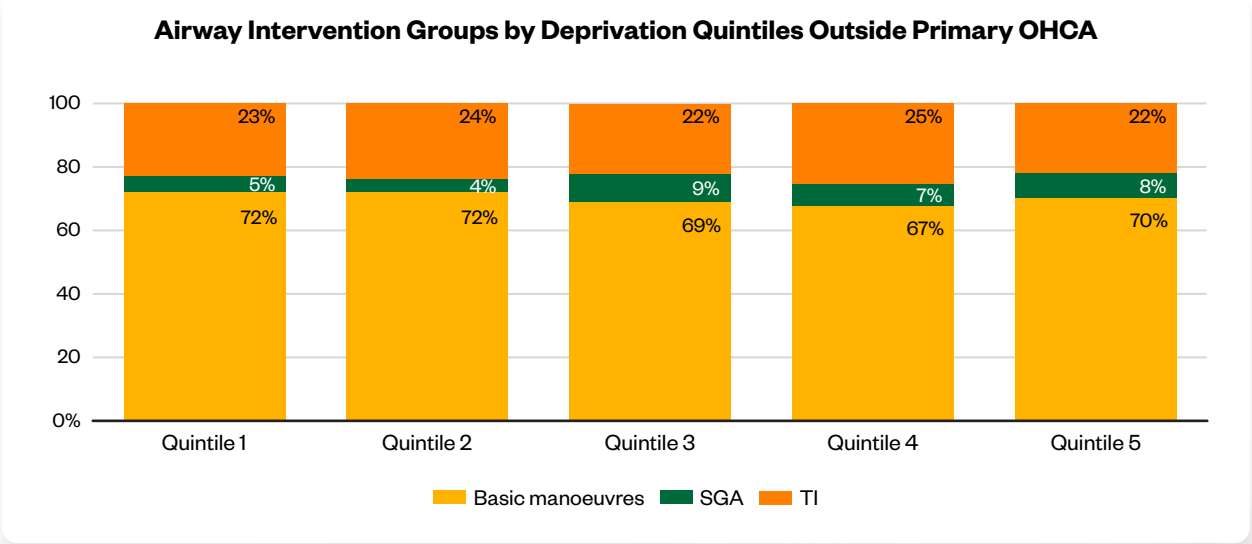
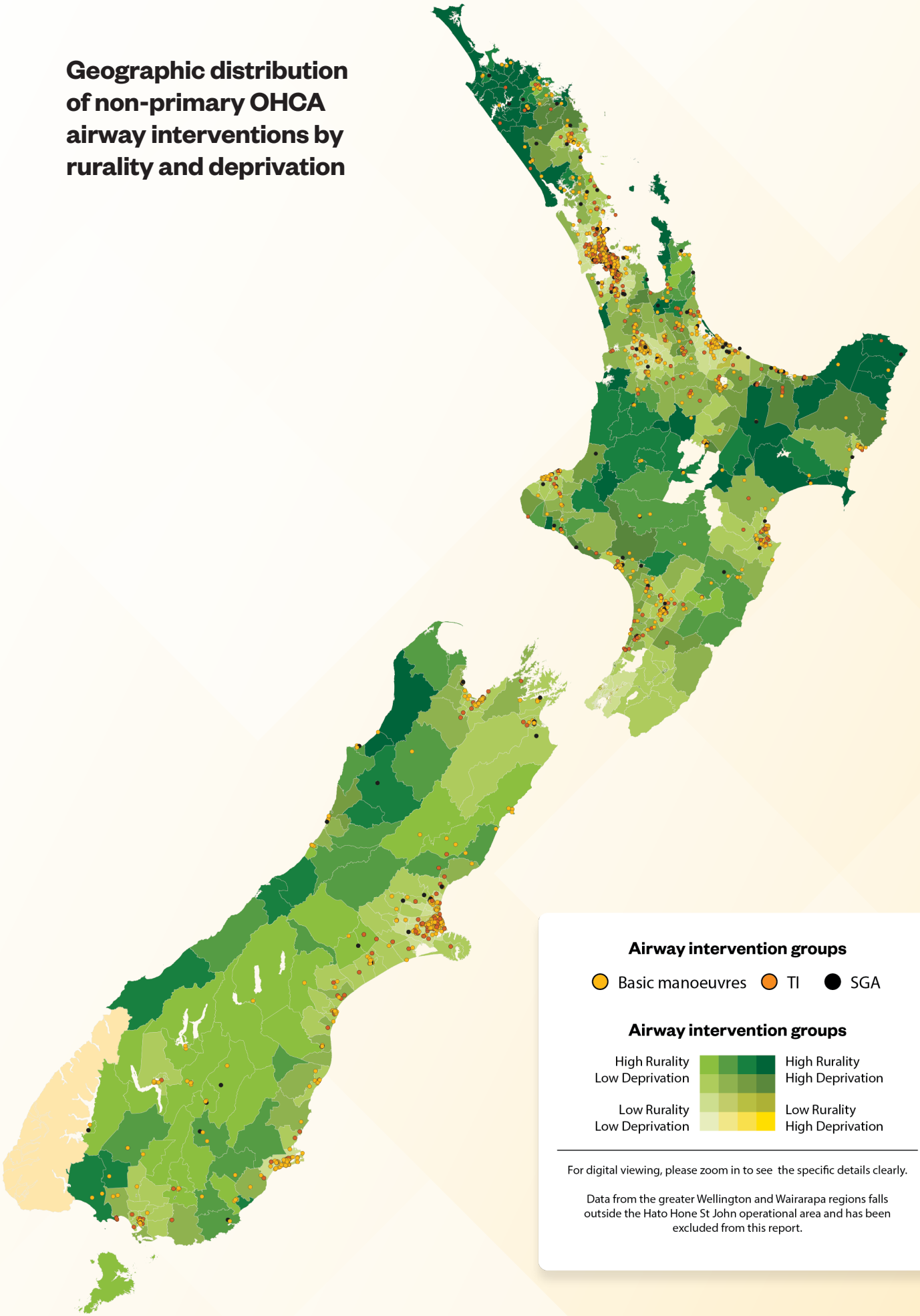


Figure 11. Airway interventions by deprivation quintiles outside primary OHCA

Geographic distribution of non-primary OHCA airway interventions by rurality and deprivation



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Te whakahaeretanga ohotata mātai arotamariki o te arahau
Paediatric emergency airway management

This registry includes 270 cases of paediatric airway management. Critically unwell paediatric patients are a very small fraction of ambulance attended incidents. Most paediatric airway emergencies are managed with basic manoeuvres.

Paediatric primary cardiac arrest is rare, whereas secondary paediatric cardiac arrest is more common and most often occurs due to respiratory aetiologies. Among children who experience out-of-hospital cardiac arrest, the use of supraglottic airways (SGAs) and tracheal intubation (TI) is roughly equally represented across cases.

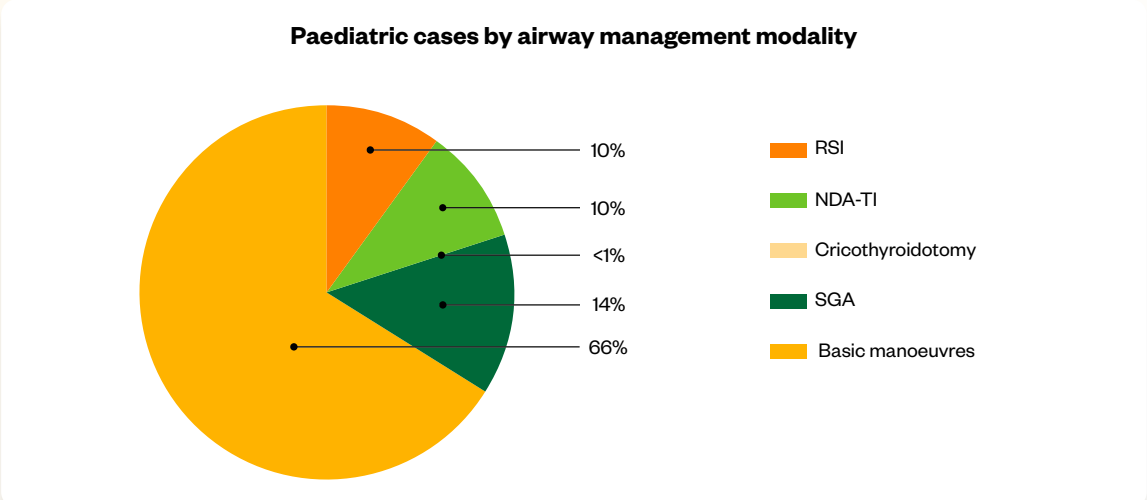

Figure 12. Paediatric cases by airway management modality

Case type	Principal clinical presentation	Basic manoeuvres	Supraglottic airway	Tracheal intubation	Row total
Primary OHCA	Primary OHCA	**2**	**8**	**1**	**11**
Secondary OHCA	Respiratory	2	18	11	31
	Trauma	1	4	8	13
	SUID	2	8	0	10
	Asphyxial	0	0	5	5
	Other medical	0	0	3	3
	Drowning	0	0	1	1
	Total	**5**	**30**	**28**	**63**
Critically ill or injured patients not in cardiac arrest	Seizure	99	3	8	110
	Altered level of consciousness	15	0	3	18
	Respiratory	16	0	0	16
	Trauma	7	0	7	14
	Sepsis/Infection	10	0	0	10
	Poisoning	8	0	1	9
	Asphyxia	7	0	1	8
	Neonatal	5	1	0	6
	Drowning	1	0	1	2
	Other Medical	2	0	0	2
	Asphyxial	0	0	1	1
	Total	**170**	**4**	**22**	**196**

Table 4. All paediatric cases across airway groups and clinical presentation

Success rates

Across cases were an SGA was used, the following success rates were measured:

Overall success rate	**79.3%**

Across non-drug-assisted tracheal intubations (n=27), the following success rates were measured:

Overall success rate	**96.3%**
First pass success rate	**74.0%**
Second pass success rate	**96.2%**

Non drug-assisted tracheal intubation in paediatric patients exclusively occurs during intra-arrest, with a large proportion of these cases involving infants. Tracheal intubation during active CPR in this age group is particularly challenging, and our first-pass success rates reflect this difficulty.

Across paediatric RSI (n=28), the following success rates were measured:

Overall success rate	**100%**
First pass success rate	**85.7%**
Second pass success rate	**100%**

Rapid sequence intubation in paediatric patients is uncommon and is typically performed in consultation with an on-call medical doctor. It is reserved for situations in which the risk of withholding the intervention strongly outweighs the risks associated with the procedure – for example, in cases of refractory status epilepticus with a prolonged transport time to hospital.

Demographics

Median age varies significantly around aetiology and airway management strategy. Most NDA-TI were infants in cardiac arrest, while most RSI were older paediatrics patients not in cardiac arrest.

Median age (years)						
	Basic manoeuvres	**SGA**	**NDA-TI**	**RSI**	**Primary Cric**	**Overall**
Primary OHCA	0	–	2	14	–	4
Secondary OHCA	0	<1	<1	12	14	<1
Not OHCA	4	1	–	6	–	4
All cases	**4**	**<1**	**<1**	**8**	**14**	**3**

Table 5. Median age of paediatric patients across airway management modalities and type of incident.

The distribution of paediatric airway management cases shows marked variation across ethnicity, geography, and socio-economic context. The ethnicity data demonstrate that Māori children account for the largest proportion of paediatric airway cases (approximately 43%), followed by European (around 36%). Pacific and Asian children represent smaller proportions of the total. This pattern indicates that paediatric airway interventions occur disproportionately among tamariki Māori relative to other groups.

Geographic analysis reveals a marked urban concentration of cases (approximately 81%), alongside a clear deprivation gradient: case numbers rise progressively across quintiles, peaking in Quintile 5.

Taken together, these findings indicate that paediatric airway management is concentrated among Māori children living in urban areas with higher socio-economic deprivation. While the underlying reasons for this over-representation cannot be directly inferred from the data presented here, the pattern is consistent with higher rates of hospitalisation among Māori children reported in other literature.[3]

While paediatric airway interventions described in this report were required for a range of conditions, many severe childhood illnesses and hospitalisations can be avoided with good preventive care. Preventable hospitalisations for tamariki Māori may be reduced with timely access to primary care, healthy and smokefree homes, immunisations, and system-wide efforts to reduce racism and bias in healthcare.[3,4]

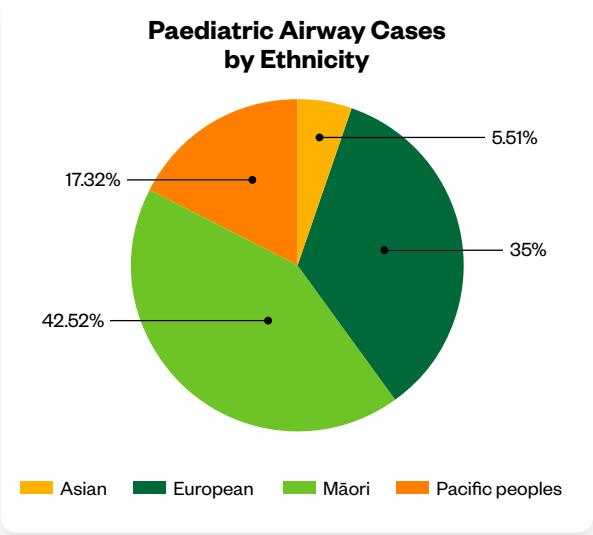

Figure 13. Paediatric cases by ethnicity

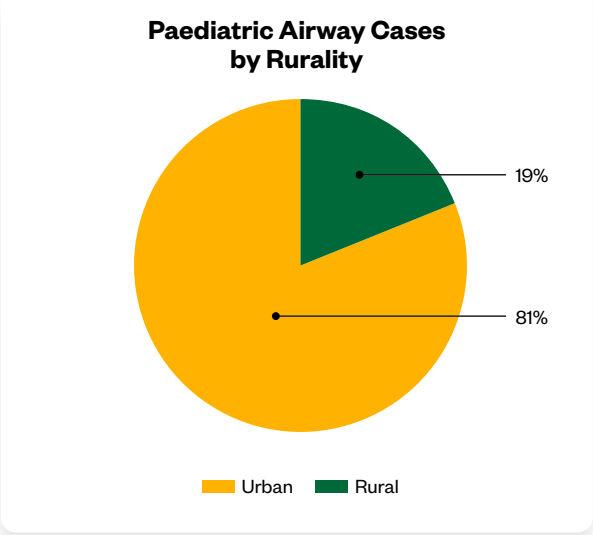

Figure 14. Paediatric cases by rurality

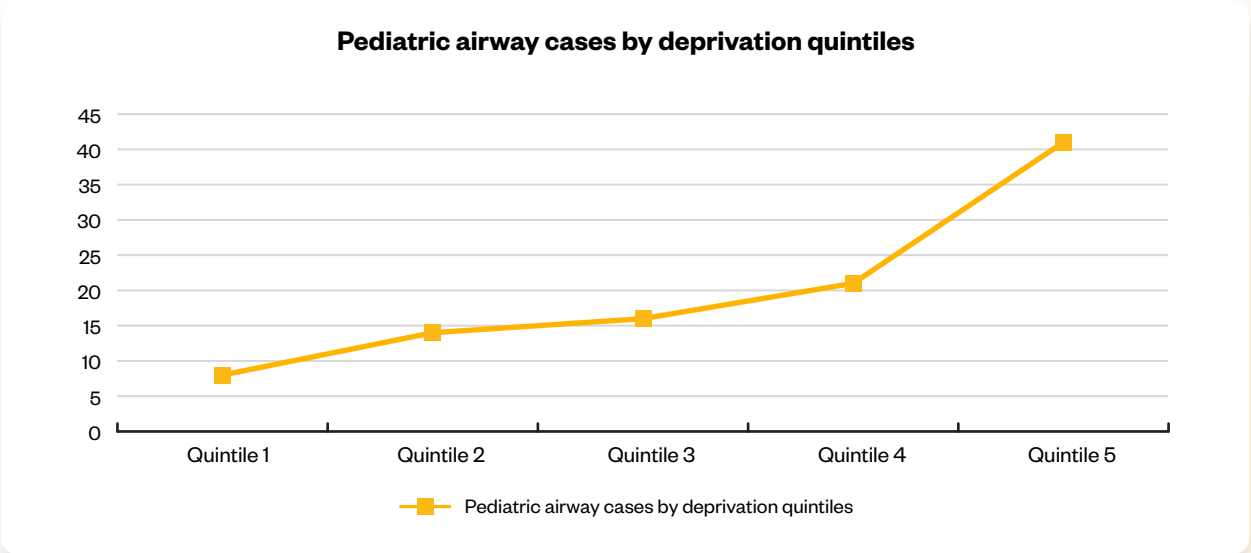

Figure 15. Paediatric cases by deprivation quintiles

Complex emergency airways

Ngā āhuatanga o te whakauru ngongo hā i te pūkorokoro me ngā whakamātau maha

Characteristics of tracheal intubations with multiple attempts

All cases identified as involving multiple intubation attempts were selected for review by the Critical Care Clinical Improvement Ropu to identify potential patterns that could inform future quality-improvement initiatives. A total of 244 cases were initially identified. Of these, 15 involved a successful initial intubation followed by a subsequent intubation to replace a dislodged or damaged tracheal tube. These cases were reclassified as first-pass successes.

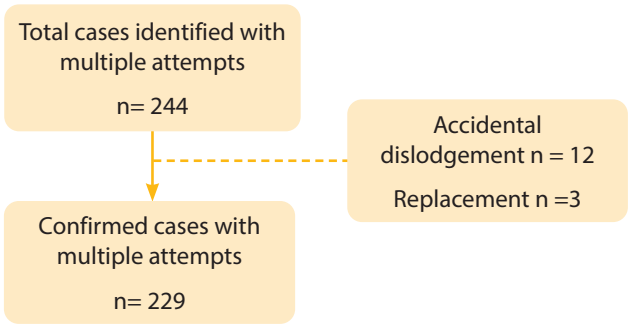

Figure 16. Confirmed TI cases with multiple attempts

The remaining 229 cases were reviewed, and barriers to first-pass success were identified where possible. In cases where this could not be determined, they were labelled as "unable to be determine".

Inability to visualise airway landmarks was more prevalent during intra-arrest intubations compared with medication-assisted intubations. This is unsurprising, as a higher proportion of intra-arrest intubations occurred on the ground, under active chest compressions, and were more likely to be performed using direct laryngoscopy. Poor landmark visualisation was not solely attributable to the act of airway instrumentation itself. Gross airway contamination was common in both non-medication-assisted and medication-assisted intubations and was a frequent contributor to visualisation difficulty.

RSI cases showed fewer visualization difficulties, which likely reflects the deliberate optimisation of intubating conditions and the frequent use of video laryngoscopy in this group. However, it is well recognised that obtaining an optimal laryngeal view does not always guarantee successful tracheal tube placement, and the higher rates of difficulty advancing the tracheal tube among RSI cases likely reflect this phenomenon.

		NDA-TI		RSI	
All Cases		946	100%	567	100%
Overall, First pass success		761	80.4%	523	92.2%
>1 attempt		185	19.6%	44	7.8%
Factors leading missed first attempt					
Inability to visualise anatomy on first attempt		113	61.1%	16	36.4%
Inability to introduce tracheal tube		29	15.7%	21	47.7%
Inability to confirm placement		20	10.8%	7	15.9%
Unable to determine		23	12.4%	0	0%
All Cases		185	100%	44	100%
Characteristics of cases with missed first attempt					
Type of laryngoscope	Direct	14	7.6%	3	6.7%
	Video	67	36.2%	42	93.3%
	Unable to Determine	104	56.2%	0	0%
Type of introducer	Stylet	66	35.7%	22	50%
	Bougie	109	58.9%	21	47.8%
	Unable to Determine	10	5.4%	1	2.2%
Intubation location	Scene	180	97.3%	30	68.18%
	Ambulance	5	2.7%	8	18.18%
	Unable to Determine	0	0%	6	13.64%
Chest compressions in progress during Intubation	Yes	111	60.0%		
	No	5	2.7%		
	Unable to Determine	69	37.3%		
Significant airway contamination	Yes	67	36.4%	17	38.6%
	No	117	63.6%	27	61.4%
	Unable to Determine	0	0%	0	0%
Morbid Obesity	Yes	20	10.8%	9	20.5%
	No	166	89.2%	26	59.1%
	Unable to Determine	0	0%	9	20.5%

Table 6. Causes and characteristics of intubations requiring multiple attempts.

Complications associated with rapid sequence intubation

While intubation first pass success is an important quality measure in airway management during RSI, The avoidance of complications during and post-intubation is also important because they can contribute to increased morbidity and mortality.

Direct and structured analysis of complications occurring during or post intubation is challenging due to current technical limitations within our airway registry database. Because of this, critical care paramedics performing RSI

submit a supplemental quality-assurance form that, among other fields, captures the incidence of the following complications:

- Cardiac arrest
- Critical desaturation (SpO_2 below 70%)
- Hypotension (systolic blood pressure below 90 mmHg)

Of the 574 drug-assisted tracheal intubations included in this report, 464 had corresponding entries in the supplemental form database. The low level of compliance is likely due to the early stage of the form's implementation and the fact that it sits outside the electronic patient report form environment. Introduced in late 2023, the form requires a change in practice across our critical care paramedic staff, which has contributed to incomplete uptake.

Out of the 464 identified cases, we found 22 cases (4.7%) in which a cardiac arrest occurred at any time during or post RSI. All cases involved complex, critically unwell patients, many of whom had ROSC, and subsequently re-arrested post intubation. Over 90% of cases had one or more risk factors prior to intubation (e.g.hypoxia, hypotension, and/or suspected metabolic acidosis).

Principal clinical presentation	Frequency	Total Percentage
OHCA: ROSC and subsequent re-arrest	17	3.6%
Complex major trauma	2	0.4%
Suspected stroke	1	0.2%
Asphyxiation	1	0.2%
Total number of cardiac arrests occurring during or post intubation	**22**	**4.7 %**

Table 7. Clinical presentations of post RSI re-arrest

Out of the remaining 442 cases, the following incidents of critical desaturation and hypotension were identified:

Complication	Frequency	Total Percentage
Critical hypoxia (<70%)	6	1.4%
Hypotension (<90 mmHg)	87	19.7%
Both	6	1.4%
Total number of reported episodes of critical hypoxia or hypotension, occurring during or post intubation	**99**	**22.5%**

Table 8. Complication rates associated with RSI

Te whakauru ohotata o te ngongo hā mā te poka i te repe tenga
Emergency cricothyroidotomy

Over the 2024/25 reporting period, there were seven cases with emergency cricothyroidotomy procedures with 100% success on first attempt.

Out-of-hospital front of neck airway access through the cricothyroid membrane is indicated if the patient has an impaired airway and impaired breathing to the point where their life is at threat and they cannot be intubated or ventilated by conventional means.

Three cricothyrotomies were performed without prior attempts at alternative airway adjuncts (primary), as crews assessed a more basic airway intervention to be futile. Each of these patients presented in secondary cardiac arrest.

The remaining four cases all received at least one attempt at an alternative airway prior to the procedure. Three patients underwent intubation attempts that were unsuccessful despite appropriate technique and equipment use.

Type	Clinical presentation
Primary cricothyroidotomy	Major facial trauma
	Airway trauma
	Airway trauma
Secondary cricothyroidotomy	Severe foreign body airway obstruction
	Severe airways burn/dislodgement
	Severe trismus despite neuromuscular blockers
	Very difficult airway

Table 9. Clinical presentations for cricothyroidotomy cases

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Conclusion

This inaugural Hato Hone St John Emergency Airway Registry Report provides the first comprehensive national view of out-of-hospital airway management practice. The data demonstrate that paramedics across the motu continue to deliver complex and time-critical airway interventions to patients in some of the most challenging clinical environments. By systematically capturing and analysing airway management activity, this registry establishes an important foundation for ongoing monitoring, benchmarking, and quality improvement.

Beyond describing current practice, the registry provides valuable insights into where care is working well and where further improvement is possible. These findings will help inform clinical governance, training, and service development, supporting evidence-based airway management and strengthening patient safety across the out-of-hospital system. As the registry matures, it will play an increasingly important role in advancing airway practice, guiding research, and ultimately improving outcomes for patients who depend on timely and effective emergency care.

Notes

Notes

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