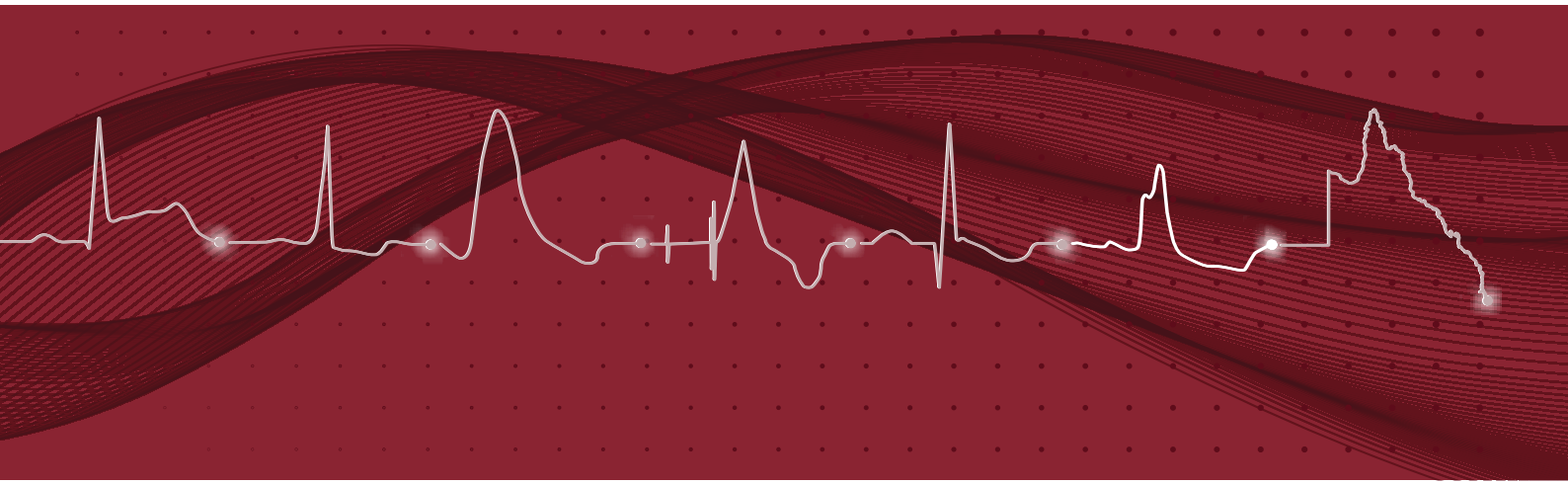
Queensland Cardiac Clinical Network

Queensland Cardiac Outcomes Registry
2021 Annual Report

Heart Failure Support Services Audit



Queensland Cardiac Outcomes Registry
2021 Annual Report

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An electronic version of this document is available at:
clinicalexcellence.qld.gov.au/priority-areas/clinician-engagement/queensland-clinical-networks/cardiac

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1 Message from the QCCN Chair

Evolution and growth have seen QCOR become far more than a clinical quality registry and fulfil many more roles and functions than traditional registries. In compiling this seventh QCOR Annual Report we can reflect on the key deliverables and impact that the Registry has across many domains of healthcare and the health system in Queensland.

Despite declines in measures of burden of disease, cardiovascular disease and coronary heart disease are conditions with the highest burden of disease and mortality rates for Queenslanders. With the relatively contemporary nature of many of the interventions used to treat cardiovascular disease many analyses, risk scores and quality assurance frameworks exist, allowing the treatment of cardiac disease to be closely monitored. This data rich environment sets it apart from many other medical fields.

In its seventh publication year, this wide-reaching quality and safety program now comprises of cumulative analysis of over 250,000 patient interactions with the Queensland public health system for cardiac disease.

As the program develops and grows, we are frequently asked what is exceptional about QCOR? The answers are compelling and far-reaching. It is the broadest cardiac clinical quality registry of its kind in Australia. It is underpinned by point of care clinical systems and applications that allow clinicians to perform their role at the highest level, knowing their daily activities are supported by quality improvement opportunities. It is a clinical quality program that offers tools, insights, benchmarking and clinical excellence initiatives. It offers the means to enact multimillion-dollar consumables savings programs allowing healthcare money to be reinvested into patient care. But most importantly it is a tool that offers transparent, meaningful clinician-led solutions that aim to improve the health outcomes for all Queenslanders.

In the third year of the global coronavirus pandemic, healthcare providers have faced new and continuing challenges that demand innovative solutions to support the provision of first-class healthcare. The current report confirms that those involved in managing heart and lung disease have delivered volumes of work similar to, or, exceeding those observed in the pre-pandemic era. More importantly, despite unprecedented system stress, the Queensland cardiac community has rallied to maintain high standards of care that are demonstrated in the 2021 outcomes analysis.

Looking forward, we keenly await the delivery of a contemporary statewide cardiovascular information system for diagnostic and interventional cardiology and echocardiography. Investment in such a forward-thinking, all-encompassing solution would not be possible without the collegiality and cooperation of cardiac clinicians throughout the state. Such collaboration is enabled by the platform laid by QCOR and its focus on clinician engagement, supported by our colleagues at eHealth Queensland.

For the public and healthcare consumers, this report provides confidence that the quality and consistency of cardiac procedural care is routinely reported to providers, supporting continuous service improvement.

As the 2021 QCOR Annual Report is finalised, all that is left is to commend the tireless work of the collegiate network of healthcare professionals that continue to uphold the highest clinical standards. We express a sincere wish that the scope of QCOR's activities will be expanded for the benefit of more Queenslanders over many years to come.

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 Queensland 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, The Townsville 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

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- Dr Anil Prabhu, The Prince Charles Hospital
- Dr Morgan Windsor, Metro North Hospital and Health Service
- Dr Sylvio Provenzano, Gold Coast University Hospital
- Dr Christopher Cole, Princess Alexandra Hospital (Chair)

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- Ms Maura Barnden, Metro North Hospital and Health Service
- Ms Wendy Fry, Cairns and Hinterland Hospital and Health Service
- Ms Emma Harmer, Metro South Hospital and Health Service
- Ms Helen Lester, Health Contact Centre – Self Management of Chronic Conditions Service
- Ms Rebecca Pich, Metro South Hospital and Health Service
- Ms Alexandra Samuels, Gold Coast Hospital and Health Service
- Ms Samara Phillips, Statewide Cardiac Rehabilitation Coordinator

Statewide Cardiac Clinical Informatics Unit

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

QCOR Electrophysiology and Pacing Committee

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- Vanessa Beattie, Gold Coast University Hospital
- Mr John Betts, The Prince Charles Hospital
- Mr Anthony Brown, Sunshine Coast University Hospital
- Mr Andrew Claughton, Princess Alexandra Hospital
- Dr Naresh Dayananda, Sunshine Coast University Hospital
- Dr Russell Denman, The Prince Charles Hospital
- Mr Braden Dinham, Gold Coast University Hospital
- Mr Nathan Engstrom, The Townsville Hospital
- A/Prof John Hill, Princess Alexandra Hospital
- Dr Paul Martin, Royal Brisbane & Women's Hospital
- Dr Caleb Mengel, Toowoomba Hospital
- Ms Sonya Naumann, Royal Brisbane & Women's Hospital
- Dr Sachin Nayyar, The Townsville Hospital
- Dr Kevin Ng, Cairns Hospital
- Dr Robert Park, Gold Coast University Hospital
- Mr Simon Townsend, The Prince Charles Hospital

QCOR Heart Failure Support Services Committee

- Mr Ben Shea, Redland Hospital
- Ms Angie Sutcliffe, Cairns Hospital
- Ms Deepali Gupta, Queen Elizabeth II Hospital
- Ms Helen Hannan, Rockhampton Hospital
- Ms Annabel Hickey, Statewide Heart Failure Services Coordinator
- Dr Rita Hwang, PhD, Princess Alexandra Hospital
- Ms Louvaine Wilson, Toowoomba Hospital
- Ms Melanie Burgess, Ipswich Hospital
- Ms Michelle Bertram, Gold Coast Hospital and Health Service
- Dr Wandy Chan, The Prince Charles Hospital
- Prof John Atherton, Royal Brisbane & Women's Hospital (Chair)

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 6, of the *Hospital and Health Boards Act 2011* 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.

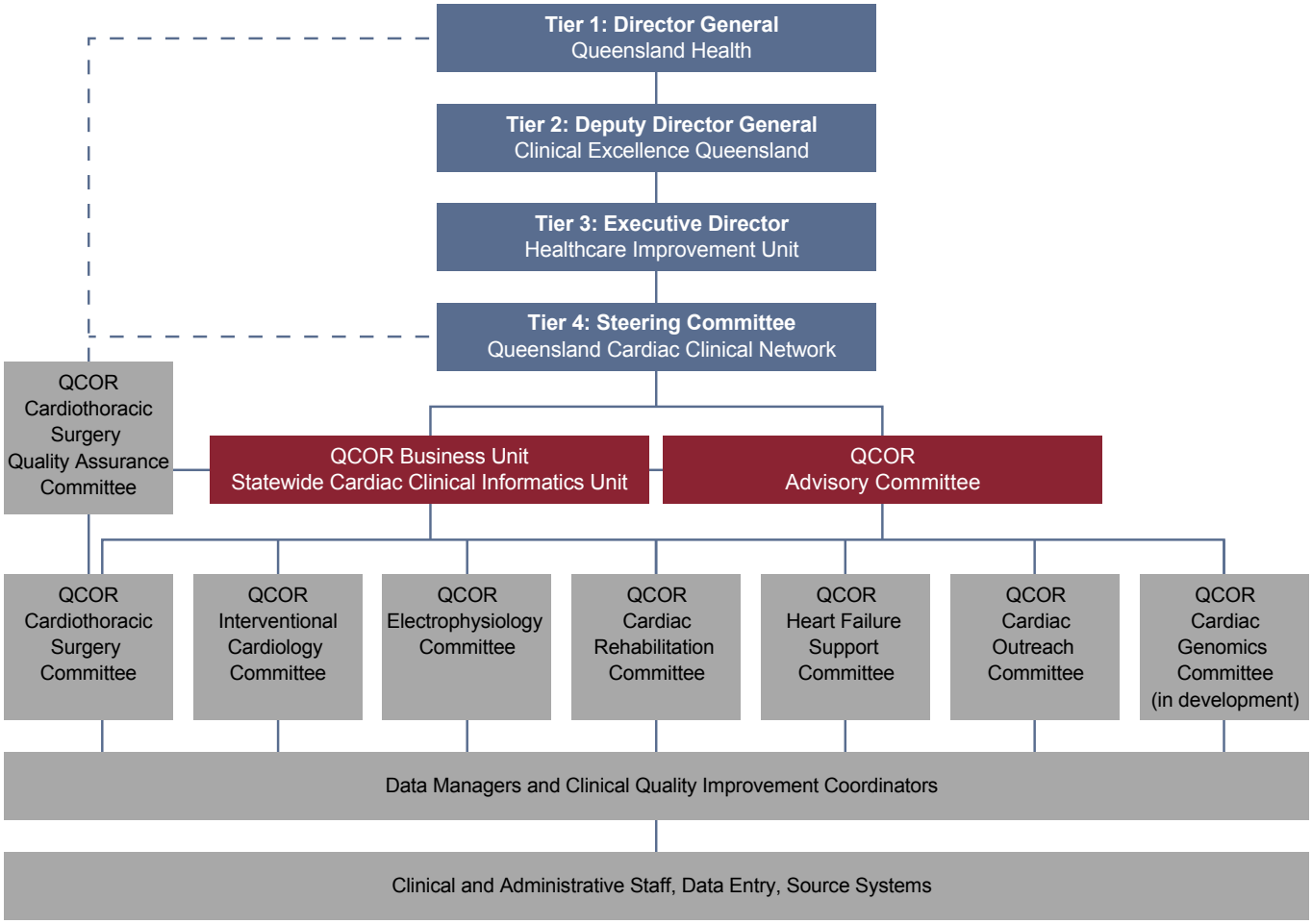


Figure 1: Governance structure

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 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.

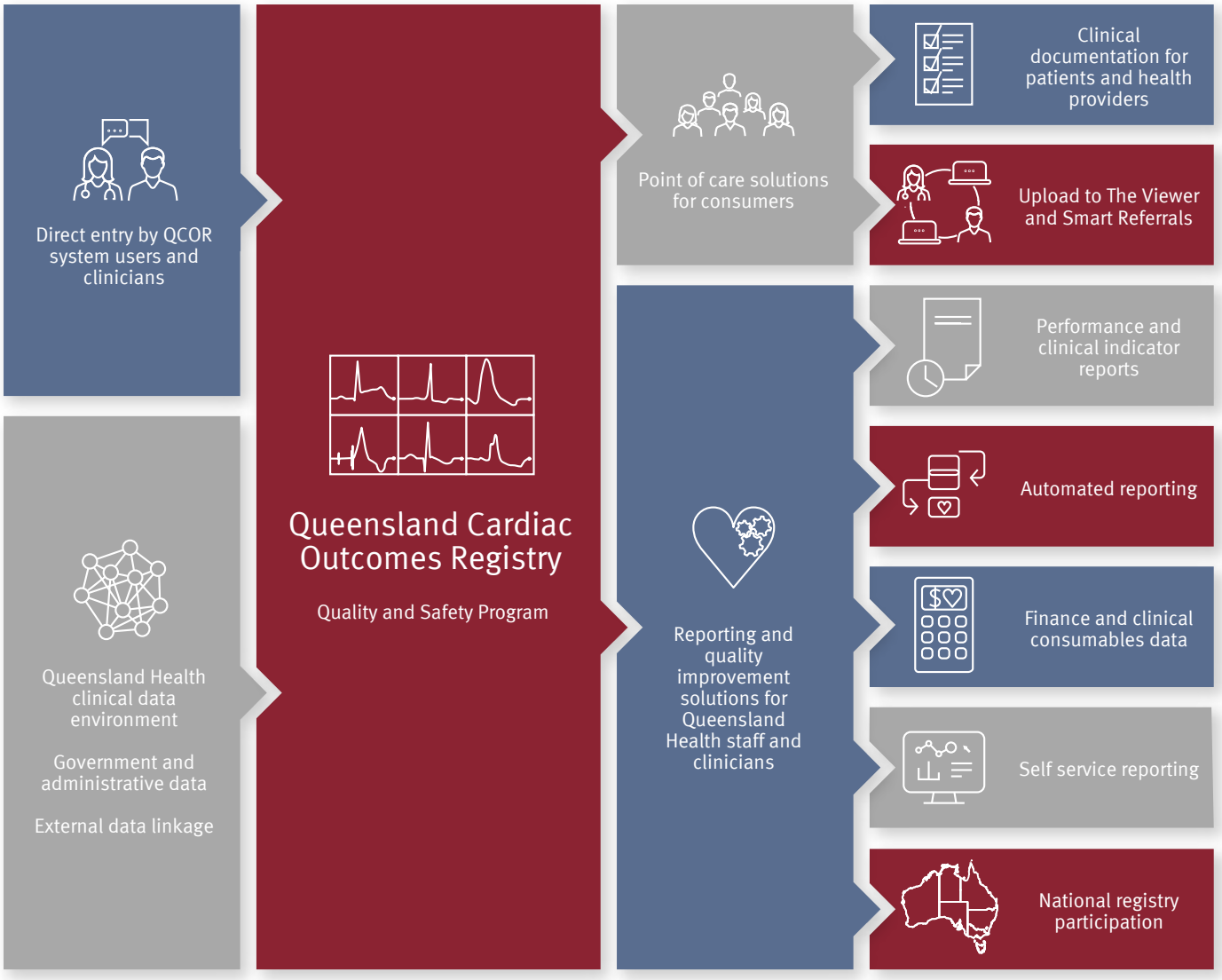
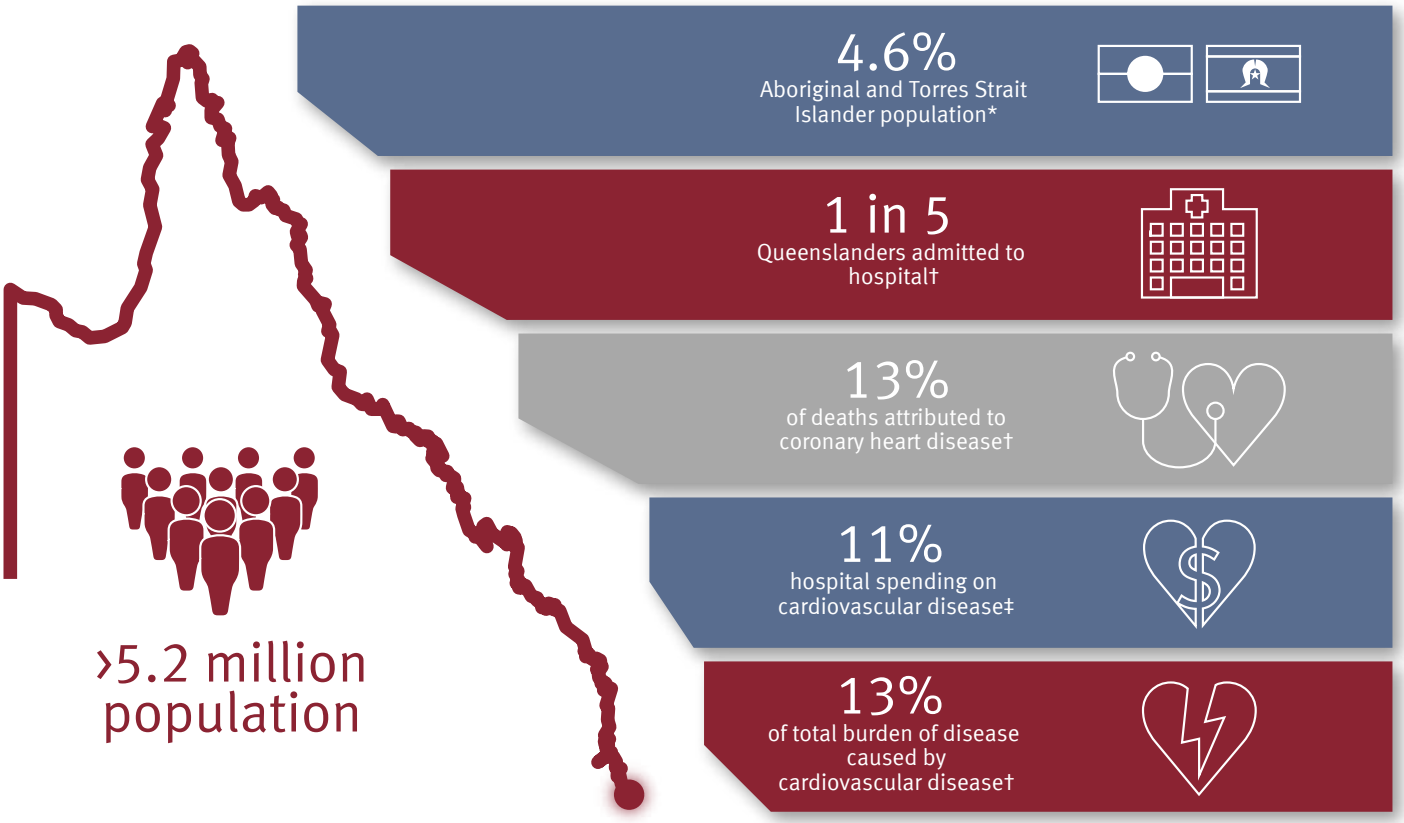


Figure 2: QCOR data flow

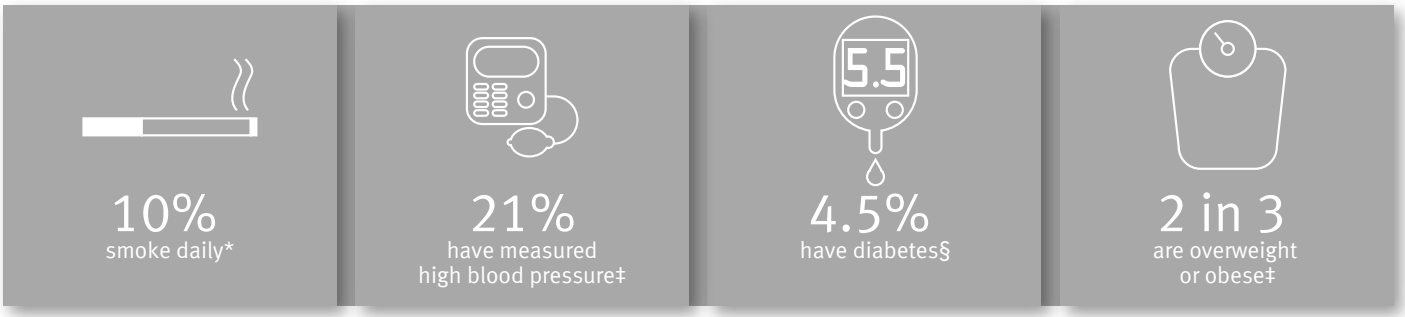
* The Australian Commission on Safety and Quality in Health Care (ACSQHC). Framework for Australian clinical quality registries. Sydney: ACSQHC; 2014.

Queensland Cardiac Outcomes Registry

The Health of Queenslanders



Comorbidities



Mortality

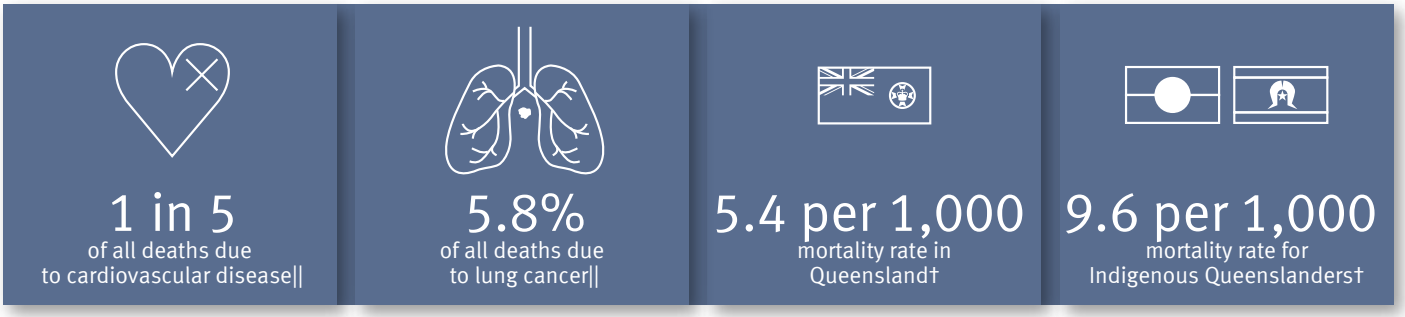


Figure 3: QCOR 2021 infographic

* 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

2021 Activity at a Glance

What's New?

- Cardiac surgery outcomes and mortality
- Cardiac genomics spotlight
- Cardiac surgery bleeding complications audit
- NSTEMI patients: Interhospital transfers analysis

Interventional Cardiology

4,894
percutaneous coronary interventions

485
structural heart disease interventions

239
transcatheter aortic valve replacements

15,443
total coronary procedures

Cardiothoracic Surgery

2,623
adult cardiac surgeries

1,067
adult thoracic surgeries

Electrophysiology & Pacing

5,269
electrophysiology and pacing procedures

3,500
cardiac implantable electronic device procedures

Heart Failure Support Services

6,326
heart failure support services referrals

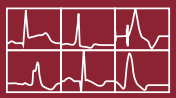
Cardiac Rehabilitation

10,647
cardiac rehabilitation referrals

Paediatric Cardiac Surgery

312
paediatric cardiac surgeries

Clinical Indicator Progress



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

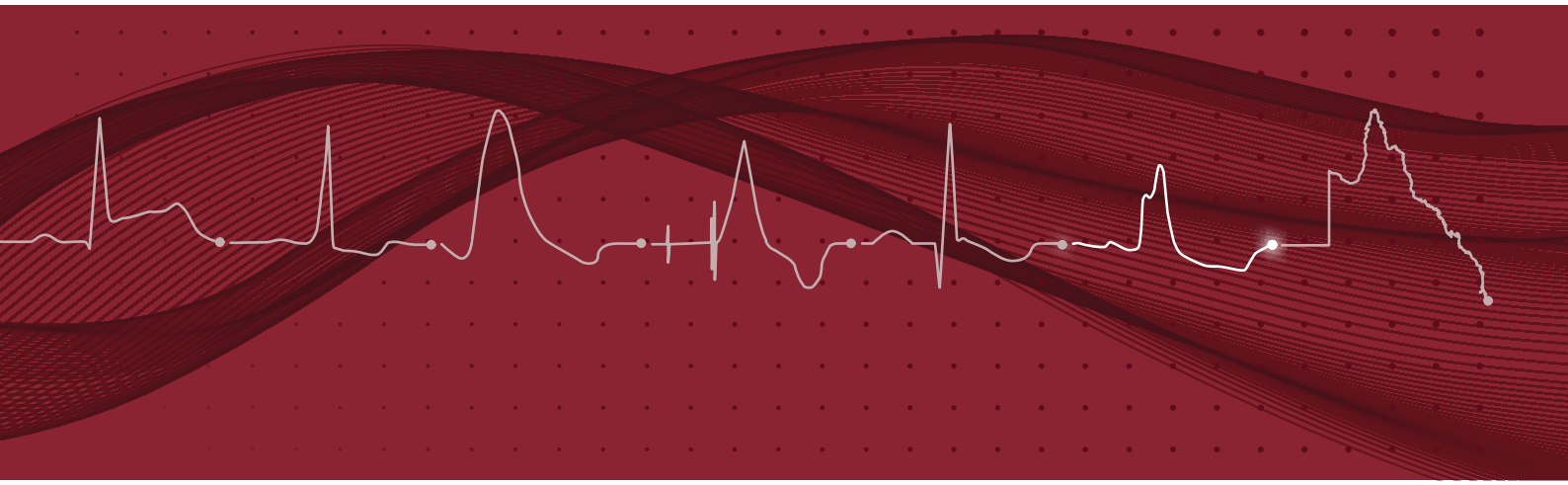
0.3%
procedural tamponade rate for cardiac device and electrophysiology procedures

91%
of patients referred to a heart failure support service on an ACEI, ARB or ARNI at discharge

93%
of cardiac rehabilitation referrals within 3 days of discharge

1.3%
mortality rate for coronary artery bypass surgery at 30 days

Heart Failure Support Services Audit



1 Message from the QCOR Heart Failure Steering Committee Chair

The last few years have been exciting times in heart failure management with advances in medications, cardiac electronic devices, and heart valve surgery. While these breakthroughs give hope to patients, the complexity of care has become greater, and the role of heart failure support teams is more important than ever.

Data collection for Heart Failure Support Services continues to grow and evolve to respond to changing evidence and practice. When data collection began in 2016, we focused on two drug classes recommended as first line treatments for patients with HFrEF and none for HFpEF. This 2021 QCOR Heart Failure Support Services Audit looks at the prescription of three drug classes. In the last year, a combination of four drug classes is now recommended for HFrEF, with emerging evidence also suggesting new medical therapy for patients with HFpEF. These changes in evidence will be reflected in the 2022 QCOR Annual Report.

The indicators related to the timeliness of follow up of referrals reflect the importance of support. Patients with heart failure need to self-manage symptoms through diet, exercise, and medications; a job that can be overwhelming for many patients and their families. As with many chronic diseases, heart failure disproportionately affects Aboriginal and Torres Strait Islander patients, the socially disadvantaged, the elderly and those with mental illness. Fortunately, patients in Queensland have access to 21 heart failure teams across the state which contribute to this registry. These teams including nurses and allied health staff support patients and liaise between medical specialists, GPs, and other primary care providers to integrate transitional care during high-risk periods.

Future plans include the introduction of comprehensive clinical performance indicators at six months from referral as it frequently takes many months to optimise the patient's care.

This registry is coupled with a statewide quality improvement program that explores barriers to change and the HERO data are used to inform the success of initiatives in implementation in the rapidly changing landscape of heart failure management.

On behalf of the QCOR Heart Failure Support Services Committee, I would like to thank all the clinicians that contribute data and the responsiveness of the SCCIU in adapting the QCOR data collection application to reflect changes in practice.

Professor John Atherton
Chair
QCOR Heart Failure Support Services Committee

2 Key findings

Characteristics of referrals to a Heart Failure Support Service (HFSS)

There were 6,326 new referrals in 2021, a 57% growth in referrals since 2016. Characteristics of referrals included: male (66%), Aboriginal and Torres Strait Islander patients (5.5%), HFrEF (81%), and patients referred from hospital (63%).

The median age of referrals was 69 years old with male patients presenting younger than females (68 years vs. 71 years respectively). Aboriginal and Torres Strait Islander patients represented a younger cohort compared with non-Indigenous patients (57 years vs. 70 years respectively), and HFrEF patients are younger than HFpEF patients (67 years vs. 77 years respectively). Patients aged 75 years or older represented approximately one third of total cases (34%).

Clinical indicator performance

Most indicators met benchmarks at a statewide level. MRA§ prescription is trending towards improvement: 43% (2019), 46% (2020) and 51% (2021). The titration and review of beta blockers (clinical indicator 6a, 6b and 6c) show that while achievement of guideline recommended targets remains low at 31% the review of beta blockers status at 6 months has improved to almost achieve benchmark (79%) and beta blocker achievement of maximum tolerated dose has reached the benchmark of 80% for the first time.

There is variation in practice between sites except for clinical indicators 3 and 4 which are uniformly above benchmarks (i.e., prescription ACEI/ARB or ARNI† and beta blockers‡.

Table 1: Summary of statewide clinical indicator performance

#	Clinical indicator	% referrals
Non pharmacological indicators		
1a	Follow-up of acute patients within 2 weeks	78.2
1b	Follow-up of non acute patients within 4 weeks	84.1*
2	Assessment of left ventricular ejection fraction within 2 years	96.7*
Pharmacological indicators		
3a	ACEI/ARB or ARNI† prescription at hospital discharge	91.2*
3b	ACEI/ARB or ARNI† at first clinical review	92.7*
4a	Beta blocker‡ prescription at hospital discharge	90.1*
4b	Beta blocker‡ prescription at first clinical review	91.5*
5a	Prescription of MRA§ for HFrEF at time of hospital discharge	51.4
5b	Prescription of MRA§ for HFrEF at time of first HFSS clinical review	51.4
6a	Beta blocker‡ titration status review at six months post referral	79.1
6b	Beta blocker‡ achievement of guideline recommended target	30.8
6c	Beta blocker‡ achievement of guideline recommended target dose or maximum tolerated dose	80.0*

* Benchmark met (benchmark is 80% achievement except for 6b which is 50%)

† Angiotensin-converting-enzyme inhibitor (ACEI), angiotensin II receptor blockers (ARB) or angiotensin receptor neprilysin inhibitor (ARNI)

‡ Bisoprolol, carvedilol, metoprolol sustained release or nebivolol

§ Mineralocorticoid receptor antagonists

Patient outcomes

Patient outcomes are based on inpatient referrals from the previous year (n 3,297) to allow for 12 month follow-up from the index hospitalisation. Mortality was 1.4% at 30 days and 11.4% at 12 months. Death/rehospitalisation was 17.7% at 30 days and 53.8% at 12 months. Based on 3,297 eligible patients, 101,548 days were lost due to death or hospitalisation over 12 months.

Table 2: Summary of outcomes for patients referred from a hospital setting

#	Measures post index hospitalisation*	30 days	1 year
1	All-cause mortality	1.4%	11.4%
2	a) All-cause rehospitalisation	17.2%	52.8%
	b) Heart failure rehospitalisation	5.8%	20.7%
3	Composite all-cause hospitalisation or all-cause mortality	17.7%	53.8%
4	Days alive and out of hospital†	N/A	364 median days

Conclusion

Follow up time of new referrals remain high overall. Optimal therapy can be difficult to achieve at hospital discharge or by the first clinical review for a range of valid reasons. As medication optimisation become more complex, it is recommended that pharmacological clinical indicators include a review of prescription and titration for all medications at 6 months so that the uptake of combination therapies be measured.

3 Participating sites

Heart Failure Support Services (HFSS) consists of teams of specialised nurses, with medical support and allied health services. There are 21 services which contributed data to this year's Annual Report and the locations and services offered are shown in Figure 3 and Table 4 respectively.

Table 3: Queensland Heart Failure Support Services (HFSS) facilities and acronyms

Hospital and Health Service (HHS)	HFSS Facility	Acronym
Cairns and Hinterland	Cairns Hospital	CH
Central Queensland	Gladstone Hospital	GLH
	Rockhampton Hospital	RKH
Darling Downs	Toowoomba Hospital	TWH
Gold Coast	Gold Coast Community Health	GCCH
Mackay	Mackay Base Hospital	MKH
Metro North	Caboolture Hospital	CBH
	Redcliffe Hospital	RDH
	Royal Brisbane & Women's Hospital	RBWH
	The Prince Charles Hospital	TPCH
Metro South	Logan Hospital	LGH
	Princess Alexandra Hospital	PAH
	Queen Elizabeth II Hospital	QEII
	Redland Hospital	RLH
North West	Mt Isa Hospital	MIH
Sunshine Coast	Gympie Hospital	GYH
	Sunshine Coast University Hospital	SCUH
Townsville	Townsville Hospital	TTH
West Moreton	Ipswich Community Health	IPCH
Wide Bay	Bundaberg Hospital	BNH
	Hervey Bay Hospital (includes Maryborough)	HBH

Figure 1: Heart Failure Support Service (HFSS) locations

Table 4: Components of Queensland Heart Failure Support Services (HFSS)

		HFSS disciplines				Modes of service (telephone + ...)				
HHS	**Facility**	**Nurse**	**NP***	**Pharm†**	**Physio or AEP‡**	**In-patient**	**Nurse or MD clinics**	**Home visits**	**Group rehab**	**Medical mentor§**
Cairns and Hinterland	CH	✓	✓	–	✓	✓	✓	✓	✓	✓
Central Queensland	GLH	✓	✓[VC]	–	✓	–	–	–	✓	–
	RKH	✓	✓	–	✓	✓	✓	–	✓	✓
Darling Downs	TWH	✓	–	–	R	✓	✓	✓	✓	✓
Gold Coast	GCCH	✓	–	✓	✓	✓	✓	✓	✓	✓
Mackay	MKH	✓	–	–	✓	✓	✓	–	✓	✓
Metro North	CBH	✓	–	✓	–	–	✓	–	–	✓
	RDH	✓	✓	–	–	–	✓	✓	–	✓
	RBWH	✓	–	✓	✓	✓	✓	–	✓	✓
	TPCH	✓	✓	✓	✓	✓	✓	–	✓	✓
Metro South	LGH	✓	✓	✓	✓	✓	✓	✓	✓	✓
	PAH	✓	✓	✓	✓	✓	✓	✓	✓	✓
	QEII	✓	✓	✓	R	✓	✓	✓	–	✓
	RLH	✓	✓	–	✓	✓	✓	✓	✓	✓
North West	MIH	✓	–	✓	R	✓	✓	✓	–	Outreach
Sunshine Coast	GYH	✓	✓[VC]	–	–	✓	✓	✓	–	✓
	SCUH	✓	✓	–	R	✓	✓	✓	–	✓
Townsville	TTH	✓	✓	✓	R	✓	✓	✓	–	✓
West Moreton	IPCH	✓	✓	✓	✓	✓	✓	✓	✓	✓
Wide Bay	BNH	✓	✓	–	R	✓	✓	✓	–	✓
	HBH	✓	✓	–	✓	✓	✓	✓	✓	Video clinic
Statewide		100%	62%	48%	86%	86%	95%	70%	62%	100%

* Nurse practitioner who can prescribe medications

† Pharmacist

‡ Physiotherapist or accredited exercise physiologist

§ The HFSS has a cardiologist or general physician mentor

R Referral for exercise that is routinely accepted by another program such as cardiac or pulmonary rehabilitation

VC Videoconference service is provided by an NP elsewhere in the HHS

4 New referrals

There were 6,326 new referrals reported by the 21 participating HFSS, with Metropolitan sites comprising 55% of all referrals. Five year trends in referral to HFSS can be seen in the figure below. Between 2016 and 2021 referral volumes increased by 57%.

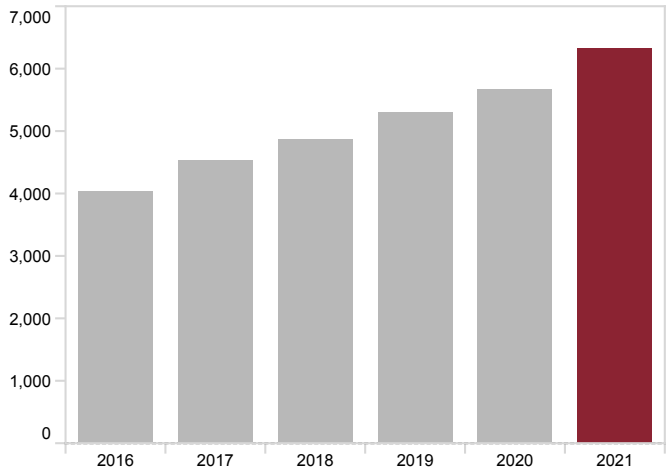


Figure 2: Total yearly HF referrals, 2016–2021

Table 5: Yearly HF referral volume, 2016–2021

	2016 n	2017 n	2018 n	2019 n	2020 n	2021 n
Yearly referrals	4,021	4,528	4,878	5,304	5,664	6,326

4.1 Location of referrals

Table 6: Distribution of new referrals by HFSS location

Referrals per HHS	n (%)	Referrals per facility	n (%)
Cairns and Hinterland	289 (4.6)	Cairns Hospital	289 (4.6)
Central Queensland	270 (4.3)	Gladstone Hospital	19 (0.3)
		Rockhampton Hospital	251 (4.0)
Darling Downs	49 (0.8)	Toowoomba Hospital	49 (0.8)
Gold Coast	475 (7.5)	Gold Coast Community Health	475 (7.5)
Mackay	136 (2.1)	Mackay Base Hospital	136 (2.1)
Metro North	2,020 (31.9)	Caboolture Hospital	439 (6.9)
		Redcliffe Hospital	151 (2.4)
		Royal Brisbane & Women's Hospital	454 (7.2)
		The Prince Charles Hospital HFS	976 (15.4)
Metro South	1,484 (23.5)	Logan Hospital	518 (8.2)
		Princess Alexandra Hospital	635 (10.0)
		Queen Elizabeth II Hospital	175 (2.8)
		Redland Hospital	156 (2.5)
North West	43 (0.7)	Mt Isa Hospital	43 (0.7)
Sunshine Coast	667 (10.5)	Gympie	93 (1.5)
		Sunshine Coast University Hospital	574 (9.1)
Townsville	240 (3.8)	Townsville Hospital	240 (3.8)
West Moreton	440 (7.0)	Ipswich Community Health	440 (7.0)
Wide Bay	213 (3.4)	Bundaberg Hospital	123 (1.9)
		Hervey Bay Hospital	90 (1.4)
Statewide			**6,326 (100.0)**

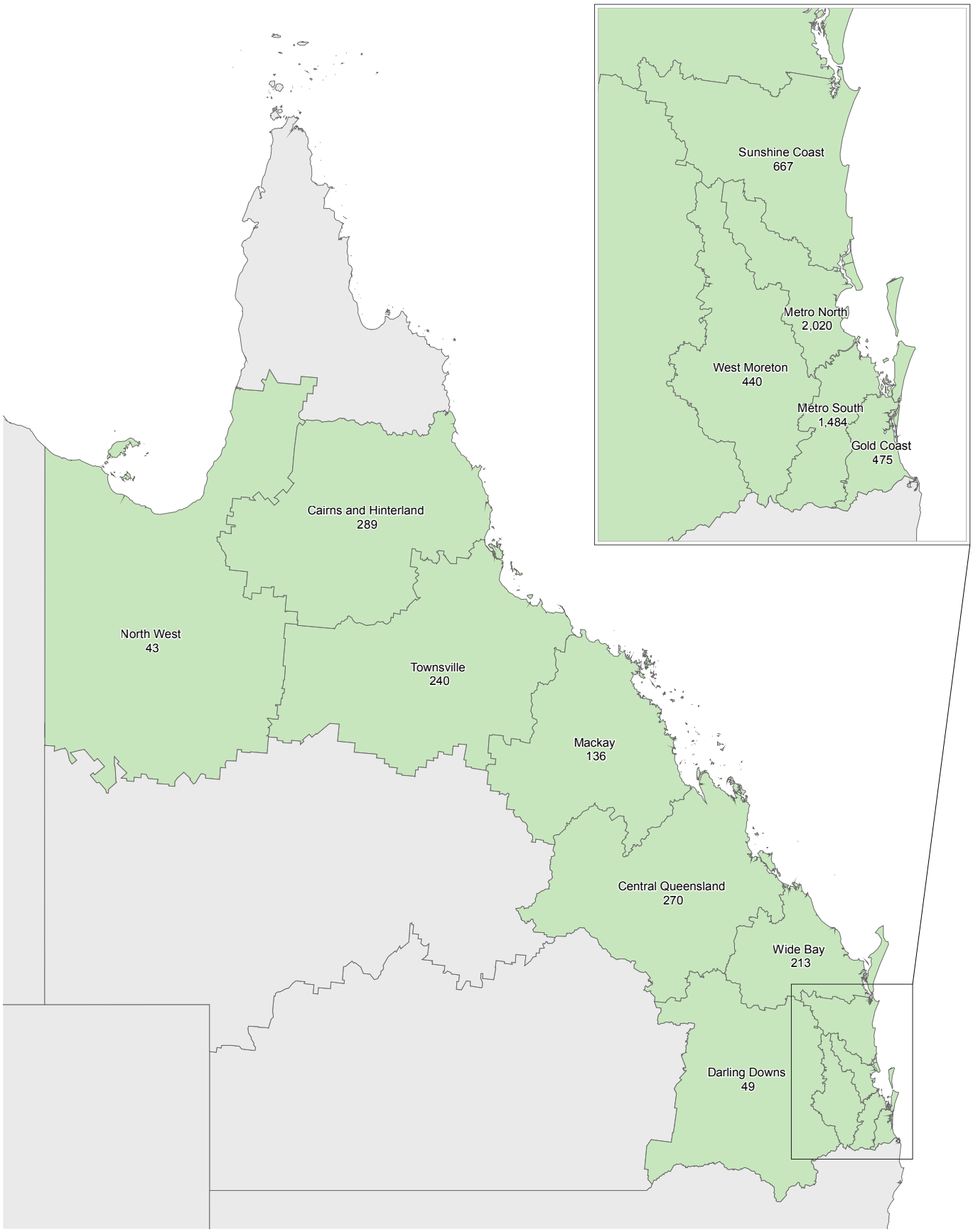


Figure 3: Regional distribution of new referrals

4.2 Referral source

Most referrals originated from an inpatient setting (63%), with smaller proportions originating from an outpatient setting (24%) or as a transfer from another service (11.7%).

Few referrals came directly from primary care (1.3%), which is expected as most referrals flow to specialty outpatient clinics for diagnosis and treatment optimisation prior to referral to an HFSS.

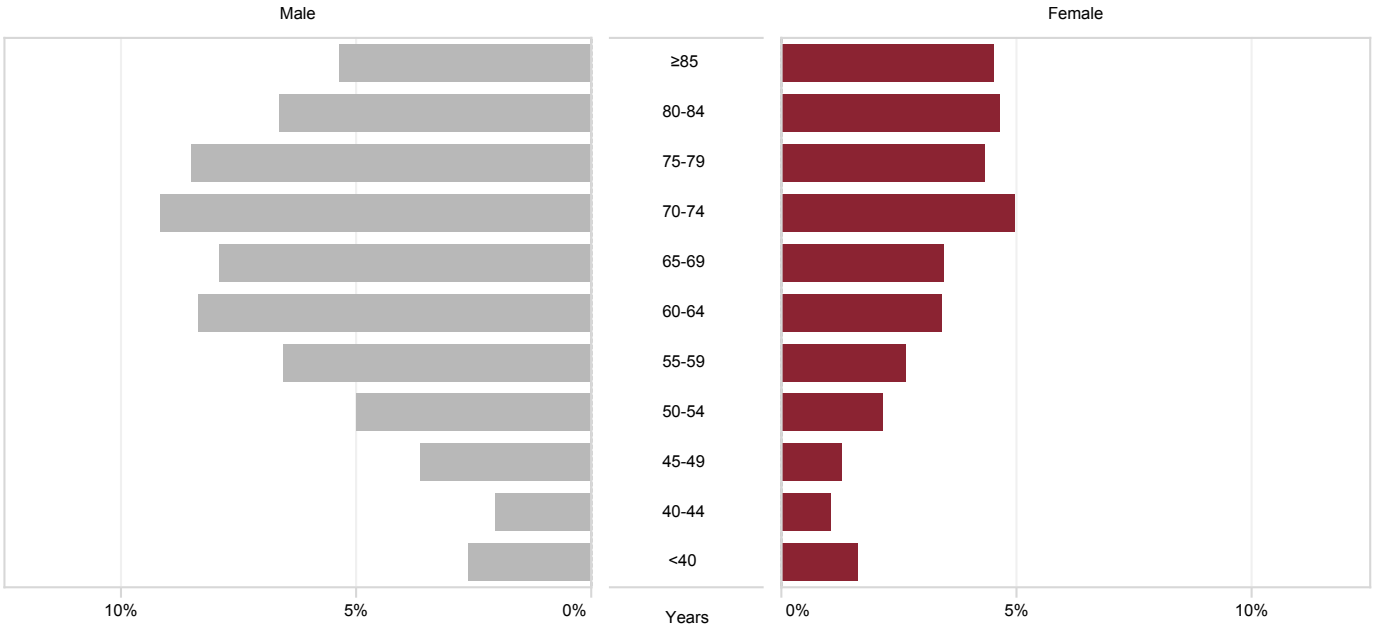
Table 7: Source of HFSS referral

HHS	HFSS	Inpatient n (%)	Outpatient n (%)	Another HFSS n (%)	Primary care n (%)
Cairns and Hinterland	Cairns Hospital	232 (80.3)	53 (18.3)	4 (1.4)	–
Central Queensland	Gladstone Hospital	9 (47.4)	3 (15.8)	7 (36.8)	–
	Rockhampton Hospital	161 (64.1)	77 (30.7)	3 (1.2)	10 (4.0)
Darling Downs	Toowoomba Hospital	9 (18.4)	38 (77.6)	2 (4.1)	–
Gold Coast	Gold Coast Community Health	285 (60.0)	145 (30.5)	31 (6.5)	14 (2.9)
Mackay	Mackay Base Hospital	60 (44.1)	68 (50.0)	7 (5.1)	1 (0.7)
Metro North	Caboolture Hospital	178 (40.5)	136 (31.0)	95 (21.6)	30 (6.8)
	Redcliffe Hospital	34 (22.5)	52 (34.4)	64 (42.4)	1 (0.7)
	Royal Brisbane & Women's Hospital	324 (71.4)	118 (26.0)	12 (2.6)	–
	The Prince Charles Hospital	687 (70.4)	282 (28.9)	6 (0.6)	1 (0.1)
Metro South	Logan Hospital	330 (63.7)	25 (4.8)	155 (29.9)	8 (1.5)
	Princess Alexandra Hospital	605 (95.3)	21 (3.3)	9 (1.4)	–
	Queen Elizabeth II Hospital	110 (62.9)	26 (14.9)	38 (21.7)	1 (0.6)
	Redland Hospital	21 (13.5)	52 (33.3)	83 (53.2)	–
North West	Mt Isa Hospital	2 (4.7)	39 (90.7)	1 (2.3)	1 (2.3)
Sunshine Coast	Gympie Hospital	25 (26.9)	11 (11.8)	56 (60.2)	1 (1.1)
	Sunshine Coast University Hospital	410 (71.4)	137 (23.9)	24 (4.2)	3 (0.5)
Townsville	Townsville Hospital	130 (54.2)	104 (43.3)	2 (0.8)	4 (1.7)
West Moreton	Ipswich Community Health	276 (62.7)	89 (20.2)	72 (16.4)	3 (0.7)
Wide Bay	Bundaberg Hospital	73 (59.3)	12 (9.8)	34 (27.6)	4 (3.3)
	Hervey Bay Hospital	17 (18.9)	35 (38.9)	36 (40.0)	2 (2.2)
Statewide		**3,978 (62.9)**	**1,523 (24.1)**	**741 (11.7)**	**84 (1.3)**

5 Patient characteristics

5.1 Age and gender

The statewide median age of patients managed by an HFSS was 69 years. The median age of women (71 years) was three years older than men. Approximately one third of patients (34%) were 75 years of age and older.



% of total (n=6,326)

Figure 4: Proportion of all referrals by gender and age group

Table 8: Median age in years by gender and HFSS

HHS	HFSS	Male years	Female years	All years
Cairns and Hinterland	Cairns Hospital	66	68	67
Central Queensland	Gladstone Hospital	62	69	66
	Rockhampton Hospital	68	71	69
Darling Downs	Toowoomba Hospital	63	63	63
Gold Coast	Gold Coast Community Health	68	72	69
Mackay	Mackay Base Hospital	64	63	64
Metro North	Caboolture Hospital	71	75	73
	Redcliffe Hospital	72	79	75
	Royal Brisbane & Women's Hospital	69	70	70
	The Prince Charles Hospital	69	74	71
Metro South	Logan Hospital	66	69	67
	Princess Alexandra Hospital	66	71	67
	Queen Elizabeth II Hospital	67	69	68
	Redland Hospital	66	70	67
North West	Mt Isa Hospital	59	64	60
Sunshine Coast	Gympie Hospital	67	74	70
	Sunshine Coast University Hospital	70	70	70
Townsville	Townsville Hospital	63	65	64
West Moreton	Ipswich Community Health	68	74	70
Wide Bay	Bundaberg Hospital	70	70	70
	Hervey Bay Hospital	70	73	71
Statewide		**68**	**71**	**69**

5.2 Gender

The majority of patients were male (66%), ranging from 61% to 73% across participating sites.

Table 9: Referrals by gender and HFSS

HHS	HFSS	Male n (%)	Female n (%)
Cairns and Hinterland	Cairns Hospital	206 (71.3)	83 (28.7)
Central Queensland	Gladstone Hospital	13 (68.4)	6 (31.6)
	Rockhampton Hospital	158 (62.9)	93 (37.1)
Darling Downs	Toowoomba Hospital	35 (71.4)	14 (28.6)
Gold Coast	Gold Coast Community Health	325 (68.4)	150 (31.6)
Mackay	Mackay Base Hospital	92 (67.6)	44 (32.4)
Metro North	Caboolture Hospital	273 (62.2)	166 (37.8)
	Redcliffe Hospital	93 (61.6)	58 (38.4)
	Royal Brisbane & Women's Hospital	313 (68.9)	141 (31.1)
	The Prince Charles Hospital	633 (64.9)	343 (35.1)
Metro South	Logan Hospital	317 (61.2)	201 (38.8)
	Princess Alexandra Hospital	462 (72.8)	173 (27.2)
	Queen Elizabeth II Hospital	111 (63.4)	64 (36.6)
	Redland Hospital	103 (66.0)	53 (34.0)
North West	Mt Isa Hospital	28 (65.1)	15 (34.9)
Sunshine Coast	Gympie Hospital	59 (63.4)	34 (36.6)
	Sunshine Coast University Hospital	384 (66.9)	190 (33.1)
Townsville	Townsville Hospital	152 (63.3)	88 (36.7)
West Moreton	Ipswich Community Health	266 (60.5)	174 (39.5)
Wide Bay	Bundaberg Hospital	89 (72.4)	34 (27.6)
	Hervey Bay Hospital	59 (65.6)	31 (34.4)
Statewide		**4,171 (65.9)**	**2,155 (34.1)**

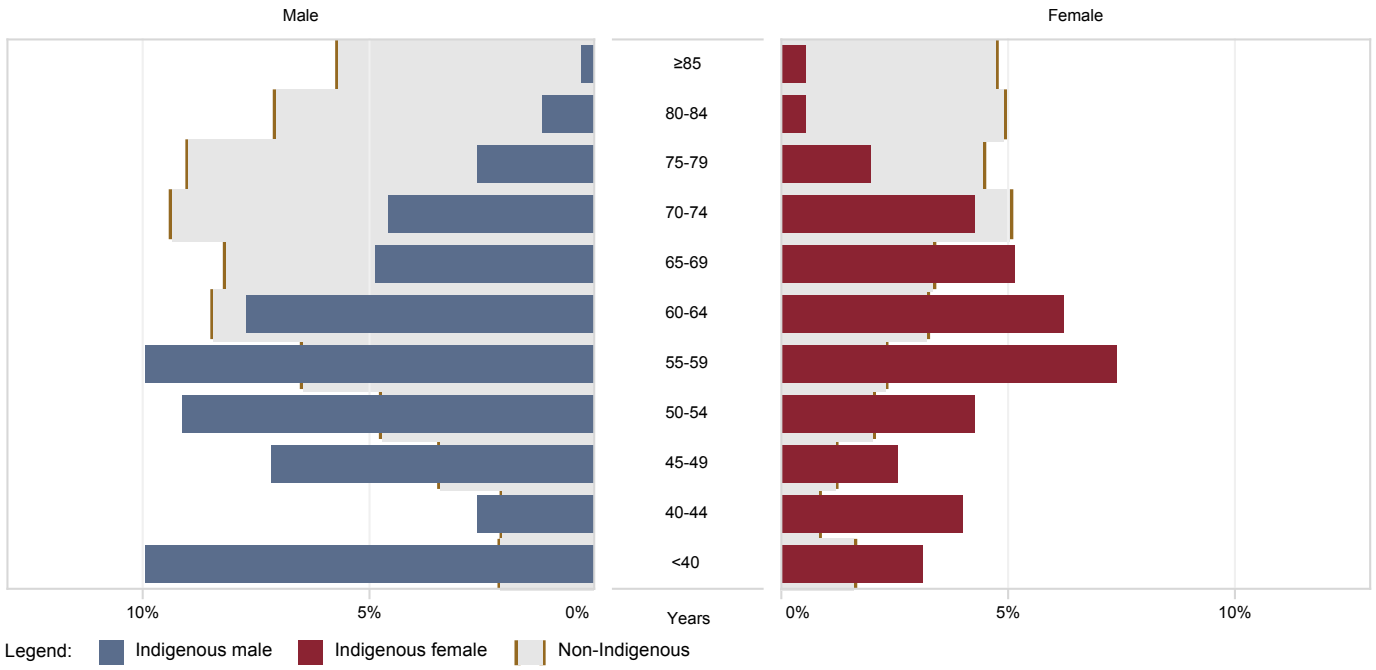
5.3 Aboriginal and Torres Strait Islander status

Patients of identified Aboriginal and Torres Strait Islander status made up 5.5% of all referrals. The number of referrals (n 351) was slightly increased in comparison the previous year (n 260). Aboriginal and Torres Strait Islander patients were significantly younger than other Queenslanders (57 years vs. 70 years). The proportion of caseload of Aboriginal and Torres Strait Islander patients was highest in Mount Isa (42%), followed by Cairns (29%) and Townsville (15%).

The number of Aboriginal and Torres Strait Islander referrals in the Greater Brisbane area (Metro North HHS and Metro South HHS) was 131 (37% of referrals statewide for Indigenous Australians).

Table 10: Aboriginal and Torres Strait Islander HFSS referrals as a proportion of caseload

HHS	HFSS	Indigenous n (%)	Non Indigenous n (%)	Not stated / unknown n (%)
Cairns and Hinterland	Cairns Hospital	84 (29.1)	204 (70.6)	1 (0.3)
Central Queensland	Gladstone Hospital	1 (5.3)	18 (94.7)	–
	Rockhampton Hospital	27 (10.8)	217 (86.5)	7 (2.8)
Darling Downs	Toowoomba Hospital	2 (4.1)	42 (85.7)	5 (10.2)
Gold Coast	Gold Coast Community Health	9 (1.9)	456 (96.0)	10 (2.1)
Mackay	Mackay Base Hospital	11 (8.1)	123 (90.4)	2 (1.5)
Metro North	Caboolture Hospital	15 (3.4)	412 (93.8)	12 (2.7)
	Redcliffe Hospital	5 (3.3)	140 (92.7)	6 (4.0)
	Royal Brisbane & Women's Hospital	13 (2.9)	429 (94.5)	12 (2.6)
	The Prince Charles Hospital	26 (2.7)	937 (96.0)	13 (1.3)
Metro South	Logan Hospital	20 (3.9)	487 (94.0)	11 (2.1)
	Princess Alexandra Hospital	42 (6.6)	590 (92.9)	3 (0.5)
	Queen Elizabeth II Hospital	4 (2.3)	164 (93.7)	7 (4.0)
	Redland Hospital	6 (3.8)	142 (91.0)	8 (5.1)
North West	Mt Isa Hospital	18 (41.9)	25 (58.1)	–
Sunshine Coast	Gympie Hospital	4 (4.3)	87 (93.5)	2 (2.2)
	Sunshine Coast University Hospital	5 (0.9)	559 (97.4)	10 (1.7)
Townsville	Townsville Hospital	35 (14.6)	200 (83.3)	5 (2.1)
West Moreton	Ipswich Community Health	15 (3.4)	414 (94.1)	11 (2.5)
Wide Bay	Bundaberg Hospital	7 (5.7)	116 (94.3)	–
	Hervey Bay Hospital	2 (2.2)	77 (85.6)	11 (12.2)
Statewide		**351 (5.5)**	**5,839 (92.3)**	**136 (2.1)**



% of total Indigenous (n=351) vs. total non-Indigenous (n=5,839). Excludes missing data (2.1%)

Figure 5: Proportion of all referrals by age group and identified Aboriginal and Torres Strait Islander status

Table 11: Median patient age by gender and Indigenous status

	Total referrals* n	Male years	Female years	Total years
Aboriginal and Torres Strait Islander	352	56	59	57
Non Aboriginal and Torres Strait Islander	5,839	69	72	70
All	**6,191**	**68**	**71**	**69**

Excludes missing data (0.3%)

5.4 Phenotype of heart failure

The table below shows rates of different HF phenotypes referred to each HFSS, these include:

- HFrEF: heart failure with reduced ejection fraction, where the left ventricular ejection fraction is less than 50% at time of diagnosis,
- HFpEF: heart failure with preserved ejection fraction, where the left ventricular ejection fraction is 50% or greater at time of diagnosis,
- Primary right heart failure e.g. cor pulmonale.

The most common referral to a HFSS was for HFrEF (81%). The median age for HFrEF was ten years younger than for patients with HFpEF (67 vs. 77 years respectively). More men had HFrEF than women (70% male), whereas HFpEF did not have a significant gender difference (46% male and 54% female).

Table 12: Proportion of patients by heart failure phenotype

HHS	HFSS	HFrEF* n (%)	HFpEF† n (%)	Primary right HF n (%)	Unsure/ unknown n (%)
Cairns and Hinterland	Cairns Hospital	259 (89.6)	11 (3.8)	15 (5.2)	4 (1.4)
Central Queensland	Gladstone Hospital	17 (89.5)	2 (10.5)	–	–
	Rockhampton Hospital	207 (82.5)	36 (14.3)	7 (2.8)	1 (0.4)
Darling Downs	Toowoomba Hospital	47 (95.9)	1 (2.0)	–	1 (2.0)
Gold Coast	Gold Coast Community Health	380 (80.0)	78 (16.4)	4 (0.8)	13 (2.7)
Mackay	Mackay Base Hospital	123 (90.4)	11 (8.1)	1 (0.7)	1 (0.7)
Metro North	Caboolture Hospital	310 (70.6)	89 (20.3)	14 (3.2)	26 (5.9)
	Redcliffe Hospital	101 (66.9)	41 (27.2)	3 (2.0)	6 (4.0)
	Royal Brisbane & Women's Hospital	382 (84.1)	62 (13.7)	2 (0.4)	8 (1.8)
Metro South	The Prince Charles Hospital	677 (69.4)	241 (24.7)	25 (2.6)	33 (3.4)
	Logan Hospital	410 (79.2)	90 (17.4)	14 (2.7)	4 (0.8)
	Princess Alexandra Hospital	567 (89.3)	54 (8.5)	14 (2.2)	–
	Queen Elizabeth II Hospital	153 (87.4)	19 (10.9)	1 (0.6)	2 (1.1)
	Redland Hospital	143 (91.7)	12 (7.7)	1 (0.6)	–
North West	Mt Isa Hospital	24 (55.8)	8 (18.6)	–	11 (25.6)
Sunshine Coast	Gympie Hospital	75 (80.6)	14 (15.1)	3 (3.2)	1 (1.1)
	Sunshine Coast University Hospital	534 (93.0)	31 (5.4)	5 (0.9)	4 (0.7)
Townsville	Townsville Hospital	230 (95.8)	8 (3.3)	1 (0.4)	1 (0.4)
West Moreton	Ipswich Community Health	316 (71.8)	74 (16.8)	40 (9.1)	10 (2.3)
Wide Bay	Bundaberg Hospital	95 (77.2)	25 (20.3)	2 (1.6)	1 (0.8)
	Hervey Bay Hospital	72 (80.0)	13 (14.4)	5 (5.6)	–
Statewide		**5,122 (81.0)**	**920 (14.5)**	**157 (2.5)**	**127 (2.0)**

* Heart failure with reduced ejection fraction (LVEF <50%)

† Heart failure with preserved ejection fraction (LVEF ≥50%)

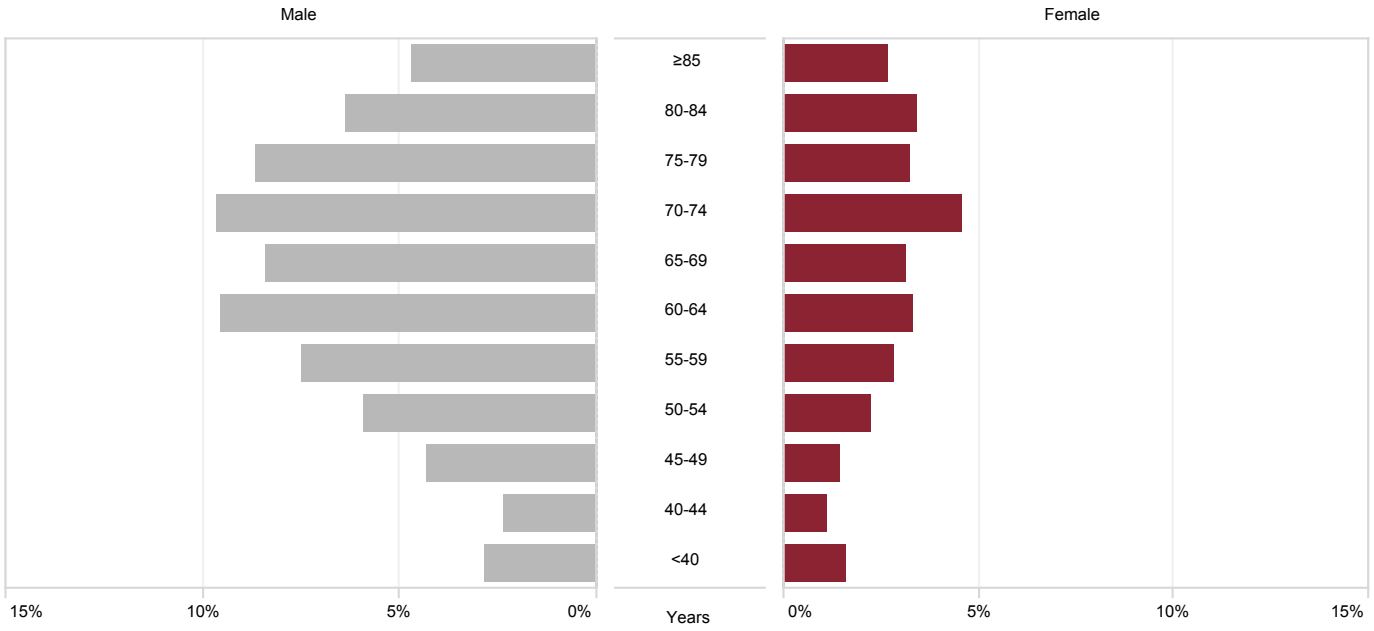
Table 13: Summary of patient age, gender and Indigenous status by heart failure phenotype

	HFrEF*	HFpEF†	Primary right HF
Number	5,122	920	157
Age (median years)	67	77	74
% male	70.4%	45.8%	43.3%
% Aboriginal and Torres Strait Islander	6.0%	3.3%	3.2%

Excludes unsure/unknown HF phenotype (2.0%)

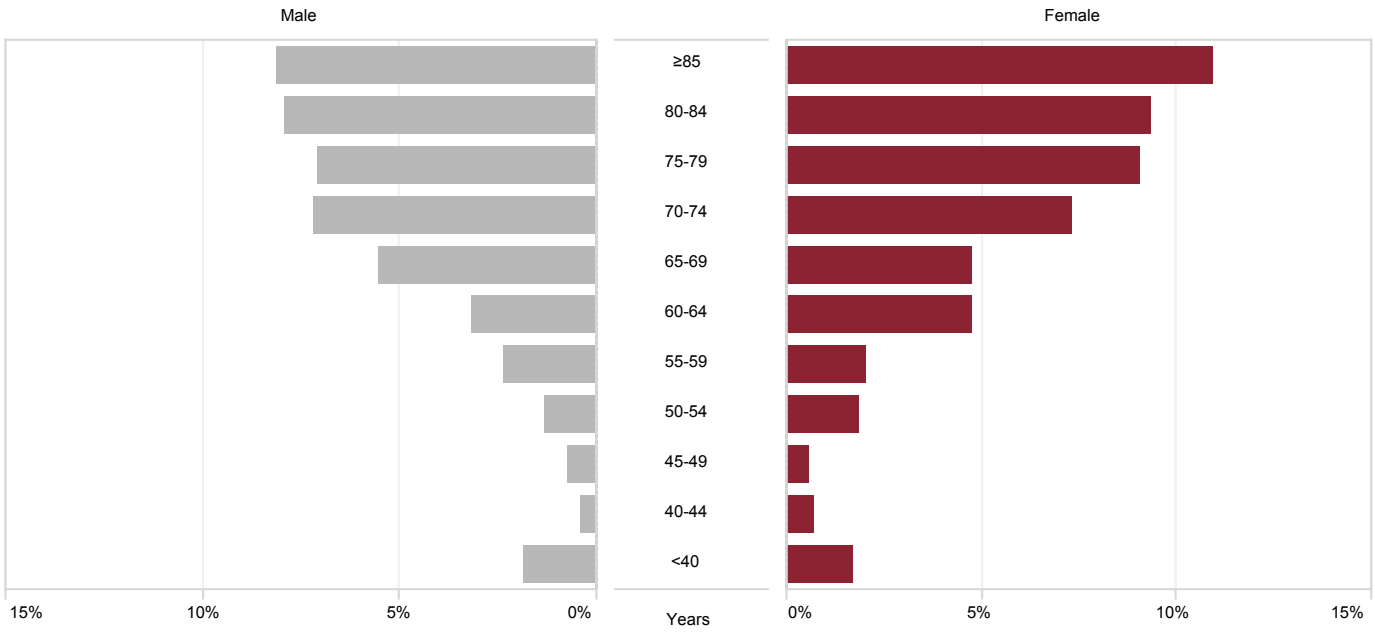
* Heart failure with reduced ejection fraction (LVEF <50%)

† Heart failure with preserved ejection fraction (LVEF ≥50%)



% of total with HFrEF (n=5,122)

Figure 6: Proportion of HFrEF referrals by gender and age group



% of total with HFpEF (n=920)

Figure 7: Proportion of HFpEF referrals by gender and age group

5.5 Summary of patient characteristics

A summary of patient characteristics from all referrals to an HFSS are shown below.

Table 14: Summary of patient characteristics

Characteristic	Summary
Participating HFSS	21
New referrals	6,326
Referrals from South East Queensland	77.8%
Referral source:	
Inpatient	62.9%
Outpatient	24.1%
Another HFSS	11.7%
Primary care	1.3%
Age (median years):	
All (median, range by service)	69 (59–79) years
Male vs. Female	68 vs. 71 years
Indigenous vs. non-Indigenous	57 vs. 70 years
HFrEF* vs. HFpEF†	67 vs. 77 years
Age group:	
75 years and over	34.0%
Males	65.9%
Aboriginal and Torres Strait Islander patients	5.5%
Heart failure phenotype:	
HFrEF*	81.0%
HFpEF†	14.5%
Primary right HF	2.5%
Unsure/unknown	2.0%

* Heart failure with reduced ejection fraction (LVEF ‹50%)

† Heart failure with preserved ejection fraction (LVEF ≥50%)

6 Clinical indicators

The number of clinical indicators is limited so that data entry is sustainable and part of routine clinical practice. The six clinical indicators selected are shown in Table 15.

The target benchmark for all indicators was set at 80%, except for 6b (beta blocker titration to clinical guideline target dose at six months) where the benchmark was set at 50%. The lower benchmark of 50% acknowledges that target doses derived from clinical trials may be inappropriate in clinical practice where patients are often older with greater disease severity and associated comorbidities compared to patients recruited to large drug trials.[52]

Table 15: Clinical process indicators

Indicator #	Process measures
1	**Timely follow-up and first clinical review** 1a) First clinical review within two weeks for inpatient referrals 1b) First clinical review within four weeks for non acute referrals
2	**Left ventricular ejection fraction (LVEF) assessed within 2 years of referral to HFSS**
3	**Prescription of angiotensin-converting-enzyme inhibitor (ACEI), angiotensin II receptor blockers (ARB) or angiotensin receptor neprilysin inhibitor (ARNI) for HFrEF** 3a) Prescription at time of hospital discharge (inpatient referrals) 3b)Prescription at time of first clinical review (all referrals)
4	**Prescription of guideline recommended beta blockers (bisoprolol, carvedilol, metoprolol sustained release or nebivolol) for HFrEF** 4a) Prescription at time of hospital discharge (inpatient referrals) 4b) Prescription at time of first clinical review (all referrals)
5	**Prescription of mineralocorticoid receptor antagonists (MRA) for patients with HFrEF** 5a) Prescription at time of hospital discharge (inpatient referrals) 5b) Prescription at time of first clinical review (all referrals)
6	**Beta blocker review and titration** 6a) Titration review conducted within 6 months of first clinical review 6b) Guideline target dose achieved at time of titration review 6c) Either target or maximum dose achieved at time of titration review

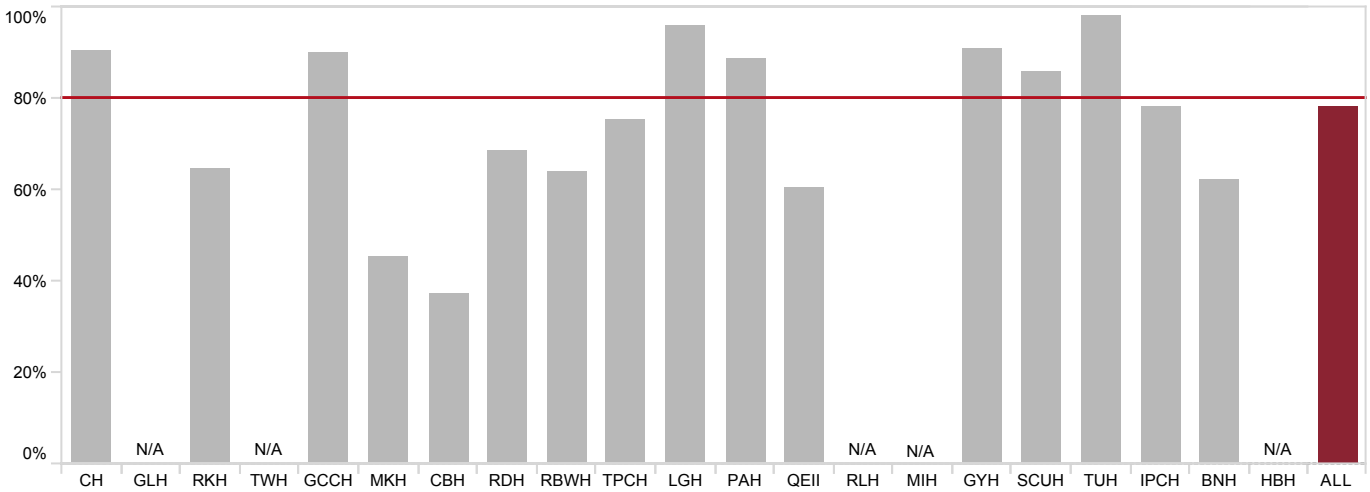
6.1 First clinical review

The HFSS review is defined as a clinical (rather than administrative) intervention and can be conducted face to face (clinic, gym or home visit) or virtually (phone, videoconference). Patients were excluded if they died, were referred to another HFSS, declined follow-up or could not be contacted.

1a First clinical review by Heart Failure Support Service within two weeks of hospital discharge (for inpatient referrals)

Early post discharge follow-up is recommended for patients with HF to monitor symptoms, provide education and support self-management principles. The review timeframe chosen for this intervention is within two weeks of hospital discharge or date of referral after recent hospitalisation.

Of the 3,978 patients referred from an acute setting, 78% received a clinical review by an HFSS within two weeks of hospital discharge. Variation in performance was observed between services and is demonstrated in the figure below.



N/A: Eligible referrals <20

Figure 8: Inpatients who received first HFSS clinical review within two weeks of hospital discharge

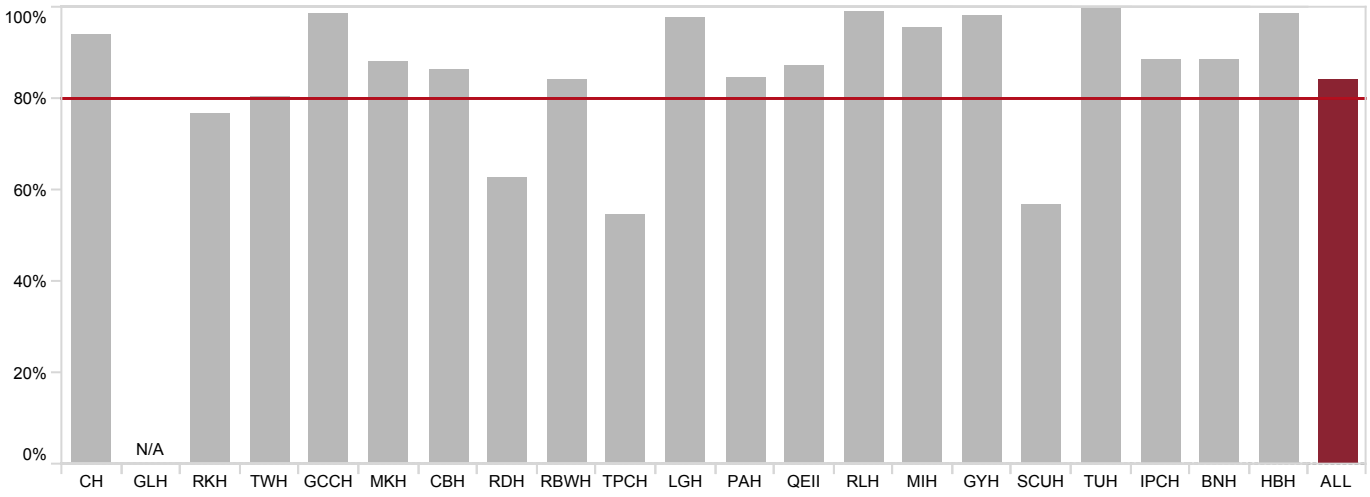
Table 16: Inclusion details for clinical indicator 1a: Inpatients receiving first HFSS clinical review within two weeks of hospital discharge

	n	%
Eligible for analysis	2,660	
Achieved benchmark	2,081	78.2
Benchmark not achieved	579	21.8
Ineligible	1,317	
Referred to another HFSS	681	
Patient could not be contacted, lives out of area or repeated failure to attend	140	
Referred to another service (e.g. cardiac rehabilitation or community nursing)	139	
Patient declined service	133	
HF no longer prime issue (palliative care, high care nursing home etc.)	85	
Patient deceased	46	
Our service is at capacity workload	14	
Other reason	79	
Missing data	1	
Total inpatient referrals	**3,978**	

1b First Heart Failure Support Service clinical review within four weeks for non acute referrals

For non acute referrals, clinical follow-up should be within four weeks of the referral date.

Referrals for 2,348 patients came from non acute services, of which 84% of the cases eligible for analysis received a clinical review within four weeks of referral. Variation in performance amongst services was observed and is outlined below.



N/A: Eligible referrals <20

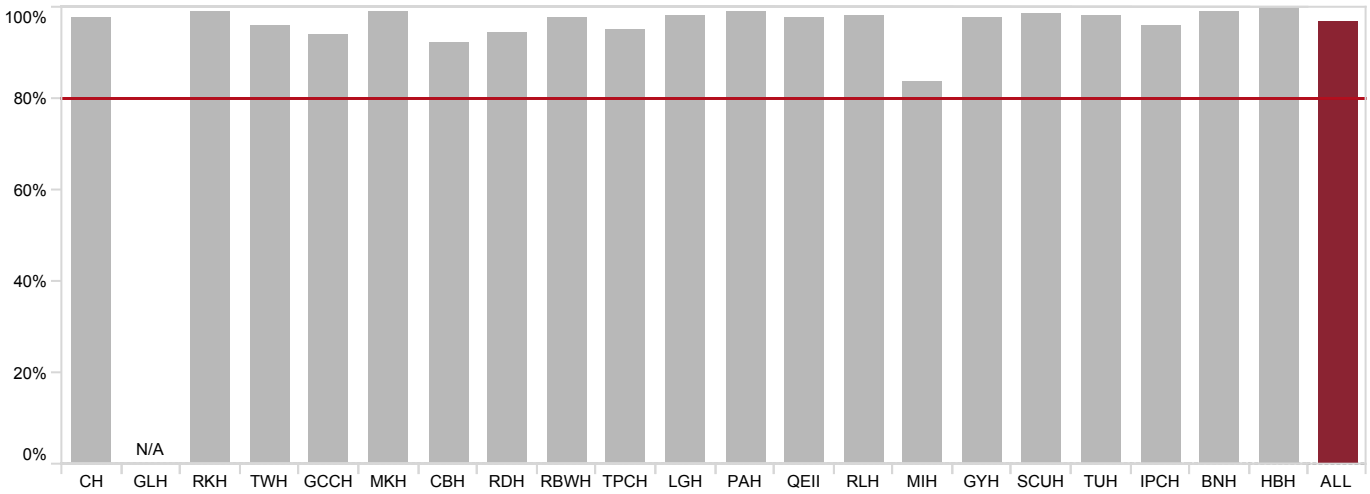
Figure 9: Proportion of non acute patients who received first HFSS clinical review within four weeks of referral

Table 17: Inclusion details for clinical indicator 1b: Non acute patients receiving first HFSS clinical review within four weeks of referral

	n	%
Eligible for analysis	2,024	
Achieved benchmark	1,703	84.1
Benchmark not achieved	321	15.9
Ineligible	319	
Referred to another HFSS	98	
Patient could not be contacted, lives out of area or repeated failure to attend	73	
Patient declined service	55	
Referred to another service (e.g. cardiac rehabilitation or community nursing)	17	
Patient deceased	15	
HF no longer prime issue (palliative care, high care nursing home etc.)	14	
Our service is at capacity workload	4	
Other reason	43	
Missing data	5	
Total non acute patients	**2,348**	

6.2 Left ventricular ejection fraction (LVEF) assessed within two years of referral to HFSS

Australian clinical guidelines recommend that all patients with heart failure should have an assessment of left ventricular function.[53] In 97% of cases, LVEF was assessed within two years of referral to an HFSS. Little variation in performance was observed and is demonstrated in the analysis below.



N/A: Eligible referrals <20

Figure 10: Proportion of all patients who had LVEF assessed within two years of referral to HFSS

Table 18: Inclusion details for clinical indicator 2: Patients who had LVEF assessed within two years of referral

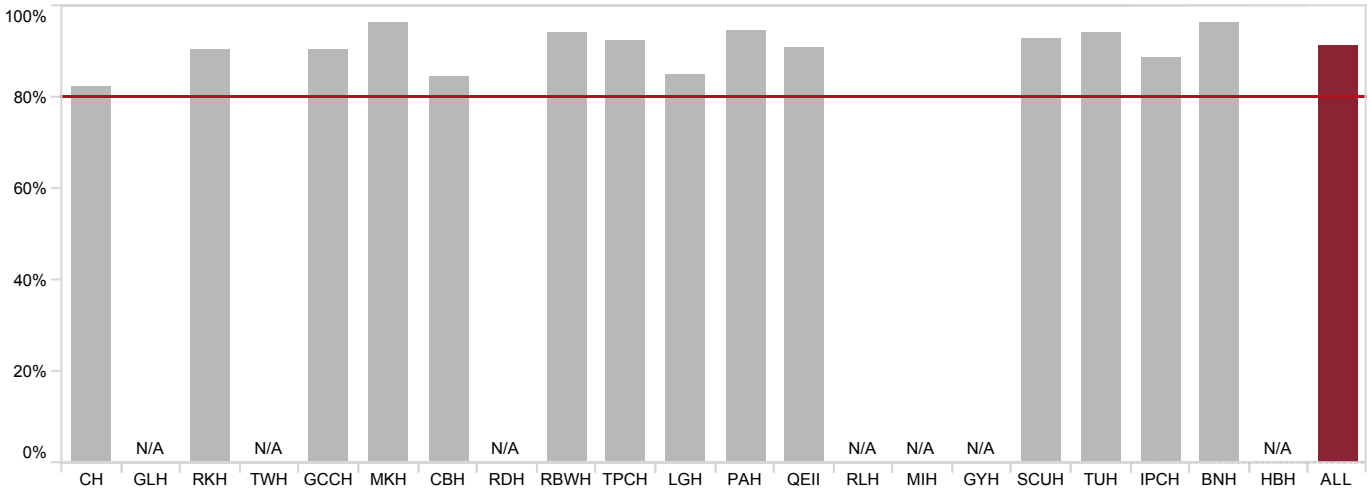
	n	%
Eligible for analysis	6,325	
Achieved benchmark	6,119	96.7
Benchmark not achieved	206	3.3
Ineligible	N/A	
Missing data	1	
Total referrals	**6,326**	

6.3 Prescription of ACEI, ARB or ARNI for patients with HFrEF

Angiotensin-converting-enzyme inhibitor (ACEI), angiotensin II receptor blockers (ARB) or angiotensin receptor neprilysin inhibitor (ARNI) have been shown to reduce mortality and morbidity in patients with HFrEF and are recommended for all patients unless contraindicated or not tolerated.[53]

3a ACEI, ARB or ARNI prescription for HFrEF at hospital discharge

Prescription benchmarks for ACEI, ARB or ARNI therapy on hospital discharge was met for 91% of eligible patients. Of these patients there were 75% of patients who were prescribed ARNI and the remaining 25% an ACEI/ARB.



N/A: Eligible referrals ‹20

Figure 11: Proportion of patients who were on ACEI, ARB or ARNI at time of hospital discharge

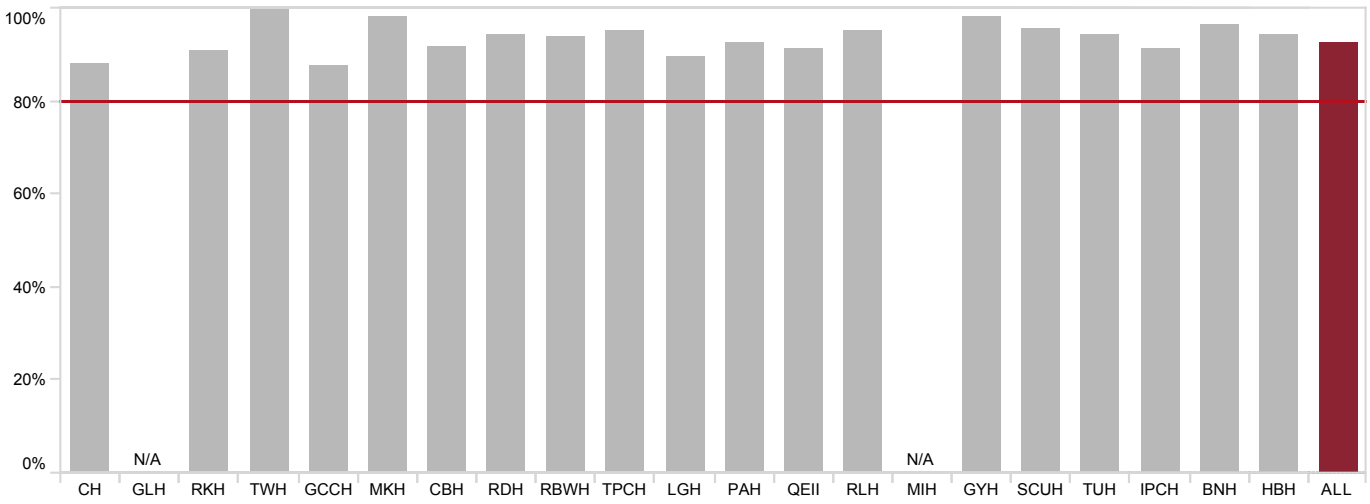
Table 19: Inclusion details for clinical indicator 3a: Inpatients on ACEI, ARB or ARNI at time of hospital discharge

	n	%
Eligible for analysis	2,943	
Achieved benchmark	2,684	91.2
Benchmark not achieved	259	8.8
Ineligible		
Documented contraindication*	170	
Incomplete data	3	
Total inpatient referrals analysed	**3,116**	

* Adverse reaction to ACEI/ARB or ARNI, palliative intent to treatment, pregnancy, eGFR ‹30mL/min/1.73m^2, severe aortic stenosis, renal artery stenosis, serum potassium ›5.5 mmol/L, symptomatic hypotension

3b ACEI, ARB or ARNI prescription for HFrEF at time of first HFSS clinical review

At the time of first clinical review, the target for prescription of ACEI, ARB or ARNI was met for 93% of eligible patients. Of these patients there were 70% of patients who were prescribed ARNI and the remaining 30% an ACEI/ARB.



N/A: Eligible referrals <20

Figure 12: Proportion of patients on ACEI, ARB or ARNI at time of first clinical review by site

Table 20: Inclusion details for clinical indicator 3b: Patients on ACEI, ARB or ARNI at first clinical review

	n	%
Eligible for analysis	3,630	
Achieved benchmark	3,365	92.7
Benchmark not achieved	265	7.3
Ineligible		
Documented contraindication*	168	
Incomplete data	6	
Total referrals analysed	**3,804**	

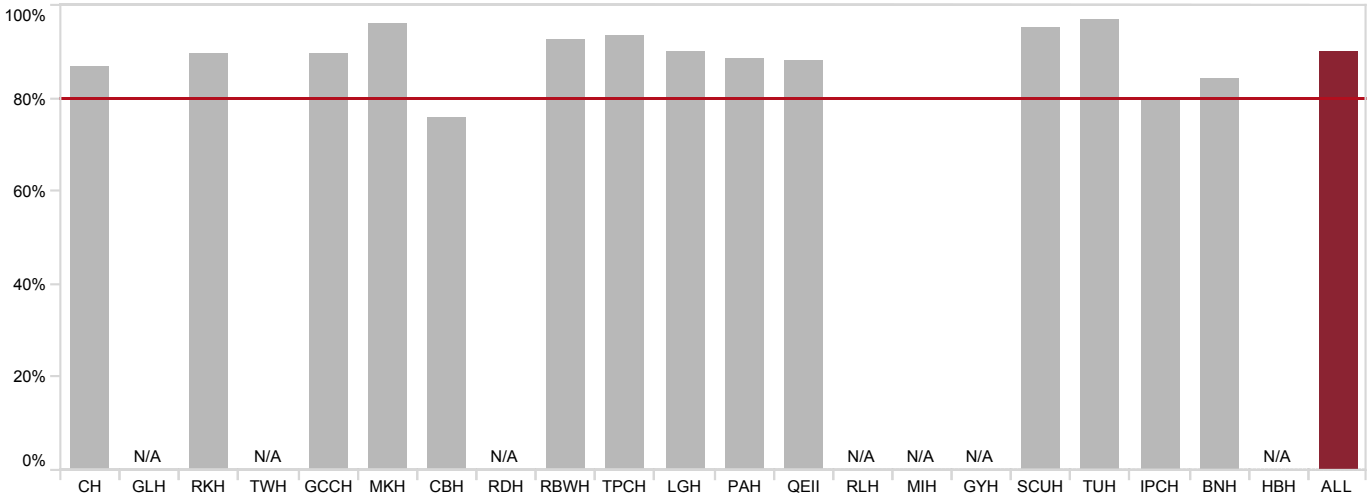
* Adverse reaction to ACEI/ARB or ARNI, palliative intent to treatment, pregnancy, eGFR <30mL/min/1.73m^2, severe aortic stenosis, renal artery stenosis, serum potassium >5.5 mmol/L, symptomatic hypotension

6.4 Prescription of guideline recommended beta blockers for HFrEF

Guideline recommended beta blockers have been shown to reduce mortality and morbidity in patients with HFrEF and are recommended for all patients unless contraindicated or not tolerated.[53,54] Guideline recommended beta blockers include bisoprolol, carvedilol, metoprolol sustained release or nebivolol. Results pertain only to these beta blocker medications.

4a Beta blocker prescription for HFrEF at time of hospital discharge

At hospital discharge, 90% of eligible patients were prescribed guideline recommended beta blockers. Of these patients there were 84%, 9%, 5% and 2% of patients who were prescribed bisoprolol, metoprolol sustained release, carvedilol, and nebivolol respectively.



N/A: Eligible referrals <20

Figure 13: Proportion of patients on guideline recommended beta blocker at hospital discharge by site

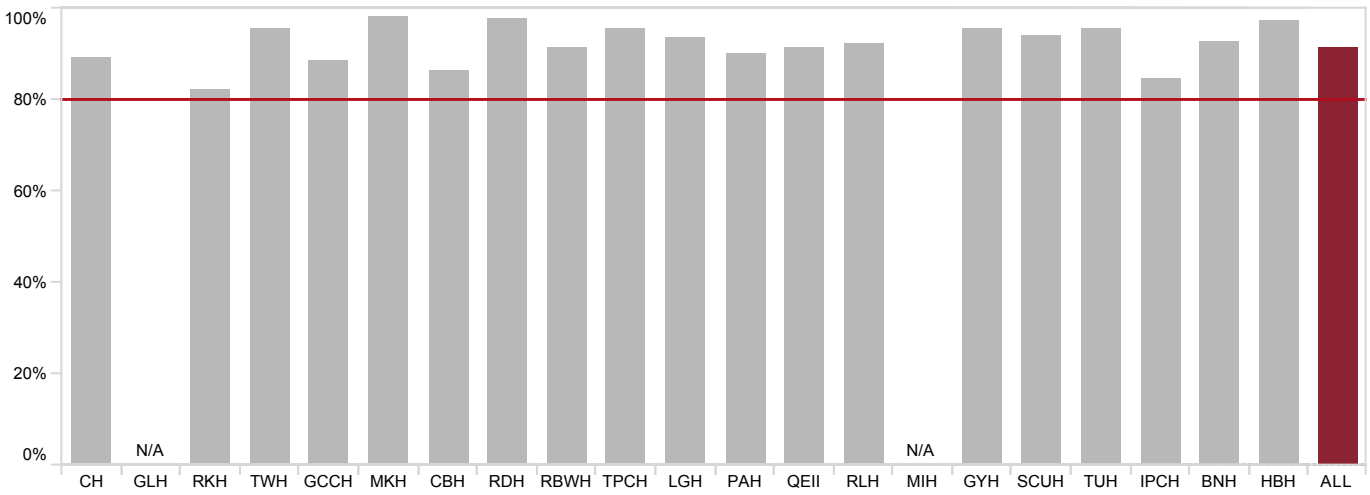
Table 21: Inclusion details for clinical indicator 4a: Patients on guideline recommended beta blocker at hospital discharge

	n	%
Eligible for analysis	3,028	
Achieved benchmark	2,728	90.1
Benchmark not achieved	300	9.9
Ineligible		
Documented contraindication*	85	
Incomplete data	3	
Total inpatient referrals analysed	**3,116**	

* Adverse reaction to beta blocker, palliative intent to treatment, pregnancy, bradycardia (HR <50bpm), symptomatic hypotension, severe COPD, asthma/reversible airways disease

4b Beta blocker prescription for HFrEF at time of first HFSS clinical review

At the first clinical review, 92% of eligible referrals to HFSS were reported to be on a guideline recommended beta blocker. Of these patients there were 82%, 9%, 6% and 3% of patients who were prescribed bisoprolol, metoprolol sustained release, carvedilol, and nebivolol respectively.



N/A: Eligible referrals <20

Figure 14: Proportion of patients on guideline recommended beta blocker therapy at first clinical review by site

Table 22: Inclusion details for clinical indicator 4b: Patients on guideline recommended beta blocker at first clinical review

	n	%
Eligible for analysis	3,715	
Achieved benchmark	3,401	91.5
Benchmark not achieved	314	8.5
Ineligible		
Documented contraindication*	83	
Incomplete data	6	
Total referrals analysed	**3,804**	

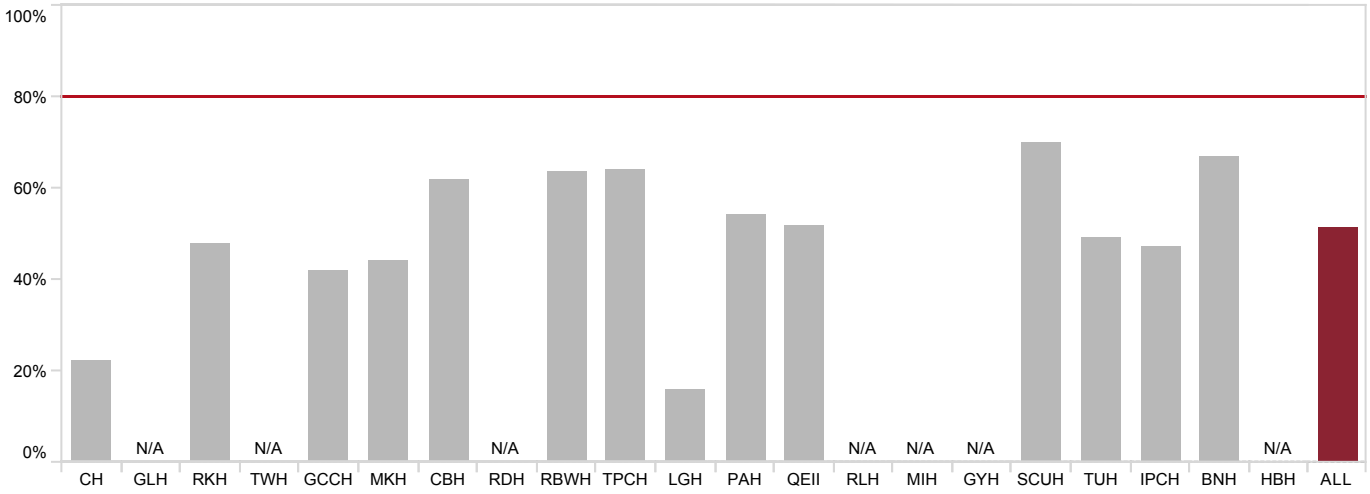
* Adverse reaction to beta blocker, palliative intent to treatment, pregnancy, bradycardia (HR <50bpm), symptomatic hypotension, severe COPD, asthma/reversible airways disease

6.5 Prescription of mineralocorticoid receptor antagonists (MRA) for patients with HFrEF

Guideline recommended mineralocorticoid receptor antagonists have been shown to reduce mortality and morbidity in patients with HFrEF and are recommended for all patients unless contraindicated or not tolerated.[53,54] Guideline recommended MRAs include eplerenone and spironolactone. All sites were below the benchmark.

5a Prescription of MRA for HFrEF at time of hospital discharge

At the time of discharge from hospital, 51% of eligible patients referred to an HFSS were prescribed an MRA. Of these patients there were 82% were prescribed spironolactone and 18% of patients who were prescribed eplerenone.



N/A: Eligible referrals <20

Figure 15: Proportion of patients on guideline recommended MRA at hospital discharge by site

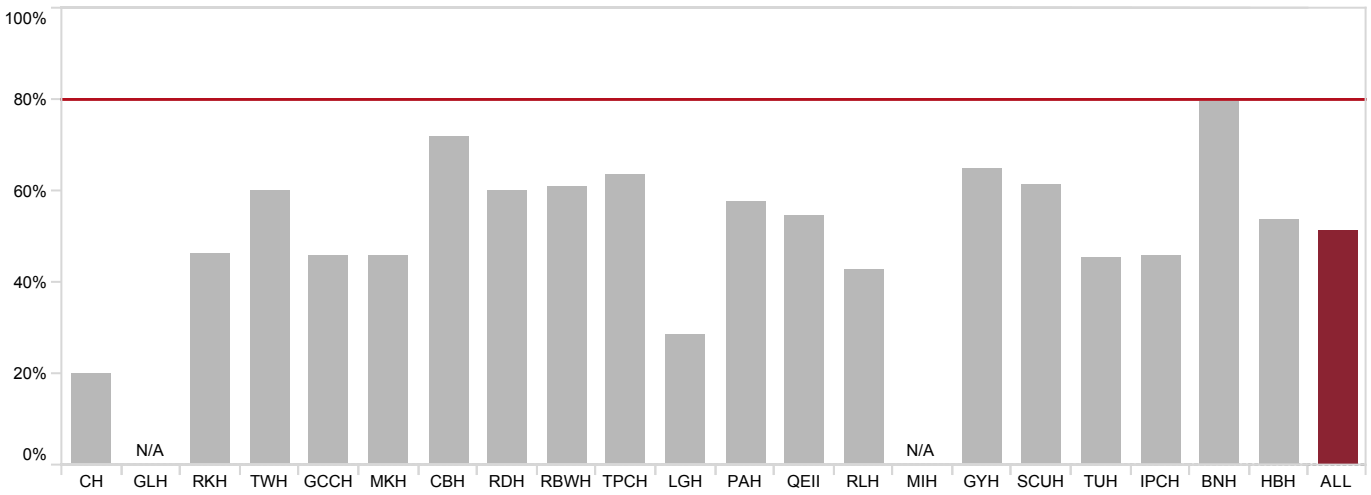
Table 23: Inclusion details for clinical indicator 5a: Patients on guideline recommended MRA at hospital discharge

	n	%
Eligible for analysis	2,805	
Achieved benchmark	1,443	51.4
Benchmark not achieved	1,362	48.6
Ineligible		
Documented contraindication*	308	
Missing data	3	
Total inpatient referrals analysed	**3,116**	

* Adverse reaction to MRA, palliative intent to treatment, serum potassium >5 mmol/L, pregnancy, eGFR <30mL/min/1.73m^2, previous gynaecomastia, Addison's disease, symptomatic hypotension or LVEF returned to >50%

5b Prescription of MRA for HFrEF at time of first HFSS clinical review

At the time of first clinical review, 51% of eligible referrals to an HFSS were reported to be on a guideline recommended MRA. Of these patients there were 85% were prescribed spironolactone and 15% of patients who were prescribed eplerenone. All sites were below the benchmark.



N/A: Eligible referrals <20

Figure 16: Proportion of patients on guideline recommended MRA at first clinical review site

Table 24: Inclusion details for clinical indicator 5b: Patients on guideline recommended MRA at first clinical review

	n	%
Eligible for analysis	3,441	
Achieved benchmark	1,767	51.4
Benchmark not achieved	1,674	48.6
Ineligible		
Documented contraindication*	357	
Missing data	6	
Total referrals analysed	**3,804**	

* Adverse reaction to MRA, palliative intent to treatment, serum potassium >5 mmol/L, pregnancy, eGFR <30mL/min/1.73m^2, previous gynaecomastia, Addison's disease, symptomatic hypotension or LVEF returned to >50%

6.6 Beta blocker titration

This indicator looks at the progress of titration of guideline recommended beta blockers at six months following hospital discharge or when deactivated from the HFSS, whichever is sooner. The timeframe is taken from the first clinical review by HFSS (usually at four weeks from referral or hospital discharge).

The indicator measures three components of beta blocker titration at six months, including:

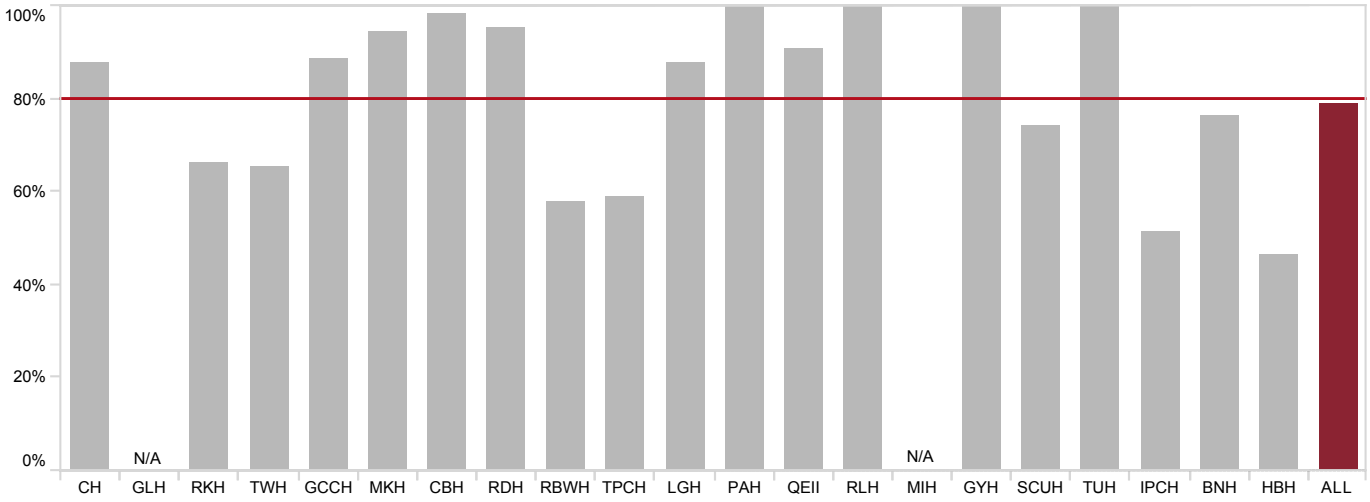
a) Review of titration status undertaken,

b) Achievement of target dose, and

c) Achievement of target or maximum tolerated dose.

6a Beta blocker titration review conducted within six months of first HFSS clinical review

At six months from referral or at the time of deactivation from the HFSS (whichever was sooner), 79% of patients received a beta blocker titration review which is below the benchmark. Variation in performance amongst services was observed and is demonstrated in the figure below.



N/A: Eligible referrals <20

Figure 17: Proportion of patients who had a beta blocker titration review conducted within six months by site

Table 25: Inclusion details for clinical indicator 6a: Patients who had a beta blocker titration review within six months

	n	%
Eligible for analysis	1,984	
Achieved benchmark	1,569	79.1
Benchmark not achieved	415	20.9
Ineligible	1,644	
Patient on target dose at the time of referral	892	
Patient could not be contacted, lives out of area or repeated failure to attend	146	
Patient declined service	113	
Referred to another HFSS	69	
HF no longer prime issue (palliative care, high care nursing home etc.)	65	
Patient deceased	59	
Referred to another service (e.g. cardiac rehabilitation or community nursing)	40	
Documented contraindication*	30	
Medical follow-up only (GP, private or public physician)	20	
Patient on maximum tolerated dose	3	
Other reason	207	
Incomplete data	44	
Total analysed	**3,672**	

* Adverse reaction to beta blocker, palliative intent to treatment, pregnancy, bradycardia (HR <50bpm), symptomatic hypotension, severe COPD, asthma/reversible airways disease

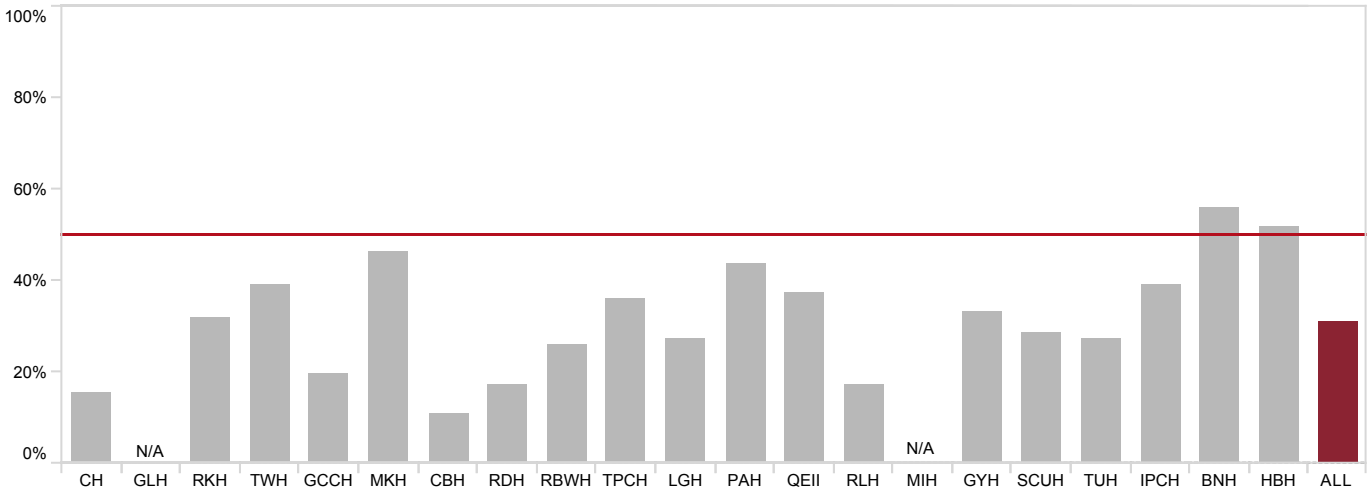
6b Beta blocker clinical guideline target dose achieved at time of titration review

The benchmark for target dose beta blocker titration was set lower than the other indicators at 50%. This lower benchmark is to accommodate differences in patients recruited to clinical trials compared to patients presenting in clinical practice who are older with more comorbidities.

Guideline recommended target dose was achieved for 31% of referrals within six months or at deactivation, with only two sites exceeding the benchmark (see Figure 18).

Daily target doses are:

- Carvedilol 50–100 mg
- Metoprolol sustained release 190 mg
- Bisoprolol 10 mg
- Nebivolol 10 mg



N/A: Eligible referrals <20

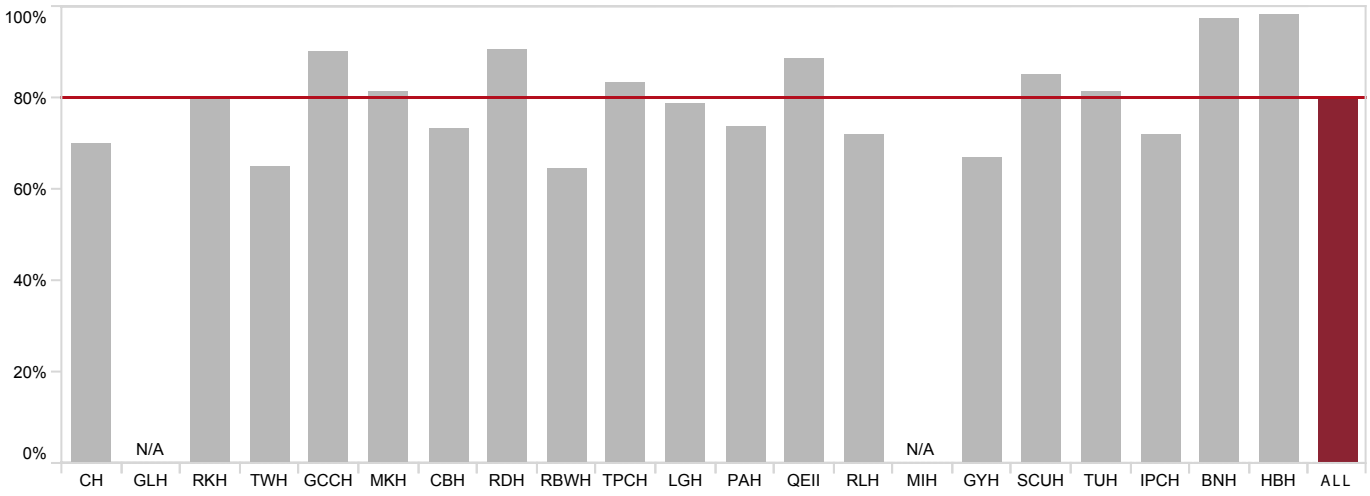
Figure 18: Proportion of patients who achieved target beta blocker dose at time of titration review by site

Table 26: Inclusion details for clinical indicator 6b: Patients who achieved target beta blocker dose at time of titration review

	n	%
Eligible for analysis	1,984	
Achieved benchmark	612	30.8
Benchmark not achieved	1,372	69.2
Ineligible	N/A	
Total titration reviews conducted	**1,984**	

6c Beta blocker titration clinical guideline target or maximum tolerated dose achieved at time of titration review

Maximum tolerated dose of beta blockers is based on a clinical judgement balancing the harm and benefit of up-titration. The proportion of patients reaching the target dose or maximum tolerated dose of guideline recommended beta blocker medication by the time of the titration review was 80%.



N/A: Eligible referrals <20

Figure 19: Proportion of patients who achieved target beta blocker dose or maximum tolerated dose at time of titration review

Table 27: Inclusion details for clinical indicator 6c: Patients who achieved target or maximum tolerated beta blocker dose at time of titration review

	n	%
Eligible for analysis	1,984	
Achieved benchmark	1,588	80.0
Benchmark not achieved	396	20.0
Ineligible	N/A	
Total titration reviews conducted	**1,984**	

6.7 Summary of clinical indicators

Table 28: Summary of clinical process indicator performance by site

	Clinical indicator achievement (%)											
HFSS	**1a**	**1b**	**2**	**3a**	**3b**	**4a**	**4b**	**5a**	**5b**	**6a**	**6b**	**6c**
Cairns Hospital	91	94	98	82	88	87	89	23	20	88	16	70
Gladstone Hospital	–	–	–	–	–	–	–	–	–	–	–	–
Rockhampton Hospital	65	77	99	91	91	89	82	48	46	66	32	80
Toowoomba Hospital	–	81	96	–	100	–	95	–	60	65	39	65
Gold Coast Community Health	90	99	94	91	88	90	89	42	46	89	20	90
Mackay Base Hospital	45	88	99	96	98	96	98	44	46	94	46	82
Caboolture Hospital	37	86	92	84	92	76	86	62	72	98	11	73
Redcliffe Hospital	69	63	95	–	94	–	98	–	60	95	17	90
Royal Brisbane & Women's Hospital	64	84	98	94	94	93	91	64	61	58	26	65
The Prince Charles Hospital	76	55	95	92	95	93	96	64	64	59	36	83
Logan Hospital	96	98	98	85	89	90	94	16	28	88	27	79
Princess Alexandra Hospital	89	85	99	95	93	89	90	54	58	100	44	74
Queen Elizabeth II Hospital	60	87	98	91	91	88	91	52	55	91	38	89
Redland Hospital	–	99	98	–	95	–	92	–	43	100	17	72
Mt Isa Hospital	–	96	84	–	–	–	–	–	–	–	–	–
Gympie Hospital	91	98	98	–	98	–	95	–	65	100	33	67
Sunshine Coast University Hospital	86	57	98	93	96	95	94	70	62	74	29	85
Townsville Hospital	98	100	98	94	94	97	96	49	45	100	27	81
Ipswich Community Health	78	89	96	89	91	80	84	47	46	51	39	72
Bundaberg Hospital	62	89	99	96	96	84	93	67	80	77	56	97
Hervey Bay Hospital	–	99	100	–	94	–	97	–	54	47	52	98
Statewide	**78**	**84**	**97**	**91**	**93**	**90**	**92**	**51**	**51**	**79**	**31**	**80**

Legend:

1a Follow-up of acute patients within two weeks (Benchmark: 80%)

1b Follow-up of non acute patients within four weeks (Benchmark: 80%)

2 Assessment of left ventricular ejection fraction within two years (Benchmark: 80%)

3a ACEI, ARB or ARNI prescription at hospital discharge (Benchmark: 80%)

3b ACEI, ARB or ARNI prescription at first clinical review (Benchmark: 80%)

4a Guideline recommended beta blocker prescription at hospital discharge (Benchmark: 80%)

4b Guideline recommended beta blocker prescription at first clinical review (Benchmark: 80%)

5a Guideline recommended MRA prescription at hospital discharge (Benchmark: 80%)

5b Guideline recommended MRA prescription at first clinical review (Benchmark: 80%)

6a Beta blocker titration status review at six months post referral (Benchmark: 80%)

6b Beta blockers achievement of guideline recommended target dose (Benchmark: 50%)

6c Beta blockers achievement of guideline recommended target dose or maximum tolerated dose (Benchmark: 80%)

7 Patient outcomes

Chronic heart failure is associated with recurrent hospitalisation and increased mortality. Support from multidisciplinary HF disease management programmes (such as an HFSS) and adherence to recommended therapies are associated with improved outcomes.

7.1 Methods

This analysis used the previously reported 2020 patient cohort to examine the early (30 day) and one year clinical outcomes (rehospitalisation and mortality) among patients referred to HFSS. This was performed using data linkage with the Queensland Hospital Admitted Patient Data Collection (QHAPDC) and Queensland Registry of Births, Deaths and Marriages.

For this report, only HFSS referrals initiated during an inpatient encounter for 2020 were included. The earliest admission of the calendar year was considered the index admission (which may not be the first time that a patient has been hospitalised with heart failure).

Eligibility criteria for the mortality and readmission analysis cohort were applied at the time of the index admission. The eligibility status for days alive and out of hospital (DAOH) analysis was reviewed at all subsequent admissions over 12 months to exclude patients who were transferred to private hospitals or interstate.

The patient outcome indicators of interest are summarised in Table 29. Survival curves were constructed using the Kaplan–Meier method and cumulative incidence function was used to estimate the risk of all-cause and HF-related rehospitalisation to account for the competing risk of death.

DAOH was calculated to reflect the burden of recurrent hospitalisation, hospital length of stay and death, and was expressed as both median values, interquartile range, and mean values. Categorical variables were summarised as frequencies and percentages.

Table 29: Patient outcome indicators

Indicator #	Measure
1	All-cause mortality within one year after index hospitalisation discharge
2	Rehospitalisation within one year after index hospitalisation discharge a) All-cause rehospitalisation b) Heart failure rehospitalisation*
3	Composite of all-cause hospitalisation or all-cause mortality within one year after index hospitalisation discharge
4	Days alive and out of hospital within one year of index hospital discharge date

* ICD10AM codes: E87.7, I13.0, I13.2, I25.5, I42.0, I42.1, I42.2, I42.5, I42.6, I42.7, I42.8, I42.9, I46.0, I46.1, I46.9, I50, J81, J90, R18, R57.0, R60.1

7.2 Findings

There were 3,782 inpatient referrals of which 96% were successfully linked with the QHAPDC data. There were 464 patients who were ineligible for readmission and mortality analysis for the reasons shown in Table 30. A further 22 patients (0.6%) did not have complete follow up over one year to allow DAOH to be calculated.

Table 30: Eligibility criteria for patient outcome indicators

	n	%
Total 2020 inpatient referrals	**3,782**	**100.0**
Ineligible at index admission		
Duplicate patient record	172	4.5
Died during index admission	14	0.4
Not a Queensland resident	61	1.6
Transferred to private hospital	29	0.8
Index admission is not overnight	25	0.7
No linkage data available	162	4.3
Included in readmission and mortality analysis	**3,319**	**87.7**
Ineligible at subsequent admission over 1 year		
Transferred to private hospital	22	0.6
Included in days alive and out of hospital analysis	**3,297**	**87.2**

7.2.1 All-cause mortality

Among patients referred to HFSS during an inpatient encounter, the 30 day and one year unadjusted all-cause mortality rates were 1.4% and 11.4%. The Kaplan-Meier survival analyses below (Figures 20 to 22) suggest that older age was associated with increased mortality rates at all time points and particularly at 12 months.

Table 31: Cumulative all-cause unadjusted mortality rate from 30 to 365 days after discharge

	30 days n (%)	90 days n (%)	180 days n (%)	365 days n (%)
Total deaths identified	45 (1.4)	111 (3.3)	210 (6.3)	379 (11.4)
Died during subsequent admission*	27 (0.8)	70 (2.1)	129 (3.9)	221 (6.7)
All other deaths	18 (0.5)	41 (1.2)	81 (2.4)	158 (4.8)
Total at risk	**3,274 (98.6)**	**3,208 (96.7)**	**3,109 (93.7)**	**2,940 (88.6)**

* Data available for Queensland public hospitals only

Table 32: Cumulative all-cause unadjusted mortality by patient characteristic

Characteristic	Total patients n	30 days n (%)	90 days n (%)	180 days n (%)	365 days n (%)
Gender					
Male	2,196	32 (1.5)	76 (3.5)	142 (6.5)	257 (11.7)
Female	1,123	13 (1.2)	35 (3.1)	68 (6.1)	122 (10.9)
Age group					
<65 years	1,273	9 (0.7)	18 (1.4)	35 (2.7)	66 (5.2)
65–74 years	836	11 (1.3)	30 (3.6)	53 (6.3)	96 (11.5)
≥75 years	1,210	25 (2.1)	63 (5.2)	122 (10.1)	217 (17.9)
Heart failure phenotype					
HFrEF	2,619	35 (1.3)	86 (3.3)	147 (5.6)	268 (10.2)
HFpEF	637	8 (1.3)	21 (3.3)	55 (8.6)	98 (15.4)
Missing/unsure	63	2 (3.2)	4 (6.3)	8 (12.7)	13 (20.6)
All	**3,319**	**45 (1.4)**	**111 (3.3)**	**210 (6.3)**	**379 (11.4)**

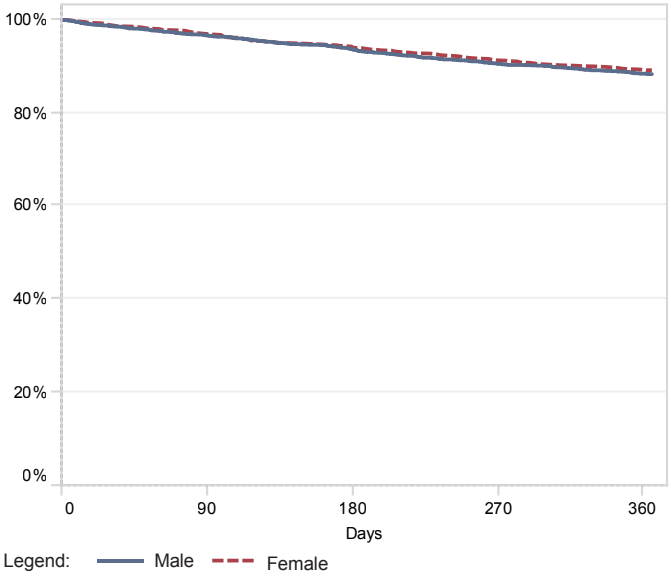


Figure 20: Heart failure survival by gender

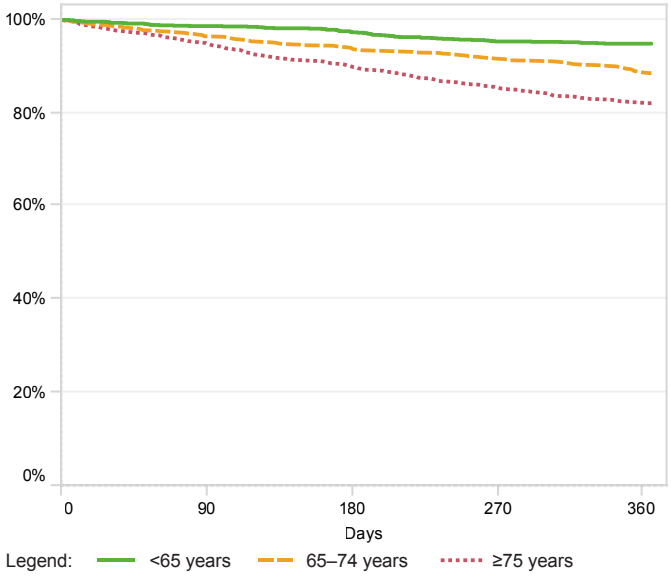


Figure 21: Heart failure survival by age group

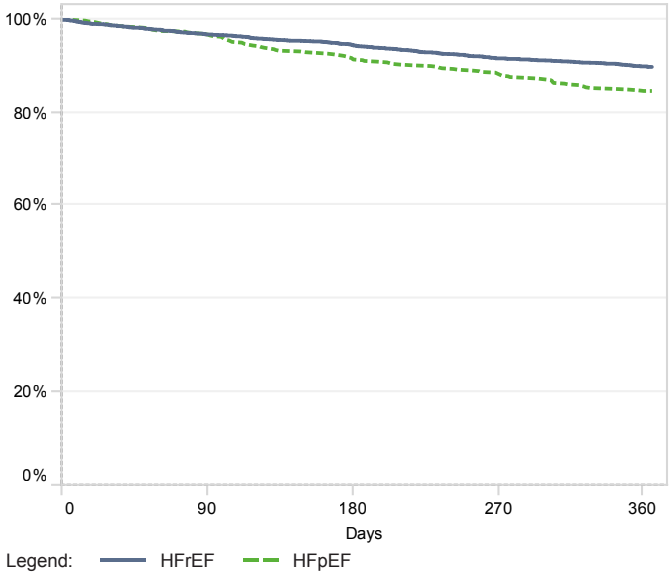


Figure 22: Heart failure survival by phenotype

7.2.2 All-cause and heart failure rehospitalisation

Cumulative incidence curves for all-cause and HF hospitalisation are shown in Figures 23 and 24. Of the 3,319 eligible patients referred to HFSS during 2020, the unadjusted rate of all-cause hospitalisation was 17.2% at 30 days, increasing to 52.8% at one year. Hospitalisations relating to HF (as identified by discharge diagnosis coding) were 5.8% and 20.7% at 30 days and one year respectively.

The overall risk of hospitalisation or death within 12 months post the index admission was 53.8% (Figure 25). More than one quarter of patients referred to an HFSS were rehospitalised at least twice in the subsequent 12 months (Table 33).

Table 33: Number of rehospitalisations per patient in the year post initial discharge

Total in one year	All-cause n (%)	Heart failure n (%)
0	1,604 (48.3)	2,678 (80.7)
1	823 (24.8)	412 (12.4)
2	366 (11.0)	125 (3.8)
3	219 (6.6)	62 (1.9)
4	127 (3.8)	21 (0.6)
≥5	180 (5.4)	21 (0.6)

Table 34: Cumulative incidence of all-cause rehospitalisation from 30 to 365 days post discharge

Characteristic	Total patients n	30 days n (%)	90 days n (%)	180 days n (%)	365 days n (%)
Gender					
Male	2,196	374 (17.1)	642 (29.5)	839 (38.8)	1,101 (51.2)
Female	1,123	195 (17.5)	341 (30.7)	466 (42.1)	614 (55.9)
Age group					
<65 years	1,273	192 (15.1)	328 (25.9)	428 (33.8)	554 (43.9)
65–74 years	836	131 (15.8)	227 (27.6)	312 (38.1)	417 (51.4)
≥75 years	1,210	246 (20.4)	428 (35.9)	565 (47.8)	744 (63.4)
Heart failure phenotype					
HFrEF	2,619	432 (16.6)	726 (28)	973 (37.6)	1,281 (49.8)
HFpEF	637	124 (19.6)	231 (36.7)	303 (48.9)	398 (64.5)
Missing/unsure	63	13 (21.0)	26 (42.6)	29 (47.5)	36 (60.0)
All	**3,319**	**569 (17.2)**	**983 (29.9)**	**1,305 (39.9)**	**1,715 (52.8)**

Table 35: Cumulative incidence of heart failure rehospitalisation from 30 to 365 days post discharge

Characteristic	Total patients n	30 days n (%)	90 days n (%)	180 days n (%)	365 days n (%)
Gender					
Male	2,196	128 (5.9)	219 (10.2)	290 (13.8)	397 (19.4)
Female	1,123	61 (5.5)	132 (12)	170 (15.7)	244 (23.2)
Age group					
<65 years	1273	59 (4.7)	112 (8.9)	128 (10.2)	176 (14.3)
65–74 years	836	44 (5.3)	72 (8.9)	102 (12.8)	145 (18.8)
≥75 years	1,210	86 (7.2)	167 (14.3)	230 (20.2)	320 (29.4)
Heart failure phenotype					
HFrEF	2,619	138 (5.3)	237 (9.3)	317 (12.5)	444 (18.1)
HFpEF	637	46 (7.3)	100 (16.1)	129 (21.5)	180 (30.9)
Missing/unsure	63	5 (8.1)	14 (23)	14 (23.7)	17 (29.8)
All	**3,319**	**189 (5.8)**	**351 (10.8)**	**460 (14.4)**	**641 (20.7)**

Table 36: Cumulative incidence of all-cause rehospitalisation or death from 30 to 365 days post discharge

Characteristic	Total patients n	30 days n (%)	90 days n (%)	180 days n (%)	365 days n (%)
Gender					
Male	2,196	384 (17.5)	665 (30.3)	873 (39.8)	1,147 (52.2)
Female	1,123	202 (18.0)	354 (31.5)	483 (43.0)	638 (56.8)
Age group					
<65 years	1,273	196 (15.4)	334 (26.2)	435 (34.2)	564 (44.3)
65–74 years	836	137 (16.4)	240 (28.7)	329 (39.4)	441 (52.8)
≥75 years	1,210	253 (20.9)	445 (36.8)	592 (48.9)	780 (64.5)
Heart failure phenotype					
HFrEF	2,619	444 (17.0)	752 (28.7)	1,005 (38.4)	1,328 (50.7)
HFpEF	637	128 (20.1)	239 (37.5)	320 (50.2)	418 (65.6)
Missing/unsure	63	14 (22.2)	28 (44.4)	31 (49.2)	39 (61.9)
All	**3,319**	**586 (17.7)**	**1,019 (30.7)**	**1,356 (40.9)**	**1,785 (53.8)**

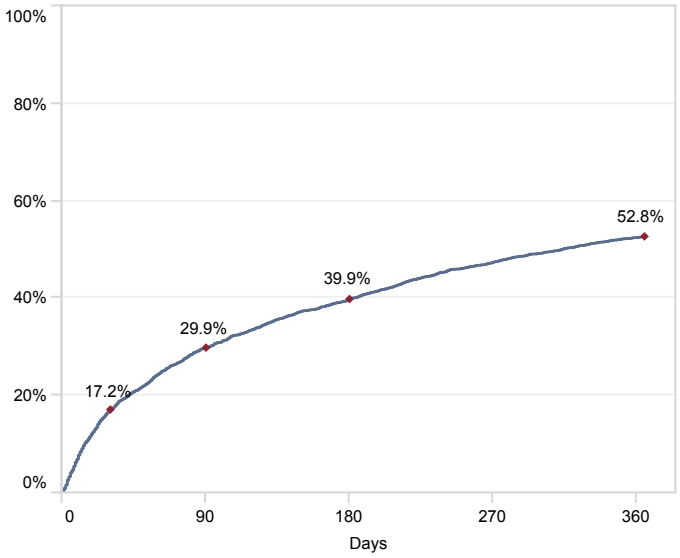


Figure 23: Cumulative incidence of all-cause rehospitalisation

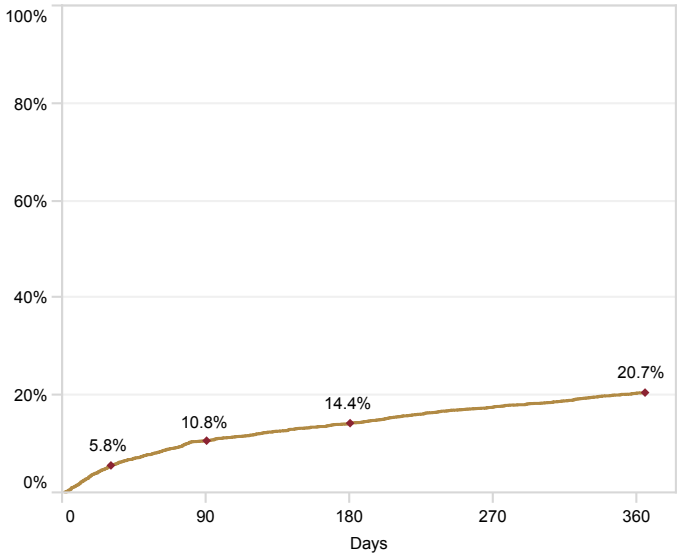


Figure 24: Cumulative incidence of heart failure rehospitalisation

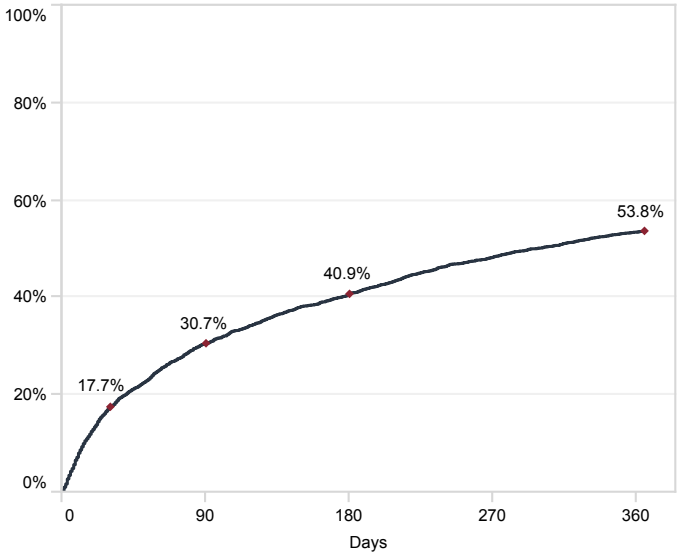


Figure 25: Cumulative incidence of all-cause rehospitalisation or death

7.2.3 Days alive and out of hospital

Days alive and out of hospital (DAOH) incorporates mortality and all hospitalisations (including length of hospital stay) within one year of discharge. This single measure demonstrates the post discharge time alive and not in hospital as a combined measure.

Almost 47% of patients survived more than a year without rehospitalisation, with a median of 364 days for the whole group. The mean days alive and out of hospital was 334.2, which equates to 101,548 days lost due to death or hospitalisation over 12 months in 3,297 patients.

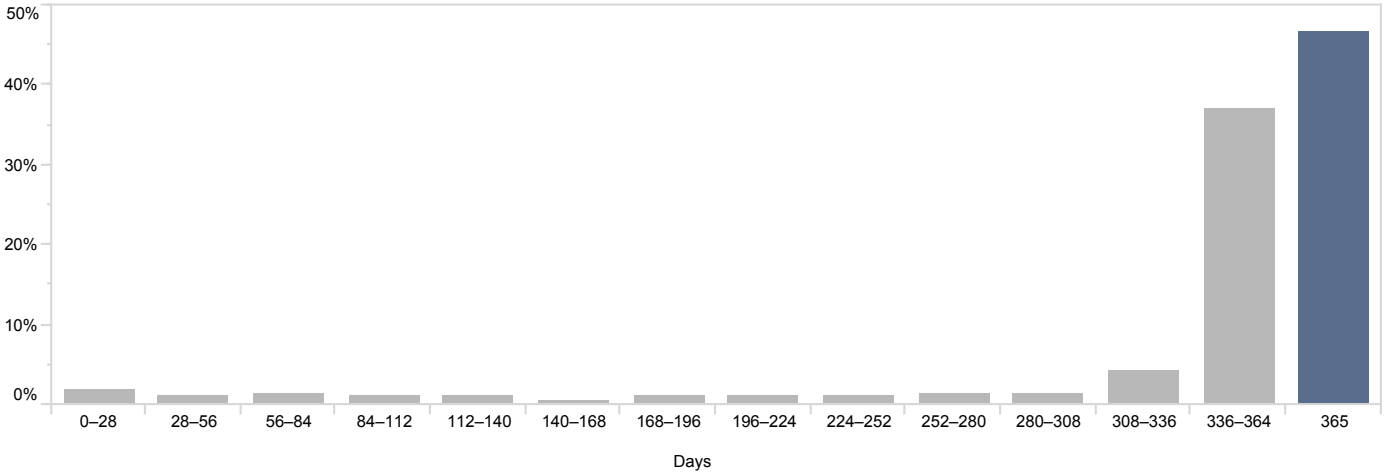
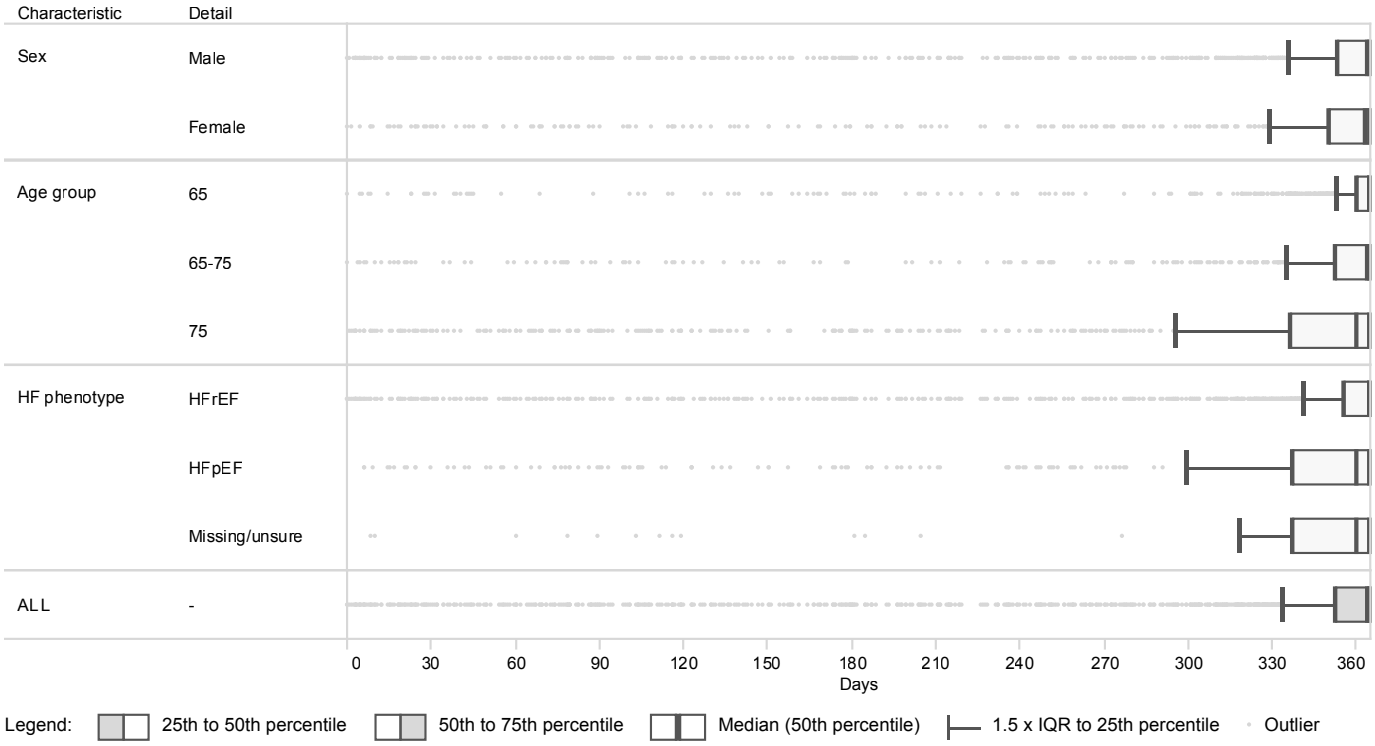


Figure 26: Days alive and out of hospital within one year after hospital discharge

Table 37: Days alive and out of hospital within one year of discharge by patient characteristic

Characteristic	Detail	n	Mean days	Median (IQR) days
Sex	Male	2,192	334.0	364 (353–365)
	Female	1,105	334.6	364 (351–365)
Age group	<65	1,273	348.2	365 (360–365)
	65–74	834	336.2	364 (353–365)
	≥75	1,190	317.8	361 (337–365)
HF phenotype	HFrEF	2,608	337.3	365 (356–365)
	HFpEF	626	323.7	360 (337–365)
	Missing/unsure	63	309.1	360 (337–365)
All		**3,297**	**334.2**	**364 (352–365)**

The box and whisker plots in Figure 27 illustrate the distribution of DAOH for different characteristics. The median DAOH is close to 365 days for most categories (the box shows the middle 50% of scores). The whiskers stretching to the left illustrate that many patients spent subsequent time in hospital or died. The DAOH was much lower for patients who were over 75 years old.



Mean, median and interquartile range (IQR) are given in days

Figure 27: Days alive and out of hospital within one year of discharge by patient characteristic

References

Heart Failure Support Services Audit

[52] Atherton, J. J., & Hickey, A. (2017). Expert comment: Is medication titration in heart failure too complex? *Cardiac Failure Review, 03(01), 25*. https://doi.org/10.15420/cfr.2017:1:2

[53] Atherton, J., Branagan, M., Sindone, A., Abhayaratna, W., Driscoll, A., De Pasquale, C., Hopper, I., MacDonald, P., Kistler, P., Newton, P., Audehm, R., Briffa, T., Wong, J., O'Loughlin, J., & Thomas, L. (2018). The National Heart Foundation of Australia and Cardiac Society of Australia and New Zealand guidelines for the prevention, detection, and management of Chronic Heart Failure in Australia 2018. *Heart, Lung and Circulation, 27*. https://doi.org/10.1016/j.hlc.2018.06.214

[54] Yancy, C. W., Jessup, M., Bozkurt, B., Butler, J., Casey, D. E., Drazner, M. H., Fonarow, G. C., Geraci, S. A., Horwich, T., Januzzi, J. L., Johnson, M. R., Kasper, E. K., Levy, W. C., Masoudi, F. A., McBride, P. E., McMurray, J. J. V., Mitchell, J. E., Peterson, P. N., Riegel, B., … Wilkoff, B. L. (2013). 2013 ACCF/AHA guideline for the management of heart failure. *Circulation, 128(16)*. https://doi.org/10.1161/cir.0b013e31829e8776

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
AUC	Area Under Curve
ARB	Angiotensin II Receptor Blocker
ARF	Acute Rheumatic Fever
ARNI	Angiotensin Receptor-Neprilysin Inhibitors
ASD	Atrial Septal Defect
AV	Atrioventricular
AVNRT	Atrioventricular Nodal Re-entry Tachycardia
BCIS	British Cardiovascular Intervention Society
BiV	Biventricular
BMI	Body Mass Index
BMS	Bare Metal Stent
BNH	Bundaberg Hospital
BSSLTx	Bilateral Sequential Single Lung Transplant
BVS	Bioresorbable Vascular Scaffold
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
COVID-19	Coronavirus disease 2019
CPB	Cardiopulmonary Bypass
CR	Cardiac Rehabilitation
CRT	Cardiac Resynchronisation Therapy
CS	Cardiac Surgery
CVA	Cerebrovascular Accident
DAOH	Days Alive and Out of Hospital
DES	Drug Eluting Stent
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	Generalized Anxiety Disorder
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
H-L	Hosmer–Lemeshow Test Statistic
HOCM	Hypertrophic Obstructive Cardiomyopathy
HSQ	Health Support Queensland
IC	Interventional Cardiology
ICD	Implantable Cardioverter Defibrillator
IE	Infective Endocarditis
IHT	Inter-hospital Transfer
IPCH	Ipswich Community Health
IVDU	Intravenous Drug Use
LAA	Left Atrial Appendage
LAD	Left Anterior Descending Artery
LCX	Circumflex Artery
LGH	Logan Hospital
LOS	Length Of Stay
LV	Left Ventricle
LVEF	Left Ventricular Ejection Fraction
LVOT	Left Ventricular Outflow Tract
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
NCR	National Cardiac Registry
NCS	Networked Cardiac Services
NP	Nurse Practitioner
NRBC	Non-Red Blood Cells
NSTEMI	Non ST Elevation Myocardial Infarction
OR	Odds Ratio
OOHCA	Out of Hospital Cardiac Arrest
ORIF	Open Reduction Internal Fixation
PAH	Princess Alexandra Hospital
PAPVD	Partial Anomalous Pulmonary Venous Drainage
PCI	Percutaneous Coronary Intervention
PDA	Patent Ductus Arteriosus
PFO	Patent Foramen Ovale
PHQ	Patient Health Questionnaire
PICU	Paediatric intensive care unit
PROMS	Patient Reported Outcome Measures
QAS	Queensland Ambulance Service
QCCN	Queensland Cardiac Clinical Network
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
SCCIU	Statewide Cardiac Clinical Informatics Unit
SCUH	Sunshine Coast University Hospital
SHD	Structural Heart Disease
SMoCC	Self Management of Chronic Conditions
STEMI	ST-Elevation Myocardial Infarction
STS	Society of Thoracic Surgery
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
TXA	Tranexamic Acid
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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