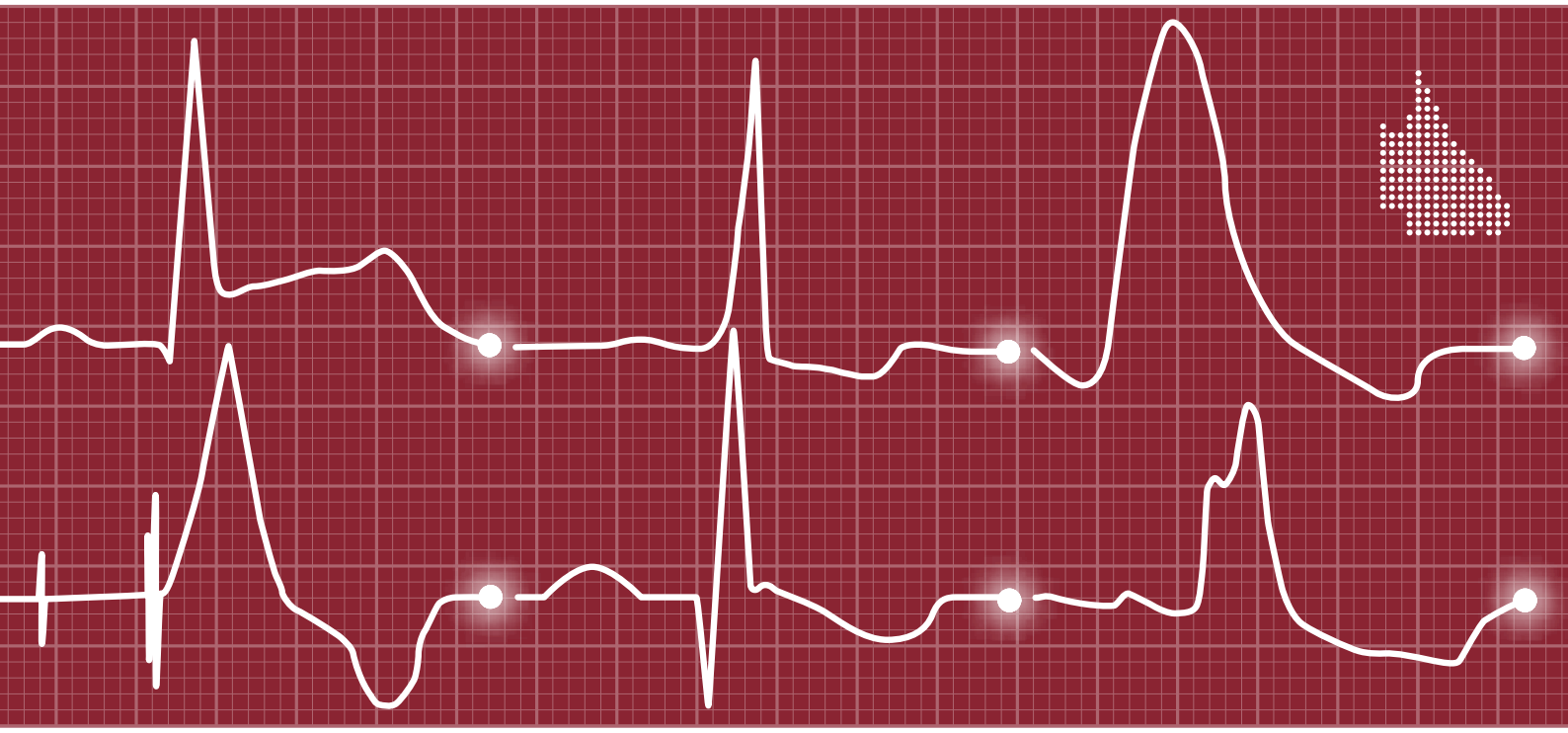
Queensland Cardiac Clinical Network

Queensland Cardiac Outcomes Registry

2022 Annual Report

Heart Failure Support Services Audit



Queensland Cardiac Outcomes Registry 2022 Annual Report

Published by the State of Queensland (Queensland Health), December 2023

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

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

Contents

Message from the Queensland Cardiac Clinical Network Chair 1
Acknowledgements 2
Introduction 3

Heart Failure Support Services Audit HF 1

Message from the QCOR Heart Failure Steering Committee Chair HF 3
Key findings HF 4
Participating sites HF 6
New referrals HF 9
- Location of referrals HF 9
- Referral source HF 11

Patient characteristics HF 12
- Age and gender HF 12
- Gender HF 13
- Aboriginal and Torres Strait Islander status HF 14
- Phenotype of heart failure HF 16
- Summary of patient characteristics HF 18

Clinical indicators HF 19
- First clinical review HF 20
- Left ventricular ejection fraction (LVEF) assessed within two years of referral to HFSS HF 22
- Prescription of ACEI, ARB or ARNI for patients with HFrEF HF 23
- Prescription of guideline recommended beta blockers for HFrEF HF 25
- Prescription of mineralocorticoid receptor antagonists (MRA) for patients with HFrEF HF 27
- Prescription of sodium-glucose cotransporter-2 (SGLT2) inhibitors for HFrEF HF 29
- Beta blocker titration HF 31
- Prescription of sodium-glucose cotransporter-2 (SGLT2) inhibitors for HFpEF HF 34
- Summary of clinical indicators HF 36

Patient outcomes HF 37
- Methods HF 37
- Findings HF 38

References i

Glossary ii

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.

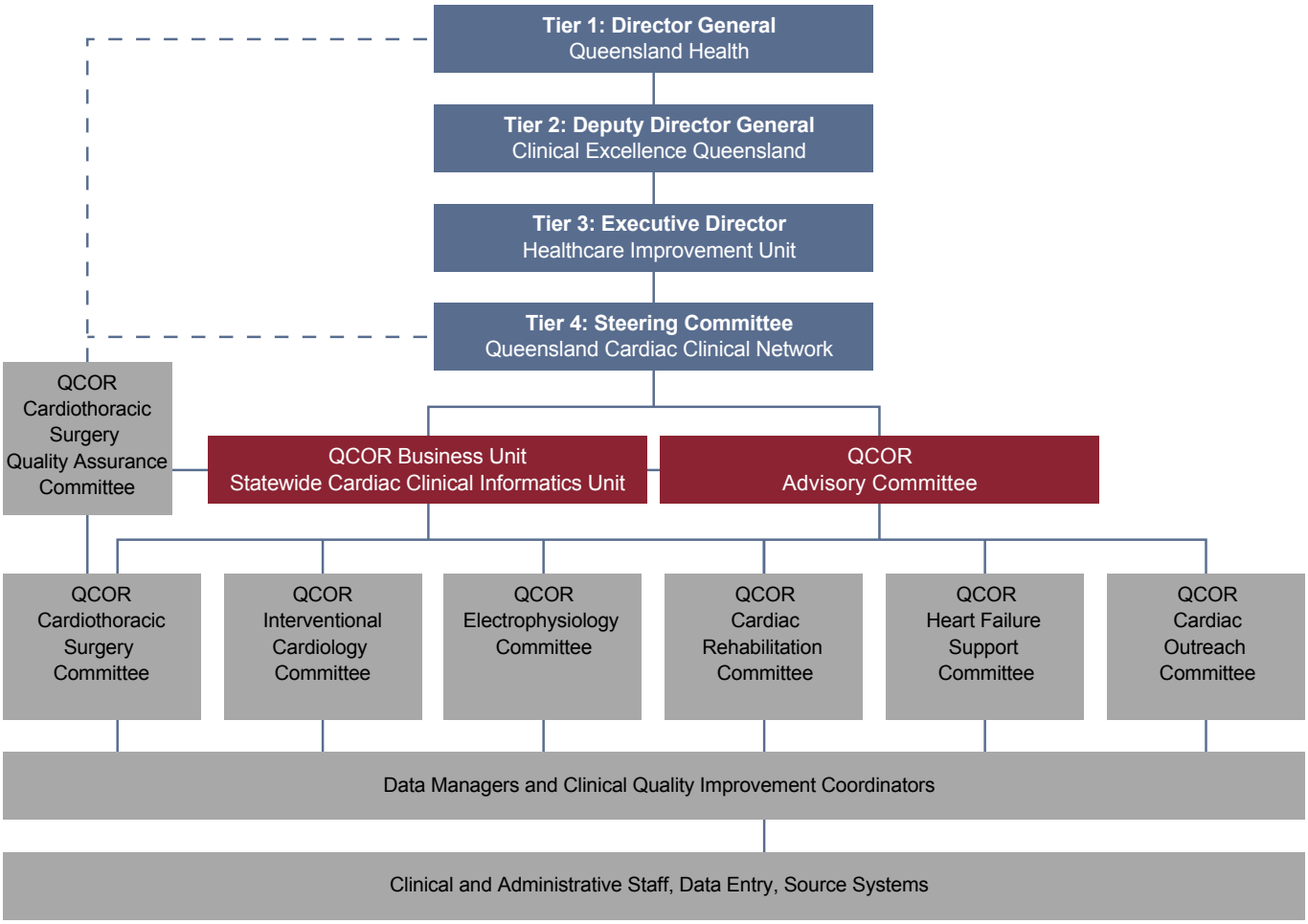


Figure 1: Governance structure

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.

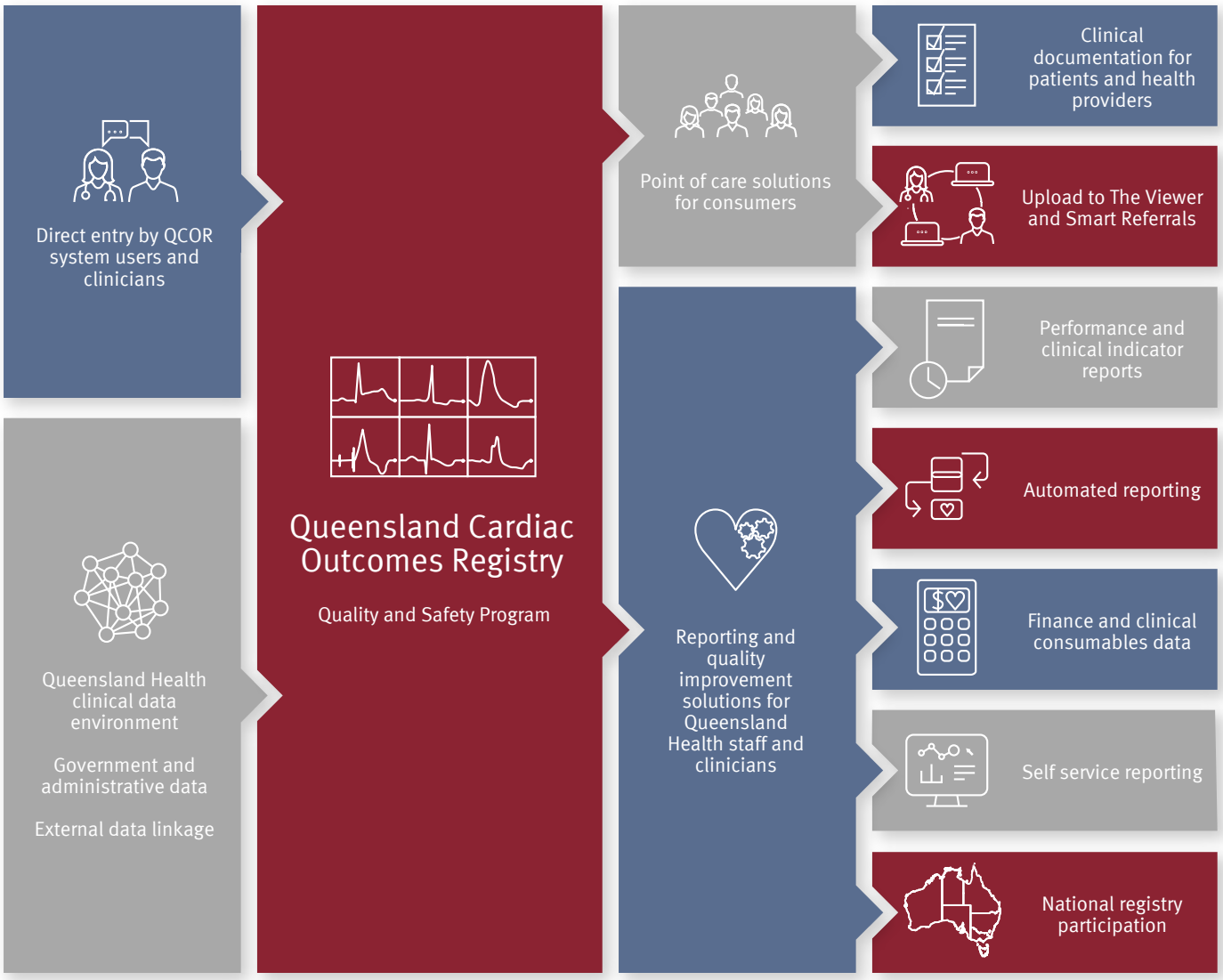
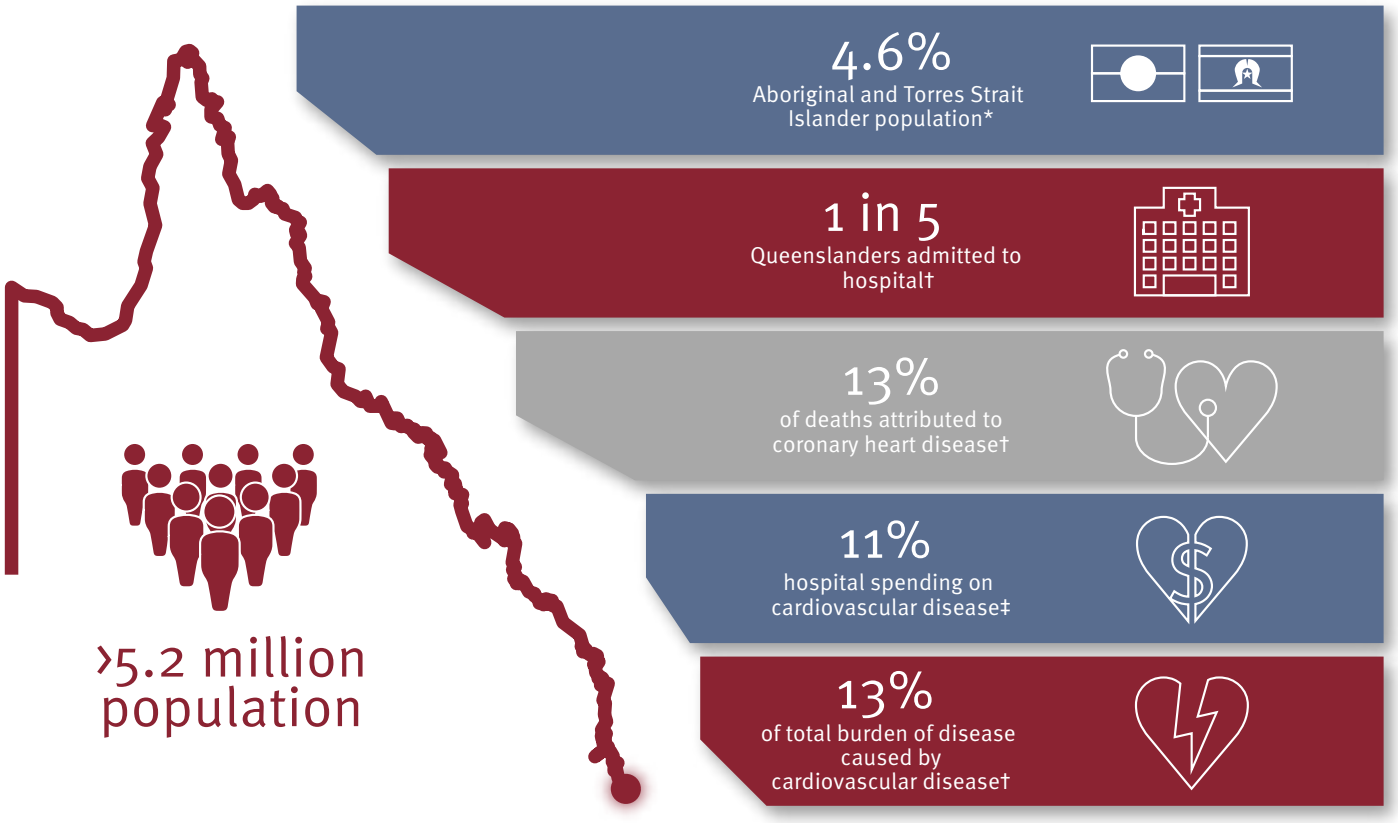


Figure 2: QCOR data flow

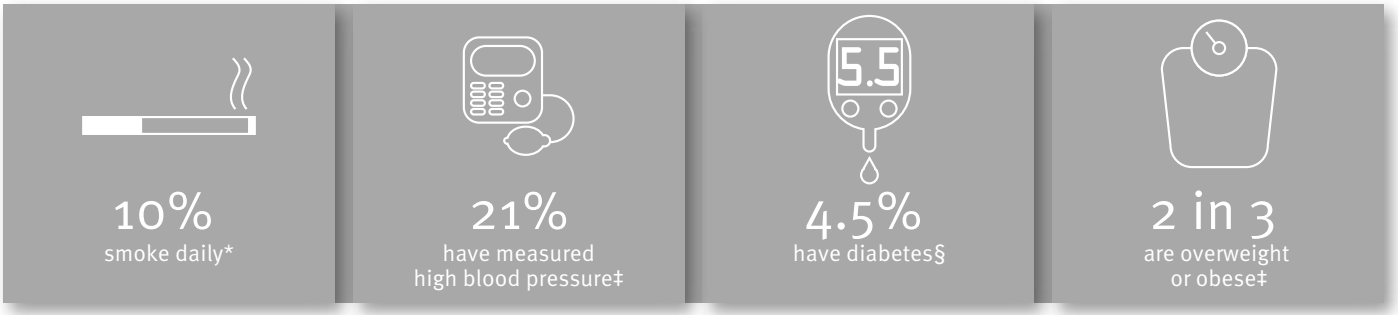
* The Australian Commission on Safety and Quality in Health Care (ACSQHC). Framework for Australian clinical quality registries. Sydney: ACSQHC; 2014

Queensland Cardiac Outcomes Registry

The Health of Queenslanders



Comorbidities



Mortality

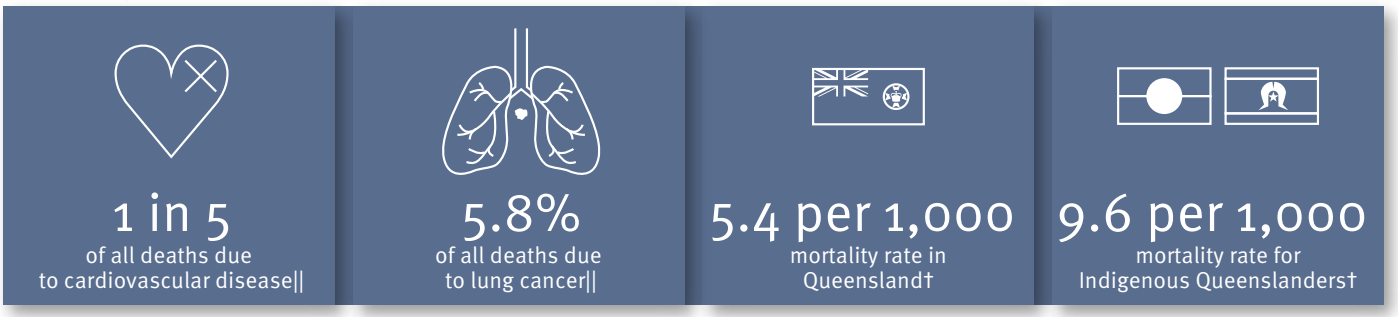


Figure 3: QCOR 2022 infographic

* 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

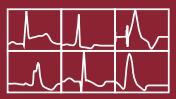
Cardiac Rehabilitation

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

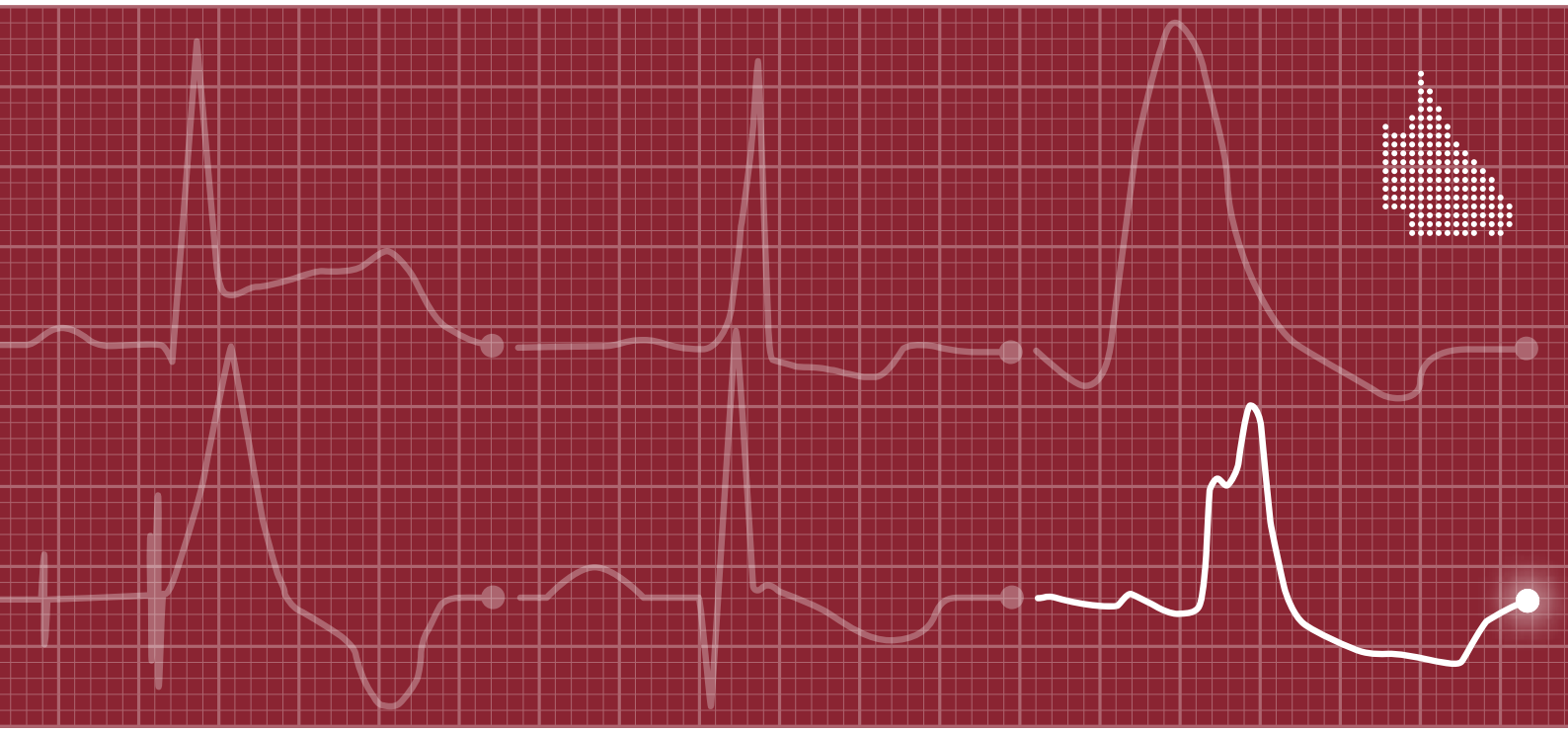
0.2%
procedural tamponade rate for cardiac device and electrophysiology procedures

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

Heart Failure Support Services Audit



1 Message from the QCOR Heart Failure Steering Committee Chair

The HERO (Heart Failure Evaluation and Reporting of Outcomes) registry provides a rich dataset that informs clinical teams about their practices and guides quality improvement priorities. The twenty-one heart failure teams across Queensland contribute to HERO and, in return, receive regular feedback within the context of structured planning and review. Quality improvement is supported by the statewide heart failure services coordinator, with oversight by a steering committee of clinicians and consumer advisors.

Some clinical indicators exhibit high variability between sites and some fall below the expected benchmarks. The mineralocorticoid receptor antagonist prescribing indicator (clinical indicator 5) serves as an example of how registry data can enhance prescription rates within a supported quality improvement environment. This led to a significant improvement in prescribing at the time of the first clinical review between 2019 (43%) and 2022 (58%).

New clinical indicators introduced this year focus on the prescription of sodium-glucose cotransporter-2 (SGLT2) inhibitors for heart failure with reduced ejection fraction (HFrEF) and heart failure with preserved ejection fraction (HFpEF) (clinical indicators 6 and 8). In this inaugural year of auditing SGLT2 inhibitors, prescribing rates were consistently below the 80% benchmark, with an average rate of 40% for HFrEF and 13% for HFpEF at the time of the first clinical review. To drive change, clinical practice feedback for this indicator has been accompanied by clinical education, updates to medication optimisation plans, distribution of an SGLT2 inhibitor resource for patients, and identification of any barriers to prescribing.

The demographic information in this report helps identify the needs and adequacy of representation for specific populations. For example, HFpEF appears under-represented in the registry (12% of referrals), which is relevant given the new indications for SGLT2 inhibitors that can improve clinical outcomes for this population.

Finally, we are excited to announce that in 2024, we will measure exercise prescription and launch an update to HERO, including auditing clinical practice at 6 months from referral or at the date of deactivation from a heart failure support service (whichever occurs sooner).

In conclusion, I would like to express gratitude to all the clinicians who contribute to HERO and commend their commitment to improving practice and to the patients and their families that inform this review.

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 6,438 new referrals in 2022, a 60% growth in referrals since 2016. Characteristics of referrals included: male (68%), Aboriginal and Torres Strait Islander patients (5.7%), HFrEF (85%), and patients referred from hospital (62%).

The median age of people referred was 68 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. 69 years respectively), and HFrEF patients are younger than HFpEF patients (67 years vs. 76 years respectively). Patients aged 75 years or older represented approximately one third of total cases (32%).

Clinical indicator performance

Most indicators met benchmarks at a statewide level. MRA|| prescription rates, despite not reaching targets are improving: 43% (2019), 46% (2020), 51% (2021) and 58% (2022). The titration and review of beta blockers (clinical indicator 7a, 7b and 7c) show that achievement of guideline recommended targets remains low at 27%, with review of beta blockers status at 6 months at 74% and achievement of maximum tolerated beta blocker dose at 72%. Prescription of SGLT2 inhibitor§ for HFrEF is reported for the first time both at hospital discharge (38%) and at first clinical review (40%). All sites were below the benchmark for SGLT2 inhibitor prescription. It is expected that the prescription rates for SGLT2 inhibitor will increase over time as prescription subsidies by the Pharmaceutical Benefits Scheme align with the international literature showing benefit to HFrEF patients despite diabetic status.

There was variation in practice between sites for all indicators, except for clinical indicators 2, 3 and 4 where all sites are above or approaching the benchmark.

Table 1: Summary of statewide clinical indicator performance

#	Clinical indicator	% referrals
Non pharmacological indicators		
1a	Follow-up of acute patients within 2 weeks	79.1
1b	Follow-up of non acute patients within 4 weeks	79.4
2	Assessment of left ventricular ejection fraction within 2 years	97.7*
Pharmacological indicators		
3a	ACEI/ARB or ARNI† prescription for HFrEF‡ at hospital discharge	91.8*
3b	ACEI/ARB or ARNI† prescription for HFrEF‡ at first clinical review	92.7*
4a	Beta blocker§ prescription for HFrEF‡ at hospital discharge	91.0*
4b	Beta blocker§ prescription for HFrEF‡ at first clinical review	92.2*
5a	Prescription of MRA|| for HFrEF‡ at time of hospital discharge	57.6
5b	Prescription of MRA|| for HFREF‡ at time of first HFSS clinical review	57.5
6a	Prescription of SGLT2§ inhibitor for HFrEF‡ at time of hospital discharge	38.1
6b	Prescription of SGLT2§inhibitor for HFrEF‡ at time of first HFSS clinical review	40.0
7a	Beta blocker# titration status review at six months post referral	73.9
7b	Beta blocker# achievement of guideline recommended target	27.2
7c	Beta blocker# achievement of guideline recommended target dose or maximum tolerated dose	72.2

* Benchmark met (benchmark is 80% achievement except for 7b which is 50%)

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

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

§ Sodium-glucose cotransporter-2 inhibitor

|| Mineralocorticoid receptor antagonists

Bisoprolol, carvedilol, metoprolol sustained release or nebivolol

Patient outcomes

Patient outcomes are based on inpatient referrals from the previous year to allow for 12 month follow-up from the index hospitalisation. Mortality was 1.2% at 30 days and 12.2% at 12 months. Death/rehospitalisation was 17.0% at 30 days and 54.1% at 12 months. Based on 3,443 eligible patients, 112,096 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	1.2%	12.2%
2	a) All-cause rehospitalisation	16.4%	52.8%
	b) Heart failure rehospitalisation	4.7%	19.4%
3	Composite all-cause hospitalisation or all-cause mortality	17.0%	54.1%
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 combined therapies can be evaluated. Evolving guidelines for the treatment of HFrEF are resulting in new therapies and measurement of prescription rates will be of interest in future audits.

3 Participating sites

Heart Failure Support Services (HFSS) consists of teams of specialised nurses, with medical support and allied health professionals. 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 6,438 new referrals reported by the 21 participating HFSS, with Metropolitan sites comprising 55% of all referrals. Seven year trends in referral to HFSS can be seen in the figure below. Between 2016 and 2022 referral volumes increased by 60%.

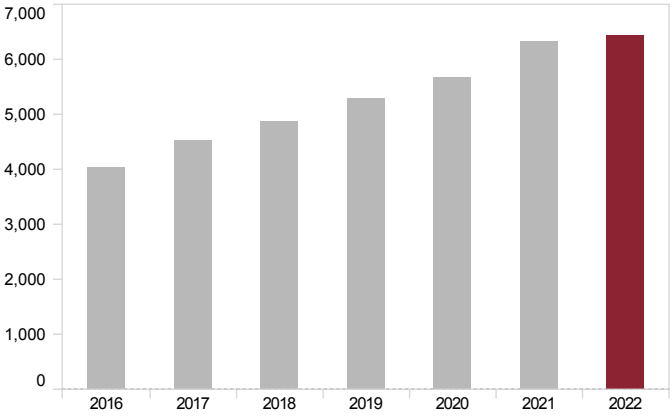


Figure 2: Total yearly HF referrals, 2016–2022

Table 5: Yearly HF referral volume, 2016–2022

	2016 n	2017 n	2018 n	2019 n	2020 n	2021 n	2022 n
Yearly referrals	4,021	4,528	4,878	5,304	5,664	6,326	6,438

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	283 (4.4)	Cairns Hospital	283 (4.4)
Central Queensland	293 (4.6)	Gladstone Hospital	30 (0.5)
		Rockhampton Hospital	263 (4.1)
Darling Downs	78 (1.2)	Toowoomba Hospital	78 (1.2)
Gold Coast	512 (8.0)	Gold Coast Community Health	512 (8.0)
Mackay	152 (2.4)	Mackay Base Hospital	152 (2.4)
Metro North	1,929 (30.0)	Caboolture Hospital	305 (4.7)
		Redcliffe Hospital	192 (3.0)
		Royal Brisbane & Women's Hospital	533 (8.3)
		The Prince Charles Hospital HFS	899 (14.0)
Metro South	1,575 (24.5)	Logan Hospital	514 (8.0)
		Princess Alexandra Hospital	739 (11.5)
		Queen Elizabeth II Hospital	146 (2.3)
		Redland Hospital	176 (2.7)
North West	29 (0.5)	Mt Isa Hospital	29 (0.5)
Sunshine Coast	627 (9.7)	Gympie	87 (1.4)
		Sunshine Coast University Hospital	540 (8.4)
Townsville	273 (4.2)	Townsville Hospital	273 (4.2)
West Moreton	396 (6.2)	Ipswich Community Health	396 (6.2)
Wide Bay	291 (4.5)	Bundaberg Hospital	184 (2.9)
		Hervey Bay Hospital & Hervey Bay/ Maryborough Hospitals	107 (1.7)
Statewide			**6,438 (100.0)**

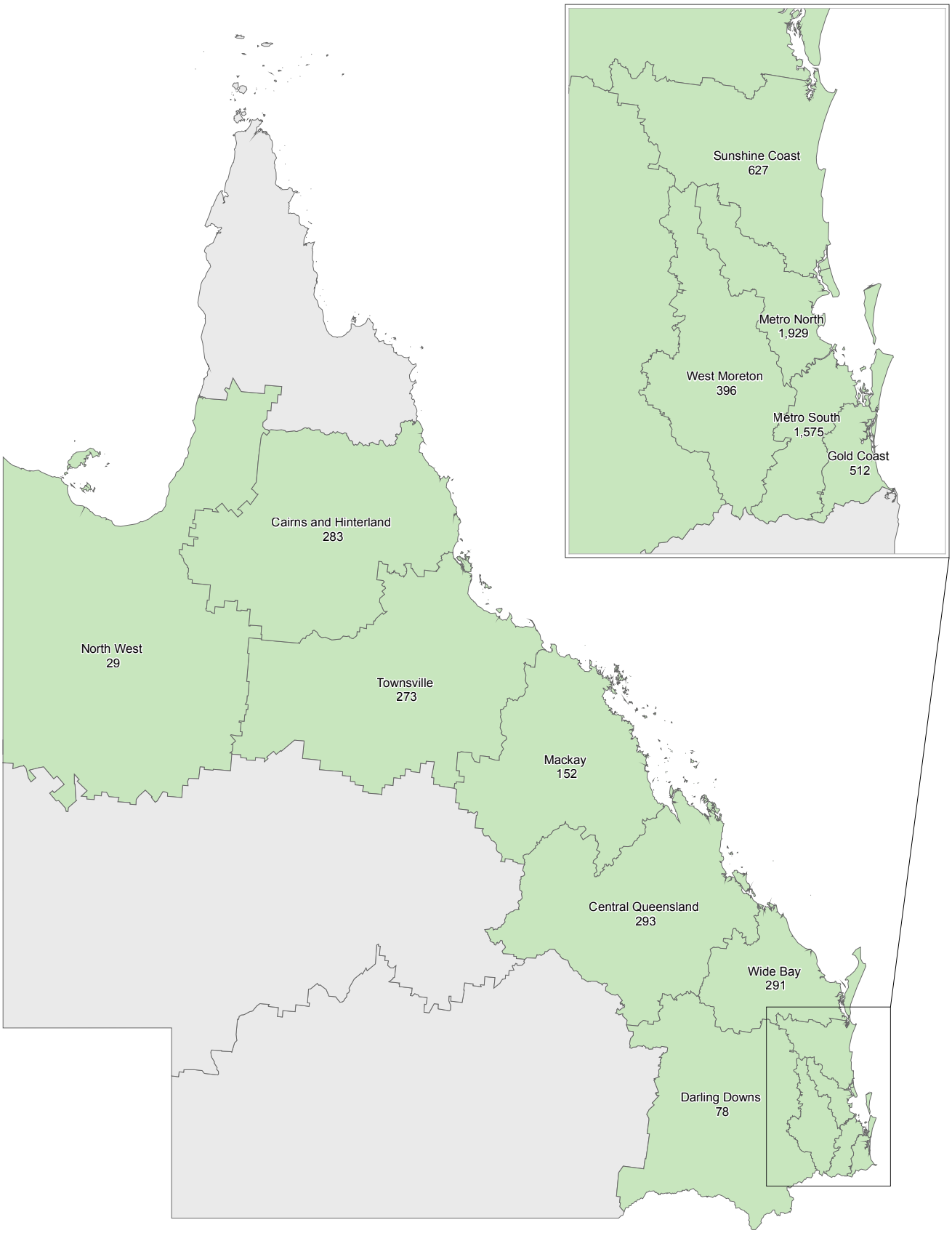


Figure 3: Regional distribution of new referrals

4.2 Referral source

Most referrals originated from an inpatient setting (62%), with smaller proportions originating from an outpatient setting (24%) or as a transfer from another service (13%).

Few referrals came directly from primary care (1%), which is expected as most referrals flow to specialty outpatient clinics for diagnosis and treatment optimisation prior to referral to an HFSS.

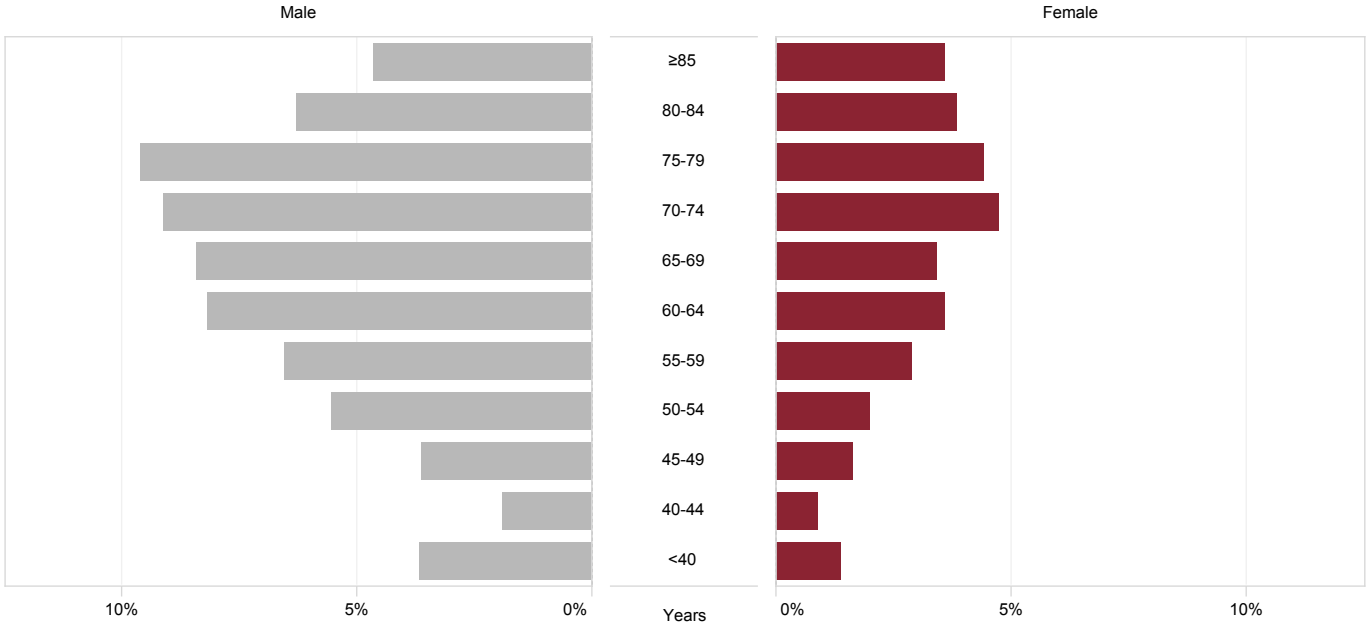
Table 7: Source of HFSS referral

HHS	HFSS	Inpatient n (%)	Outpatient n (%)	Another HFSS n (%)	Primary care n (%)
Cairns and Hinterland	Cairns Hospital	206 (72.8)	76 (26.9)	1 (0.4)	–
Central Queensland	Gladstone Hospital	11 (36.7)	7 (23.3)	12 (40.0)	–
	Rockhampton Hospital	147 (55.9)	95 (36.1)	11 (4.2)	10 (3.8)
Darling Downs	Toowoomba Hospital	24 (30.8)	46 (59.0)	7 (9.0)	1 (1.3)
Gold Coast	Gold Coast Community Health	325 (63.5)	147 (28.7)	32 (6.3)	8 (1.6)
Mackay	Mackay Base Hospital	70 (46.1)	75 (49.3)	6 (3.9)	1 (0.7)
Metro North	Caboolture Hospital	128 (42.0)	28 (9.2)	131 (43.0)	18 (5.9)
	Redcliffe Hospital	40 (20.8)	55 (28.6)	97 (50.5)	–
	Royal Brisbane & Women's Hospital	357 (67.0)	167 (31.3)	9 (1.7)	–
	The Prince Charles Hospital	694 (77.2)	191 (21.2)	14 (1.6)	–
Metro South	Logan Hospital	318 (61.9)	44 (8.6)	149 (29.0)	3 (0.6)
	Princess Alexandra Hospital	652 (88.2)	77 (10.4)	10 (1.4)	–
	Queen Elizabeth II Hospital	94 (64.4)	22 (15.1)	30 (20.5)	–
	Redland Hospital	31 (17.6)	49 (27.8)	95 (54.0)	1 (0.6)
North West	Mt Isa Hospital	10 (34.5)	18 (62.1)	1 (3.4)	–
Sunshine Coast	Gympie Hospital	25 (28.7)	28 (32.2)	33 (37.9)	1 (1.1)
	Sunshine Coast University Hospital	356 (65.9)	172 (31.9)	12 (2.2)	–
Townsville	Townsville Hospital	173 (63.4)	93 (34.1)	7 (2.6)	–
West Moreton	Ipswich Community Health	184 (46.5)	114 (28.8)	96 (24.2)	2 (0.5)
Wide Bay	Bundaberg Hospital	90 (48.9)	39 (21.2)	42 (22.8)	13 (7.1)
	Hervey Bay Hospital	23 (21.5)	26 (24.3)	49 (45.8)	9 (8.4)
Statewide		**3,958 (61.5)**	**1,569 (24.4)**	**844 (13.1)**	**67 (1.0)**

5 Patient characteristics

5.1 Age and gender

The statewide median age of patients managed by an HFSS was 68 years. The median age of women (71 years) was three years older than men. Approximately one third of patients (32%) were 75 years of age and older.



% of total (n=6,438)

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	67	66	67
Central Queensland	Gladstone Hospital	63	64	64
	Rockhampton Hospital	66	72	68
Darling Downs	Toowoomba Hospital	68	64	67
Gold Coast	Gold Coast Community Health	68	68	68
Mackay	Mackay Base Hospital	66	70	66
Metro North	Caboolture Hospital	71	73	72
	Redcliffe Hospital	68	73	71
	Royal Brisbane & Women's Hospital	68	67	67
	The Prince Charles Hospital	68	73	70
Metro South	Logan Hospital	65	70	67
	Princess Alexandra Hospital	64	71	66
	Queen Elizabeth II Hospital	62	68	64
	Redland Hospital	69	74	70
North West	Mt Isa Hospital	66	69	67
Sunshine Coast	Gympie Hospital	73	74	73
	Sunshine Coast University Hospital	72	72	72
Townsville	Townsville Hospital	65	61	64
West Moreton	Ipswich Community Health	65	72	66
Wide Bay	Bundaberg Hospital	71	73	71
	Hervey Bay Hospital	70	70	70
Statewide		**68**	**71**	**68**

5.2 Gender

The majority of patients were male (68%), ranging from 61% to 83% across participating sites.

Table 9: Referrals by gender and HFSS

HHS	HFSS	Male n (%)	Female n (%)
Cairns and Hinterland	Cairns Hospital	184 (65.0)	99 (35.0)
Central Queensland	Gladstone Hospital	25 (83.3)	5 (16.7)
	Rockhampton Hospital	172 (65.4)	91 (34.6)
Darling Downs	Toowoomba Hospital	58 (74.4)	20 (25.6)
Gold Coast	Gold Coast Community Health	346 (67.6)	166 (32.4)
Mackay	Mackay Base Hospital	107 (70.4)	45 (29.6)
Metro North	Caboolture Hospital	199 (65.2)	106 (34.8)
	Redcliffe Hospital	117 (60.9)	75 (39.1)
	Royal Brisbane & Women's Hospital	362 (67.9)	171 (32.1)
	The Prince Charles Hospital	584 (65.0)	315 (35.0)
Metro South	Logan Hospital	352 (68.5)	162 (31.5)
	Princess Alexandra Hospital	548 (74.2)	191 (25.8)
	Queen Elizabeth II Hospital	99 (67.8)	47 (32.2)
	Redland Hospital	119 (67.6)	57 (32.4)
North West	Mt Isa Hospital	20 (69.0)	9 (31.0)
Sunshine Coast	Gympie Hospital	57 (65.5)	30 (34.5)
	Sunshine Coast University Hospital	365 (67.6)	175 (32.4)
Townsville	Townsville Hospital	181 (66.3)	92 (33.7)
West Moreton	Ipswich Community Health	268 (67.7)	128 (32.3)
Wide Bay	Bundaberg Hospital	132 (71.7)	52 (28.3)
	Hervey Bay Hospital	65 (60.7)	42 (39.3)
Statewide		**4,360 (67.7)**	**2,078 (32.3)**

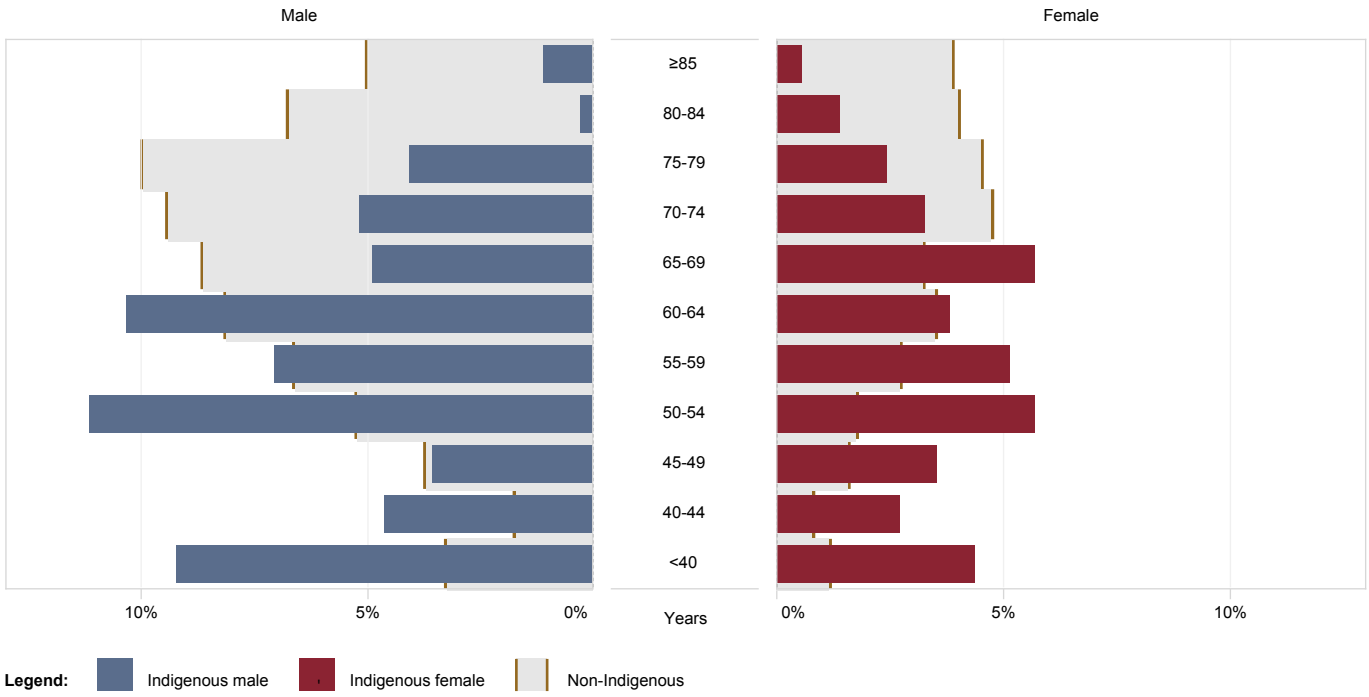
5.3 Aboriginal and Torres Strait Islander status

Patients of identified Aboriginal and Torres Strait Islander status made up 5.7% of all referrals. The number of referrals (n 368) was similar to the previous year (n 351). Aboriginal and Torres Strait Islander patients were significantly younger than other Queenslanders (median age of 57 years vs. 69 years). The proportion of caseload of Aboriginal and Torres Strait Islander patients was highest in Mount Isa (35%), followed by Cairns (21%) and Townsville (20%).

The number of Aboriginal and Torres Strait Islander referrals in the Greater Brisbane area (Metro North HHS and Metro South HHS) was 128 (35% 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	58 (20.5)	216 (76.3)	9 (3.2)
Central Queensland	Gladstone Hospital	4 (13.3)	26 (86.7)	–
	Rockhampton Hospital	32 (12.2)	222 (84.4)	9 (3.4)
Darling Downs	Toowoomba Hospital	6 (7.7)	68 (87.2)	4 (5.1)
Gold Coast	Gold Coast Community Health	12 (2.3)	486 (94.9)	14 (2.7)
Mackay	Mackay Base Hospital	9 (5.9)	140 (92.1)	3 (2.0)
Metro North	Caboolture Hospital	14 (4.6)	284 (93.1)	7 (2.3)
	Redcliffe Hospital	3 (1.6)	187 (97.4)	2 (1.0)
	Royal Brisbane & Women's Hospital	21 (3.9)	501 (94.0)	11 (2.1)
	The Prince Charles Hospital	41 (4.6)	844 (93.9)	14 (1.6)
Metro South	Logan Hospital	22 (4.3)	481 (93.6)	11 (2.1)
	Princess Alexandra Hospital	19 (2.6)	713 (96.5)	7 (0.9)
	Queen Elizabeth II Hospital	4 (2.7)	137 (93.8)	5 (3.4)
	Redland Hospital	4 (2.3)	161 (91.5)	11 (6.3)
North West	Mt Isa Hospital	10 (34.5)	19 (65.5)	–
Sunshine Coast	Gympie Hospital	1 (1.1)	85 (97.7)	1 (1.1)
	Sunshine Coast University Hospital	14 (2.6)	520 (96.3)	6 (1.1)
Townsville	Townsville Hospital	55 (20.1)	214 (78.4)	4 (1.5)
West Moreton	Ipswich Community Health	19 (4.8)	362 (91.4)	15 (3.8)
Wide Bay	Bundaberg Hospital	17 (9.2)	162 (88.0)	5 (2.7)
	Hervey Bay Hospital	3 (2.8)	84 (78.5)	20 (18.7)
Statewide		**368 (5.7)**	**5,912 (91.8)**	**158 (2.5)**



% of total Indigenous (n=368) vs. total non-Indigenous (n=5,912)

Excludes missing data (2.5%)

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	ALL years
Aboriginal and Torres Strait Islander	368	57	58	57
Non Aboriginal and Torres Strait Islander	5,912	68	71	69
ALL	**6,280**	**68**	**71**	**69**

* Excludes missing data (2.5%)

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 (85%). The median age for HFrEF was ten years younger than for patients with HFpEF (67 vs. 76 years respectively). More men had HFrEF than women (71% male), whereas HFpEF did not have a significant gender difference (48% male and 52% 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	270 (95.4)	6 (2.1)	3 (1.1)	4 (1.4)
Central Queensland	Gladstone Hospital	28 (93.3)	2 (6.7)	–	–
	Rockhampton Hospital	214 (81.4)	44 (16.7)	1 (0.4)	4 (1.5)
Darling Downs	Toowoomba Hospital	71 (91.0)	4 (5.1)	–	3 (3.8)
Gold Coast	Gold Coast Community Health	430 (84.0)	63 (12.3)	9 (1.8)	10 (2.0)
Mackay	Mackay Base Hospital	138 (90.8)	14 (9.2)	–	–
Metro North	Caboolture Hospital	219 (71.8)	70 (23.0)	6 (2.0)	10 (3.3)
	Redcliffe Hospital	148 (77.1)	43 (22.4)	–	1 (0.5)
	Royal Brisbane & Women's Hospital	461 (86.5)	65 (12.2)	2 (0.4)	5 (0.9)
Metro South	The Prince Charles Hospital	680 (75.6)	198 (22.0)	8 (0.9)	13 (1.4)
	Logan Hospital	432 (84.0)	59 (11.5)	14 (2.7)	9 (1.8)
	Princess Alexandra Hospital	685 (92.7)	40 (5.4)	12 (1.6)	2 (0.3)
	Queen Elizabeth II Hospital	131 (89.7)	12 (8.2)	2 (1.4)	1 (0.7)
	Redland Hospital	152 (86.4)	19 (10.8)	3 (1.7)	2 (1.1)
North West	Mt Isa Hospital	13 (44.8)	1 (3.4)	1 (3.4)	14 (48.3)
Sunshine Coast	Gympie Hospital	75 (86.2)	9 (10.3)	–	3 (3.4)
	Sunshine Coast University Hospital	507 (93.9)	26 (4.8)	3 (0.6)	4 (0.7)
Townsville	Townsville Hospital	261 (95.6)	7 (2.6)	–	5 (1.8)
West Moreton	Ipswich Community Health	336 (84.8)	43 (10.9)	11 (2.8)	6 (1.5)
Wide Bay	Bundaberg Hospital	161 (87.5)	20 (10.9)	3 (1.6)	–
	Hervey Bay Hospital	85 (79.4)	17 (15.9)	4 (3.7)	1 (0.9)
Statewide		**5,497 (85.4)**	**762 (11.8)**	**82 (1.3)**	**97 (1.5)**

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

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

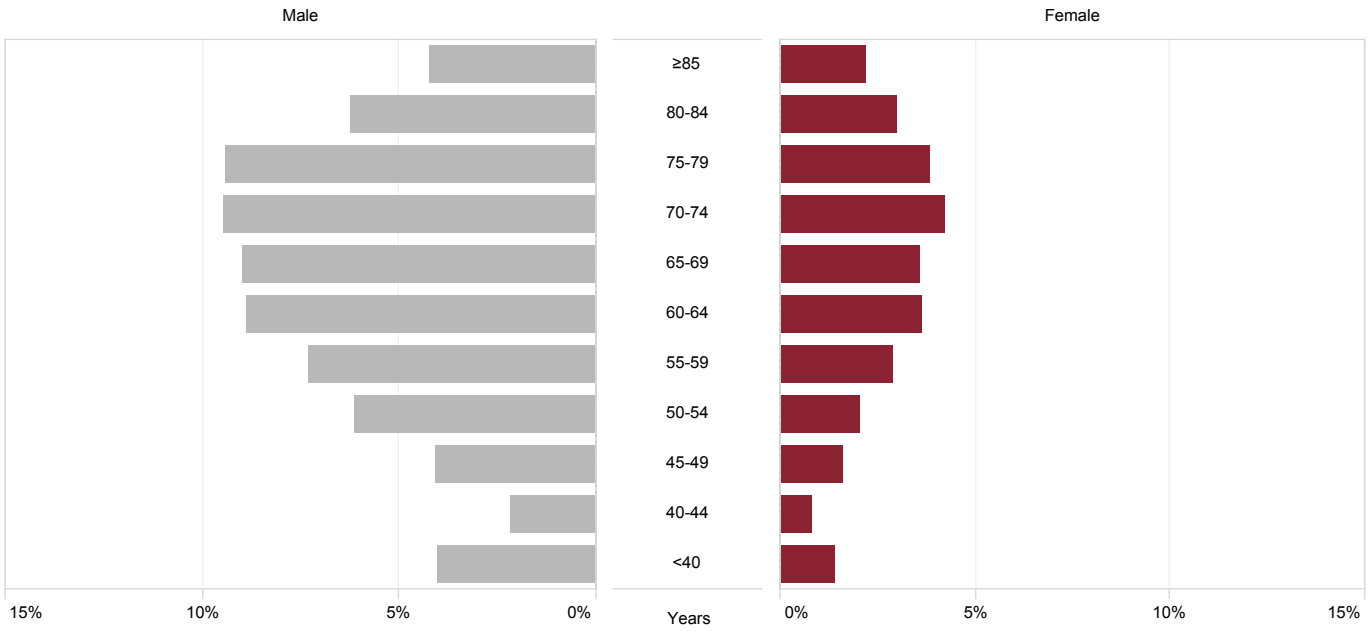
Table 13: Summary of patient age, gender and Indigenous status by heart failure phenotype

	HFrEF*	HFpEF†	Primary right HF
Number	5,497	762	82
Age (median years)	67	76	75
% male	70.9%	48.3%	52.4%
% Aboriginal and Torres Strait Islander	6.0%	3.5%	3.7%

Excludes unsure/unknown HF phenotype (1.5%)

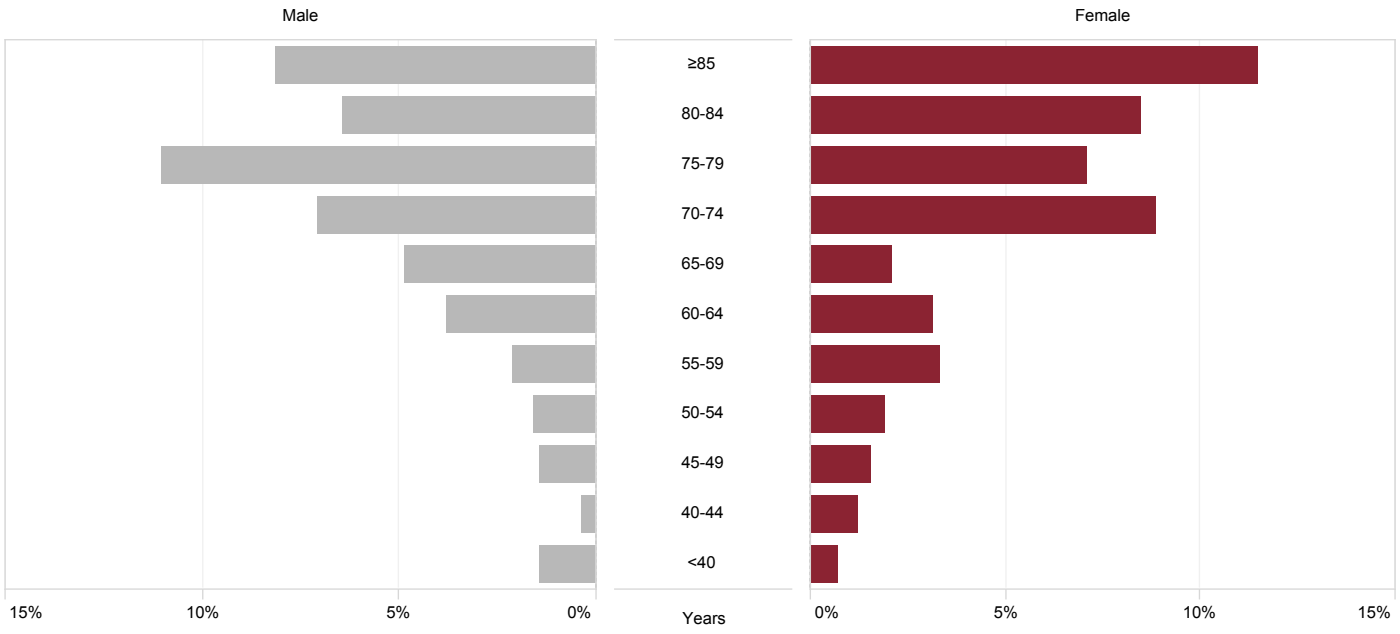
* Heart failure with reduced ejection fraction (LVEF <50%)

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



% of total with HFrEF (n=5,497)

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



% of total with HFpEF (n=762)

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	6,438
Referrals from South East Queensland	72%
Referral source:	
Inpatient	61.5%
Outpatient	24.4%
Another HFSS	13.1%
Primary care	1.0%
Age (median years):	
All (median, range by service)	68 (64–73) years
Male vs. Female	68 vs. 71 years
Indigenous vs. non-Indigenous	57 vs. 69 years
HFrEF* vs. HFpEF†	67 vs. 76 years
Age group:	
75 years and over	32.0%
Males	67.7%
Aboriginal and Torres Strait Islander patients	5.7%
Heart failure phenotype:	
HFrEF*	85.4%
HFpEF†	11.8%
Primary right HF	1.3%
Unsure/unknown	1.5%

* 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 7b (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.[55]

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	**Prescription of sodium-glucose cotransporter-2 (SGLT2) inhibitors for HFrEF** 6a) Prescription at time of hospital discharge (inpatient referrals) 6b) Prescription at time of first clinical review (all referrals)
7	**Beta blocker review and titration** 7a) Titration review conducted within 6 months of first clinical review 7b) Guideline target dose achieved at time of titration review 7c) Either target or maximum dose achieved at time of titration review
8	**Prescription of sodium-glucose cotransporter-2 (SGLT2) inhibitors for HFpEF** 8a) Prescription at time of hospital discharge (inpatient referrals) 8b) Prescription at time of first clinical review (all referrals)

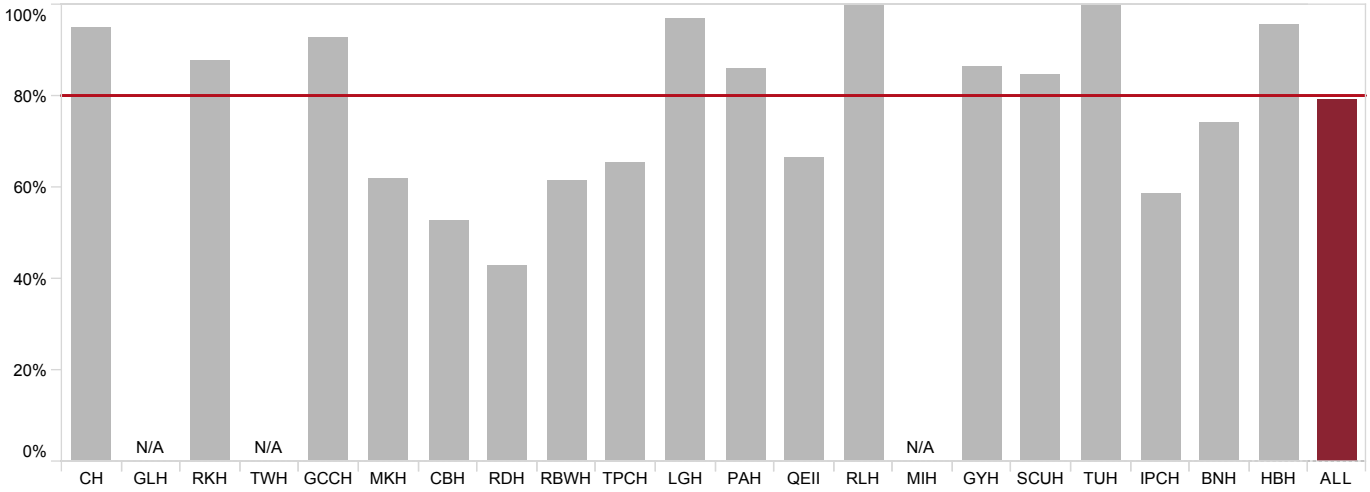
6.1 First clinical review

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 3,958 patients referred from an acute setting, 79% 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

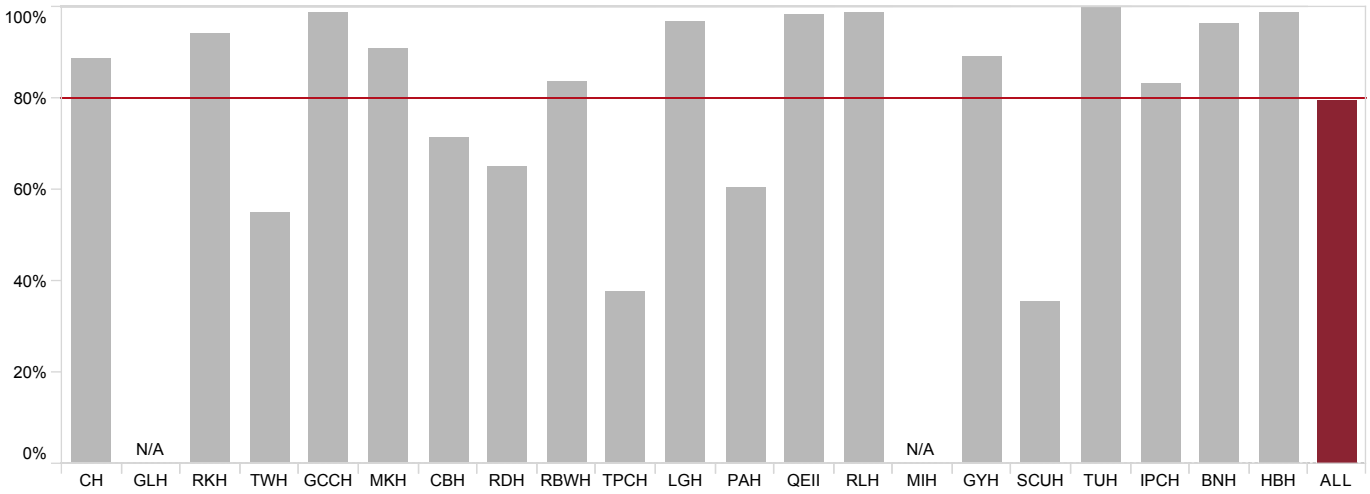
Table 16: Inclusion details for clinical indicator 1a: Inpatients receiving first HFSS clinical review within two weeks of hospital discharge

	n	%
Eligible for analysis	2,533	
Achieved benchmark	2,003	79.1
Benchmark not achieved	530	20.9
Ineligible	1,419	
Referred to another HFSS	780	
Patient could not be contacted, lives out of area or repeated failure to attend	178	
Referred to another service (e.g. cardiac rehabilitation or community nursing)	125	
Patient declined service	113	
HF no longer prime issue (palliative care, high care nursing home etc.)	80	
Patient deceased	57	
Other reason	86	
Missing data	6	
Total inpatient referrals	**3,958**	

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 2,480 patients came from non acute services, of which 79% 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

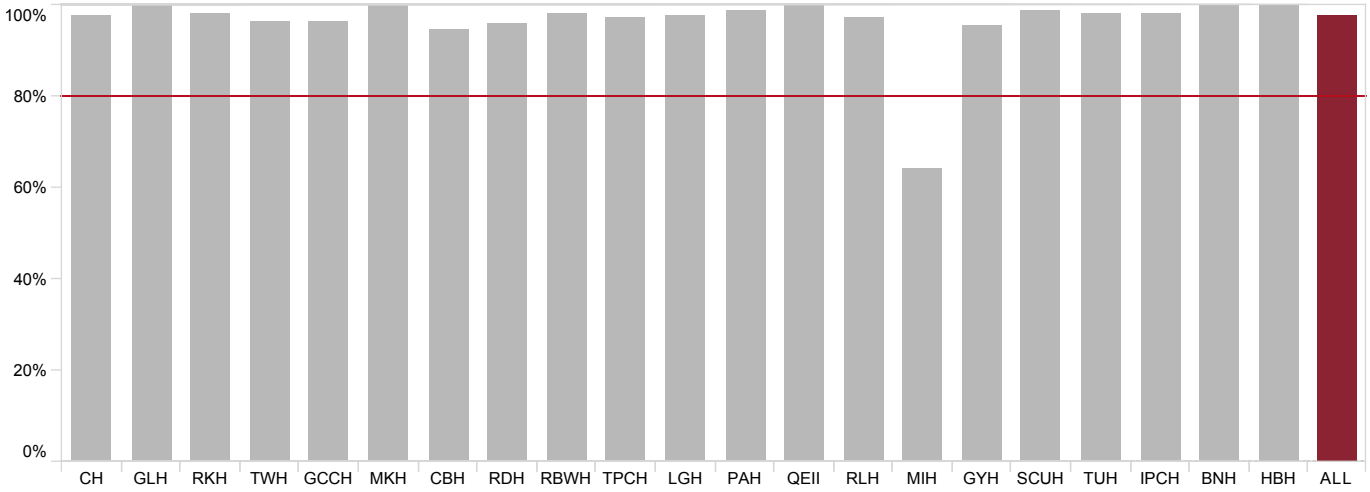
Figure 9: Proportion of non acute patients who received first HFSS clinical review within four weeks of referral

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	2,186	
Achieved benchmark	1,735	79.4
Benchmark not achieved	451	20.6
Ineligible	293	
Referred to another HFSS	86	
Patient could not be contacted, lives out of area or repeated failure to attend	85	
Patient declined service	48	
HF no longer prime issue (palliative care, high care nursing home etc.)	27	
Patient deceased	12	
Referred to another service (e.g. cardiac rehabilitation or community nursing)	10	
Other reason	25	
Missing data	1	
Total non acute patients	**2,480**	

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.[57] In 98% 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

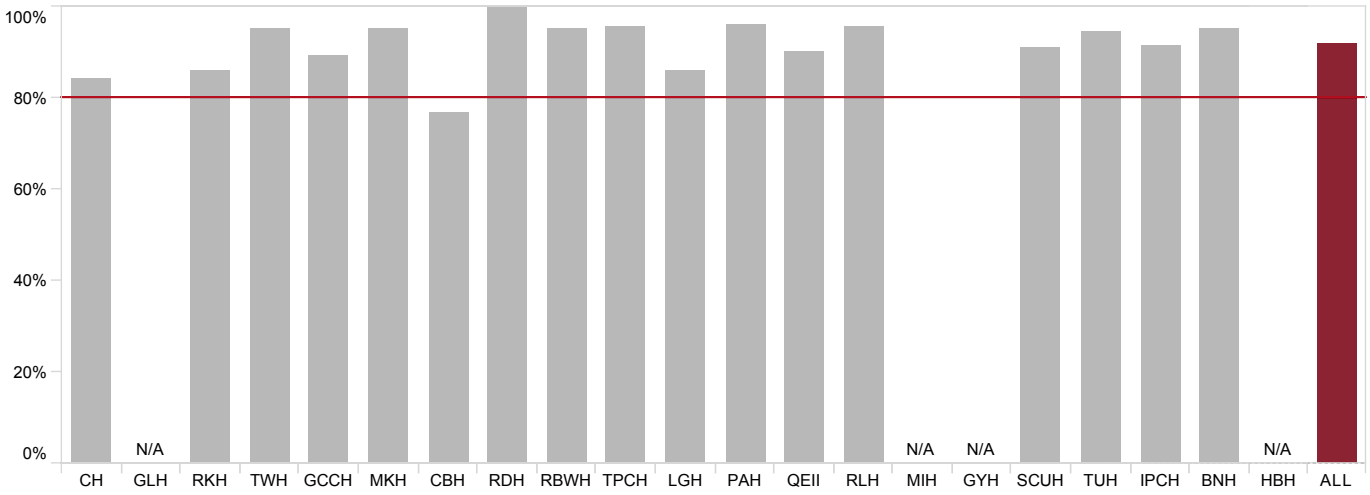
	n	%
Eligible for analysis	6,436	
Achieved benchmark	6,287	97.7
Benchmark not achieved	149	2.3
Ineligible	N/A	
Missing data	2	
Total referrals	**6,438**	

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.[57]

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 92% 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

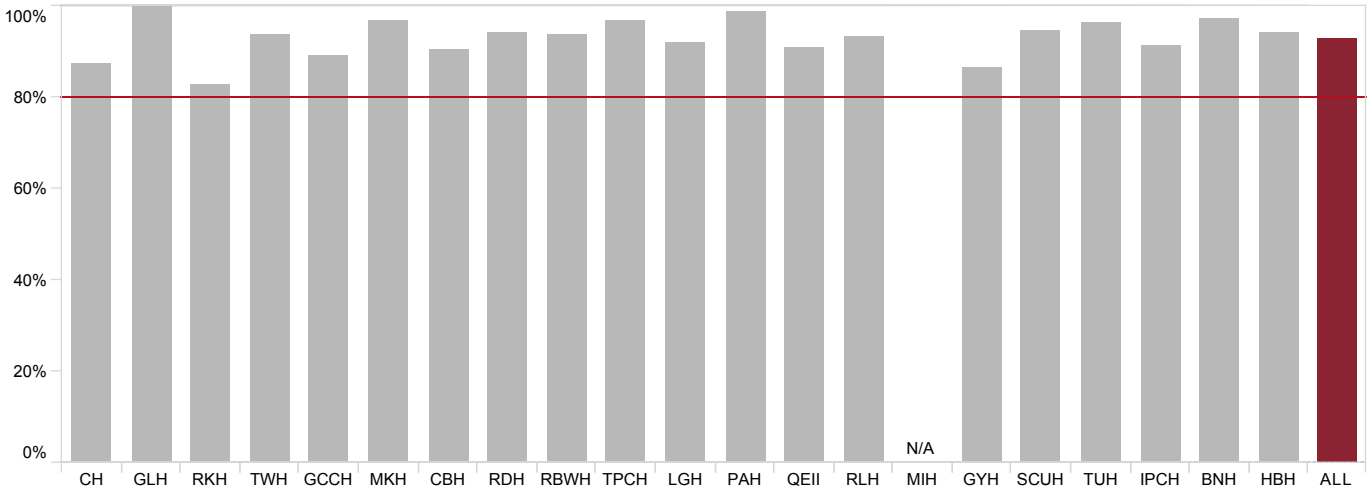
Table 19: Inclusion details for clinical indicator 3a: Inpatients on ACEI, ARB or ARNI at time of hospital discharge

	n	%
Eligible for analysis	3,189	
Achieved benchmark	2,926	91.8
Benchmark not achieved	263	8.2
Ineligible		
Documented contraindication*	143	
Incomplete data	14	
Total inpatient referrals analysed	**3,346**	

* Adverse reaction to ACEI/ARB or ARNI, palliative intent to treatment, pregnancy, eGFR <30mL/min/1.73m², 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 69% of patients who were prescribed ARNI and the remaining 31% 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	3,927	
Achieved benchmark	3,640	92.7
Benchmark not achieved	287	7.3
Ineligible		
Documented contraindication*	129	
Incomplete data	9	
Total analysed	**4,065**	

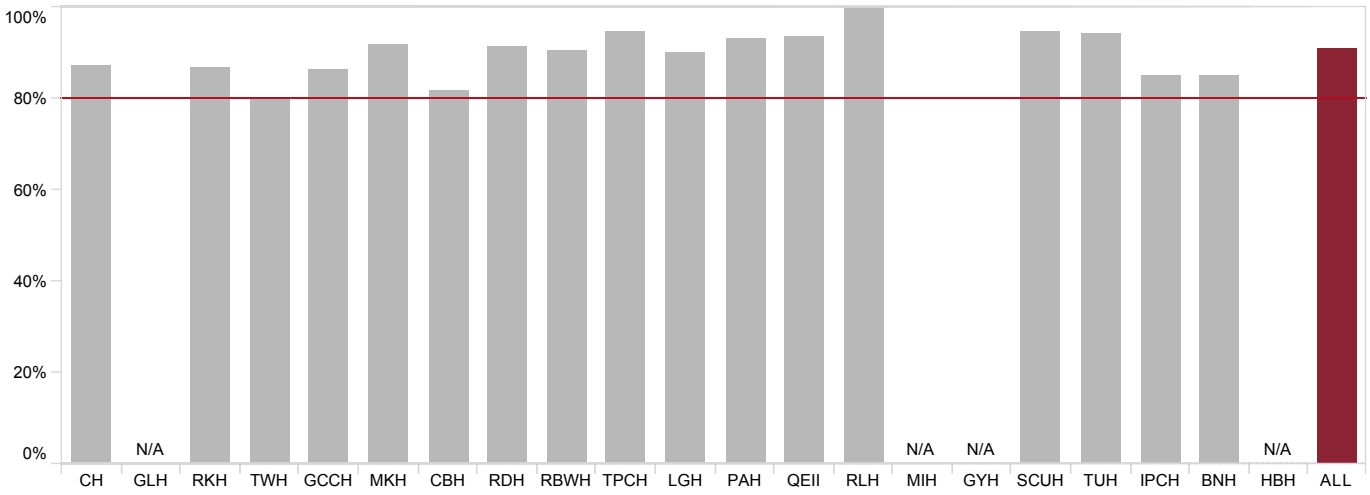
* Adverse reaction to ACEI/ARB or ARNI, palliative intent to treatment, pregnancy, eGFR <30mL/min/1.73m², severe aortic stenosis, renal artery stenosis, serum potassium >5.5 mmol/L, symptomatic hypotension

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.[56,57] 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, 91% of eligible patients were prescribed guideline recommended beta blockers. Of these patients there were 85%, 8%, 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

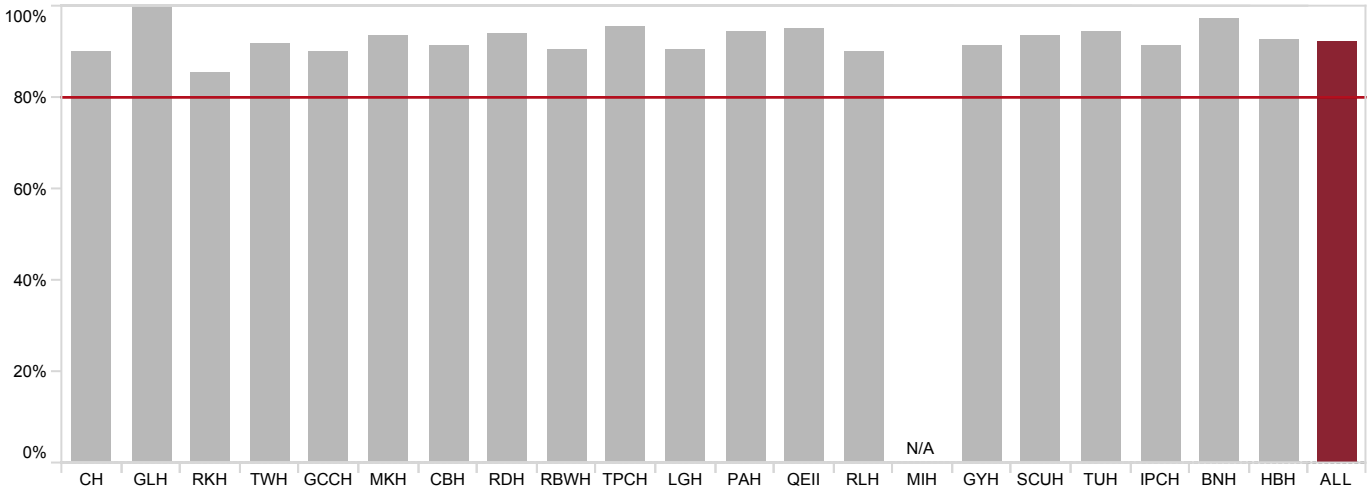
Table 21: Inclusion details for clinical indicator 4a: Patients on guideline recommended beta blocker at hospital discharge

	n	%
Eligible for analysis	3,264	
Achieved benchmark	2,969	91.0
Benchmark not achieved	295	9.0
Ineligible		
Documented contraindication*	68	
Incomplete data	14	
Total inpatient referrals analysed	**3,346**	

* 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 84%, 8%, 5% 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	3,976	
Achieved benchmark	3,664	92.2
Benchmark not achieved	312	7.8
Ineligible		
Documented contraindication*	80	
Incomplete data	9	
Total referrals analysed	**4,065**	

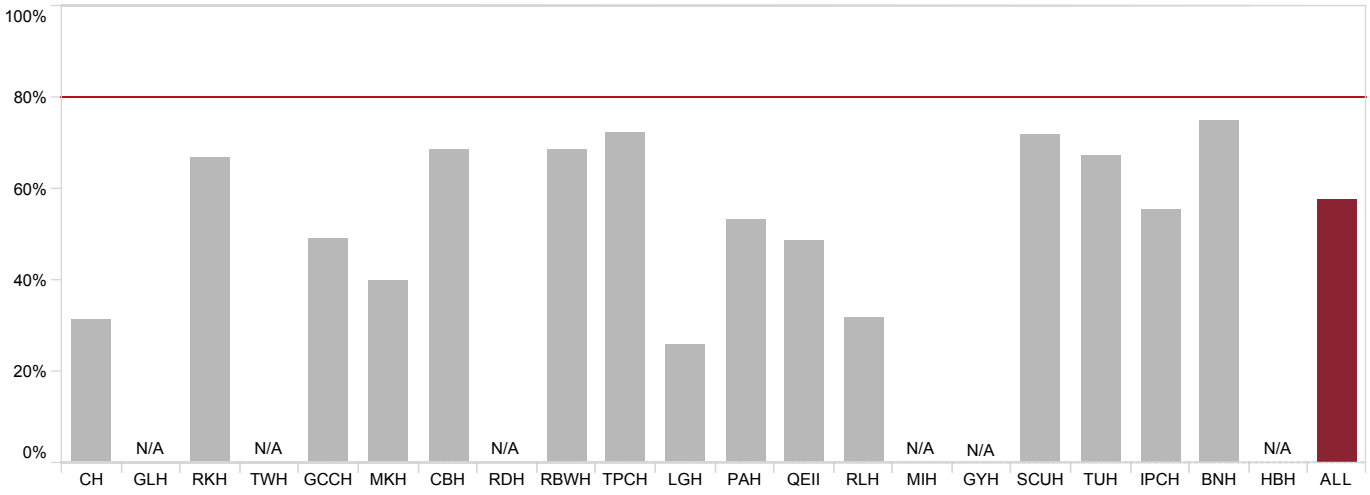
* Adverse reaction to beta blocker, palliative intent to treatment, pregnancy, bradycardia (HR <50bpm), symptomatic hypotension, severe COPD, asthma/reversible airways disease

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.[56,57] 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, 58% of eligible patients referred to an HFSS were prescribed an MRA. Of these patients there were 81% who were prescribed spironolactone and 19% prescribed eplerenone. All sites were below the benchmark.



N/A: Eligible referrals <20

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

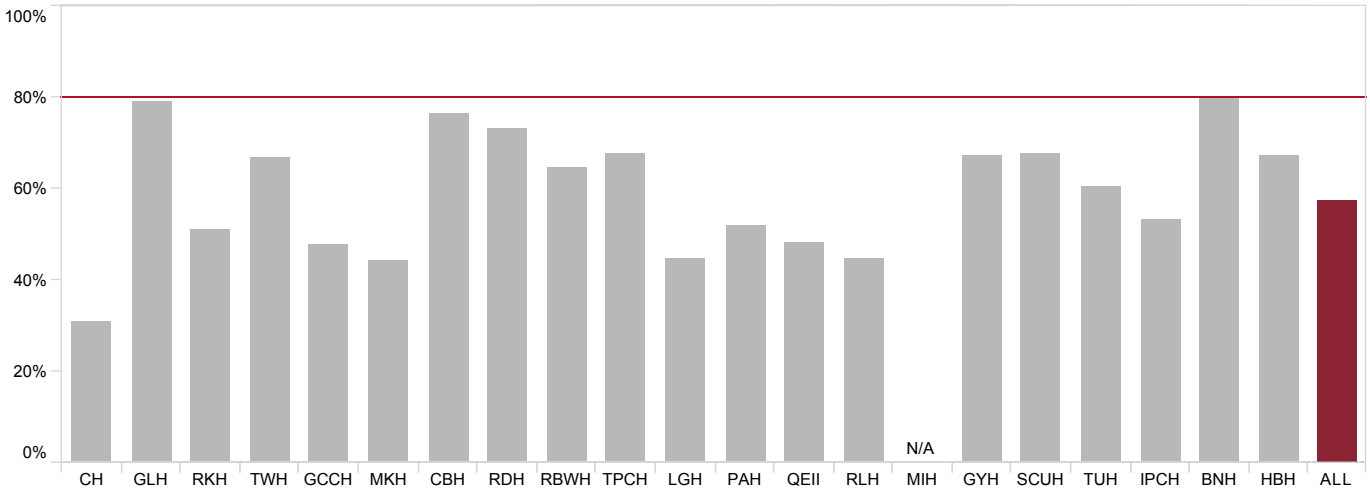
Table 23: Inclusion details for clinical indicator 5a: Patients on guideline recommended MRA at hospital discharge

	n	%
Eligible for analysis	3,346	
Achieved benchmark	1,758	57.6
Benchmark not achieved	1,292	42.4
Ineligible		
Documented contraindication*	282	
Missing data	14	
Total inpatient referrals analysed	**3,346**	

* Adverse reaction to MRA, palliative intent to treatment, serum potassium >5 mmol/L, pregnancy, eGFR <30mL/min/1.73m², 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, 58% of eligible referrals to an HFSS were reported to be on a guideline recommended MRA. Of these patients there were 86% prescribed spironolactone and 14% of patients who were prescribed eplerenone.



N/A: Eligible referrals <20

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

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

	n	%
Eligible for analysis	3,721	
Achieved benchmark	2,138	57.5
Benchmark not achieved	1,583	42.5
Ineligible		
Documented contraindication*	335	
Missing data	9	
Total referrals analysed	**4,065**	

* Adverse reaction to MRA, palliative intent to treatment, serum potassium >5 mmol/L, pregnancy, eGFR <30mL/min/1.73m², previous gynaecomastia, Addison's disease, symptomatic hypotension or LVEF returned to >50%

6.6 Prescription of sodium-glucose cotransporter-2 (SGLT2) inhibitors for HFrEF

Guideline recommended sodium-glucose cotransporter-2 (SGLT2) inhibitors have been shown to reduce mortality and morbidity in patients with HFrEF and are recommended for all patients unless contraindicated or not tolerated. Guideline recommended SGLT2 inhibitors include dapagliflozin and empagliflozin.[58,59,60]

6a Prescription of SGLT2 inhibitor for HFrEF at time of hospital discharge

At the time of discharge from hospital, 38% of eligible referrals to an HFSS were reported to be on a guideline recommended SGLT2 inhibitor for HFrEF.

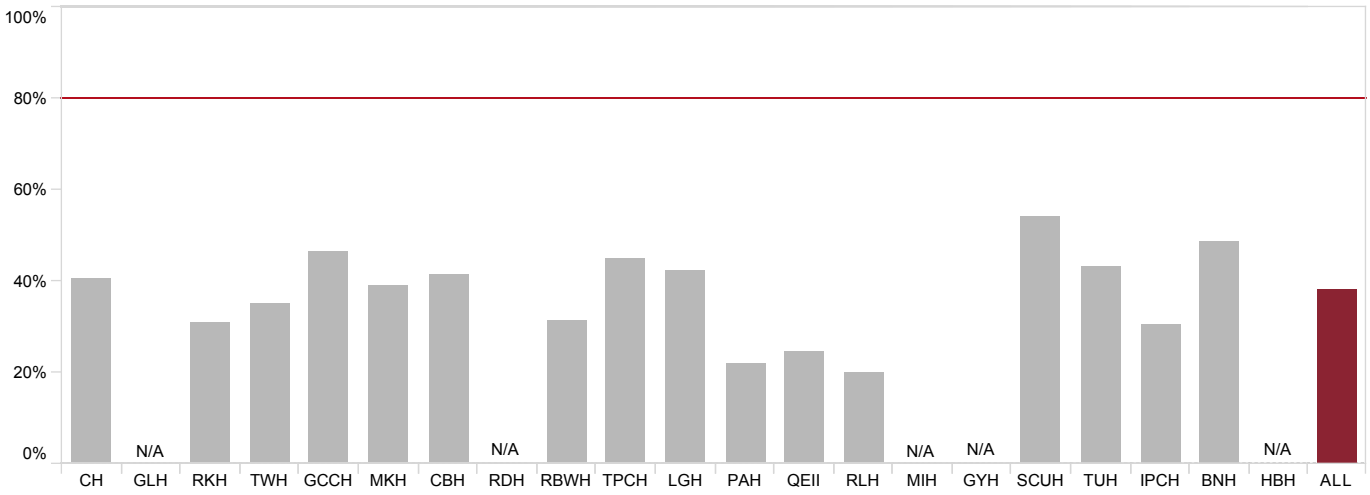


Figure 17: Proportion of HFrEF patients on guideline recommended SGLT2 inhibitor at hospital discharge by site

Table 25: Inclusion details for clinical indicator 6a: HFrEF patients on guideline recommended SGLT2 inhibitor at hospital discharge

	n	%
Eligible for analysis	2,812	
Achieved benchmark	1,072	38.1
Benchmark not achieved	1,740	61.9
Ineligible		
Documented contraindication*	251	
Missing data	283	
Total referrals analysed	**3,346**	

* SGLT2 inhibitor adverse reaction, type 1 diabetes mellitus, previous ketoacidosis, palliative intent to treatment, pregnancy, eGFR <20mL/min/1.73m², or symptomatic hypotension

6b Prescription of SGLT2 inhibitor for HFrEF at time of first HFSS clinical review

At the time of first clinical review, 40% of eligible referrals to an HFSS were reported to be on a guideline recommended SGLT2 inhibitor for HFrEF.

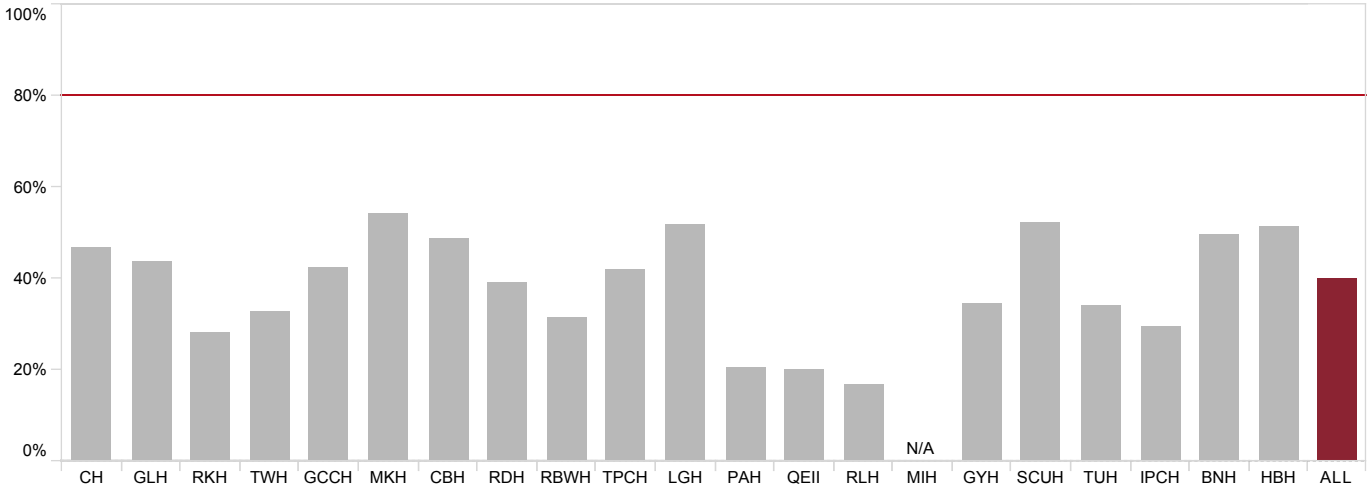


Figure 18: Proportion of HFrEF patients on guideline recommended SGLT2 inhibitor at first clinical review by site

Table 26: Inclusion details for clinical indicator 6b: HFrEF patients on guideline recommended SGLT2 inhibitor at first clinical review

	n	%
Eligible for analysis	3,529	
Achieved benchmark	1,410	40.0
Benchmark not achieved	2,119	60.0
Ineligible		
Documented contraindication*	262	
Missing data	274	
Total referrals analysed	**4,065**	

* SGLT2 inhibitor adverse reaction, type 1 diabetes mellitus, previous ketoacidosis, palliative intent to treatment, pregnancy, eGFR <20mL/min/1.73m², or symptomatic hypotension

6.7 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:

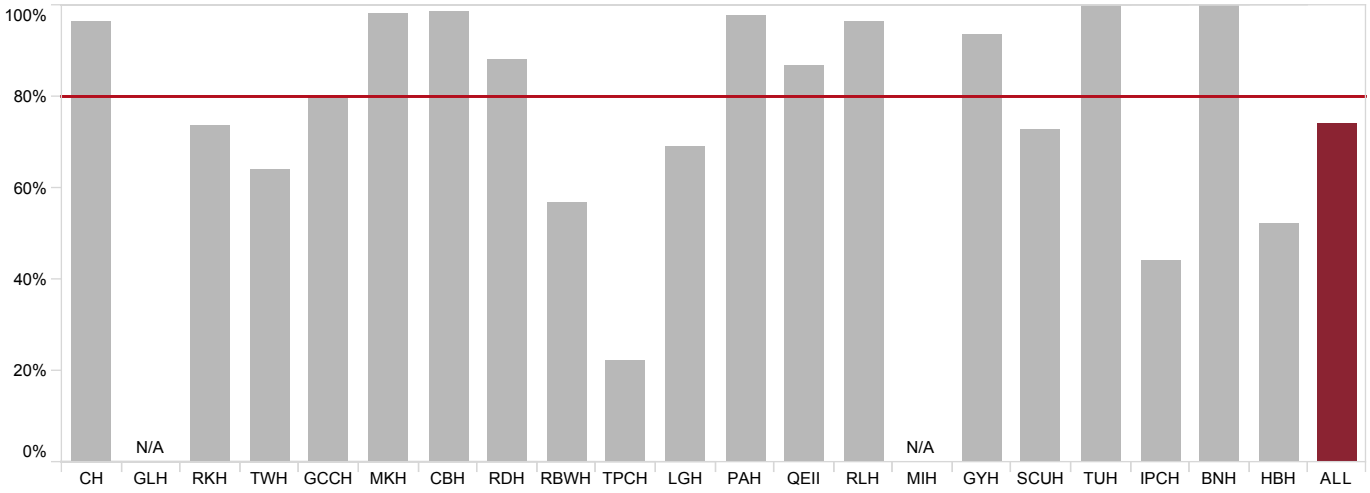
a) Review of titration status undertaken,

b) Achievement of target dose, and

c) Achievement of target or maximum tolerated dose.

7a 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), 74% 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 19: Proportion of patients who had a beta blocker titration review conducted within six months by site

Table 27: Inclusion details for clinical indicator 6a: Patients who had a beta blocker titration review within six months

	n	%
Eligible for analysis	1,959	
Achieved benchmark	1,447	73.9
Benchmark not achieved	512	26.1
Ineligible	1,653	
Patient on target dose at the time of referral	775	
Patient could not be contacted, lives out of area or repeated failure to attend	158	
Patient declined service	138	
Referred to another HFSS	79	
HF no longer prime issue (palliative care, high care nursing home etc.)	69	
Patient deceased	66	
Referred to another service (e.g. cardiac rehabilitation or community nursing)	51	
Documented contraindication*	28	
Other reason	289	
Incomplete data	38	
Total analysed	**3,650**	

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

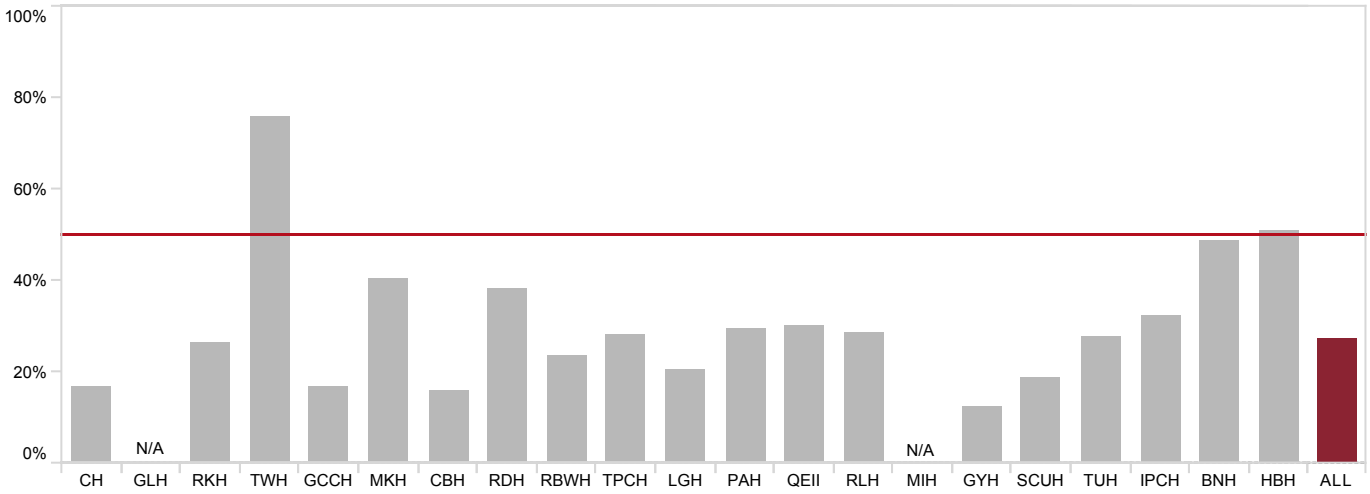
7b Beta blocker clinical guideline target dose achieved at time of titration review

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 27% of referrals within six months or at deactivation, with only two sites exceeding the benchmark (see Figure 20).

Daily target doses are:

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



N/A: Eligible referrals <20

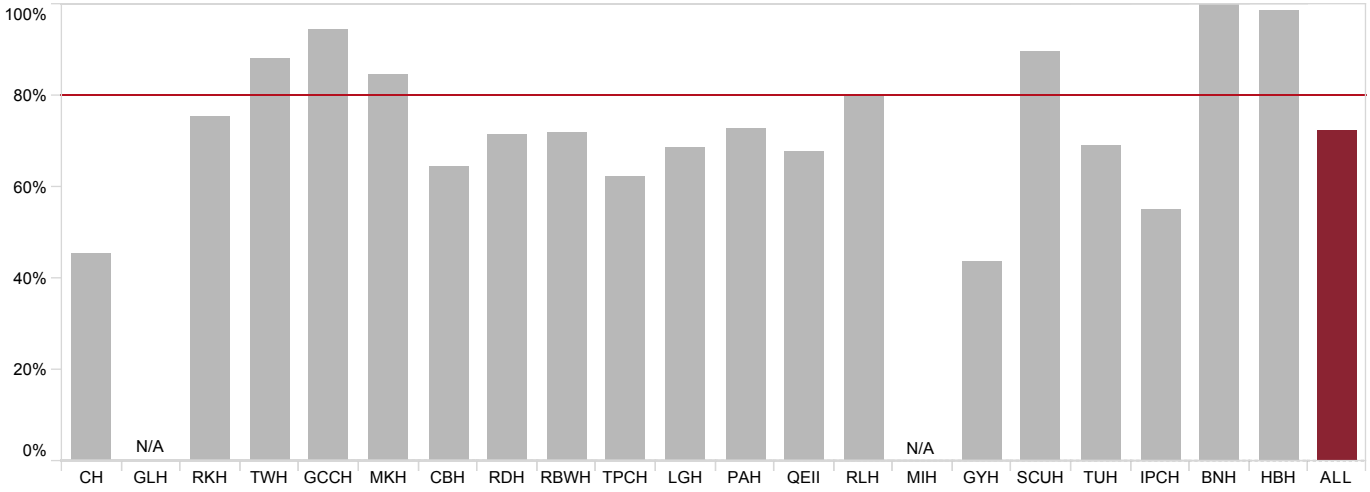
Figure 20: Proportion of patients who achieved target beta blocker dose at time of titration review by site

Table 28: Inclusion details for clinical indicator 6b: Patients who achieved target beta blocker dose at time of titration review

	n	%
Eligible for analysis	1,959	
Achieved benchmark	533	27.2
Benchmark not achieved	1,426	72.8
Ineligible	N/A	
Total titration reviews conducted	**1,959**	

7c 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 72%.



N/A: Eligible referrals <20

Figure 21: Proportion of patients who achieved target beta blocker dose or maximum tolerated dose at time of titration review

Table 29: 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	1,959	
Achieved benchmark	1,415	72.2
Benchmark not achieved	544	27.8
Ineligible	N/A	
Total titration reviews conducted	**1,959**	

6.8 Prescription of sodium-glucose cotransporter-2 (SGLT2) inhibitors for HFpEF

Guideline recommended sodium-glucose cotransporter-2 (SGLT2) have been shown to reduce cardiovascular death or HF hospitalisations in patients with HFpEF and are recommended for all patients unless contraindicated or not tolerated. Guideline recommended SGLT2 inhibitors for HFpEF including dapagliflozin and empagliflozin.[58,60]

8a Prescription of SGLT2 inhibitor for HFpEF at time of hospital discharge

At the time of discharge from hospital, 13% of eligible referrals to an HFSS were reported to be on a guideline recommended SGLT2 inhibitor for HFpEF.

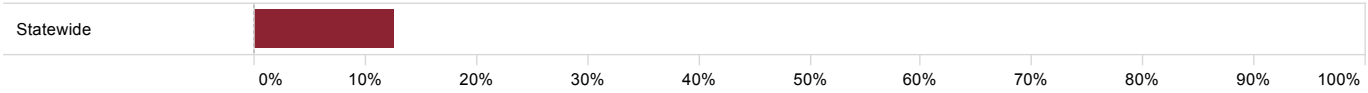


Figure 22: Proportion of HFpEF patients on guideline recommended SGLT2 inhibitor at hospital discharge

Table 30: Inclusion details for clinical indicator 8a: HFpEF patients on guideline recommended SGLT2 inhibitor at hospital discharge

	n	%
Eligible for analysis	287	
Achieved benchmark	36	12.5
Benchmark not achieved	251	87.5
Ineligible		
Documented contraindication*	43	
Missing data	45	
Total referrals analysed	**375**	

* SGLT2 inhibitor adverse reaction, type 1 diabetes mellitus, previous ketoacidosis, palliative intent to treatment, pregnancy, eGFR <20mL/min/1.73m², or symptomatic hypotension

8b Prescription of SGLT2 inhibitor for HFpEF at time of first HFSS clinical review

At the time of first clinical review, 14% of eligible referrals to an HFSS were reported to be on a guideline recommended SGLT2 inhibitor for HFpEF.

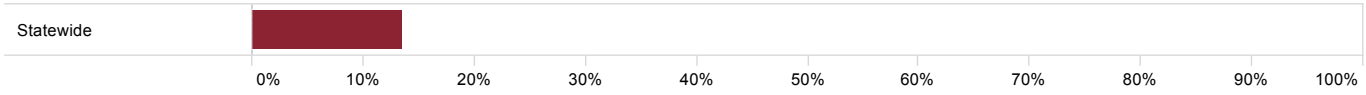


Figure 23: Proportion of HFpEF patients on guideline recommended SGLT2 inhibitor at first clinical review by site

Table 31: Inclusion details for clinical indicator 8b: HFpEF patients on guideline recommended SGLT2 inhibitor at first clinical review

	n	%
Eligible for analysis	312	
Achieved benchmark	42	13.5
Benchmark not achieved	270	86.5
Ineligible		
Documented contraindication*	47	
Missing data	69	
Total referrals analysed	**428**	

* SGLT2 inhibitor adverse reaction, type 1 diabetes mellitus, previous ketoacidosis, palliative intent to treatment, pregnancy, eGFR <20mL/min/1.73m^2, or symptomatic hypotension

6.9 Summary of clinical indicators

Table 32: Summary of clinical process indicator performance by site

	Clinical indicator achievement (%)													
HFSS	**1a**	**1b**	**2**	**3a**	**3b**	**4a**	**4b**	**5a**	**5b**	**6a**	**6b**	**7a**	**7b**	**7c**
Cairns Hospital	95	89	98	84	88	88	90	31	31	40	47	100	17	51
Gladstone Hospital	–	–	100	–	100	–	100	–	79	–	44	–	–	–
Rockhampton Hospital	88	94	98	86	83	87	86	67	51	31	28	97	29	76
Toowoomba Hospital	–	55	96	95	94	80	92	–	67	35	33	–	–	–
Gold Coast Community Health	93	99	97	89	89	87	90	49	48	46	42	78	18	94
Mackay Base Hospital	62	91	100	95	97	92	93	40	44	39	54	100	32	85
Caboolture Hospital	53	71	95	77	90	82	92	69	76	41	49	99	17	63
Redcliffe Hospital	43	65	96	100	94	91	94	–	73	–	39	–	–	–
Royal Brisbane & Women's Hospital	61	84	98	95	94	90	91	68	65	31	31	84	33	84
The Prince Charles Hospital	66	38	97	95	97	94	95	72	68	45	42	29	28	74
Logan Hospital	97	97	98	86	92	90	90	26	45	42	52	64	21	75
Princess Alexandra Hospital	86	61	99	96	98	93	95	53	52	22	21	97	29	71
Queen Elizabeth II Hospital	66	98	100	90	91	94	95	49	48	25	20	88	38	78
Redland Hospital	100	99	97	96	93	100	90	32	44	20	17	93	32	91
Mt Isa Hospital	–	–	64	–	–	–	–	–	–	–	–	–	–	–
Gympie Hospital	86	89	95	–	87	–	91	–	67	–	34	81	10	24
Sunshine Coast University Hospital	85	35	99	91	95	95	93	72	68	54	52	75	19	88
Townsville Hospital	100	100	98	95	96	94	95	67	60	43	34	100	29	72
Ipswich Community Health	59	83	98	92	91	85	91	56	53	31	30	33	35	55
Bundaberg Hospital	74	97	100	95	97	85	97	75	80	49	50	100	53	100
Hervey Bay Hospital	96	99	100	–	94	–	93	–	68	–	52	53	47	97
Statewide	**79**	**79**	**98**	**92**	**93**	**91**	**92**	**58**	**58**	**38**	**40**	**77**	**28**	**75**

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 Guideline recommended SGLT2 inhibitor prescription for HFrEF at hospital discharge (Benchmark: 80%)

6b Guideline recommended SGLT2 inhibitor prescription for HFrEF at first clinical review (Benchmark: 80%)

7a Beta blocker titration status review at six months post referral (Benchmark: 80%)

7b Beta blockers achievement of guideline recommended target dose (Benchmark: 50%)

7c 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 2021 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 2021 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 33. 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 33: 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 3,978 inpatient referrals of which 96% were successfully linked with the QHAPDC data. There were 454 patients who were ineligible for readmission and mortality analysis for the reasons shown in Table 34. A further 81 patients (2%) did not have complete follow up over one year to allow DAOH to be calculated.

Table 34: Eligibility criteria for patient outcome indicators

	n	%
Total 2021 inpatient referrals	**3,978**	**100.0**
Ineligible at index admission		
Duplicate patient record	139	3.5
Not a Queensland resident	58	1.5
Transferred to private hospital	35	0.9
Died during index admission	32	0.8
Index admission is not overnight	25	0.6
No linkage data available	165	4.1
Included in readmission and mortality analysis	**3,524**	**88.6**
Ineligible at subsequent admission over 1 year		
Transferred to private hospital	81	2.0
Included in days alive and out of hospital analysis	**3,443**	**86.6**

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 1.2% and 12.2%. The Kaplan-Meier survival analyses below (Figures 24 to 26) suggest that older age was associated with increased mortality rates at all time points and particularly at 12 months.

Table 35: 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	41 (1.2)	132 (3.7)	240 (6.8)	431 (12.2)
Died during subsequent admission*	16 (0.5)	66 (1.9)	133 (3.8)	237 (6.7)
All other deaths	25 (0.7)	66 (1.9)	107 (3.0)	194 (5.5)
Total at risk	**3,483 (98.8)**	**3,392 (96.3)**	**3,284 (93.2)**	**3,093 (87.8)**

* Data available for Queensland public hospitals only

Table 36: 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	2,275	24 (1.1)	79 (3.5)	148 (6.5)	275 (12.1)
Female	1,249	17 (1.4)	53 (4.2)	92 (7.4)	156 (12.5)
Age group					
<65 years	1301	7 (0.5)	26 (2.0)	41 (3.2)	67 (5.1)
65–74 years	910	14 (1.5)	34 (3.7)	57 (6.3)	107 (11.8)
≥75 years	1313	20 (1.5)	72 (5.5)	142 (10.8)	257 (19.6)
Heart failure phenotype					
HFrEF	2738	29 (1.1)	94 (3.4)	163 (6.0)	302 (11.0)
HFpEF	599	7 (1.2)	26 (4.3)	57 (9.5)	91 (15.2)
Primary right HF	125	3 (2.4)	9 (7.2)	15 (12.0)	29 (23.2)
Missing/unsure	62	2 (3.2)	3 (4.8)	5 (8.1)	9 (14.5)
ALL	**3,524**	**41 (1.2)**	**132 (3.7)**	**240 (6.8)**	**431 (12.2)**

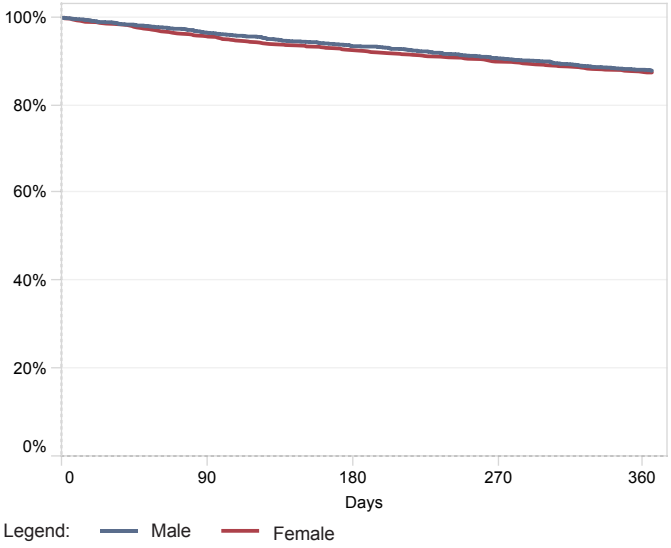


Figure 24: Heart failure survival by gender

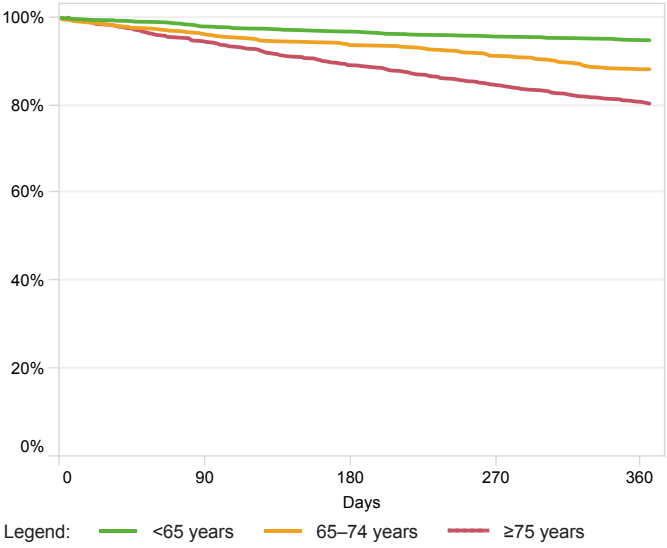


Figure 25: Heart failure survival by age group

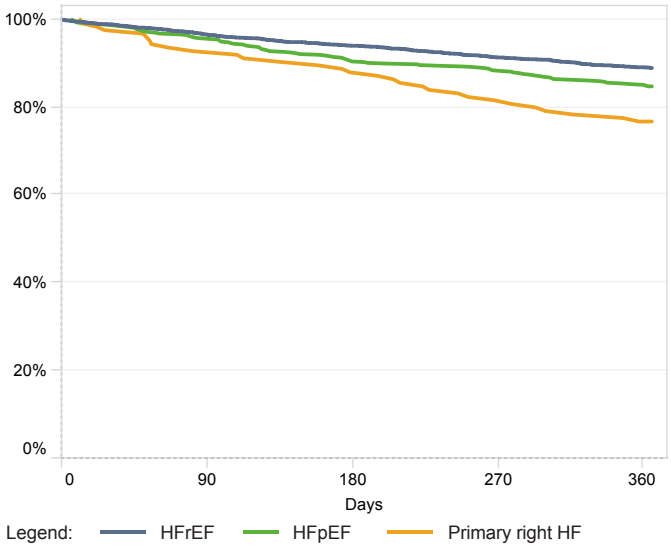


Figure 26: Heart failure survival by phenotype

7.2.2 All-cause and heart failure rehospitalisation

Cumulative incidence curves for all-cause and HF hospitalisation are shown in Figures 27 and 28. Of the 3,524 eligible patients referred to HFSS during 2021, the unadjusted rate of all-cause hospitalisation was 16.4% at 30 days, increasing to 52.8% at one year. Hospitalisations relating to HF (as identified by discharge diagnosis coding) were 4.7% and 19.4% at 30 days and one year respectively.

The overall risk of hospitalisation or death within 12 months post the index admission was 54.1% (Figure 29). More than one quarter of patients referred to an HFSS were rehospitalised at least twice in the subsequent 12 months (Table 37).

Table 37: Number of rehospitalisations per patient in the year post initial discharge

Total in one year	All-cause n (%)	Heart failure n (%)
0	1,713 (48.6)	2,894 (82.1)
1	841 (23.9)	426 (12.1)
2	417 (11.8)	124 (3.5)
3	231 (6.6)	46 (1.3)
4	139 (3.9)	14 (0.4)
≥5	183 (5.2)	20 (0.6)

Table 38: 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	2,275	347 (15.4)	651 (29)	879 (39.4)	1,122 (50.8)
Female	1,249	226 (18.3)	400 (32.4)	527 (42.9)	689 (56.4)
Age group					
<65 years	1,301	168 (13)	321 (24.9)	438 (34.1)	570 (44.4)
65–74 years	910	164 (18.2)	281 (31.2)	367 (41.1)	456 (51.9)
≥75 years	1,313	241 (18.5)	449 (34.8)	601 (46.9)	785 (62.0)
Heart failure phenotype					
HFrEF	2,738	422 (15.5)	766 (28.3)	1,024 (38.0)	1,310 (49.1)
HFpEF	599	114 (19.1)	217 (36.5)	286 (48.6)	377 (64.6)
Primary right HF	125	30 (24.4)	51 (41.8)	72 (59.5)	89 (76.1)
Missing/unsure	62	7 (11.7)	17 (28.8)	24 (40.7)	35 (59.3)
ALL	**3,524**	**573 (16.4)**	**1051 (30.2)**	**1406 (40.6)**	**1,811 (52.8)**

Table 39: 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	2,275	105 (4.7)	205 (9.2)	289 (13.3)	384 (18.3)
Female	1,249	60 (4.9)	132 (10.9)	182 (15.3)	246 (21.4)
Age group					
<65 years	1,301	48 (3.7)	98 (7.6)	135 (10.6)	173 (13.8)
65–74 years	910	46 (5.1)	84 (9.5)	116 (13.3)	168 (20.0)
≥75 years	1,313	71 (5.5)	155 (12.3)	220 (18.0)	289 (25.0)
Heart failure phenotype					
HFrEF	2,738	127 (4.7)	237 (8.9)	331 (12.6)	442 (17.3)
HFpEF	599	29 (4.9)	74 (12.6)	105 (18.7)	141 (26.1)
Primary right HF	125	7 (5.7)	20 (16.8)	29 (24.6)	37 (34.3)
Missing/unsure	62	2 (3.3)	6 (10.2)	6 (10.5)	10 (18.5)
ALL	**3,524**	**165 (4.7)**	**337 (9.8)**	**471 (14.0)**	**630 (19.4)**

Table 40: 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	2,275	363 (16.0)	681 (29.9)	921 (40.5)	1190 (52.3)
Female	1,249	237 (19.0)	415 (33.2)	548 (43.9)	717 (57.4)
Age group					
<65 years	1,301	173 (13.3)	335 (25.7)	454 (34.9)	588 (45.2)
65–74 years	910	173 (19.0)	291 (32.0)	383 (42.1)	488 (53.6)
≥75 years	1,313	254 (19.3)	470 (35.8)	632 (48.1)	831 (63.3)
Heart failure phenotype					
HFrEF	2,738	442 (16.1)	801 (29.3)	1070 (39.1)	1380 (50.4)
HFpEF	599	117 (19.5)	221 (36.9)	296 (49.4)	392 (65.4)
Primary right HF	125	32 (25.6)	54 (43.2)	76 (60.8)	97 (77.6)
Missing/unsure	62	9 (14.5)	20 (32.3)	27 (43.5)	38 (61.3)
ALL	**3,524**	**600 (17.0)**	**1,096 (31.1)**	**1,469 (41.7)**	**1,907 (54.1)**

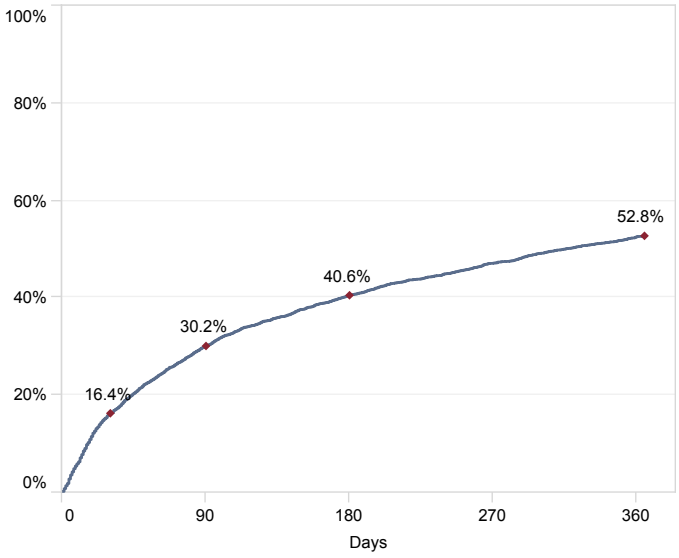


Figure 27: Cumulative incidence of all-cause rehospitalisation

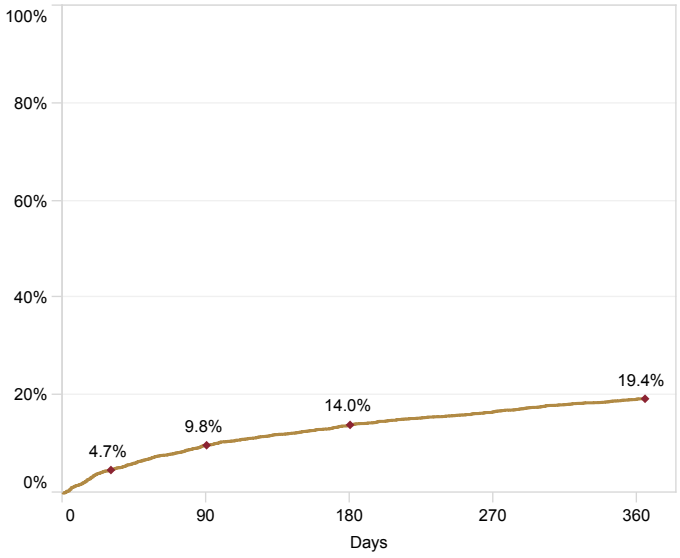


Figure 28: Cumulative incidence of heart failure rehospitalisation

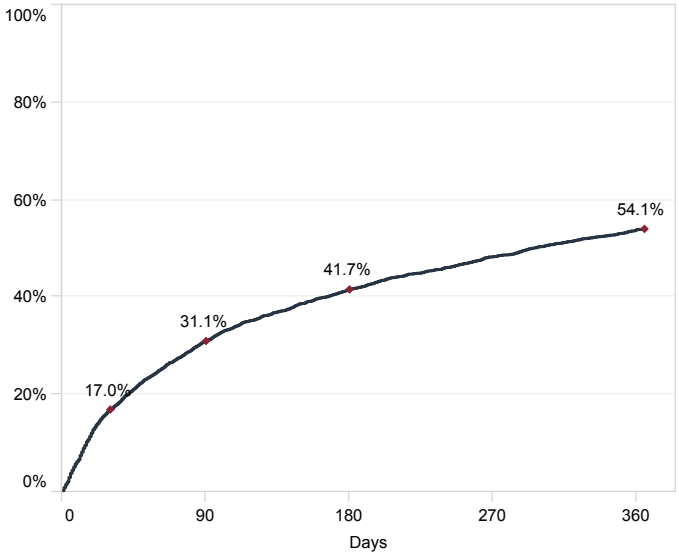


Figure 29: Cumulative incidence of all-cause rehospitalisation or death

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, with 112,096 days lost due to death or hospitalisation over 12 months in 3,443 patients.

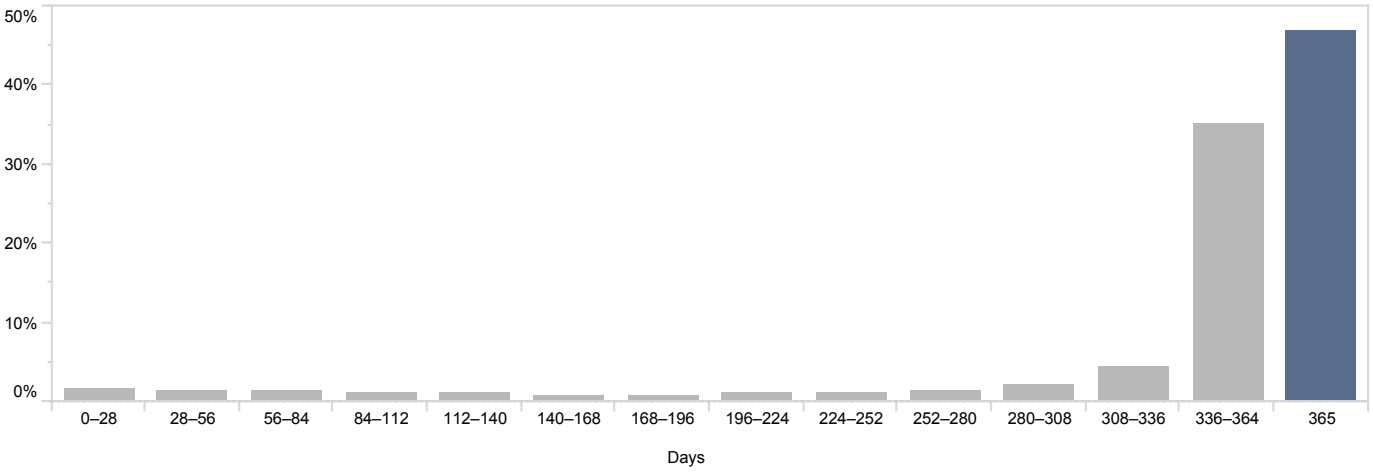
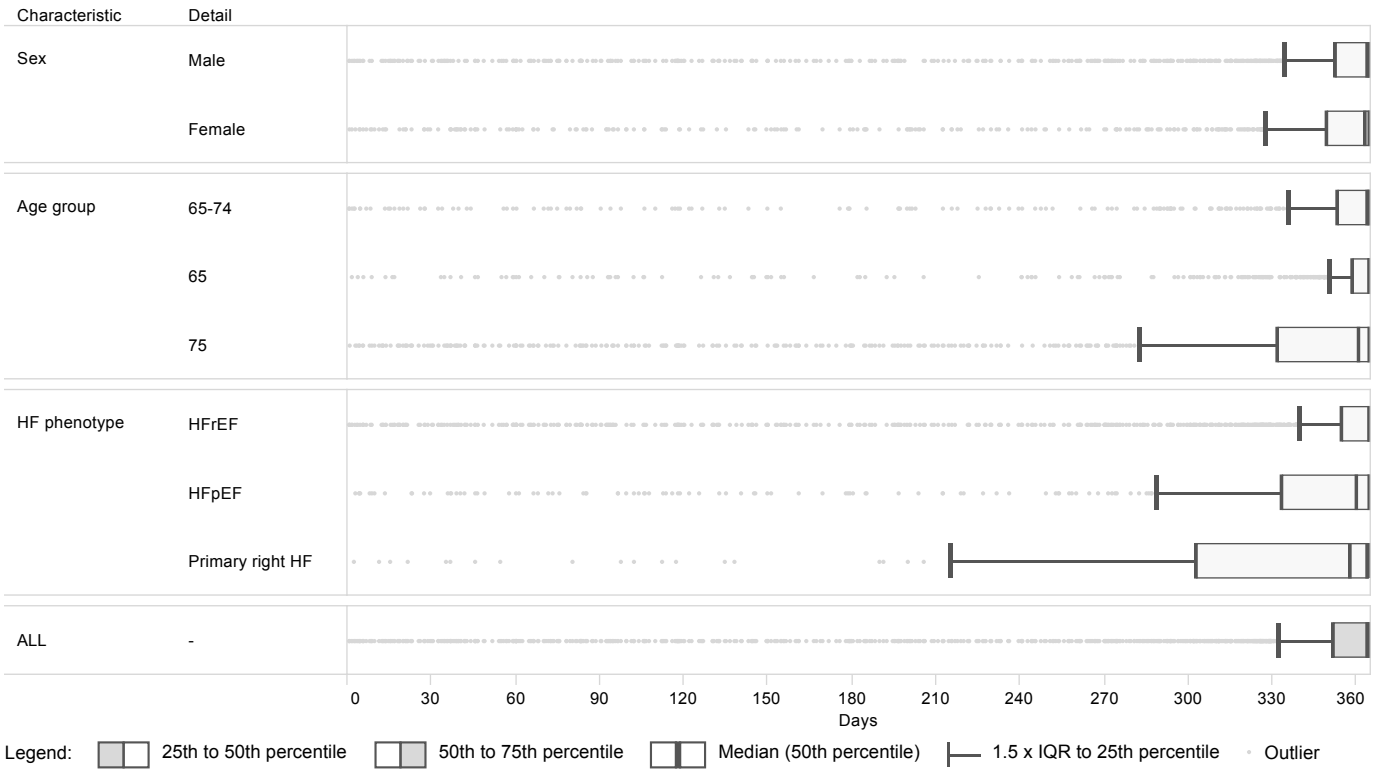


Figure 30: Days alive and out of hospital within one year after hospital discharge

Table 41: Days alive and out of hospital within one year of discharge by patient characteristic

Characteristic	Detail	n	Mean days	Median (IQR) days
Sex	Male	2,227	334.1	364 (353–365)
	Female	1,216	329.4	363 (350–365)
Age group	<65	1,291	347.2	365 (359–365)
	65–74	884	334.2	364 (353–365)
	≥75	1,268	316.2	361 (332–365)
HF phenotype	HFrEF	2,688	336.1	365 (355–365)
	HFpEF	578	321.7	361 (334–365)
	Primary right HF	117	304.3	358 (303–365)
	Missing/unsure	60	326.1	363 (350–365)
ALL		**3,443**	**332.4**	**364 (352–365)**

The box and whisker plots in Figure 31 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 31: Days alive and out of hospital within one year of discharge by patient characteristic

References

Heart Failure Support Services Audit

55 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

56 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

57 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

58 McDonagh, T. A., Metra, M., Adamo, M., Gardner, R. S., Baumbach, A., Böhm, M., … Skibelund, A. K. (2021). 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: Developed by the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) With the special contribution of the Heart Failure Association (HFA) of the ESC. *European Heart Journal, 42*(36), 3599–3726. https://doi.org/10.1093/eurheartj/ehab368

59 Sindone, A. P., De Pasquale, C., Amerena, J., Burdeniuk, C., Chan, A., Coats, A., Hare, D. L., Macdonald, P., Sverdlov, A., & Atherton, J. J. (2022). Consensus statement on the current pharmacological prevention and management of heart failure. *Medical Journal of Australia, 217*(4), 212–217. https://doi.org/10.5694/mja2.51656

60 Heidenreich, P. A., Bozkurt, B., Aguilar, D., Allen, L. A., Byun, J. J., Colvin, M. M., Deswal, A., Drazner, M. H., Dunlay, S. M., Evers, L. R., Fang, J. C., Fedson, S. E., Fonarow, G. C., Hayek, S. S., Hernandez, A. F., Khazanie, P., Kittleson, M. M., Lee, C. S., Link, M. S., … Yancy, C. W. (2022). 2022 AHA/ACC/HFSA guideline for the management of heart failure. *Journal of the American College of Cardiology, 79*(17). https://doi.org/10.1016/j.jacc.2021.12.012

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

clinicalexcellence.qld.gov.au