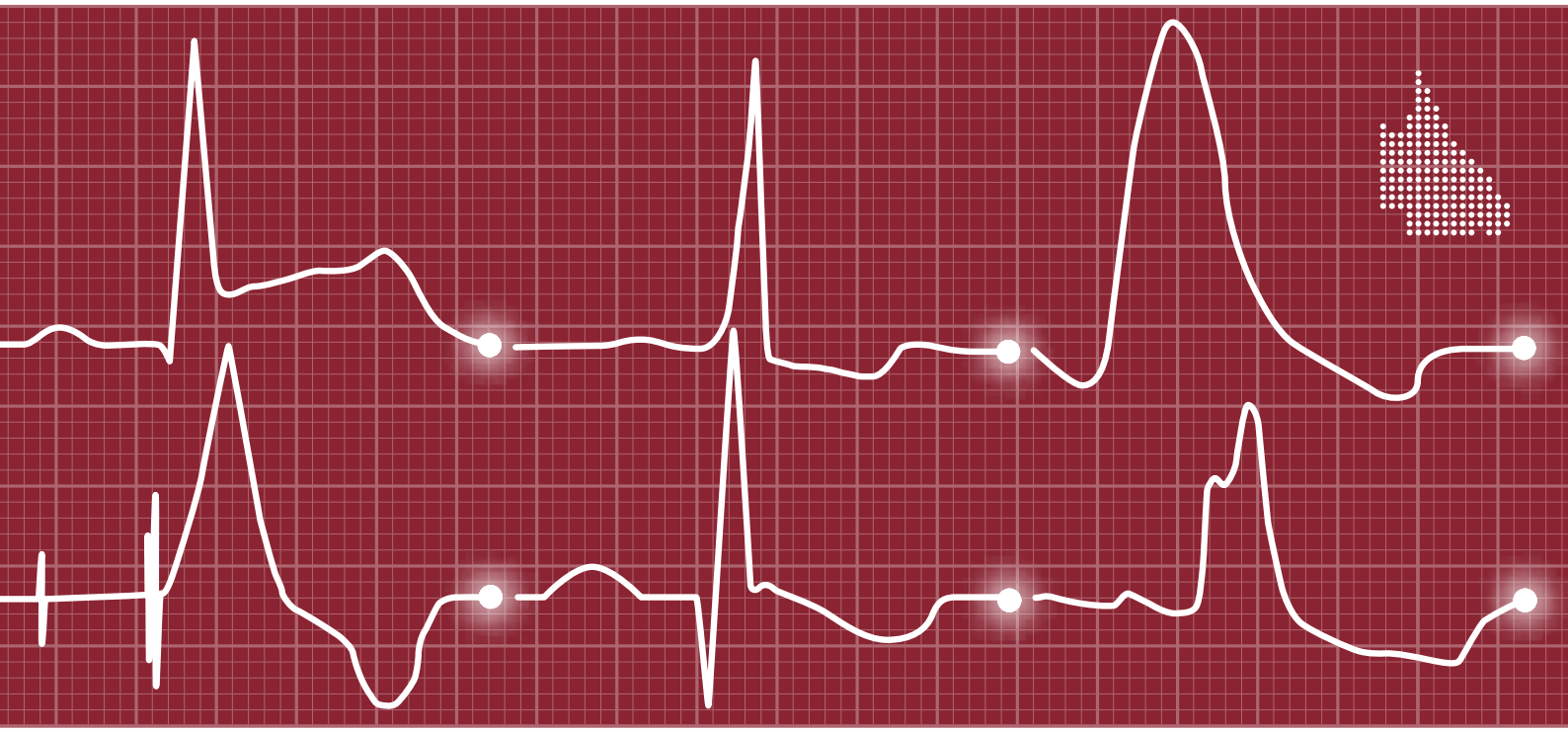
Queensland Cardiac Clinical Network

Queensland Cardiac Outcomes Registry

2022 Annual Report

Electrophysiology and Pacing Audit



Queensland Cardiac Outcomes Registry 2022 Annual Report

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For more information contact:
Queensland Cardiac Clinical Network,
Department of Health, GPO Box 48,
Brisbane QLD 4001,
email scciu@health.qld.gov.au

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1 Message from the Queensland Cardiac Clinical Network Chair

It is with great pleasure that we present the Annual Report of the Queensland Cardiac Outcomes Registry. This report serves as a testament to the relentless pursuit of excellence in cardiovascular care within the Queensland region. The data, analyses, and insights presented here reflect the collective efforts of our passionate team, whose commitment to improving patient outcomes remains unwavering.

QCOR remains one of the most comprehensive clinician-led clinical registries in the country, incorporating modules reporting on interventional cardiology, cardiac surgery, thoracic surgery, electrophysiology and pacing, cardiac rehabilitation and heart failure support services. Through rigorous data collection, innovative research endeavours, and collaborative efforts, we have made significant strides in enhancing patient outcomes, advancing medical knowledge, and fostering a healthier future for our community.

We continue to keenly await the delivery of a contemporary statewide cardiovascular information system for diagnostic and interventional cardiology and echocardiography. Following a successful procurement process, the platform for a forward-thinking, all-encompassing solution has been laid and throughout the process to date, the collegiality and cooperation of cardiac clinicians throughout the state has once again been exemplified.

In the era of expanding datasets and advanced analytics, our commitment will be to translating the knowledge gained from this program into information supporting patient safety and quality initiatives. We are looking forward to expanded capability for data collection and analysis to become part of real-time care delivery, recognising always the patient as the focus of our efforts. We trust that this report will serve as a valuable for knowledge exchange, and ultimately, better cardiovascular outcomes for our community.

Dr Rohan Poulter and Dr Peter Stewart
Co-chairs, Queensland Cardiac Clinical Network

2 Acknowledgements

This collaborative report was produced by the SCCIU, audit lead for QCOR for and on behalf of the Statewide Cardiac Clinical Network. This would not be possible without the tireless work of clinicians in contributing quality data and providing quality patient care, while the contributions of QCOR committee members and others who had provided writing or other assistance with this year's Annual Report is also gratefully acknowledged.

QCOR Interventional Cardiology Committee

- Dr Sugeet Baveja, Townsville University Hospital
- Dr Yohan Chacko, Ipswich Hospital
- Dr Christopher Hammett, Royal Brisbane & Women's Hospital
- Dr Dale Murdoch, The Prince Charles Hospital
- A/Prof Atifur Rahman, Gold Coast University Hospital
- Dr Sam Sidharta, Rockhampton Hospital
- Dr Yash Singbal, Princess Alexandra Hospital
- Dr Gregory Starmer, Cairns Hospital
- Dr Michael Zhang, Mackay Base Hospital
- Dr Rohan Poulter, Sunshine Coast University Hospital (Chair)

QCOR Cardiothoracic Surgery Committee

- Dr Manish Mathew, Townsville University Hospital
- Dr Rishendran Naidoo, Metro North Hospital and Health Service
- Dr Anil Prabhu, The Prince Charles Hospital
- Dr Andrie Stroebel, Gold Coast University Hospital
- Dr Christopher Cole, Princess Alexandra Hospital (Chair)

QCOR Electrophysiology and Pacing Committee

- Dr Naresh Dayananda, Sunshine Coast University Hospital
- A/Prof John Hill, Princess Alexandra Hospital
- Dr Paul Martin, Royal Brisbane & Women's Hospital
- Dr Caleb Mengel, Toowoomba Hospital
- Dr Sachin Nayyar, Townsville University Hospital
- Dr Kevin Ng, Cairns Hospital
- Dr Robert Park, Gold Coast University Hospital
- Dr Russell Denman, The Prince Charles Hospital (Chair)

QCOR Cardiac Rehabilitation Committee

- Ms Wendy Fry, Cairns and Hinterland Hospital and Health Service
- Ms Emma Harmer, Metro South Hospital and Health Service
- Ms Audrey Miller, Health Contact Centre – Self Management of Chronic Conditions Service
- Ms Samara Phillips, Statewide Cardiac Rehabilitation Coordinator
- Ms Rebecca Pich, Metro South Hospital and Health Service
- Ms Alexandra Samuels, Gold Coast Hospital and Health Service
- Ms Michelle Aust, Sunshine Coast University Hospital (Co-Chair)
- Ms Maura Barnden, Metro North Hospital and Health Service (Co-Chair)

QCOR Heart Failure Support Services Committee

- Ms Melanie Burgess, Ipswich Hospital
- Dr Wandy Chan, The Prince Charles Hospital
- Ms Deepali Gupta, Queen Elizabeth II Hospital
- Ms Annabel Hickey, Statewide Heart Failure Services Coordinator
- Dr Rita Hwang, PhD, Princess Alexandra Hospital
- Ms Sophie Lloyd, Royal Brisbane & Women's Hospital
- Ms Menaka Louis, Gold Coast Hospital and Health Service
- Ms Kellie Mikkelsen, Redcliffe Hospital
- Ms Melissa Moore, Townsville University Hospital
- Ms Rachelle Mulligan, Princess Alexandra Hospital
- Ms Louvaine Wilson, Toowoomba Hospital
- Prof John Atherton, Royal Brisbane & Women's Hospital (Chair)

Statewide Cardiac Clinical Informatics Unit

- Mr Michael Mallouhi
- Mr Marcus Prior
- Dr Ian Smith, PhD
- Mr William Vollbon

Queensland Ambulance Service

- Dr Tan Doan, PhD

3 Introduction

The Queensland Cardiac Outcomes Registry (QCOR) is an ever-evolving clinical registry and quality program established by the Queensland Cardiac Clinical Network (QCCN) in partnership with statewide cardiac clinicians and made possible through the funding and support of Clinical Excellence Queensland. QCOR provides access to quality, contextualised clinical and procedural data to inform and enhance patient care and support the drive for continual improvement of quality and safety initiatives across cardiac and cardiothoracic surgical services in Queensland.

QCOR is a clinician-led program, and the strength of the Registry would not be possible without this input. The Registry is governed by clinical committees providing direction and oversight over Registry activities for each cardiac and cardiothoracic specialty area, with each committee reporting to the QCCN and overarching QCOR Advisory Committee. Through the QCOR committees, clinicians are continually developing and shaping the scope of the Registry based on contemporary best practices and the unique requirements of each clinical domain.

Goals and mission

- Identify, through data and analytics, initiatives to improve the quality, safety and effectiveness of cardiac care in Queensland.
- Provide data, analysis expertise, direction and advice to the Department of Health and Hospital and Health Services concerning cardiac care-related service planning and emerging issues at the local, statewide and national levels.
- Provide decision support, expertise, direction and advice to clinicians caring for patients within the domain of cardiac care services.
- Develop an open and supportive environment for clinicians and consumers to discuss data and analysis relative to cardiac care in Queensland.
- Foster education and research in cardiac care best practice.

Registry data collections and application modules are maintained and administered by the Statewide Cardiac Clinical Informatics Unit (SCCIU), which forms the business unit of QCOR. The SCCIU performs data quality, audit and analysis functions, and coordinates individual QCOR committees, whilst also providing expert technical and informatics resources and subject matter expertise to support continuous improvement and development of specialist Registry application modules and reporting.

The SCCIU team consists of:

Mr Graham Browne, Database Administrator	Mr Michael Mallouhi, Clinical Analyst
Mr Marcus Prior, Informatics Analyst	Mr William Vollbon, Manager*
Dr Ian Smith, PhD, Biostatistician	Mr Karl Wortmann, Application Developer

* Principal contact officer/QCOR program lead

The application custodian for QCOR is the Executive Director, Healthcare Improvement Unit, CEQ, while data custodianship for the overarching data collection of QCOR is the Chair/s of the QCCN. The individual modular data collections are governed by the Chair of each of the individual QCOR specialty committees.

The QCOR Clinical specialty committees provide direction and oversight for each domain of the Registry. An overarching QCOR Advisory Committee provides collective oversight with each of these groups reporting to the QCCN. Through the QCOR committees, clinicians are continually developing and shaping the scope of the Registry based on contemporary best practices and the unique requirements of each clinical domain.

QCOR manages the Cardiothoracic Surgery Quality Assurance Committee which has been formed under Part 5 of the *Hospital and Health Boards Regulation 2023* to facilitate the participation of clinicians and administrators responsible for the management and delivery of cardiac services. This group enables the peer review of safety and quality of the cardiothoracic services delivered in Queensland and guides any service improvement activities that may be required.

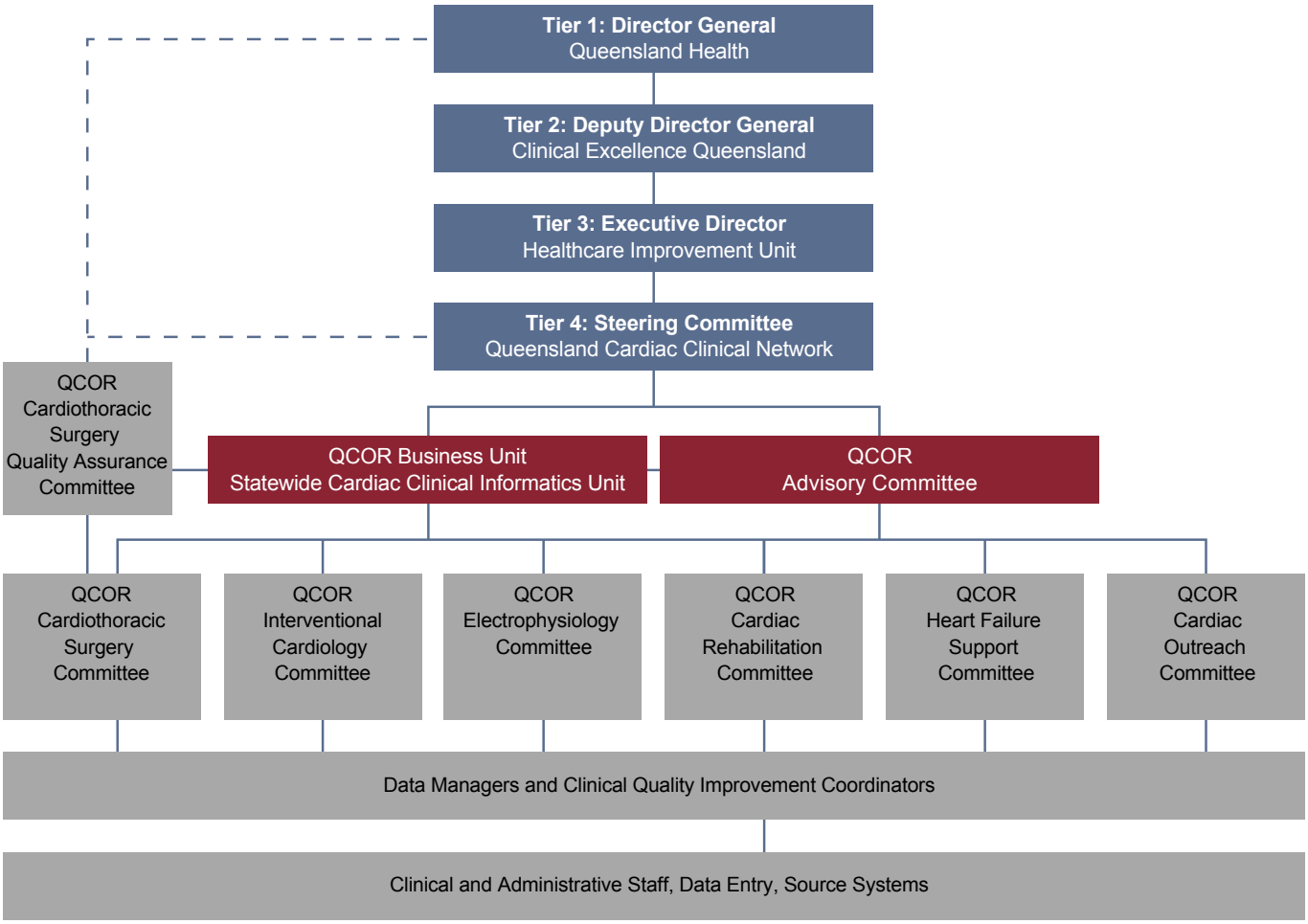


Figure 1: Governance structure

QCOR functions in line with the accepted and endorsed clinical quality registry feedback loop where improvements in clinical care through data-based initiatives and regular interaction with clinicians and stakeholders.

QCOR acts under a well-defined data custodianship model that ensures clearly defined processes and usage of the data collected. The operation of QCOR is guided by the principles outlined by the Australian Commission on Safety and Quality in Health Care in the Framework for Australian clinical quality registries.

The Registry data collection is a blend of clinician-entered data along with various data linkages activities as outlined above. The data is scrutinised using in-app data validations and automated routine data quality reporting. The data quality auditing processes aim to identify and resolve incomplete or inaccurate data to ensure clinician trust in the analysis and outcome reporting process, along with routine reporting and requests for information functions.

In 2014, the Australian Commission on Safety and Quality in Healthcare published a Framework for Australian clinical quality registries*. Since then, QCOR has worked to align itself with these guidelines and subsequent frameworks and standards which form the basis of its quality and safety program. It is recognised that clinical quality registries collect, analyse and report back essential risk-adjusted clinical information to patients, consumers, frontline clinicians and government, with a focus on quality improvement.

The measurement of clinical indicators and benchmarks aims to support the feedback of safety and quality data to several levels of the health system, including consumers, clinicians, administrators and funders. Meaningful metrics are required to understand what the major safety issues are across the care continuum, proactively mitigate patient safety risks and stimulate improvement. Evidence demonstrates that safety and quality improve when clinicians and managers are provided with relevant and timely clinical information.

Through the availability of data insights, clinical reporting and clinical documentation produced by both patient-facing and technical solutions. QCOR has allowed the instantaneous delivery of clinical reports and documentation to clinicians via enterprise solutions. Data insights, performance measure and clinical indicator reporting is also made available in real time via dashboards and reports delivered to clinicians at a frequency and medium of their choosing. Access to real-time data enables key staff to plan and deliver more efficient care to more patients.

QCOR data and analytics have informed and supported statewide healthcare planning activities for capital expansion as well as made possible market share activities for procurement of high-cost clinical consumables resulting in multimillion dollar savings to the healthcare system.

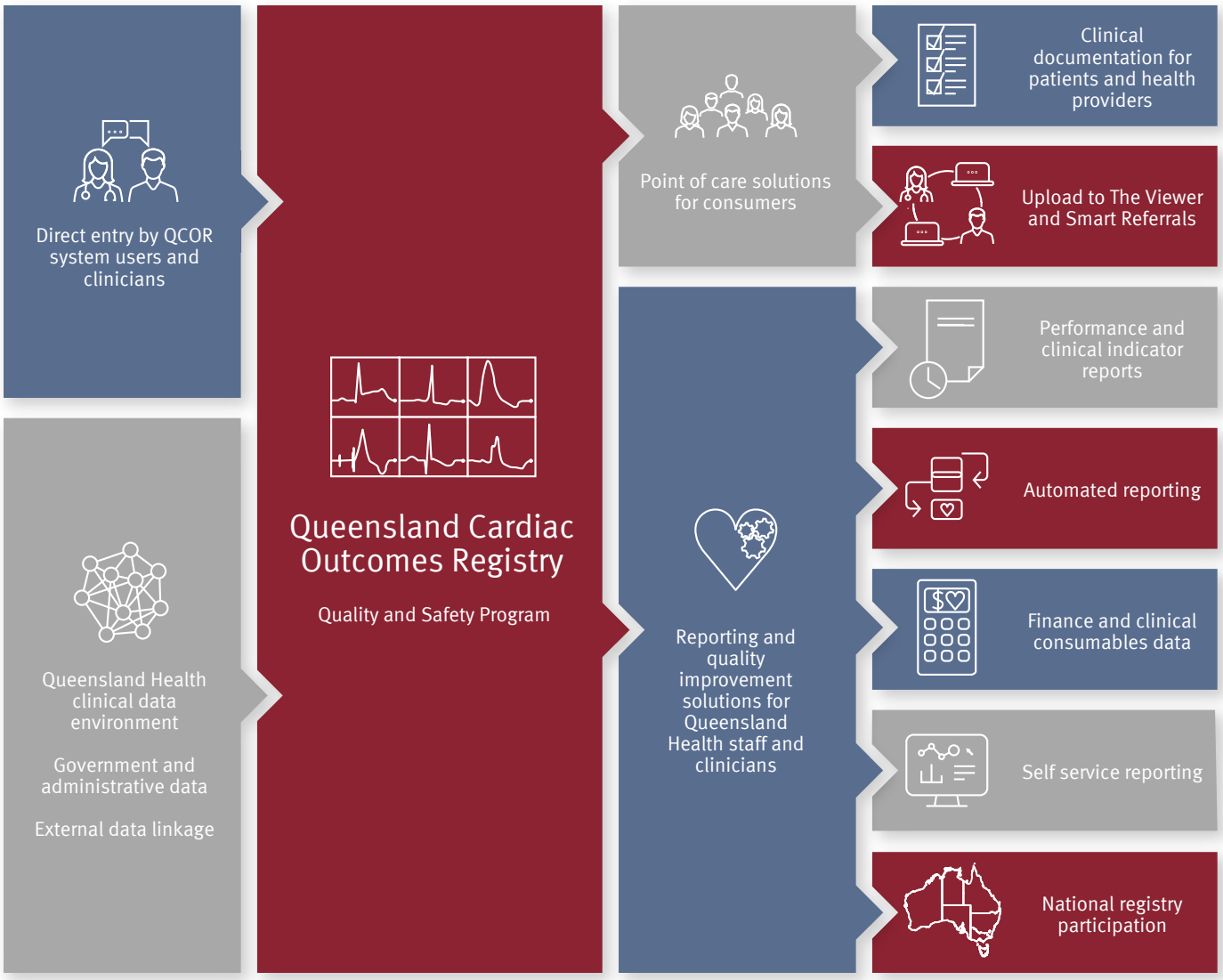
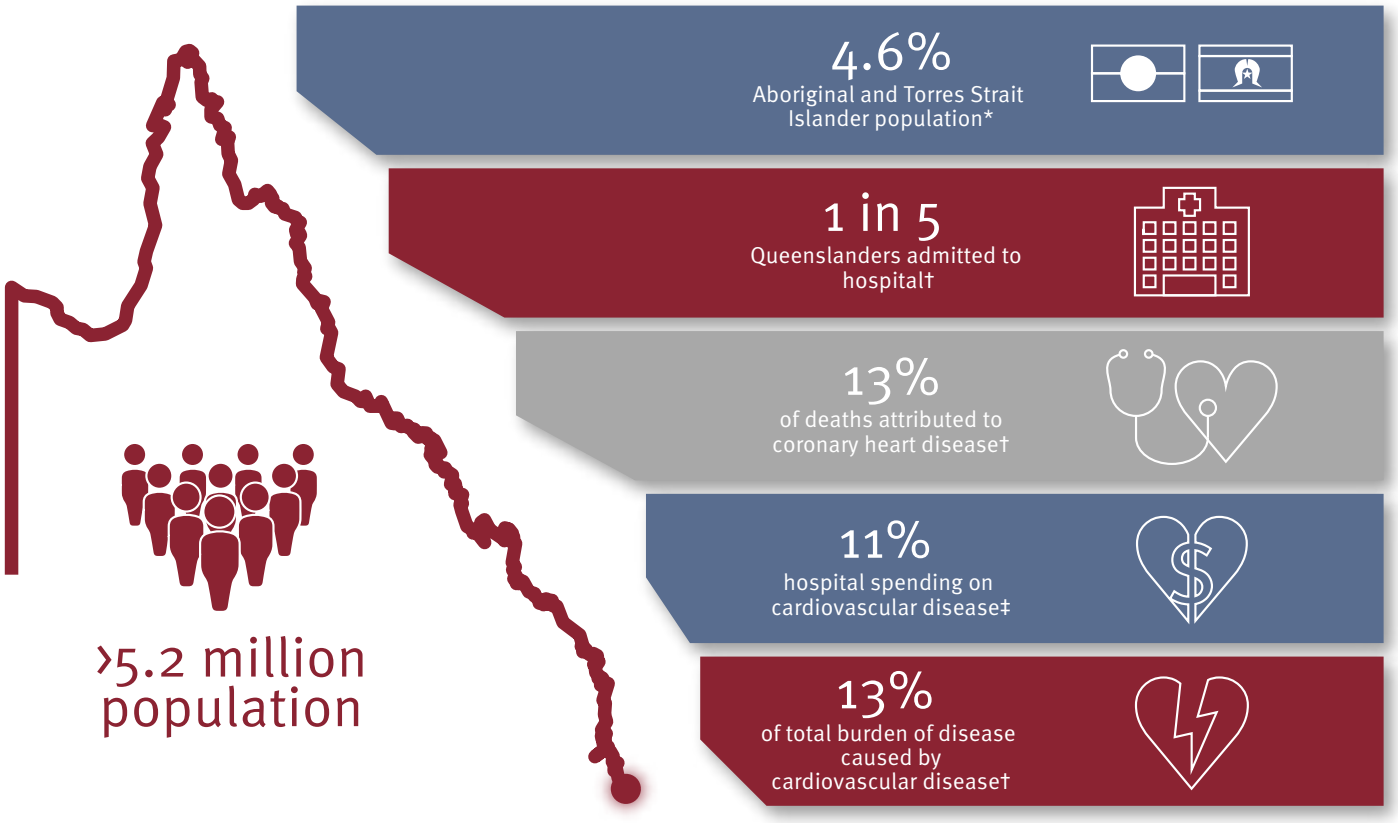


Figure 2: QCOR data flow

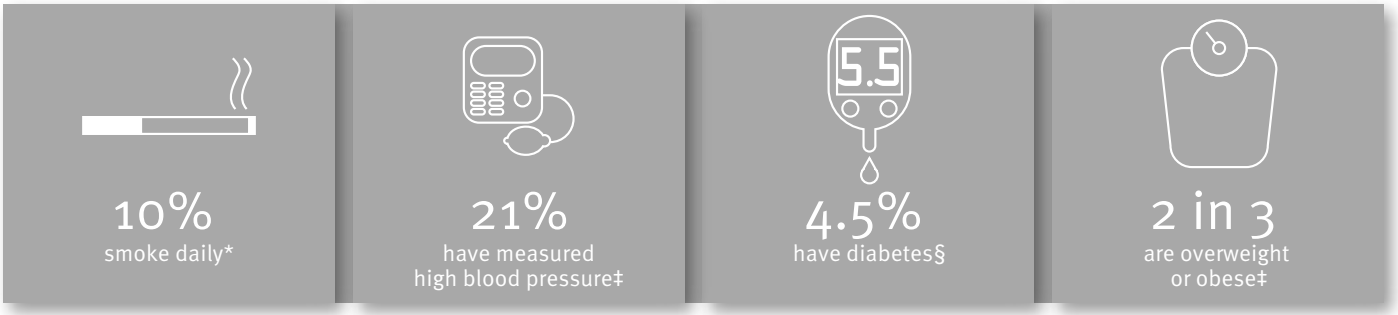
* The Australian Commission on Safety and Quality in Health Care (ACSQHC). Framework for Australian clinical quality registries. Sydney: ACSQHC; 2014

Queensland Cardiac Outcomes Registry

The Health of Queenslanders



Comorbidities



Mortality

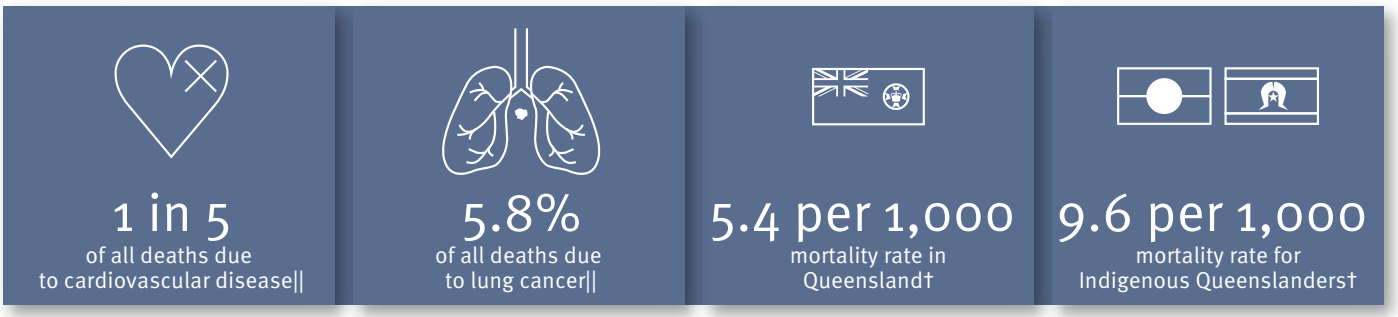


Figure 3: QCOR 2022 infographic

* Australian Bureau of Statistics. (2022, July 1). Queensland: Aboriginal and Torres Strait Islander population summary. ABS. https://www.abs.gov.au/articles/queensland-aboriginal-and-torres-strait-islander-population-summary

† Queensland Health. (2020). The health of Queenslanders 2020. *Report of the Chief Health Officer Queensland*. Queensland Government: Brisbane

‡ Australian Bureau of Statistics. (2019). *National health survey: first results, 2017-18*. Cat. no. 4364.0.55.001. ABS: Canberra

§ Diabetes Australia. (2018). *State statistical snapshot: Queensland*. As at 30 June 2018

|| Australian Institute of Health and Welfare (2021). MORT (Mortality Over Regions and Time) books: State and territory, 2015–2019. https://www.aihw.gov.au/getmedia/8967a11e-905f-45c6-848b-6a7dd4ba89cb/MORT_STE_2015_2019.xlsx.aspx

2022 Activity at a Glance

What's New?

- Cardiac Surgery health equity spotlight
- Cardiac Rehabiliation expanded outcomes audit
- Heart Failure Support Services SGLT2 inhibitor indicator
- Interventional Cardiology adjunct devices review

Interventional Cardiology

4,818
percutaneous coronary interventions

617
structural heart disease interventions

335
transcatheter aortic valve replacements

14,769
total coronary procedures

Cardiothoracic Surgery

2,230
adult cardiac surgeries

918
adult thoracic surgeries

Electrophysiology & Pacing

5,305
electrophysiology and pacing procedures

3,611
cardiac implantable electronic device procedures

Heart Failure Support Services

6,438
heart failure support services referrals

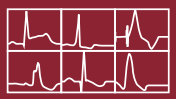
Cardiac Rehabilitation

9,317
cardiac rehabilitation referrals

Paediatric Cardiac Surgery

292
paediatric cardiac surgeries

Clinical Indicator Progress



85 mins
median first diagnostic ECG to reperfusion time for primary PCI

0.2%
procedural tamponade rate for cardiac device and electrophysiology procedures

92%
of patients referred to a heart failure support service on an ACEI, ARB or ARNI at discharge

92%
of cardiac rehabilitation referrals within 3 days of discharge

1.5%
mortality rate for coronary artery bypass surgery at 30 days

4 Facility profiles

4.1 Cairns Hospital

- Referral hospital for Cairns and Hinterland and Torres and Cape Hospital and Health Services, serving a population of approximately 280,000
- Public tertiary level invasive cardiac services provided at Cairns Hospital include:
  - Coronary angiography
  - Percutaneous coronary intervention
  - Structural heart disease intervention
  - ICD, CRT and pacemaker implantation
- Cardiac genomics clinics provider
- Networked cardiac services outreach hub for Cairns and Hinterland and Torres and Cape Hospital and Health Services

4.2 Townsville University Hospital

- Referral hospital for Townsville and North West Hospital and Health Services, serving a population of approximately 295,000
- Public tertiary level invasive cardiac services provided at Townsville University Hospital include:
  - Coronary angiography
  - Percutaneous coronary intervention
  - Structural heart disease intervention
  - Electrophysiology
  - ICD, CRT and pacemaker implantation
  - Cardiothoracic surgery
- Networked cardiac services outreach hub for Townsville and North West Hospital and Health Service

4.3 Mackay Base Hospital

- Referral hospital for Mackay and Whitsunday regions, serving a population of approximately 182,000
- Public tertiary level invasive cardiac services provided at Mackay Base Hospital include:
  - Coronary angiography
  - Percutaneous coronary intervention
  - ICD and pacemaker implants

4.4 Sunshine Coast University Hospital

- Referral hospital for Sunshine Coast and Wide Bay Hospital and Health Services, serving a population of approximately 563,000
- Public tertiary level invasive cardiac services provided at Sunshine Coast University Hospital include:
  - Coronary angiography
  - Percutaneous coronary intervention
  - Structural heart disease intervention
  - Electrophysiology
  - ICD, CRT and pacemaker implantation

4.5 The Prince Charles Hospital

- Referral hospital for Metro North, Wide Bay and Central Queensland Hospital and Health Services, serving a population of approximately 900,000 (shared referral base with the Royal Brisbane & Women's Hospital)
- Public tertiary level invasive cardiac services provided at The Prince Charles Hospital include:
  - Coronary angiography
  - Percutaneous coronary intervention
  - Structural heart disease intervention
  - Electrophysiology
  - ICD, CRT and pacemaker implantation
  - Cardiothoracic surgery
  - Heart/lung transplant unit
  - Adult congenital heart disease unit
- Cardiac genomics clinics provider

4.6 Royal Brisbane & Women's Hospital

- Referral hospital for Metro North, Wide Bay and Central Queensland Hospital and Health Services, serving a population of approximately 900,000 (shared referral base with The Prince Charles Hospital)
- Public tertiary level invasive cardiac services provided at The Royal Brisbane & Women's Hospital include:
  - Coronary angiography
  - Percutaneous coronary intervention
  - Structural heart disease intervention
  - Electrophysiology
  - ICD, CRT and pacemaker implantation
  - Thoracic surgery
- Cardiac genomics clinics provider

4.7 Queensland Children's Hospital

- Children's Health Queensland is a specialist statewide Hospital and Health Service dedicated to caring for children and young people from across Queensland and northern New South Wales
- Public tertiary level invasive cardiac services provided at the Queensland Children's Hospital include:
  - Percutaneous congenital cardiac abnormality diagnostics and intervention
  - Electrophysiology
  - ICD and pacemaker implantation
  - Paediatric cardiac and thoracic surgery

4.8 Princess Alexandra Hospital

- Referral hospital for Metro South and South West Hospital and Health Services, serving a population of approximately 1,000,000
- Public tertiary level invasive cardiac services provided at the Princess Alexandra Hospital include:
  - Coronary angiography
  - Percutaneous coronary intervention
  - Structural heart disease intervention
  - Electrophysiology
  - ICD, CRT and pacemaker implantation
  - Cardiothoracic surgery
- Cardiac genomics clinics provider
- Networked cardiac services outreach hub for Metro South, Darling Downs and South West Hospital and Health Service

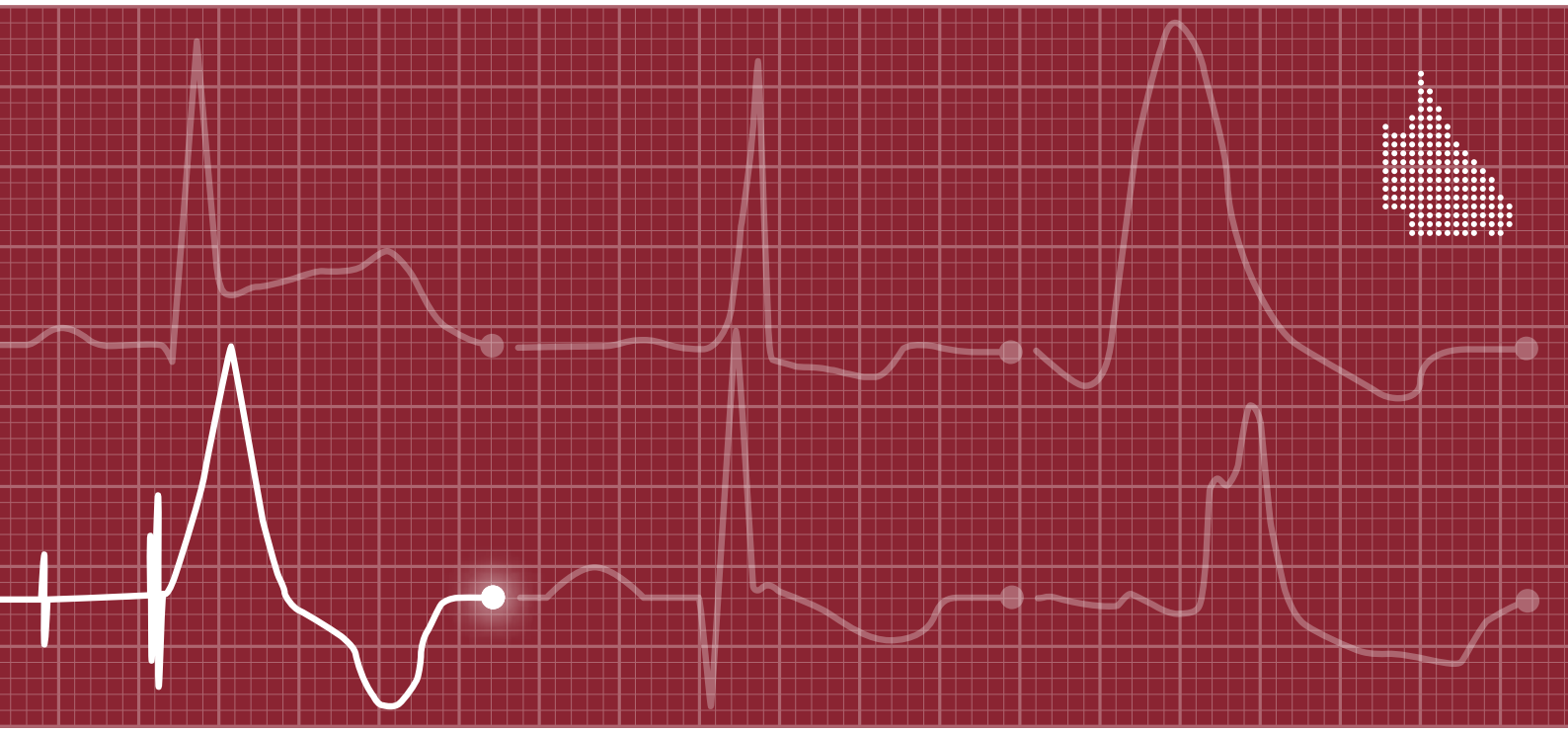
4.9 Toowoomba Hospital

- Referral hospital for Darling Downs Hospital and Health Services, servicing a population of approximately 280,000
- Public invasive cardiac services provided at the Toowoomba Hospital include:
  - Coronary angiography
  - ICD, CRT and pacemaker implantation
- Networked cardiac services outreach hub for Darling Downs Hospital and Health Service

4.10 Gold Coast University Hospital

- Referral Hospital for Gold Coast and northern New South Wales regions, serving a population of approximately 700,000
- Public tertiary level invasive cardiac services provided at the Gold Coast University Hospital include:
  - Coronary angiography
  - Percutaneous coronary intervention
  - Structural heart disease intervention
  - Electrophysiology
  - ICD, CRT and pacemaker implantation
  - Cardiothoracic surgery

Electrophysiology and Pacing Audit



1 Message from the QCOR Electrophysiology and Pacing Committee Chair

I am pleased to present the 2022 Annual Report on behalf of the Electrophysiology and Pacing Committee. It provides key insights into the performance of the nine public sites that contribute data to the statewide registry. Overall procedural volumes continue to increase with over 5,300 cases performed in 2022. Device-related procedures accounted for 68% of the workload.

Device procedures continue to account for the majority of electrophysiology (EP) and pacing procedures across the state. Low-voltage device procedures account for 78% of the case mix. Pleasingly, reported procedural complications in the first 12 months remain low. Lead dislodgement is the most common and has remained static at 2.3% over the last few years. Infection resulting in the removal of the device is by far the most serious complication in the first 12 months after a cardiac device procedure and this was reported at 0.2% for the 2021 patient cohort. This is a truly remarkable result for the state. Access times for device-related procedures remain essentially unchanged from previous years. There is still incomplete data capture for all adverse events following EP and pacing procedures, but as QCOR reporting matures over the next three to five years, it is my hope that we can leverage other data sources to improve the accuracy of these outcomes.

There has been a small reduction in the total number of ablation procedures performed this year which probably reflects the increased demand for atrial fibrillation ablation, which is a considerably more complex and longer procedure. Since 2018 there has been a 55% increase in the number of ablations for atrial fibrillation performed across the state. During the same period, there has been a very modest reduction in the number of simple ablations (i.e. bypass tracts and atrioventricular node re-entry tachycardia) which is consistent with worldwide trends. Coupled with the continued growth in device-related procedures, this continues to place considerable pressure on EP and pacing infrastructure. Median waiting times for atrial fibrillation ablation have increased slightly in 2022, suggesting that at least at some sites, infrastructure constraints are starting to play a role in service delivery. To overcome this, significant investments in both infrastructure (EP labs) and/or emerging technologies like pulsed field ablation will need to be explored more seriously. Importantly, despite the increased complexity of EP procedures, overall reported complication rates remain low at 1.2% with cardiac tamponade rates under 0.5%.

Finally, I would like to thank all the staff for their enormous effort in the collection of the data that makes this report possible. It allows us to provide reassurance to all Queenslanders that across the state, EP and pacing procedures are being delivered to a high standard with a low complication rate.

Dr Russell Denman
Chair
QCOR Electrophysiology and Pacing Committee

2 Key findings

This Electrophysiology and Pacing Audit describes baseline demographics, risk factors, procedures performed and outcomes for 2022.

Key findings include:

- Across Queensland, nine public sites contributed to the registry with all sites contributing a complete year of data.
- Of the 5,305 electrophysiology and pacing cases, 3,611 were device procedures and 1,286 were electrophysiology procedures.
- An increase of 475 device procedures was observed in 2022 over 2018 volumes and an additional 225 electrophysiology procedures were performed.
- Complex electrophysiology has increased as proportion of all electrophysiology cases from 52% in 2018 to 85% in 2022.
- Pulmonary vein isolation for atrial fibrillation cases have increased from 295 in 2018 to 458 in 2022.
- Almost three quarters of patients were aged 60 years or over (72%) with a median age of 70 years.
- The overall proportion of Aboriginal and Torres Strait Islander patients was 3.7%.
- The vast majority of patients (73%) were classed as having an unhealthy body mass index (BMI) of greater than 30 kg/m^2.
- Complex electrophysiology procedures which utilise three-dimensional mapping technology, involve pulmonary vein isolation or ventricular arrhythmias accounted for 85% of this case cohort.
- Atrial flutter, pulmonary vein isolation for atrial fibrillation, and atrioventricular node re-entry tachycardia ablations accounted for 75% of all ablation cases.
- The reported complication rate for all device procedures was 0.6%, while electrophysiology procedures had a 1.2% complication rate.
- There was a 0.2% procedural tamponade rate reported for all cases.
- The statewide median wait time for complex ablation was 88 days with 75% of cases meeting the 180 day benchmark.
- The 12 month device system loss rate due to infection was 0.2%.

3 Participating sites

There were nine public electrophysiology and pacing units spread across metropolitan and regional Queensland. All of these entered data directly into the Queensland Cardiac Outcomes Registry (QCOR) electrophysiology and pacing application.

Patients came from a wide geographical area, with the majority of patients residing on the Eastern Seaboard.

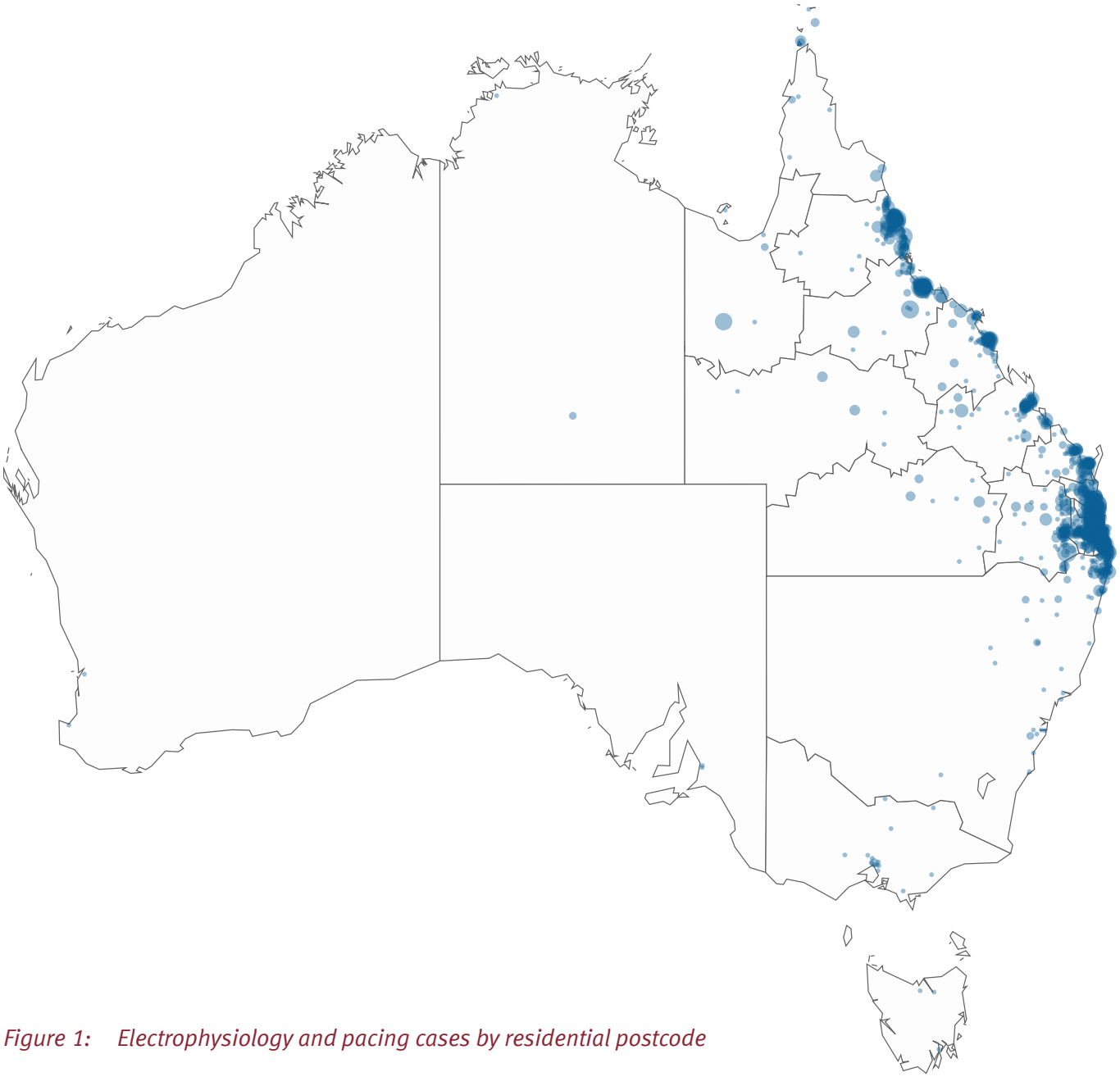


Figure 1: Electrophysiology and pacing cases by residential postcode

Table 1: Participating sites

Acronym	Site name
CH	Cairns Hospital
TUH	Townsville University Hospital
MBH	Mackay Base Hospital
SCUH	Sunshine Coast University Hospital
TPCH	The Prince Charles Hospital
RBWH	Royal Brisbane & Women's Hospital
PAH	Princess Alexandra Hospital
TWH	Toowoomba Hospital
GCUH	Gold Coast University Hospital

4 Case totals

4.1 Case volume

In 2022, were 5,305 electrophysiology and pacing procedures documented using the QCOR electrophysiology and pacing application.

Table 2: Total cases by category

Procedure combination	Category	Total cases n (%)
Cardiac device procedure	Device	3,566 (67.2)
Cardiac device procedure + EP study		22 (0.4)
Cardiac device procedure + other procedure		8 (0.2)
Cardiac device procedure + EP study + ablation		4 (0.1)
Cardiac device procedure + drug challenge		4 (0.1)
Cardiac device procedure + cardioversion		3 (0.1)
Cardiac device procedure + pericardiocentesis		3 (0.1)
Cardiac device procedure + EP study + cardioversion		1 (<0.1)
EP study + ablation	EP	1,009 (19.0)
EP study		139 (2.6)
Ablation		94 (1.8)
EP study + ablation + cardioversion		33 (0.6)
EP study + ablation + other procedure		3 (0.1)
EP study + ablation + cardioversion + other procedure		2 (<0.1)
EP study + cardioversion		2 (<0.1)
EP study + drug challenge		2 (<0.1)
EP study + other procedure		2 (<0.1)
Cardioversion	Other	352 (6.6)
Drug challenge		33 (0.6)
Other procedure		17 (0.3)
Pericardiocentesis		5 (0.1)
Cardioversion + other procedure		1 (<0.1)
ALL		**5,305 (100.0)**

4.2 Cases by category

The majority of cases performed were cardiac device procedures accounting for over two thirds (68%) of documented procedures. The rest of the cases were electrophysiology and ablation procedures (24%), with the remainder categorised as 'other' procedures (8%).

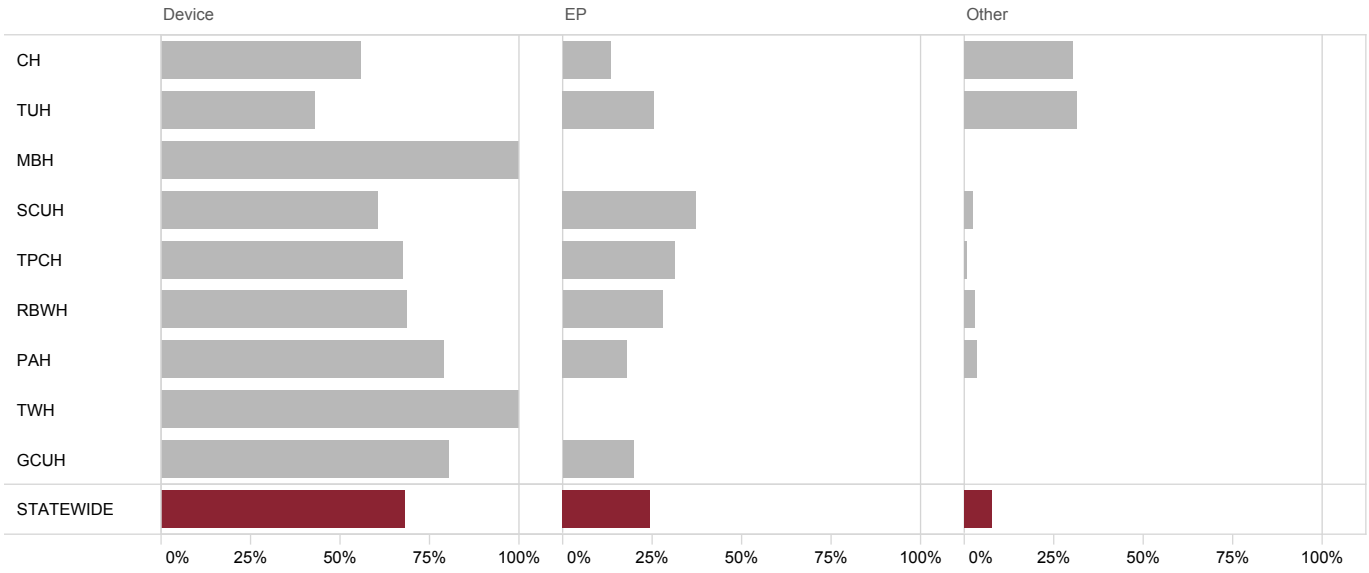


Figure 2: Proportion of cases by site and category

Table 3: Cases by case category

Site	Device n (%)	EP n (%)	Other n (%)	Total n (%)
CH	312 (8.6)	75 (5.8)	169 (41.4)	556 (10.5)
TUH	224 (6.2)	132 (10.3)	164 (40.2)	520 (9.8)
MBH	142 (3.9)	–	–	142 (2.7)
SCUH	397 (11.0)	243 (18.9)	15 (3.7)	655 (12.3)
TPCH	805 (22.3)	375 (29.2)	10 (2.5)	1,190 (22.4)
RBWH	451 (12.5)	184 (14.3)	20 (4.9)	655 (12.3)
PAH	737 (20.4)	166 (12.9)	30 (7.4)	933 (17.6)
TWH	94 (2.6)	–	–	94 (1.8)
GCUH	449 (12.4)	111 (8.6)	–	560 (10.6)
STATEWIDE	**3,611 (68.1)**	**1,286 (24.2)**	**408 (7.7)**	**5,305 (100.0)**

4.3 Yearly case distribution

Yearly growth has been noted over the years since QCOR reporting has begun and this can now be better understood with a larger dataset. It is evident that since 2020 that the volume of cardiac device procedures and electrophysiology procedures has increased. The reasons for these increases are likely multifactorial and include expansion of services at some sites and new services offered at others.

The complexity of electrophysiology procedures has a large bearing on the time taken and resources used to perform these procedures. A notable increase in the volume and proportion of complex electrophysiology procedures can be seen over time. Again, there are multiple underlying contributing factors to this increase and that this increase in ability to treat complex cases underlines the quality services in place.

An increase in the proportion and volume of pulmonary vein isolation/atrial fibrillation ablation has been observed over the past three years. It is recognised that there is a significant demand for these services.

Wait times for procedures has varied over the past three years. Of particular note is a recent increase in wait time for elective pacemaker procedures. Also, wait times for complex ablation procedures has increased from 2021 to 2022 (78 days to 88 days).

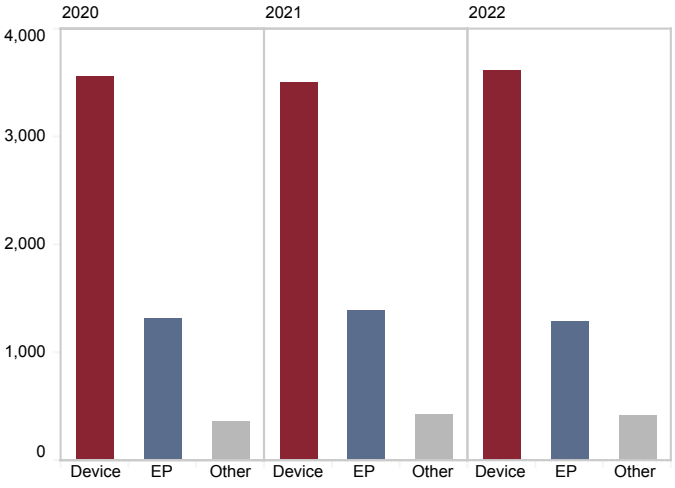


Figure 3: Proportion of cases by category, 2020–2022

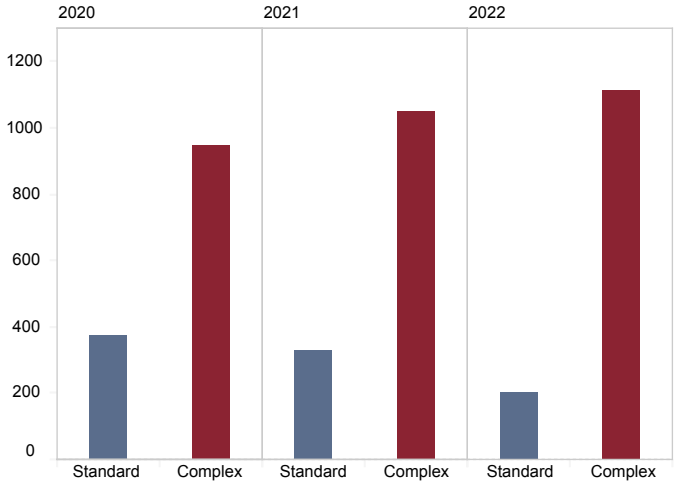


Figure 4: Yearly case volume by electrophysiology procedural complexity, 2020–2022

Table 4: Yearly case volume by case category, 2020–2022

Case category	2020 n (%)	2021 n (%)	2022 n (%)
Device	3,551	3,500	3,611
EP	1,319	1,379	1,286
Other	364	424	408

Table 5: Yearly case volume by electrophysiology procedural complexity, 2020–2022

Electrophysiology procedure complexity	2020 n (%)	2021 n (%)	2022 n (%)
Standard	374 (28.3)	327 (23.7)	201 (15.3)
Complex	946 (71.7)	1,052 (76.3)	1,113 (84.7)

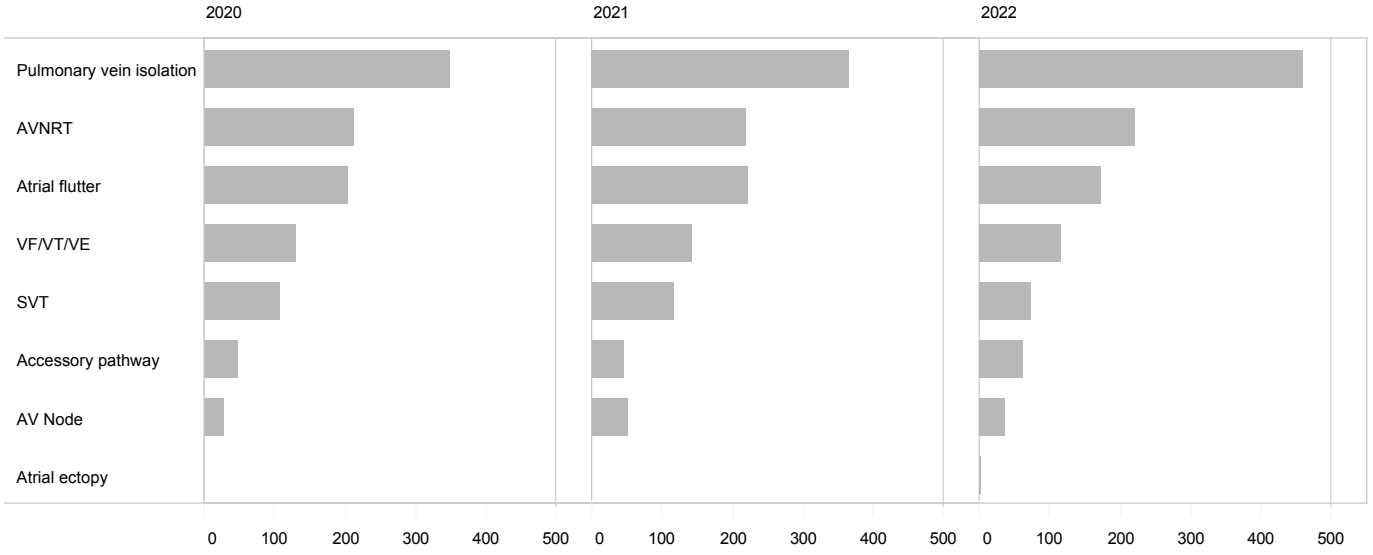


Figure 5: Number of yearly ablation cases by arrhythmia type, 2020–2022

Table 6: Yearly ablation cases by arrhythmia type, 2020–2022

Ablation type	2020 n	2021 n	2022 n
Pulmonary vein isolation	349	367	458
AVNRT	214	219	222
Atrial flutter	205	221	173
Ventricular arrhythmia/ectopy	129	141	116
Supraventricular tachycardia	107	115	63
Accessory pathway	49	45	44
AV node	27	52	37
Atrial ectopy	0	0	1

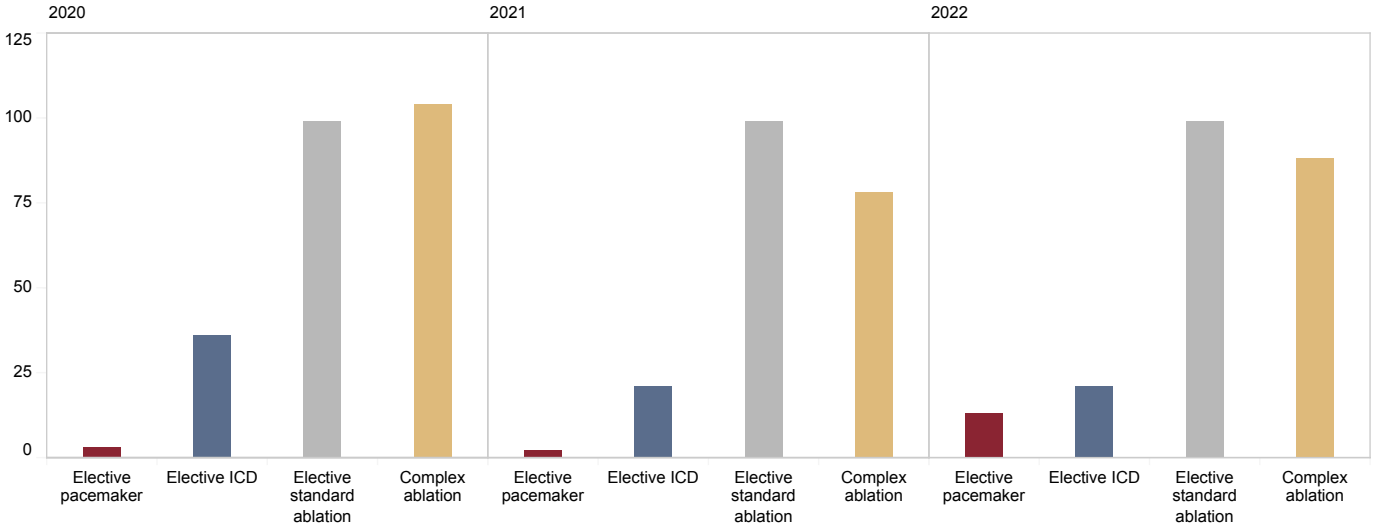


Figure 6: Median wait time analysis by procedure category, 2020–2022

Table 7: Median wait time analysis by procedure category, 2020–2022

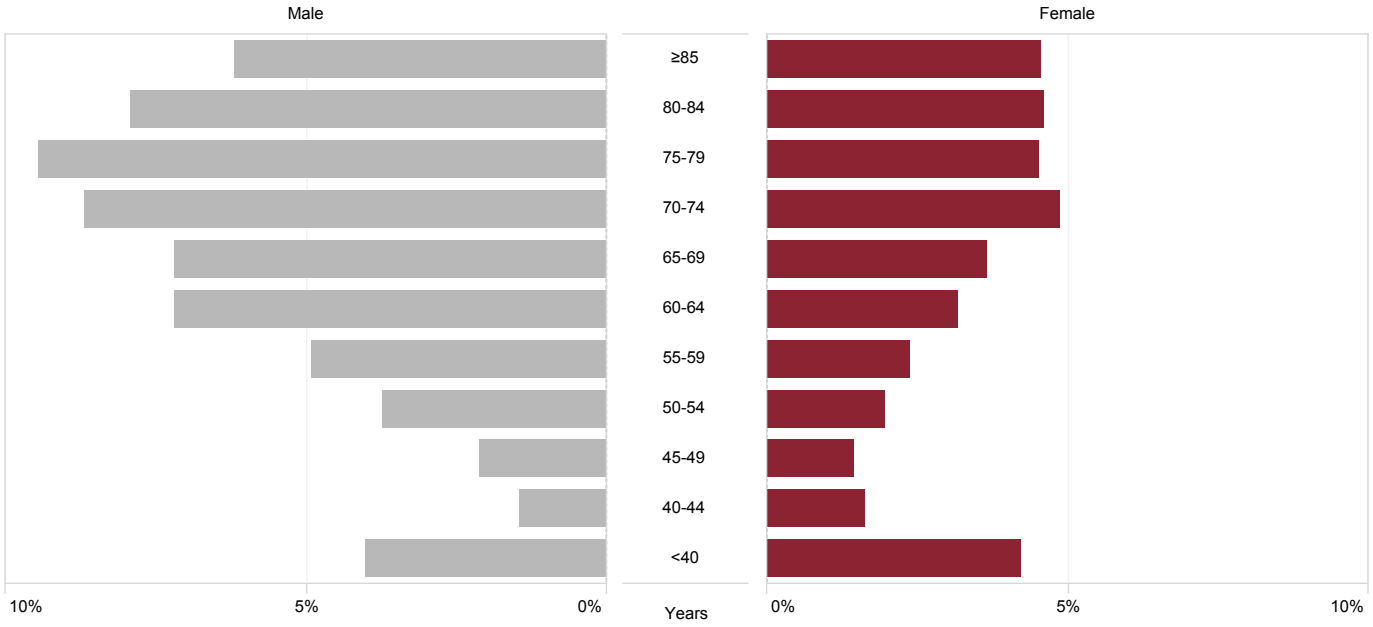
Procedure category	2020 days	2021 days	2022 days
Elective PPM	3	2	13
Elective ICD	36	21	21
Elective standard ablation	99	99	99
Complex ablation	104	78	88

5 Patient characteristics

5.1 Age and gender

Age is an important risk factor for developing cardiovascular disease with the majority of patients in this cohort aged 60 years and above (72%). The median age of the overall electrophysiology and pacing patient cohort was 70 years of age. Males between the age of 75 and 79 comprised the largest proportion by age and gender.

The median age of males and females was 70 years. Median patient age differed considerably by procedure category with the median age of patients undergoing electrophysiology procedures being 59 years compared to 74 years for cardiac device procedures.



% of total (n=5,305)

Figure 7: Proportion of all cases by age group and gender

Table 8: Median age by gender and case category

	Total cases n	Male years	Female years	ALL years
Device	3,611	74	74	74
EP	1,286	60	56	59
Other	408	64	67	64
Total	**5,305**	**70**	**70**	**70**

Overall, 63% of patients were male with a similar distribution across all procedure categories. The largest proportion of females was represented in the electrophysiology category (42%).

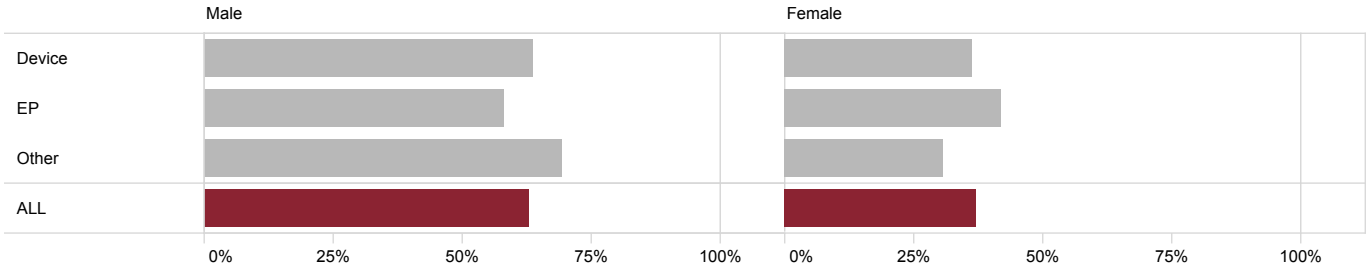


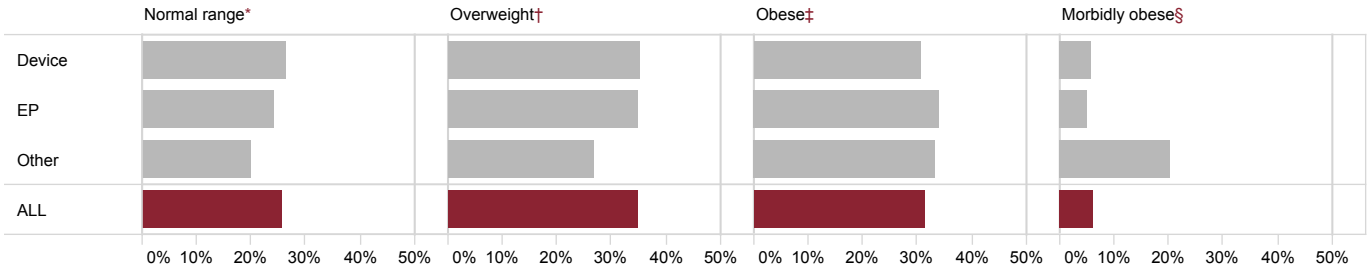
Figure 8: Proportion of cases by gender and category

Table 9: Proportion of cases by gender and category

	Total cases n	Male n (%)	Female n (%)
Device	3,611	2,304 (63.8)	1,307 (36.2)
EP	1,286	749 (58.2)	537 (41.8)
Other	408	283 (69.4)	125 (30.6)
ALL	**5,305**	**3,336 (62.9)**	**1,969 (37.1)**

5.2 Body mass index

Patients classed as having a body mass index (BMI) category of overweight (35%), obese (32%) or morbidly obese (6%) represented almost three quarters of all electrophysiology and pacing patients. Patients classed as underweight represented less than 2% of all cases.



* BMI 18.5–24.9 kg/m²

† BMI 25.0–29.9 kg/m²

‡ BMI 30.0–39.9 kg/m²

§ BMI ≥40.0 kg/m²

Figure 9: Proportion of cases by BMI and case category

5.3 Aboriginal and Torres Strait Islander status

Overall, the proportion of identified Aboriginal and Torres Strait Islander patients undergoing electrophysiology and pacing procedures was 3.7%. This correlates with the estimated proportion of Aboriginal and Torres Strait Islander peoples within Queensland (4.6%).[2] There was large variation between units, with the North Queensland and western Queensland sites seeing a larger proportion of Aboriginal and Torres Strait Islander patients.

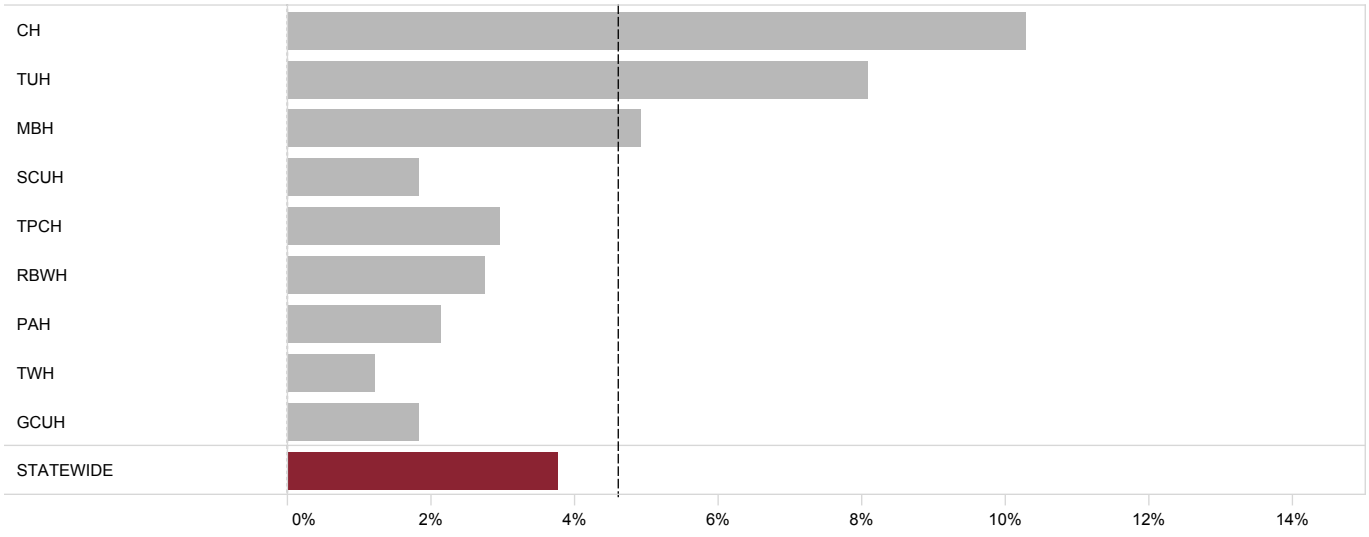


Figure 10: Proportion of cases by identified Aboriginal and Torres Strait Islander status and site

5.4 Device procedures

Case types and procedure combinations varied across the state and is driven primarily by services offered at individual sites. Single and dual chamber pacemaker implants/generator changes accounted for the majority of cases. There were eight sites across the state offering biventricular (BiV) pacemaker/ implantable cardioverter defibrillator insertion, with seven sites providing leadless pacemaker implants.

Table 10: Cardiac device case types by site

Procedure type	CH n	TUH n	MBH n	SCUH n	TPCH n	RBWH n	PAH n	TWH n	GCUH n
Pacemaker procedure*	157	86	85	223	392	207	470	60	261
ICD procedure*	36	42	7	42	116	87	104	6	75
Loop recorder implant/explant	76	18	49	58	76	93	40	14	43
BiV ICD procedure*	16	42	–	27	80	37	53	9	25
BiV pacemaker procedure*	8	12	–	25	25	8	14	2	10
Device explant	1	2	1	3	70	3	7	1	6
Lead revision/replacement/pocket revision	8	7	–	13	24	8	19	1	12
Temporary pacing system	6	–	–	6	7	5	24	–	6
Leadless pacemaker implant	4	15	–	–	13	3	6	1	11
Insertion of epicardial lead	–	–	–	–	2	–	–	–	–
ALL	**312**	**224**	**142**	**397**	**805**	**451**	**737**	**94**	**449**

* Implant/generator change/upgrade

5.5 Electrophysiology studies/ablations

Electrophysiology studies involving radiofrequency ablation were the most common individual procedure performed across all sites, ranging from 46% of case volume at Cairns Hospital to 87% at PAH.

Table 11: Electrophysiology study/ablation types by site

Site	Procedure type	Complex EP n	Standard EP n	Case n (%)
CH	Radiofrequency ablation	18	18	36 (46.2)
	Cryotherapy ablation	27	–	27 (34.6)
	Electrophysiology study	8	6	14 (17.9)
	Radiofrequency and cryotherapy ablation	1	–	1 (1.3)
TUH	Radiofrequency ablation	94	5	99 (74.4)
	Electrophysiology study	17	3	20 (15.0)
	Cryotherapy ablation	13	–	13 (9.8)
	Radiofrequency and cryotherapy ablation	1	–	1 (0.8)
SCUH	Radiofrequency ablation	149	7	156 (63.7)
	Cryotherapy ablation	49	–	49 (20.0)
	Electrophysiology study	26	12	38 (15.5)
	Radiofrequency and cryotherapy ablation	2	–	2 (0.8)
TPCH	Radiofrequency ablation	203	43	246 (64.2)
	Cryotherapy ablation	75	–	75 (19.6)
	Electrophysiology study	17	20	37 (9.7)
	Electrophysiology study and pulsed field ablation	22	–	22 (5.7)
	Radiofrequency and cryotherapy ablation	2	–	2 (0.5)
	Electrophysiology study and drug challenge	–	1	1 (0.3)
RBWH	Radiofrequency ablation	135	–	135 (71.4)
	Cryotherapy ablation	25	–	25 (13.3)
	Electrophysiology study	17	5	22 (11.6)
	Radiofrequency and cryotherapy ablation	6	–	6 (3.2)
	Electrophysiology study and drug challenge	1	–	1 (0.5)
PAH	Radiofrequency ablation	129	24	153 (87.4)
	Electrophysiology study	12	10	22 (12.6)
GCUH	Radiofrequency ablation	52	38	90 (81.1)
	Electrophysiology study	5	9	14 (12.6)
	Cryotherapy ablation	7	–	7 (6.3)
STATEWIDE		**1,113**	**201**	**1,314**

5.5.1 Ablation type/arrhythmia

The most frequently ablated clinical arrhythmia was atrial fibrillation (pulmonary vein isolation), which accounted for 40% of ablations across all sites. This was followed by atrioventricular nodal re-entry tachycardias (AVNRT) (19%) and atrial flutter (15%).

Age and gender varied depending on the arrythmia ablated. Patients undergoing accessory pathway ablation had a lower median age than those who underwent pulmonary vein isolation or AV node ablation. Furthermore, almost two thirds of patients undergoing pulmonary vein isolation were male which contrasts with the AVNRT cohort which is predominately a female group.

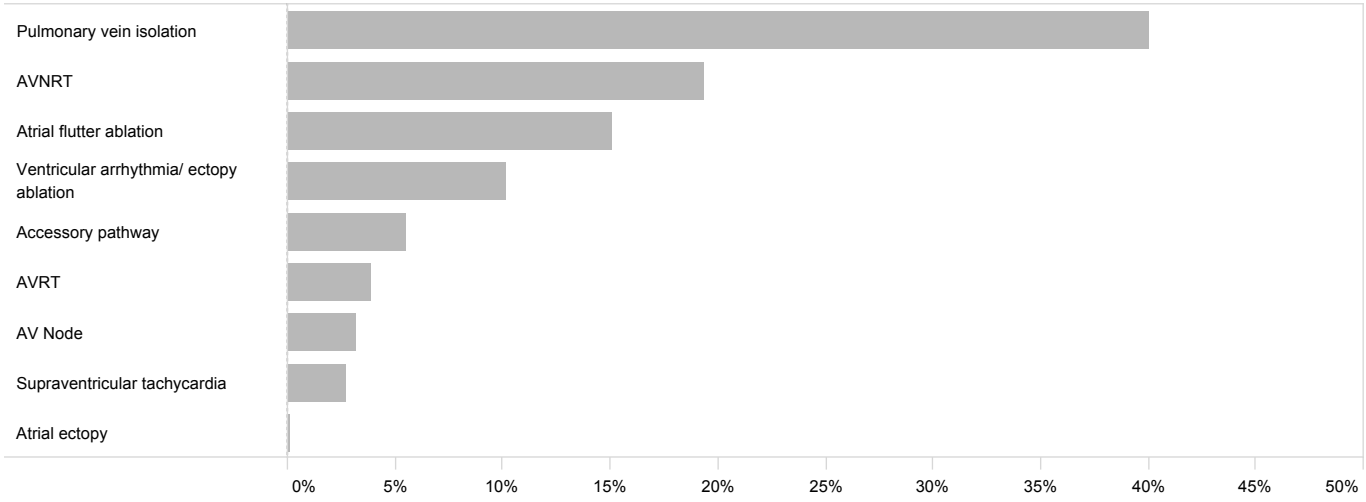


Figure 11: Proportion of arrhythmias ablated

Table 12: Median age and gender by ablation type

Ablation type	Gender	Total cases n (%)	Median age years
Pulmonary vein isolation	Male	301 (65.7)	61
	Female	157 (34.3)	64
AVNRT	Male	84 (37.8)	58
	Female	138 (62.2)	47
Atrial flutter	Male	135 (78.0)	66
	Female	38 (22.0)	68
Ventricular arrhythmia/ectopy	Male	72 (62.1)	63
	Female	44 (37.9)	53
Accessory pathway	Male	32 (50.8)	32
	Female	31 (49.2)	31
AVRT	Male	25 (56.8)	37
	Female	19 (43.2)	34
AV node	Male	13 (35.1)	66
	Female	24 (64.9)	76
Supraventricular tachycardia	Male	14 (45.2)	36
	Female	17 (54.8)	55
Atrial ectopy	Female	1 (100.0)	22
ALL		**1,145 (100.0)**	**59**

Table 13: Arrhythmia type by site

Site	Ablation type	Count n (%)
CH	Pulmonary vein isolation	35 (3.1)
	AVNRT	15 (1.3)
	Atrial flutter ablation	4 (0.3)
	AVRT	3 (0.3)
	AV node	3 (0.3)
	Ventricular arrhythmia/ectopy ablation	2 (0.2)
	Supraventricular tachycardia	2 (0.2)
TUH	Pulmonary vein isolation	40 (3.5)
	AVNRT	26 (2.3)
	Atrial flutter ablation	18 (1.6)
	Ventricular arrhythmia/ectopy ablation	14 (1.2)
	Accessory pathway	8 (0.7)
	AV node	3 (0.3)
	Supraventricular tachycardia	3 (0.3)
	AVRT	1 (0.1)
SCUH	Pulmonary vein isolation	78 (6.8)
	Atrial flutter ablation	45 (3.9)
	AVNRT	35 (3.1)
	AV node	16 (1.4)
	Supraventricular tachycardia	11 (1.0)
	Ventricular arrhythmia/ectopy ablation	9 (0.8)
	Accessory pathway	9 (0.8)
	AVRT	4 (0.3)
TPCH	Pulmonary vein isolation	149 (13.0)
	AVNRT	59 (5.2)
	Ventricular arrhythmia/ectopy ablation	52 (4.5)
	Atrial flutter ablation	40 (3.5)
	Accessory pathway	24 (2.1)
	AVRT	10 (0.9)
	Supraventricular tachycardia	8 (0.7)
	AV node	3 (0.3)
RBWH	AVNRT	47 (4.1)
	Pulmonary vein isolation	45 (3.9)
	Atrial flutter ablation	32 (2.8)
	Ventricular arrhythmia/ectopy ablation	13 (1.1)
	AVRT	13 (1.1)
	Accessory pathway	9 (0.8)
	AV node	4 (0.3)
	Supraventricular tachycardia	2 (0.2)
	Atrial ectopy	1 (0.1)
PAH	Pulmonary vein isolation	70 (6.1)
	AVNRT	25 (2.2)
	Ventricular arrhythmia/ectopy ablation	20 (1.7)
	Atrial flutter ablation	15 (1.3)
	Accessory pathway	11 (1.0)
	AVRT	6 (0.5)
	AV node	3 (0.3)
	Supraventricular tachycardia	3 (0.3)
GCUH	Pulmonary vein isolation	41 (3.6)
	AVNRT	15 (1.3)
	Atrial flutter ablation	19 (1.7)
	AVRT	7 (0.6)
	Ventricular arrhythmia/ectopy ablation	6 (0.5)
	AV node	5 (0.4)
	Accessory pathway	2 (0.2)
	Supraventricular tachycardia	2 (0.2)
STATEWIDE		**1,145 (100.0)**

5.6 Other procedures

The most common other procedure was cardioversion (87%). Variations in clinical practice across sites can be observed here with not all cardioversions performed being carried out in the electrophysiology laboratory environment or documented using the QCOR module.

Table 14: Other procedures

	Total n	Cardioversion n (%)	Drug challenge n (%)	Other procedure n (%)	Pericardiocentesis n (%)
CH	169	160 (94.7)	8 (4.7)	1 (0.6)	–
TUH	164	161 (98.2)	–	3 (1.8)	–
SCUH	15	–	11 (73.3)	2 (13.3)	2 (13.3)
TPCH	10	–	1 (10.0)	6 (60.0)	3 (30.0)
RBWH	20	6 (30.0)	10 (50.0)	4 (20.0)	–
PAH	30	26 (86.7)	3 (10.0)	1 (3.3)	–
STATEWIDE	**408**	**353 (86.5)**	**33 (8.1)**	**17 (4.2)**	**5 (1.2)**

6 Procedural complications

Complications are a well-known, but rare outcome following any medical procedure or intervention. Some complications are more severe than others with a wide range of management options. The summary of complications below denotes events observed during and post procedure. The QCOR electrophysiology application is predominantly utilised for procedural detail reporting and as such, documentation of peri and post-procedural complications is the responsibility of site practitioners.

The complication rates for procedures are reflected as the proportion of the total number of device and electrophysiology procedures respectively. On some rare occasions, the development of an intraprocedural complication such as coronary sinus dissection necessitated a change of procedure type from BiV implant/upgrade to a non BiV device procedure. In these instances, complications are reported against the final procedure type.

The overall device procedure complication rate was 0.6%, while electrophysiology procedures had a 1.2% complication rate.

Table 15: Cardiac device procedure complications

Procedure type	Complication	Total n (%)
Pacemaker implant/generator change	Pericardial effusion without tamponade	2 (0.1)
	Lead complication	1 (0.1)
	Pneumothorax	1 (0.1)
	Conduction block	1 (0.1)
	Haematoma	1 (0.1)
	Drug reaction	1 (0.1)
	Other	1 (0.1)
ICD implant/generator change/upgrade	Coronary sinus dissection	3 (0.6)
BiV ICD implant/generator change/upgrade	Coronary sinus dissection	3 (1.0)
	Pericardial effusion without tamponade	2 (0.7)
	Cardiac arrest	1 (0.3)
BiV pacemaker implant/generator change/upgrade	Coronary sinus dissection	2 (1.9)
	Pericardial effusion with tamponade	1 (1.0)
	Vascular injury	1 (1.0)
Device explant	Pericardial effusion with tamponade	1 (1.1)
Temporary pacing system	Conduction block	1 (1.9)
ALL		**23 (0.6)**

Table 16: Electrophysiology procedure complications by study type and complexity

Procedure type	Complexity	Complication	Total n (%)
Electrophysiology study	Complex EP	Pericardial effusion without tamponade	2 (2.0)
Radiofrequency ablation	Standard EP	Conduction block	1 (0.7)
Radiofrequency ablation	Complex EP	Pericardial effusion with tamponade	3 (0.4)
		Haematoma	2 (0.3)
		Drug reaction	1 (0.1)
		Vascular injury	1 (0.1)
Cryotherapy ablation	Complex EP	Phrenic nerve injury	3 (1.5)
		Pericardial effusion with tamponade	1 (0.5)
		Bleeding requiring transfusion	1 (0.5)
Radiofrequency and cryotherapy ablation	Complex EP	Haemodynamic instability	1 (0.1)
ALL			**16 (1.2)**

7 Clinical indicators

Clinical indicators are important measures of the clinical management and outcomes of patient care. An indicator that is clinically relevant and useful should highlight specific issues that may require attention or signal areas for improvement. Rate-based indicators typically identify the rate of occurrence of an event. There is emerging recognition that a capacity to evaluate and report on quality is a critical building block for system-wide improvement of healthcare delivery and patient outcomes.

The quality and safety indicators which have been nominated by the QCOR Electrophysiology and Pacing Committee are outlined below.

Table 17: Electrophysiology and pacing clinical indicators

Clinical indicator	Description
1	Waiting time from booking date to procedure by case category
2	Procedural tamponade rates
3	Reintervention within one year of procedure date due to cardiac device lead dislodgement
4	Rehospitalisation within one year of procedure due to infection resulting in loss of the device
5	12 month all-cause mortality for cardiac device procedures

7.1 Waiting time from referral date to procedure by case category

Waiting times for clinical interventions and investigations are an important metric for monitoring service provision and identifying potential unmet need. This clinical indicator examines the waiting time for various cardiac device procedure types. Specifically, the median wait time from the date the procedure was referred to the date of the case. For the purpose of this indicator, procedures classed as elective (not performed as part of an acute admission) are examined.

The adverse consequences of treatment delay are well known and include deterioration in the condition for which treatment is awaited, the loss of utility from delay (especially if treatment can relieve significant disability), a rise in the costs of total treatment, accumulation of any loss of income from work, and, as an extreme outcome, death.

An important distinction exists between the waiting time of the patients booked for their procedure and those who are referred for specialist opinion and subsequent treatment. As this indicator examines the wait time from booking date to case date, it is reflective of system performance that is specifically focused on electrophysiology and pacing demand and need.

7.1.1 Elective pacemaker

Examination of the waiting time for elective pacemaker procedures is below. Of the 325 cases with complete data, the median wait time was 13 days.

Table 18: Elective pacemaker wait time analysis

	Total cases n	Total cases analysed n	Median wait time days	Interquartile range days
STATEWIDE	403	325	13	0–41

7.1.2 Elective ICD wait time and proportion within 28 days

This analysis examines the waiting time for elective ICD procedures and the proportion adhering to the benchmark of 28 days or less.

Table 19: Elective ICD wait time analysis

	Total cases n	Total cases analysed n	Median wait time days	Interquartile range days	Met target %
STATEWIDE	197	151	21	0–55	59.6

7.1.3 Standard ablation

Waiting times for standard ablation procedures are presented below. Of the 93 cases eligible for analysis, the median wait time was 99 days.

Table 20: Elective standard ablation wait time analysis

	Total cases n	Total cases analysed n	Median wait time days	Interquartile range days
STATEWIDE	100	93	99	21–198

7.1.4 Complex ablation with proportion within 180 days or less

Complex ablations are defined as cases using three-dimensional mapping technology or involving ventricular arrhythmia or pulmonary vein isolation. This indicator examines the waiting time for these procedures and the proportion adhering to the benchmark of 180 days or less.

A median wait time of 78 days was observed, with a large interquartile range demonstrating there are a number of patients with considerably long waits.

Table 21: Elective complex ablation wait time analysis

	Total cases n	Total cases analysed n	Median wait time days	Interquartile range days	Met target %
STATEWIDE	869	662	88	29–180	75.1

7.2 Procedural tamponade rates

Cardiac tamponade is a known complication of cardiac device and electrophysiology procedures. This indicator examines the rate of procedural pericardial tamponade in these procedure categories. As pericardial tamponade is a clinical diagnosis, this indicator explicitly reports those patients with this specific diagnosis and does not include those patients with the diagnosis or finding of pericardial effusion.

Table 22: Procedural tamponade analysis

Procedure category	Total cases analysed n	Procedural tamponade observed n	Procedural tamponade rate %
Device	3,611	4	0.1
EP	1,286	4	0.3
ALL	**4,897**	**8**	**0.2**

7.3 Reintervention within one year of procedure date due to cardiac device lead dislodgement

This indicator identifies the number of cases where one or more lead dislodgements were observed within one year of lead insertion. The cases included in this indicator were all new device implants or upgrades where a new lead/s had been implanted and a lead revision or replacement was subsequently required due to dislodgement. Index implant procedures were cases performed within Queensland Health implanting facilities in the 2021 calendar year.

The analysis found 51 cases (2.3%) where reintervention was required within 12 months of the index procedure. There were 32 right ventricular lead dislodgements, 22 right atrial and 4 left ventricular. More than one lead dislodgement was observed in some cases.

These results compare similarly with international cohorts, where observed dislodgement rates for pacemaker system implants vary from 1.0 to 2.7%.[49]

Table 23: Reintervention due to lead dislodgement analysis

	Cases analysed n	12 month lead dislodgement n	12 month lead dislodgement rate %	Median time to dislodgement days	Interquartile range days
Eligible 2021 device cases	2,176	51	2.3	5	1–25

7.4 Rehospitalisation within one year of procedure due to infection resulting in loss of the device system

One of the most serious long-term complications related to mortality and morbidity for patients with cardiac implantable electronic devices is infection. Complete removal of all hardware is the recommended treatment for patients with established device infection because infection relapse rates due to retained hardware are high. For this indicator, implant cases where new devices or leads were implanted form the cohort.

A system loss rate of 0.2% was observed at 12 months post procedure. This is reassuring when compared to international literature which suggests infection rates necessitating explant of approximately 2.4%.[50]

Table 24: Rehospitalisation with device loss analysis

	Cases analysed n	12 month system loss due to infection n	12 month system loss rate %
Eligible 2021 device cases	2,655	6	0.2

7.5 12 month all-cause mortality for cardiac device procedures

The all-cause unadjusted mortality rate following cardiac device procedure was 6.5%. To allow complete follow up over 12 months, these outcomes are reported for the previous 2021 patient cohort.

When interpreting this figure, it is important to note patients undergoing cardiac device procedures are often of advanced age (median age 81 years). In addition, many patients have advanced symptomology such as advanced heart failure, or most likely suffering from multiple underlying risk factors or comorbidities.

Table 25: 12 month all-cause unadjusted mortality for cardiac device procedures

	Cases analysed n	12 month mortality observed n	12 month mortality rate %	Median age at procedure years	Interquartile range years
Any BiV procedure	420	25	6.0	76	68–79
ICD procedure	551	23	4.2	68	64–77
Pacemaker procedures	1,889	139	7.4	84	77–89
ALL 2021 device cases	**2,860**	**187**	**6.5**	**81**	**75–87**

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Electrophysiology and Pacing Audit

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Glossary

6MWT	Six Minute Walk Test
ACC	Aristotle Comprehensive Complexity
ACEI	Angiotensin Converting Enzyme Inhibitor
ACP	Advanced Care Paramedic
ACS	Acute Coronary Syndromes
AEP	Accredited Exercise Physiologist
ANZCORS	Australia and New Zealand Congenital Outcomes Registry for Surgery
ANZSCTS	Australian and New Zealand Society of Cardiac and Thoracic Surgeons
AQoL	Assessment of Quality of Life
ARB	Angiotensin II Receptor Blocker
ARNI	Angiotensin Receptor-Neprilysin Inhibitors
ASD	Atrial Septal Defect
AV	Atrioventricular
AVNRT	Atrioventricular Nodal Re-entry Tachycardia
AVRT	Atrioventricular Re-entrant Tachycardia
BCIS	British Cardiovascular Intervention Society
BiV	Biventricular
BMI	Body Mass Index
BNH	Bundaberg Hospital
BSSLTx	Bilateral Sequential Single Lung Transplant
CABG	Coronary Artery Bypass Graft
CAD	Coronary Artery Disease
CBH	Caboolture Hospital
CCL	Cardiac Catheter Laboratory
CCP	Critical Care Paramedic
CH	Cairns Hospital
CI	Clinical Indicator
CIED	Cardiac Implantable Electronic Device
CNC	Clinical Nurse Consultant
COVID-19	Coronavirus disease 2019
CPB	Cardiopulmonary Bypass
CR	Cardiac Rehabilitation
CRT	Cardiac Resynchronisation Therapy
CS	Cardiac Surgery
CVA	Cerebrovascular Accident
CVD	Cardiovascular Disease
DAOH	Days Alive and Out of Hospital
DOSA	Day of Surgery Admission
DSWI	Deep Sternal Wound Infection
ECG	12 lead Electrocardiograph
ECMO	Extracorporeal membrane oxygenation
ED	Emergency Department
eGFR	Estimated Glomerular Filtration Rate
EP	Electrophysiology
EuroSCORE	European System for Cardiac Operative Risk Evaluation
EWMA	Exponentially Weighted Moving Average
FdECG	First Diagnostic Electrocardiograph
FMC	First Medical Contact
FTR	Failure to Rescue
GAD	Generalised Anxiety Disorder
GC	Genetic Counsellor
GCCH	Gold Coast Community Health
GCS	Glasgow Coma Scale
GCUH	Gold Coast University Hospital
GLH	Gladstone Hospital
GP	General Practitioner
GYH	Gympie Hospital
HB	Haemoglobin
HBH	Hervey Bay Hospital (includes Maryborough)
HCC	Health Contact Centre
HF	Heart Failure
HFpEF	Heart Failure with Preserved Ejection Fraction
HFrEF	Heart Failure with Reduced Ejection Fraction
HFSS	Heart Failure Support Service
HHS	Hospital and Health Service
HOCM	Hypertrophic Obstructive Cardiomyopathy
IC	Interventional Cardiology
ICD	Implantable Cardioverter Defibrillator
IE	Infective Endocarditis
IER	Index of Economic Resources
IEO	Index of Education and Occupation
IHD	Ischaemic Heart Disease
IHT	Inter hospital Transfer
IPCH	Ipswich Community Health
IQR	Inter Quartile Range
IRSAD	Index of Relative Socioeconomic Advantage and Disadvantage
IRSD	Index of Relative Socioeconomic Disadvantage
IVDU	Intravenous Drug Use
LAA	Left Atrial Appendage
LAD	Left Anterior Descending Artery
LCX	Circumflex Artery
LGH	Logan Hospital
LMCA	Left Main Coronary Artery
LOS	Length Of Stay
LV	Left Ventricle

LVEF	Left Ventricular Ejection Fraction
LVOT	Left Ventricular Outflow Tract
MDT	Multidisciplinary Team Meeting
MBH	Mackay Base Hospital
MI	Myocardial Infarction
MIH	Mt Isa Hospital
MKH	Mackay Base Hospital
MRA	Mineralocorticoid Receptor Antagonists
MSSA	Methicillin Susceptible Staphylococcus Aureus
MTHB	Mater Adult Hospital, Brisbane
NCDR	The National Cardiovascular Data Registry
NCS	Networked Cardiac Services
NN	Nurse Navigator
NP	Nurse Practitioner
NRBC	Non-Red Blood Cells
NSTEMI	Non-ST Elevation Myocardial Infarction
OOHCA	Out of Hospital Cardiac Arrest
ORIF	Open Reduction Internal Fixation
PAH	Princess Alexandra Hospital
PCI	Percutaneous Coronary Intervention
PDA	Patent Ductus Arteriosus
PFO	Patent Foramen Ovale
PHQ	Patient Health Questionnaire
PICU	Paediatric intensive care unit
PPM	Permanent Pacemaker
PROMS	Patient Reported Outcome Measures
QAC	Quality Assurance Committee
QAS	Queensland Ambulance Service
QCCN	Queensland Cardiac Clinical Network
QCGP	Queensland Cardiology Genomics Project
QCOR	Queensland Cardiac Outcomes Registry
QEII	Queen Elizabeth II Jubilee Hospital
QHAPDC	Queensland Hospital Admitted Patient Data Collection
QPCR	Queensland Paediatric Cardiac Research
RBC	Red Blood Cells
RBWH	Royal Brisbane & Women's Hospital
RCA	Right Coronary Artery
RDH	Redcliffe Hospital
RHD	Rheumatic Heart Disease
RKH	Rockhampton Hospital
RLH	Redland Hospital
RVOT	Right Ventricular Outflow Tract
SAVR	Surgical Aortic Valve Replacement
SCCIU	Statewide Cardiac Clinical Informatics Unit
SCUH	Sunshine Coast University Hospital
SEIFA	Socioeconomic Indexes for Areas
SGLT2	Sodium-Glucose Cotransporter-2
SHD	Structural Heart Disease
SIR	Standardised Incidence Ratio
SMoCC	Self Management of Chronic Conditions
STEMI	ST-Elevation Myocardial Infarction
STS	Society of Thoracic Surgery
SVT	Supraventricular Tachycardia
TAVR	Transcatheter Aortic Valve Replacement
TIMI	Thrombolysis in Myocardial Infarction
TMVR	Transcatheter Mitral Valve Replacement
TNM	Tumour, Lymph Node, Metastases
TPCH	The Prince Charles Hospital
TPVR	Transcatheter Pulmonary Valve Replacement
TUH	Townsville University Hospital
TWH	Toowoomba Hospital
TTE	Transthoracic echocardiogram
VAD	Ventricular Assist Device
VATS	Video Assisted Thoracic Surgery
VCOR	Victorian Cardiac Outcomes Registry
VF	Ventricular Fibrillation
VSD	Ventricular Septal Defect

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