Statewide Cardiac Clinical Network
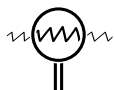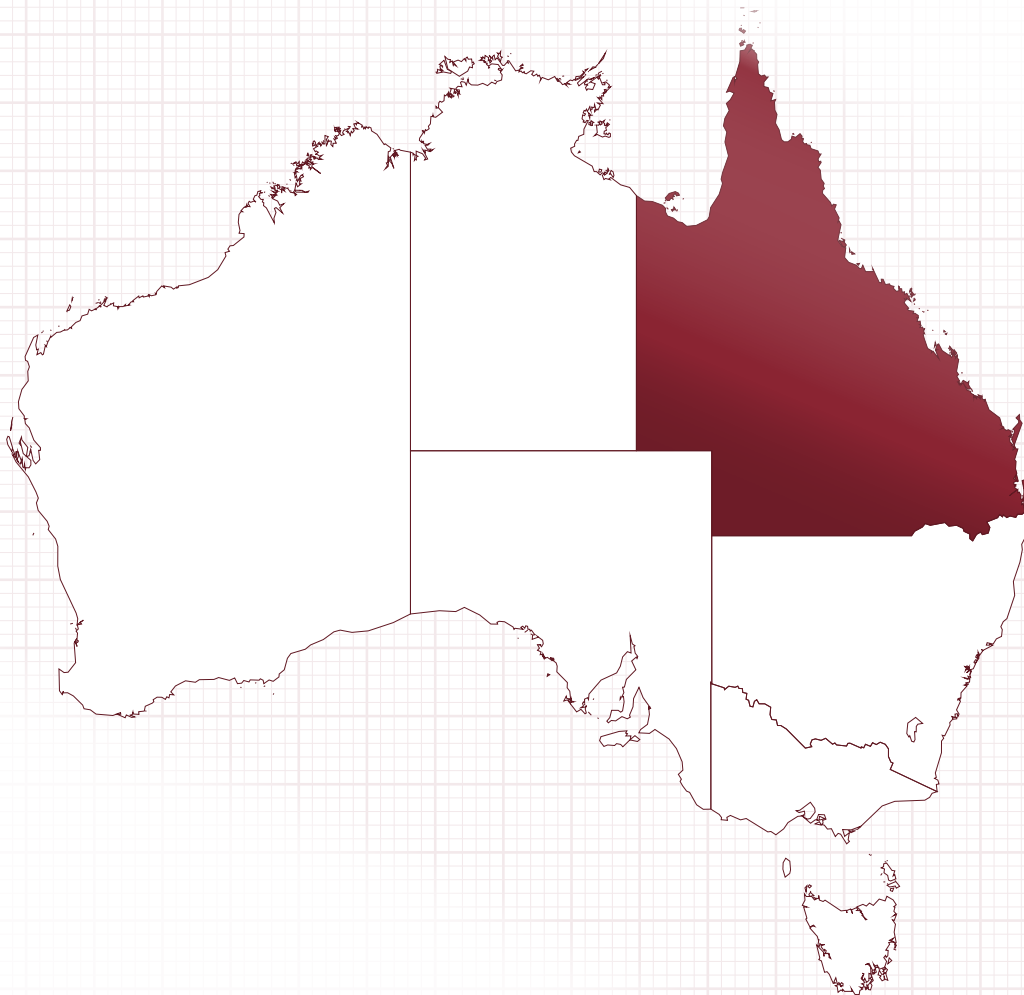
Queensland Cardiac Outcomes Registry
2018 Annual Report
Heart Failure Support Services Audit

Improvement | Transparency | Patient Safety | Clinician Leadership | Innovation

Queensland
Government

Contents

Figures

Heart Failure Support Services Audit

Tables

1   Foreword

As Director General of Queensland Health, I am pleased to present the *Queensland Cardiac Outcomes Registry (QCOR) 2018 Annual Report*. The Annual Report provides detailed information on the performance of our clinical care for, and outcomes of, people with cardiac disorders.

The Annual Report examines a range of clinical areas including cardiac and thoracic surgery, cardiac rehabilitation, cardiac catheter interventions, electrophysiology and pacing, and heart failure support services. This year's Annual Report includes additional analysis of specific areas of interest to enable examination of clinical issues faced by practitioners at the face of patient care.

The Annual Report exemplifies how Queensland Health is meeting its objective to *enable safe, high quality services*. The results show that Queenslanders are receiving some of the best cardiac care in the country, and often the world. Queensland Health is committed to empowering our people to provide the best possible healthcare, to be transparent in our work and importantly use information to inform and improve the health outcomes of our patients.

The high level of clinical engagement extends beyond clinical practice to working collaboratively with Queensland Health administrators to improve the efficiency of our organisation. Recently, cardiac clinicians and administrators collaborated and used QCOR data to improve the purchasing process of clinical products resulting in savings of $5 million. These funds will now be available in the relevant Hospital and Health Services to reinvest into patient care.

QCOR data allows us to be responsive to the needs of our patients and community. It is actively used to inform how we improve the access, equity, safety, efficiency and effectiveness of our cardiac healthcare.

I would like to acknowledge the ongoing effort of the Statewide Cardiac Clinical Network and its many clinicians and colleagues, who have collaborated to produce this Annual Report.

Dr John Wakefield PSM
Director-General
Queensland Health

2   Message from the SCCN Chair

It is my pleasure to introduce the 4th Queensland Cardiac Outcome Registry (QCOR) Annual Report. The activities of QCOR continue to mature, and this report gives us yet another opportunity to re-examine the reasons for continuing this work, as well as forming a stimulus to reinvigorate our efforts. The chance to ask, "Why are we doing this?" – a lot of effort, repeated committee meetings, some late nights, and occasional irritation with colleagues, as a counterpoise to the ingrained clinician desire to do the absolute best for every patient we care for and to have data to prove it. The ledger is strongly tilted in the affirmative.

Queensland is now acknowledged as having some of the most comprehensive cardiac data in the country, and the success of this program absolutely rests on the sustained clinician participation on which the programme is built. Every step from patient care, through recording of data, to submission, reverification and analysis is heavily invested by the clinicians. This intensive participation towards a common goal has certainly drawn the cardiac community together and we can be rightly proud of the cohesiveness of the efforts to improve care across the state.

The report this year further extends important elements of patient care – we have a strong collaboration with Queensland Ambulance Service (QAS), and now have access to quite comprehensive prehospital care including QAS administered thrombolysis and outcomes. In a state as large as Queensland it is critical that we track these important aspects of care. The documentation of post hospital cardiac rehabilitation and heart failure management continues to provide a more comprehensive picture extending the window of acute admission and without doubt adding to the safety of our acute interventions.

It is gratifying to see that procedural outcomes across all of the participating institutions remain stable and of high quality.

Finally, one of the important reasons which clinicians originally identified supporting participation in the program has come to fruition – the cardiac data derived from QCOR has now led to specific investment by the state government in the processes of cardiac care. In the coming year, in an initial investment roll out, hospitals in Cairns and Townsville will significantly expand their outreach into rural and remote centres in Torres and Cape and across to the North West Hospital and Health Service. QCOR data has clearly profiled both the need and the shortfall of cardiac services in these areas and has led to a recognition of our responsibilities for delivering safe and efficacious treatment both for patients who live close to major centres, but also especially for those far removed. This programme will extend to the remaining Hospital and Health Services in a multi-year investment.

Again, I give thanks to all of the clinicians who continue to participate in this important work. In the coming year, QCOR will have the capacity to invite private cardiac providers in the state to submit data to QCOR, so that we can obtain a more complete picture both public and private, of cardiac services across the state.

A special thanks is given to the Statewide Cardiac Clinical Informatics Unit technical and administrative staff who continue to supply superb assistance to the program and who are truly integral to the quality of the attached report.

Dr Paul Garrahy
Chair
Statewide Cardiac Clinical Network

3 Introduction

The Queensland Cardiac Outcomes Registry (QCOR) is an ever-evolving clinical information collection which enables clinicians and other key stakeholders access to quality, contextualised clinical and procedural data. On the background of significant investment and direction from the Statewide Cardiac Clinical Network (SCCN) and under the auspices of Clinical Excellence Queensland, QCOR provides analytics and overview for several clinical information systems and databases. By utilising extensive ancillary complementary administrative datasets, a sophisticated level of multi-purpose reporting and insight has been gained.

QCOR data collections are governed by bespoke clinical committees which provide oversight and direction to reporting content and analysis as well as informing decision-making for future endeavours. These committees are supported by Statewide Cardiac Clinical Informatics Unit (SCCIU) who form the business unit of QCOR. All processes and groups report to the SCCN, which is facilitated by Clinical Excellence Queensland.

The strength of the Registry would not be possible without significant clinician input. Assisting to maintain quality, relevance and context through QCOR committees, clinicians are continually developing and evolving the analysis and focus of each specific group. The SCCIU performs the role of coordinating these individual QCOR committees which each have their individual direction and unique requirements.

The SCCIU provide the reporting, analysis, and development of the many clinical cardiology and cardiothoracic surgical applications and systems in use across Queensland Health. The SCCIU also provides data quality and audit functions as well as expert technical and informatics resources for development, maintenance and continual improvement of specialised clinical applications and relevant secondary uses.

The SCCIU team consists of:

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

This 2018 QCOR report now includes a total of 6 clinical audits. The addition of the thoracic surgery audit report complements the existing cardiac surgery report to enable a clearer picture of the work undertaken by cardiac and thoracic surgeons in Queensland. This work reflects efforts in this space and the highlights the vast patient cohort that are encountered by clinicians working in this specialty. It is with this continual development and evolution of clinical reporting maturity that QCOR hopes to further support cardiothoracic clinical informatics into the future.
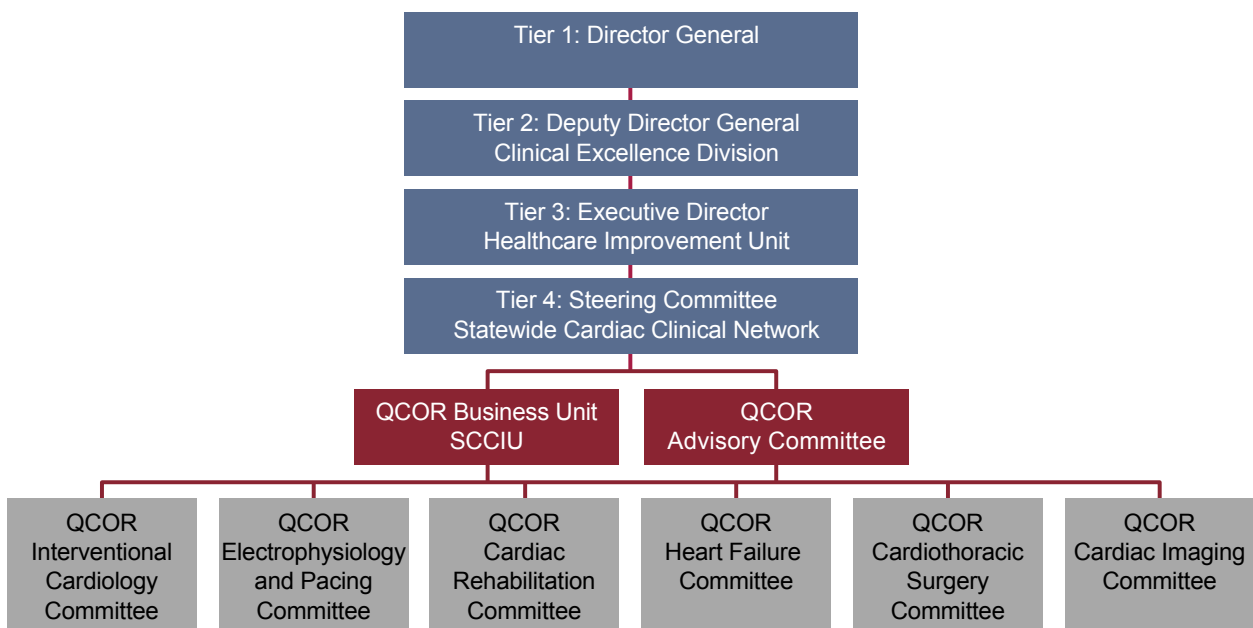
Figure A: Operational structure

Queensland Cardiac Outcomes Registry

The health of Queenslanders

>5 million
population*

1 in 5
admitted to hospital†

766,000
aged 65 years or older†

16%
Coronary heart disease
is the leading cause of
death

15%
of total disease burden
is caused by
cardiovascular disease†

11%
Hospital spending on
cardiovascular disease

31%
have untreated
high total cholesterol

11%
smoke daily†

23%
have untreated
high blood pressure

2 in 3
are overweight
or obese†

63%
are sufficiently active†

28%
of all deaths due
to cardiovascular disease

4.6%
Aboriginal and Torres Strait
Islander population‡

4.8%
have diabetes§

What's new?

Thoracic Surgery Audit	Interhospital transfer for coronary intervention review
Electrophysiology and pacing clinical indicators	Cardiac rehabilitation patient outcome measures
Thrombolysis for STEMI analysis	Body mass index in cardiac surgery investigation

Figure B: QCOR 2018 infographic

2018 Activity at a Glance

Case and patient volumes

4,867 percutaneous coronary interventions

401 structural heart disease interventions

148 transcatheter aortic valve replacement procedures

2,384 adult cardiac surgeries

850 adult thoracic surgeries

4,474 electrophysiology and pacing procedures

3,136 cardiac electronic implantable device procedures

4,878 new heart failure support services referrals

11,723 cardiac rehabilitation referrals

Clinical indicator progress

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

0.9% mortality rate for coronary artery bypass surgery at 30 days

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

95% of cardiac rehabilitation referrals within 3 days of discharge

0.3% procedural tamponade rate for cardiac device and electrophysiology procedures

Continuing our work

Data linkage opportunities

Structural heart disease application

National registry alignment

Cardiac outreach application

Clinical indicator review

ECG Flash project

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*   Australian Bureau of Statistics. Regional population growth, Australia, 2017-2018. Cat. no. 3218.0. ABS:Canberra; 2019

†   Queensland Health (2018).The health of Queenslanders 2018. Report of the Chief Health Officer Queensland. Brisbane. Queensland Government

‡   Australian Bureau of Statistics. Estimates of Aboriginal and Torres Strait Islander Australians, June 2016. Cat. no 3238.055001. ABS: Canberra; 2018

§   Diabetes Australia. State statistical snapshot: Queensland. As at 30 June 2018; 2018

4   Executive summary

This report encompasses procedures and cases for 8 cardiac catheterisation laboratories (CCL) and electrophysiology and pacing (EP) facilities and 5 cardiothoracic surgery units operating across Queensland public hospitals. It also includes referrals to clinical support and rehabilitation services for the management of heart disease including 22 heart failure support services and 55 cardiac rehabilitation outpatient facilities.

- 15,436 diagnostic or interventional cases were performed across the 8 public cardiac catheterisation laboratory facilities in Queensland hospitals. Of these, 4,867 involved percutaneous coronary intervention (PCI).

- Patient outcomes following PCI remain encouraging. The 30 day mortality rate following PCI was 1.9%, and of the 94 deaths observed, 74% were classed as either salvage or emergency PCI.

- In analysis for patients with STEMI, the median time from FdECG to reperfusion and arrival at PCI facility to reperfusion was observed at 85 minutes and 42 minutes. This compares favourably to results for previous years and internationally.

- Across the four sites with a cardiac surgery unit, a total of 2,384 cases were performed including 1,414 CABG and 1,005 valve procedures.

- As in previous years, observed rates for cardiac surgery mortality and morbidity are either within the expected range or better than expected, depending on the risk model used to evaluate these outcomes. Once again the exception was the rate of deep sternal wound infection.

- The Cardiac Surgery Audit includes a focused supplement on obesity in cardiac surgery. This report highlights the increased rate of post-operative morbidity and mortality for patients with a higher BMI ($>$30 kg/m^2).

- The five public hospitals providing thoracic surgery services in 2018 performed a total of 850 cases. Almost one-third (30%) of surgeries followed a preoperative diagnosis of primary lung cancer or pleural disease (33%). This is the first QCOR Annual Report to examine thoracic surgery, and this will be expanded in future years.

- At the 8 public EP sites, a total of 4,474 cases were performed, which included 3,136 cardiac device procedures and 1,061 electrophysiology procedures. This audit includes expanded reporting around clinical indicators for EP cases.

- This Electrophysiology and Pacing Audit identified a median wait time of 81 days for complex ablation procedures, and 33 days for elective ICD implants.

- There were a total of 11,723 referrals to one of the 55 public cardiac rehabilitation services in 2018. Most referrals (77%) followed an admission at a public hospital in Queensland.

- The vast majority of referrals to CR were created within three days of the patient being discharged from hospital (95%), while over half of patients went on to complete an initial assessment by CR within 28 days of discharge (59%).

- There were 4,878 new referrals to a heart failure support service in 2018. Clinical indicator benchmarks were achieved for timely follow-up of referrals, and prescription of angiotensin-converting-enzyme inhibitor (ACEI) or angiotensin II receptor blockers (ARB) and appropriate beta blockers as per clinical guidelines.

5 Acknowledgements and authors

This collaborative report was produced by the SCCIU, audit lead for QCOR for and on behalf of the Statewide Cardiac Clinical Network.

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6   Future plans

Continual progress with expanded analyses and uses of clinical data has been a focus for QCOR in 2018. This is evident through new report elements encompassing thoracic surgery and extended examination of patients undergoing thrombolysis for myocardial infarction. Similarly, obesity and cardiac surgery have been examined and have unveiled key findings that are highly relevant given the increasing incidence of obesity within the general population. Intending to provide clinically relevant analysis, the future work of QCOR is exciting.

The utilisation of linkage data provided by administrative datasets continues to enable and assist QCOR data collections. These data enable information from different sources to be brought together to create a new, richer dataset. Examples of future opportunities for the use of supplementary datasets are medication detail from discharge summaries and pathology investigations undertaken within public Queensland facilities. With access to these expanded data collections, there are opportunities to be seized across many fronts including enhanced risk adjustment options, expanded clinical indicator programs and streamlined participation in national registry activities. Furthermore, this will enable efficiencies in data collections where elements are either not available or practical for collection at the point-of-care, and thereby reduce duplication of entry across clinical systems.

Opportunities exist to better integrate QCOR clinical applications with enterprise systems such as the acclaimed Queensland Health application, The Viewer. It is envisaged that cardiac rehabilitation referrals and assessment forms will be incorporated within the patient record, along with procedure reports generated by the upcoming QCOR structural heart disease application. These developments are set to complement the existing report sharing functionality present within the QCOR electrophysiology system. Further opportunities have been flagged across the heart failure support services and cardiothoracic surgery space to enhance these applications to meet the bespoke requirements of the clinical specialty areas. By embracing opportunities to share valuable clinical data kept in various QCOR systems, investment in QCOR applications will be further realised and valued.

Continual development, revision, and optimisation of clinical indicator programs is essential to the ongoing relevance of the Registry. QCOR will continue to collaborate with experts in all clinical domains to expand the scope of our existing analyses. This will be undertaken with a view to maintain and enhance the quality of reporting and improve the timeliness and relevance of the information provided for clinical leads. Such areas where reporting will be enhanced for next year's Annual Report include:

• Time to angiography for patients receiving thrombolysis

• Expanded radiation safety analyses for diagnostic and interventional cardiology

• Review of risk adjustment models for interventional cardiology

• EuroSCORE II risk adjustment for cardiac surgery patients

• MRA prescription rates for HFrEF patients

• CR referrals rates following cardiac intervention

QCOR is actively investigating opportunities within several areas including the implementation of new patient-reported outcomes and quality-of-life measures and realising further efficiencies concerning statewide procurement of medical devices. New areas of research and research partners and opportunities to contribute to works underway across Queensland Health, and at a national level, are continually being pursued and engaged.

7   Facility profiles

7.1   Cairns Hospital

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

Figure 1:   Cairns Hospital

7.2   The Townsville Hospital

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

Figure 2:   The Townsville Hospital

7.3   Mackay Base Hospital

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

Figure 3:   Mackay Base Hospital

7.4   Sunshine Coast University Hospital

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

Figure 4:   Sunshine Coast University Hospital

7.5 The Prince Charles Hospital
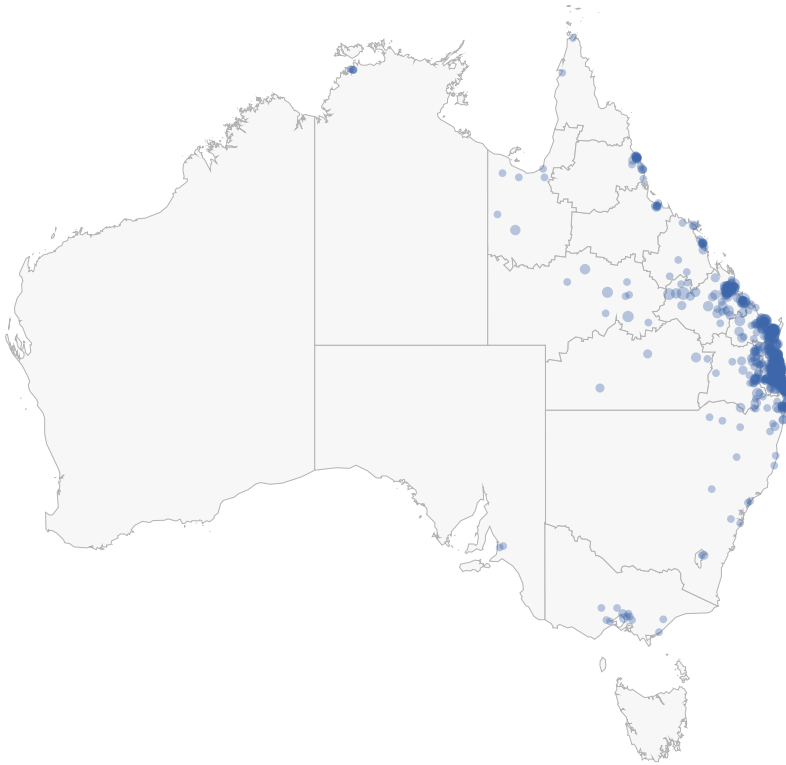
Figure 5: The Prince Charles Hospital

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

7.6 Royal Brisbane and Women's Hospital
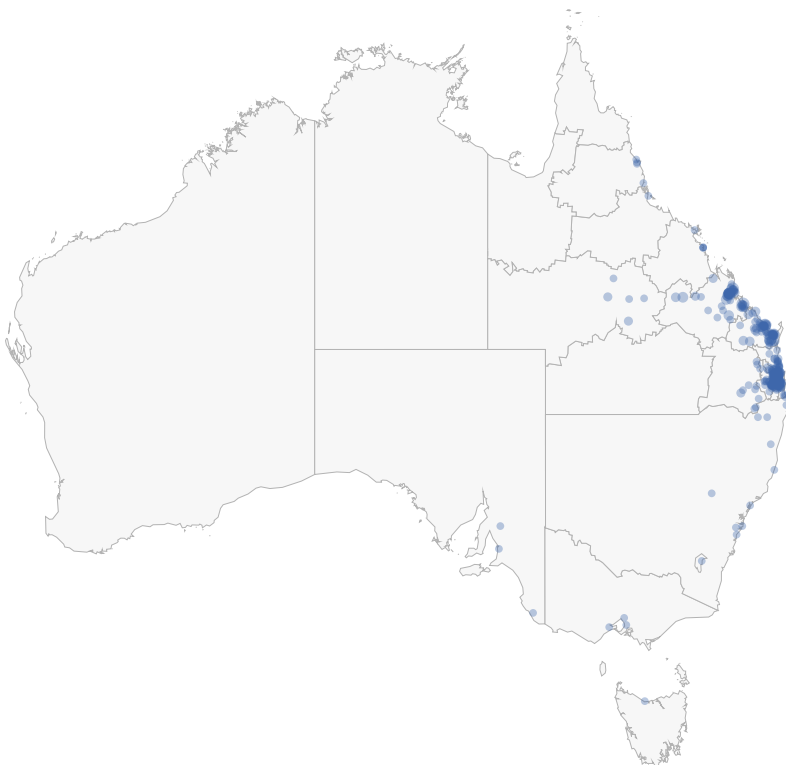
Figure 6: Royal Brisbane and Women's Hospital

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

7.7   Princess Alexandra Hospital
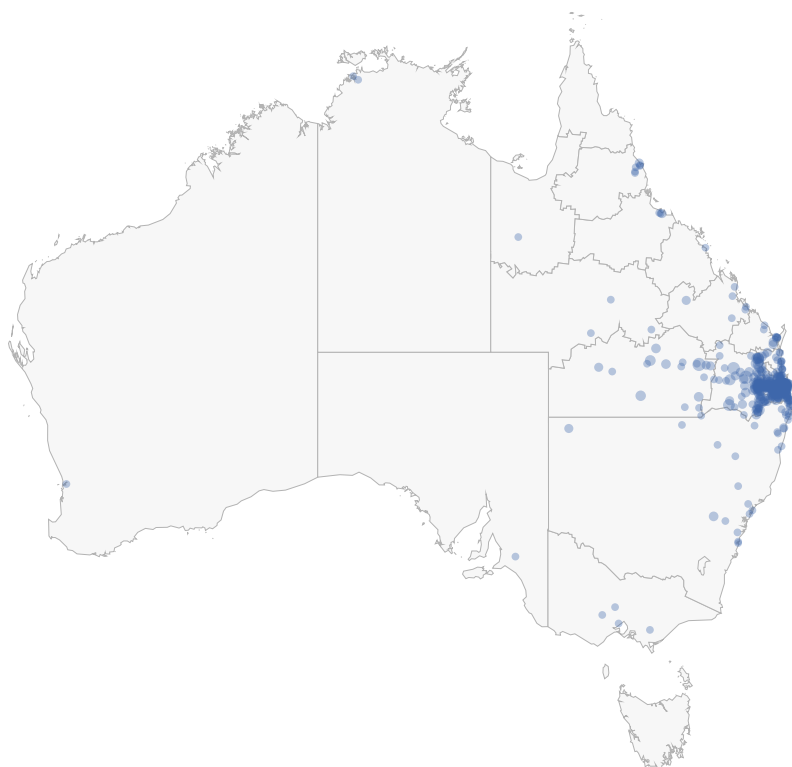
Figure 7:   Princess Alexandra Hospital

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

7.8   Gold Coast University Hospital

Figure 8:   Gold Coast University Hospital

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

Heart Failure Support Services Audit
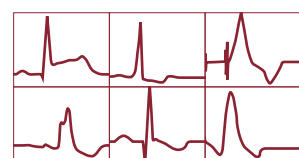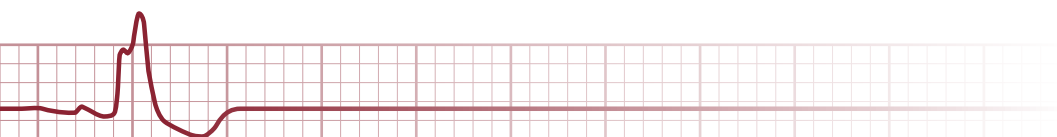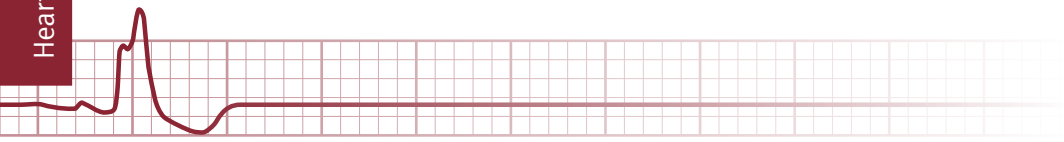
1 Message from the Heart Failure Steering Committee Chair

It is my pleasure to release the third annual report on patients referred to Heart Failure Support Services (HFSS) in Queensland Health. Since 2015 we have collected information on the care and outcomes of 14,500 unique patients with heart failure who were referred to one of the multidisciplinary support services of nurses and allied health across Queensland Health.

Clinical performance indicators are based on patients referred to a HFSS in the 2018 calendar year and are related to timeliness of follow-up, assessment of left ventricular function, prescription of key medications and beta blocker titration. The select group of clinical indicators is reflective of best practice at a statewide and local level.

Patient outcomes include information about survival, re-hospitalisation and days alive and out-of-hospital at a statewide level. The outcome analysis is based on the cohort from the previous year to allow for tracking outcomes over the 12 months post the hospital discharge associated with the referral.

This rich dataset would not exist without the commitment of heart failure nurses and other healthcare providers to data collection as part of routine practice. Reporting of clinical standards and outcomes is in the context of a larger ongoing statewide quality improvement program where the reasons for variations in practice can be explored and systems of care can be developed to ensure that patients receive the best standard of care.

Patients and their families referred to heart failure support services manage a multitude of social, emotional and physical factors related to this chronic condition. We hope that the monitoring of our clinical practice is one small, but important contribution to ensuring that patients receive the best possible clinical care to ultimately live longer and achieve the best quality of life.

Associate Professor John Atherton
Chair of the QCOR Heart Failure committee

2   Key findings

Characteristics of the 2018 cohort of referrals to a Heart Failure Support Service (HFSS)

- The majority of the 4,878 referrals were: male (68%), non-Indigenous (94.7%), referred to South East Queensland HFSS (85%); from an inpatient setting (70%); and diagnosed with HFrEF (80.2%).

- Median age of referrals was 69 years old with: males younger than females (68 vs 72 years); Aboriginal and Torres Strait Islander younger than non-Indigenous patients (56 vs 70 years); HFrEF patients younger than HFpEF (68 vs 76 years); and over 20% aged 80 years or more.

Clinical indicator performance for 2018

- Most indicators met benchmarks at a statewide level except for the review and titration of beta blockers (Clinical indicator 5a, b, c) (see Table 1).

- There is variation in practice with many of the 21 HFSS below benchmarks for clinical indicators 1a (follow-up of inpatient referrals in two weeks) and 5a, b, c (beta blocker review and titration).

- Prescribing of guideline directed medications met benchmarks for all sites.

Table 1:   Summary of statewide clinical indicator performance

#	Clinical indicator	% referrals
1a	Follow-up of acute patients within 2 weeks	78.5
1b	Follow-up of non-acute patients within 4 weeks	82.4*
2	Assessment of left ventricular ejection fraction within 2 years	95.5*
3a	ACEI/ARB† prescription at hospital discharge	92.1*
3b	ACEI/ARB† at first clinical review	91.0*
4a	Beta blocker‡ prescription at hospital discharge	89.6*
4b	Beta blocker‡ prescription at first clinical review	91.3*
5a	Beta blocker‡ titration status review at six months post referral	66.7
5b	Beta blocker‡ achievement of guideline recommended target	32.4
5c	Beta blocker‡ achievement of guideline recommended target dose or maximum tolerated dose	72.2

*   Benchmark met (benchmark is 80% achievement except for 5b which is 50%)

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

‡   Bisoprolol, Carvedilol, Metoprolol sustained release, or Nebivolol

Heart Failure Support Services

Patient outcomes

Patient outcomes regarding hospital use and death are based on 2017 referrals from an inpatient source to allow for 12 month follow-up from the index hospitalisation. Key findings are summarised in Table 2.

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

#	Measures post index hospitalisation*	30 days	1 year
1	All-cause mortality	1.7%	14.3%
2	a) All-cause rehospitalisation	17.8%	57.0%
	b) Heart failure rehospitalisation	5.6%	24.2%
3	Composite all-cause hospitalisation or all-cause mortality	18.1%	58.1%
4	Days alive and out-of-hospital†	N/A	363 median days‡

* Commences from date of discharge for index admission

† A single measure of mortality, readmissions and length of stay

‡ Approximately 55% of patients had additional time in hospital

Recommendations

• Monitor Mineralocorticoid receptor antagonists (MRA) prescribing and use of Angiotensin Receptor-Neprilysin Inhibitors (ARNI) (underway for 2019 cohort).

• Collect information about HF with associated valvular disease and right heart failure (underway for 2019 cohort).

• Record reasons for not achieving target dose of beta blockers (underway for 2019 cohort).

• Record the use of cardiac implantable electronic devices (CIED) (under development for 2020 cohort).

• Include a clinical indicator related to exercise training.

• Further develop systems of care to improve beta blocker titration.

• Collect additional variables to allow for risk adjustment of patient outcomes.

3 Participating sites

Heart failure support services (HFSS) consist of teams of specialised nurses with medical support. Some services include a range of allied health. Of the 22 HFSS in Queensland, 21 contributed data to this year's annual report. There were 23 services in 2017, but two nursing services at The Prince Charles Hospital amalgamated into one in 2018. The locations and services offered are shown in Figure 1 and Table 3.

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	MBH
Metro North	Caboolture Hospital	CBH
	Redcliffe Hospital*	RDH
	Royal Brisbane and Women's Hospital	RBWH
	The Prince Charles Hospital	TPCH
Metro South	Logan Hospital	LGH
	Mater Adult Hospital, Brisbane	MTHB
	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

*   Partial participation

†   Did not participate

Figure 1:   Heart Failure Support Service locations

Heart Failure Support Services

Table 4: Components of Queensland Heart Failure Support Services

HHS	Facility	HFSS Disciplines				Modes of service (telephone + …)				Medical mentor§
		Nurse	NP*	Pharm†	Physio or AEP‡	In-patient	Nurse or MD clinics	Home visits	Groups	
Cairns and Hinterland	CH	Y	Y	–	Y	Y	Y	Y	Y	Y
Central Queensland	GLH	Y	–	–	Y	Y	–	–	Y	Video clinic
	RKH	Y	Y	Y	Y	Y	Y	–	Y	Y
Darling Downs	TWH	Y	–	Y	–	–	Y	Y	–	Y
Gold Coast	GCCH	Y	–	Y	Y	Y	Y	Y	Y	Y
Mackay	MBH	Y	–	–	Y	–	Y	–	Y	Y
Metro North	CBH	Y	–	Y	–	–	Y	–	–	Y
	RDH	Y	–	–	–	–	–	Y	–	Y
	RBWH	Y	–	Y	Y	Y	Y	–	Y	Y
	TPCH	Y	Y	Y	Y	Y	Y	–	Y	Y
Metro South	LGH	Y	Y	Y	Y	Y	Y	Y	Y	Y
	MTHB	Y	Y	–	R	Y	Y	Y	–	Y
	PAH	Y	Y	Y	Y	Y	Y	Y	Y	Y
	QEII	Y	Y	Y	R	Y	Y	Y	–	Y
	RLH	Y	Y	–	Y	Y	Y	Y	Y	Y
North West	MIH	Y	Y	–	R	Y	Y	Y	–	Outreach
Sunshine Coast	GYH	Y	–	–	–	Y	Y	Y	Y	Y
	SCUH	Y	Y	–	R	Y	Y	Y	–	Y
Townsville	TTH	Y	Y	Y	R	Y	Y	Y	–	Y
West Moreton	IPCH	Y	Y	Y	Y	Y	Y	Y	Y	Y
Wide Bay	BNH	Y	–	–	R	–	–	–	–	Y
	HBH	Y	Y	–	Y	Y	Y	Y	Y	Video clinic
Statewide		100%	59%	50%	82%	77%	86%	68%	59%	100%

*   Nurse practitioner who can prescribe medications

†   Pharmacist

§   The HFSS has a cardiologist or general physician mentor

‡   Physiotherapist or Accredited Exercise Physiologist

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

4 New referrals

In 2018, there were 4,878 new referrals reported by 21 participating HFSS.

4.1 Location of referrals

Table 5: *Distribution of new referrals by HFSS location*

Referrals per HHS	n (%)	Referrals per facility in each HHS	n (%)
Cairns and Hinterland	156 (3.2)	Cairns Hospital	156 (3.9)
Central Queensland	201 (4.2)	Gladstone Hospital	13 (0.3)
		Rockhampton Hospital	188 (3.9)
Darling Downs	100 (2.1)	Toowoomba Hospital	100 (2.1)
Gold Coast	503 (10.3)	Gold Coast Community Health	503 (10.3)
Mackay	85 (1.7)	Mackay Base Hospital	85 (1.7)
Metro North	1,367 (28.0)	Caboolture Hospital	187 (3.8)
		Redcliffe Hospital	33 (0.7)
		Royal Brisbane and Women's Hospital	362 (7.4)
		The Prince Charles Hospital	785 (16.1)
Metro South	1,409 (28.9)	Logan Hospital	362 (7.4)
		Mater Adult Hospital	92 (1.9)
		Princess Alexandra Hospital	639 (13.1)
		Queen Elizabeth II Hospital	133 (2.7)
		Redland Hospital	183 (3.8)
North West	45 (0.9)	Mt Isa Hospital	45 (0.9)
Sunshine Coast	488 (10.0)	Gympie Hospital	113 (2.3)
		Sunshine Coast University Hospital	375 (7.7)
Townsville	184 (3.8)	Townsville Hospital	184 (3.8)
West Moreton	274 (5.6)	Ipswich Community Health	274 (5.6)
Wide Bay	66 (1.4)	Hervey Bay Hospital	66 (1.4)
Statewide			**4,878 (100.0)**
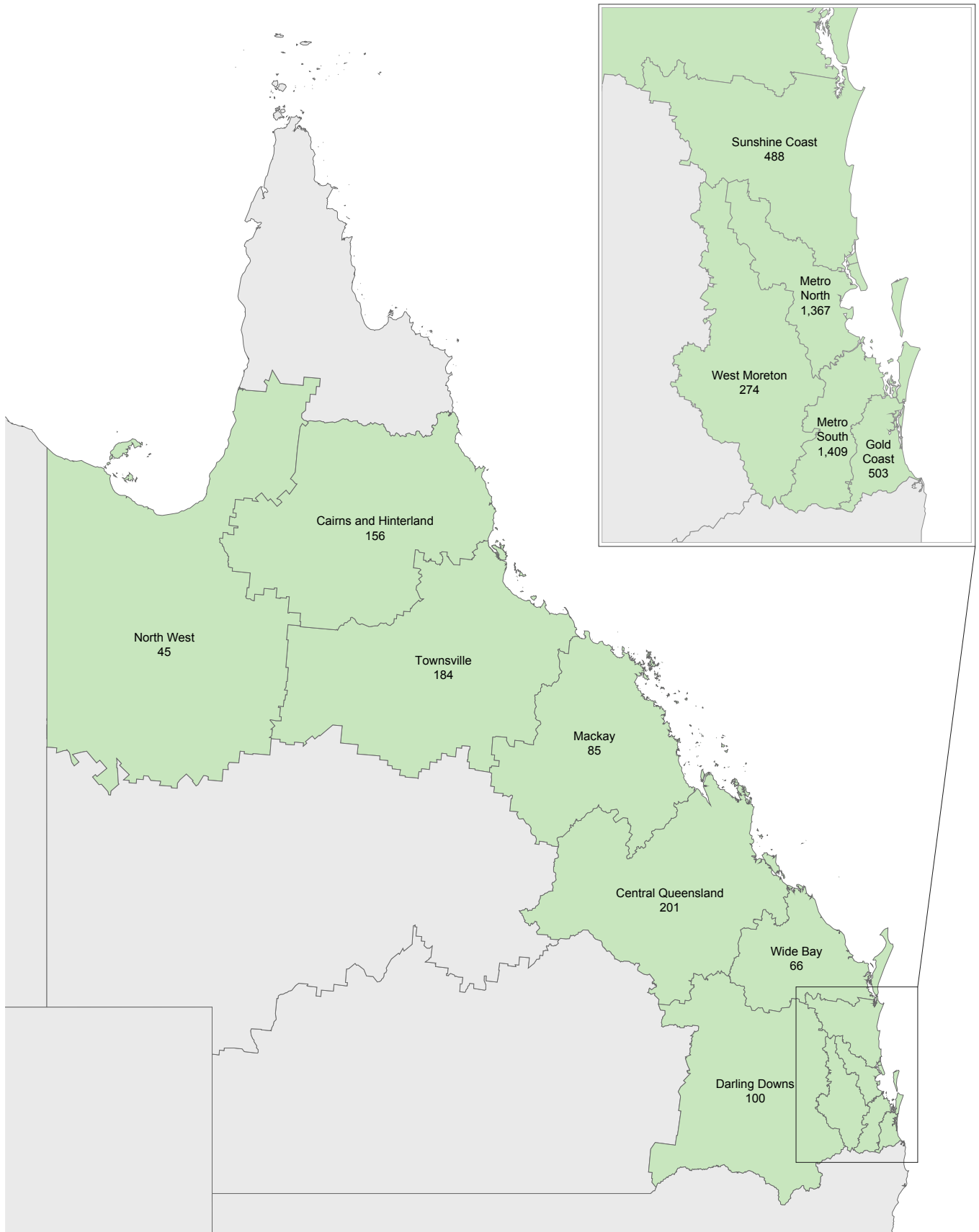
Figure 2: *Regional distribution of new referrals*

Map labels:
- Sunshine Coast 488
- Metro North 1,367
- West Moreton 274
- Metro South 1,409
- Gold Coast 503
- Cairns and Hinterland 156
- North West 45
- Townsville 184
- Mackay 85
- Central Queensland 201
- Wide Bay 66
- Darling Downs 100

4.2   Referral source

Most referrals originated from an inpatient setting (70%). Few referrals came directly from primary care (3%) as most referrals flow to specialty outpatient clinics for diagnosis and treatment optimisation prior to referral to a HFSS.

Table 6:   Source of HFSS referral

HHS	HFSS	Inpatient n (%)	Outpatient n (%)	Another HFSS n (%)	Primary care n (%)
Cairns and Hinterland	Cairns Hospital	96 (61.5)	60 (38.5)	–	–
Central Queensland	Gladstone Hospital	7 (53.8)	1 (7.7)	5 (38.5)	–
	Rockhampton Hospital	112 (59.6)	59 (31.4)	4 (2.1)	13 (6.9)
Darling Downs	Toowoomba Hospital	16 (16.0)	74 (74.0)	10 (10.0)	–
Gold Coast	Gold Coast Community Health	374 (74.4)	86 (17.1)	21 (4.2)	22 (4.4)
Mackay	Mackay Base Hospital	38 (44.7)	45 (52.9)	2 (2.4)	–
Metro North	Caboolture Hospital	29 (15.5)	56 (29.9)	8 (4.3)	94 (50.3)
	Redcliffe Hospital	16 (48.5)	14 (42.4)	3 (9.1)	–
	Royal Brisbane and Women's Hospital	271 (74.9)	90 (24.9)	1 (0.3)	–
	The Prince Charles Hospital	689 (87.8)	91 (11.6)	4 (0.5)	1 (0.1)
Metro South	Logan Hospital	261 (72.1)	35 (9.7)	59 (16.3)	7 (1.9)
	Mater Adult Hospital	66 (71.7)	26 (28.3)	–	–
	Princess Alexandra Hospital	591 (92.5)	44 (6.9)	4 (0.6)	–
	Queen Elizabeth II Hospital	93 (69.9)	24 (18.0)	15 (11.3)	1 (0.8)
	Redland Hospital	87 (47.5)	27 (14.8)	67 (36.6)	2 (1.1)
North West	Mt Isa Hospital	16 (35.6)	29 (64.4)	–	–
Sunshine Coast	Gympie Hospital	61 (54.0)	14 (12.4)	37 (32.7)	1 (0.9)
	Sunshine Coast University Hospital	307 (81.9)	62 (16.5)	6 (1.6)	–
Townsville	Townsville Hospital	123 (66.8)	60 (32.6)	1 (0.5)	–
West Moreton	Ipswich Community Health	152 (55.5)	86 (31.4)	34 (12.4)	2 (0.7)
Wide Bay	Hervey Bay Hospital	8 (12.1)	14 (21.2)	40 (60.6)	4 (6.1)
Statewide		**3,413 (70.0)**	**997 (20.4)**	**321 (6.6)**	**147 (3.0)**

5 Patient characteristics

5.1 Age

The statewide median age of patients managed by a HFSS was 69 years. The median age of women (72 years) was four years older than for men. Over one-third (34%) of patients were 75 years of age and older.
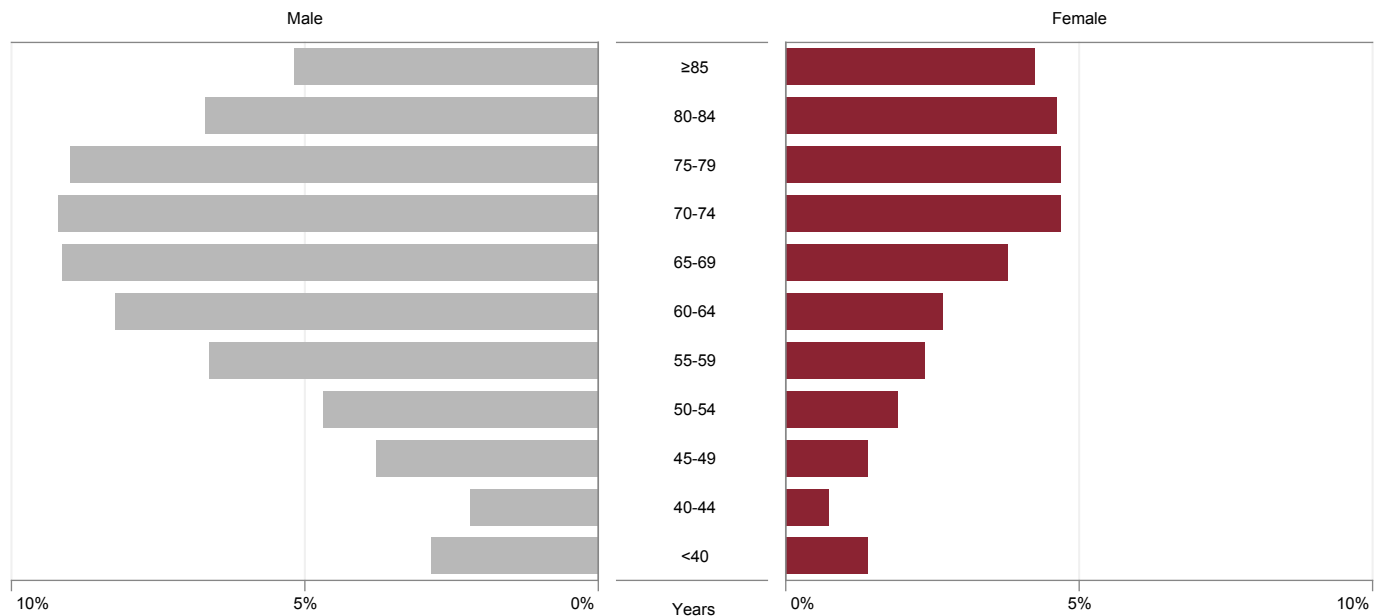
% of total (n=4,878)

Figure 3:   Proportion of referrals to HFSS by gender and age group

Table 7:   Median age of referrals by gender

HHS	HFSS	Male years	Female years	ALL years
Cairns and Hinterland	Cairns Hospital	63	65	64
Central Queensland	Gladstone Hospital	59	74	67
	Rockhampton Hospital	69	66	68
Darling Downs	Toowoomba Hospital	65	59	63
Gold Coast	Gold Coast Community Health	70	75	72
Mackay	Mackay Base Hospital	63	68	65
Metro North	Caboolture Hospital	71	70	71
	Redcliffe Hospital	80	78	78
	Royal Brisbane and Women's Hospital	67	72	68
	The Prince Charles Hospital	68	72	70
Metro South	Logan Hospital	67	75	69
	Mater Adult Hospital	66	75	70
	Princess Alexandra Hospital	68	71	69
	Queen Elizabeth II Hospital	67	76	70
	Redland Hospital	68	77	73
North West	Mt Isa Hospital	59	57	58
Sunshine Coast	Gympie Hospital	76	75	76
	Sunshine Coast University Hospital	72	73	72
Townsville	Townsville Hospital	65	66	65
West Moreton	Ipswich Community Health	66	71	67
Wide Bay	Hervey Bay Hospital	71	74	71
Statewide		**68**	**72**	**69**

Heart Failure Support Services

5.2   Gender

The majority of patients were male (68%), ranging from 42% to 81% across participating sites.

Table 8:   Number and proportion of referrals to HFSS by gender

HHS	HFSS	Male n (%)	Female n (%)	ALL n (%)
Cairns and Hinterland	Cairns Hospital	116 (74.4)	40 (25.6)	156 (100.0)
Central Queensland	Gladstone Hospital	10 (76.9)	3 (23.1)	13 (100.0)
	Rockhampton Hospital	133 (70.7)	55 (29.3)	188 (100.0)
Darling Downs	Toowoomba Hospital	81 (81.0)	19 (19.0)	100 (100.0)
Gold Coast	Gold Coast Community Health	347 (69.0)	156 (31.0)	503 (100.0)
Mackay	Mackay Base Hospital	56 (65.9)	29 (34.1)	85 (100.0)
Metro North	Caboolture Hospital	129 (69.0)	58 (31.0)	187 (100.0)
	Redcliffe Hospital	14 (42.4)	19 (57.6)	33 (100.0)
	Royal Brisbane and Women's Hospital	251 (69.3)	111 (30.7)	362 (100.0)
	The Prince Charles Hospital	507 (64.6)	278 (35.4)	785 (100.0)
Metro South	Logan Hospital	247 (68.2)	115 (31.8)	362 (100.0)
	Mater Adult Hospital	57 (62.0)	35 (38.0)	92 (100.0)
	Princess Alexandra Hospital	450 (70.4)	189 (29.6)	639 (100.0)
	Queen Elizabeth II Hospital	81 (60.9)	52 (39.1)	133 (100.0)
	Redland Hospital	109 (59.6)	74 (40.4)	183 (100.0)
North West	Mt Isa Hospital	30 (66.7)	15 (33.3)	45 (100.0)
Sunshine Coast	Gympie Hospital	68 (60.2)	45 (39.8)	113 (100.0)
	Sunshine Coast University Hospital	263 (70.1)	112 (29.9)	375 (100.0)
Townsville	Townsville Hospital	129 (70.1)	55 (29.9)	184 (100.0)
West Moreton	Ipswich Community Health	171 (62.4)	103 (37.6)	274 (100.0)
Wide Bay	Hervey Bay Hospital	48 (72.7)	18 (27.3)	66 (100.0)
Statewide		**3,297 (67.6)**	**1,581 (32.4)**	**4,878 (100.0)**

Heart Failure Support Services

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=258) represented a 40% increase in referrals from the previous year (n=185). Aboriginal and Torres Strait Islander patients were significantly younger than other Queenslanders. Table 9 shows that the proportion of Aboriginal and Torres Strait Islander referrals was highest in Mt Isa (47%), followed by Townsville (23%) and Cairns (20%).

Although a smaller proportion of total referrals, almost 40% of all Aboriginal and Torres Strait Islander referrals were to facilities in the greater Brisbane area (Metro North or Metro South Hospital and Health Services).

Table 9:   Proportion of site referrals identified Aboriginal and Torres Strait Islander

HHS	Facility	Indigenous n (%)	Non-Indigenous n (%)	Not stated / unknown n (%)
Cairns and Hinterland	Cairns Hospital	31 (19.9)	125 (80.1)	–
Central Queensland	Gladstone Hospital	1 (7.7)	12 (92.3)	–
	Rockhampton Hospital	20 (10.6)	168 (89.4)	–
Darling Downs	Toowoomba Hospital	5 (5.0)	94 (94.0)	1 (1.0)
Gold Coast	Gold Coast Community Health	10 (2.0)	488 (97.0)	5 (1.0)
Mackay	Mackay Base Hospital	5 (5.9)	80 (94.1)	–
Metro North	Caboolture Hospital	7 (3.7)	180 (96.3)	–
	Redcliffe Hospital	–	33 (100.0)	–
	Royal Brisbane and Women's Hospital	12 (3.3)	349 (96.4)	1 (0.3)
	The Prince Charles Hospital	22 (2.8)	763 (97.2)	–
Metro South	Logan Hospital	15 (4.1)	347 (95.9)	–
	Mater Adult Hospital	4 (4.3)	86 (93.5)	2 (2.2)
	Princess Alexandra Hospital	32 (5.0)	605 (94.7)	2 (0.3)
	Queen Elizabeth II Hospital	3 (2.3)	130 (97.7)	–
	Redland Hospital	8 (4.4)	175 (95.6)	–
North West	Mt Isa Hospital	21 (46.7)	24 (53.3)	–
Sunshine Coast	Gympie Hospital	1 (0.9)	112 (99.1)	–
	Sunshine Coast University Hospital	7 (1.9)	366 (97.6)	2 (0.5)
Townsville	Townsville Hospital	42 (22.8)	142 (77.2)	–
West Moreton	Ipswich Community Health	12 (4.4)	262 (95.6)	–
Wide Bay	Hervey Bay Hospital	–	66 (100.0)	–
Statewide		**258 (5.3)**	**4,607 (94.4)**	**13 (0.3)**

Heart Failure Support Services

Male | Female

| Years |
| ≥85 |
| 80-84 |
| 75-79 |
| 70-74 |
| 65-69 |
| 60-64 |
| 55-59 |
| 50-54 |
| 45-49 |
| 40-44 |
| <40 |

Legend: Indigenous male | Indigenous female | Non Indigenous
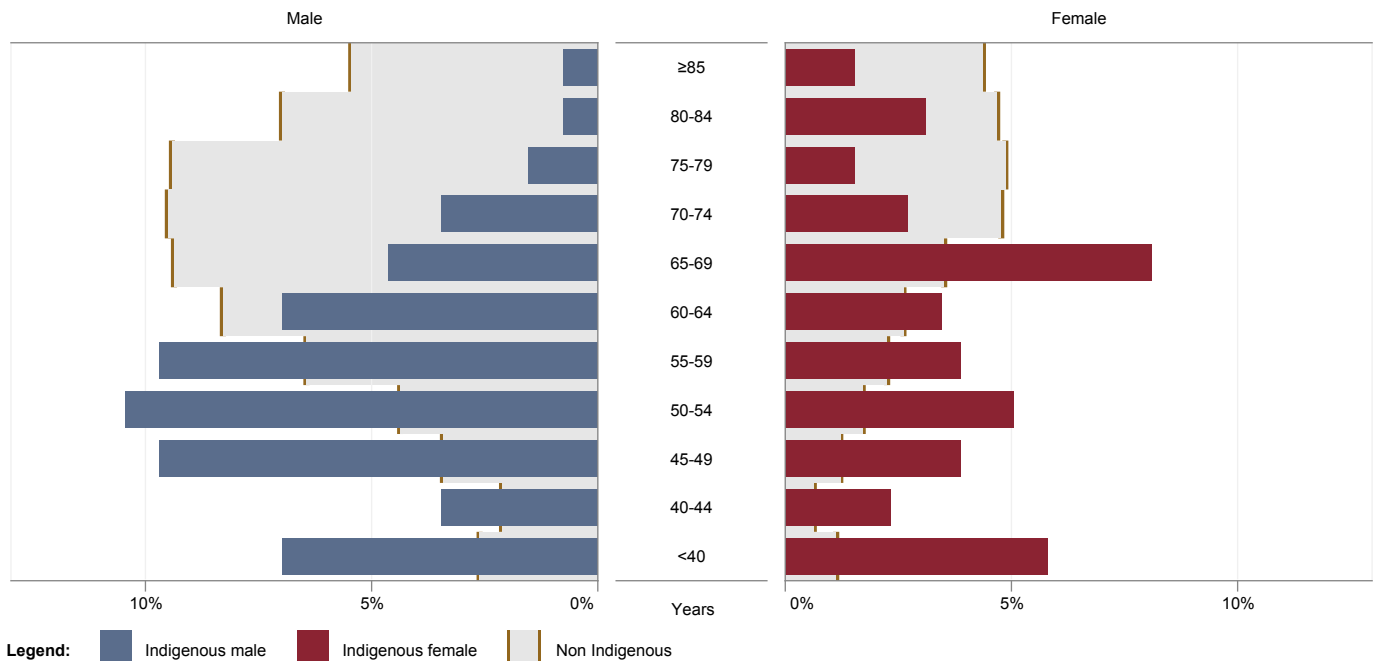
% of total Indigenous (n=258) and total Non-Indigenous (n=4,607)

Excludes missing data (0.3%)

Figure 4:   Proportion of all referrals by age group and Indigenous status

Table 10:   Median patient age by gender and Indigenous status

HHS	Total referrals n	Male years	Female years	ALL years
Indigenous	258	55	60	56
Non-Indigenous	4,607	69	73	70
ALL	**4,865**	**68**	**72**	**69**

Heart Failure Support Services

5.4 Classification of heart failure by left ventricular ejection fraction

Heart failure with reduced ejection fraction (HFrEF) was defined as patients with an ejection fraction (EF) equal or equivalent to 50% at time of diagnosis. The EF may return to normal for some patients but still require ongoing medications to manage HFrEF.[27]

The data categorised patients as predominately HFrEF or heart failure with preserved ejection fraction (HFpEF). HFrEF was attributed to 80% of patients in the 2018 cohort. The table below shows the rates of HFrEF and HFpEF as well as the rates where the phenotype is uncertain. Six sites had more than 20% of referrals with HFpEF. Five sites had over 95% of referrals with HFrEF and, of these, four were in Far North Queensland (Cairns, Townsville, Mackay and Mt Isa).

There was no significant gender difference between patients with HFpEF (males 49.7% vs females 50.3%). Patients with HFrEF were more likely to be male (71.7%) with a median age was eight years younger than for HFpEF (68 years vs 76 years).

Table 11: Proportion of patients by heart failure type

HHS	HFSS	HFrEF* n (%)	HFpEF† n (%)	Unsure/ Unknown n (%)
Cairns and Hinterland	Cairns Hospital	154 (98.7)	1 (0.6)	1 (0.6)
Central Queensland	Gladstone Hospital	11 (84.6)	1 (7.7)	1 (7.7)
	Rockhampton Hospital	157 (83.5)	26 (13.8)	5 (2.7)
Darling Downs	Toowoomba Hospital	97 (97.0)	–	3 (3.0)
Gold Coast	Gold Coast Community Health	396 (78.7)	96 (19.1)	11 (2.2)
Mackay	Mackay Base Hospital	85 (100.0)	–	–
Metro North	Caboolture Hospital	138 (73.8)	39 (20.9)	10 (5.3)
	Redcliffe Hospital	15 (45.5)	9 (27.3)	9 (27.3)
	Royal Brisbane and Women's Hospital	308 (85.1)	50 (13.8)	4 (1.1)
	The Prince Charles Hospital	559 (71.2)	184 (23.4)	42 (5.4)
Metro South	Logan Hospital	269 (74.3)	85 (23.5)	8 (2.2)
	Mater Adult Hospital	67 (72.8)	14 (15.2)	11 (12.0)
	Princess Alexandra Hospital	550 (86.1)	73 (11.4)	16 (2.5)
	Queen Elizabeth II Hospital	107 (80.5)	18 (13.5)	8 (6.0)
	Redland Hospital	127 (69.4)	41 (22.4)	15 (8.2)
North West	Mt Isa Hospital	43 (95.6)	2 (4.4)	–
Sunshine Coast	Gympie Hospital	56 (49.6)	44 (38.9)	13 (11.5)
	Sunshine Coast University Hospital	320 (85.3)	53 (14.1)	2 (0.5)
Townsville	Townsville Hospital	171 (92.9)	8 (4.3)	5 (2.7)
West Moreton	Ipswich Community Health	222 (81.0)	50 (18.2)	2 (0.7)
Wide Bay	Hervey Bay Hospital	58 (87.9)	8 (12.1)	–
Statewide		**3,910 (80.2)**	**802 (16.4)**	**166 (3.4)**

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

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

Heart Failure Support Services

Table 12: Summary of patient age, gender and Indigenous status by type of heart failure

	HFrEF*	HFpEF†	Unsure/ Unknown
Number	3,910	802	166
Age (median years)	68	76	77
% male	71.7	49.7	2.0
% Indigenous	4.6	3.6	0.1

Excludes missing data (3.5%)

*   Heart failure with reduced ejection fraction

†   Heart failure with preserved ejection fraction
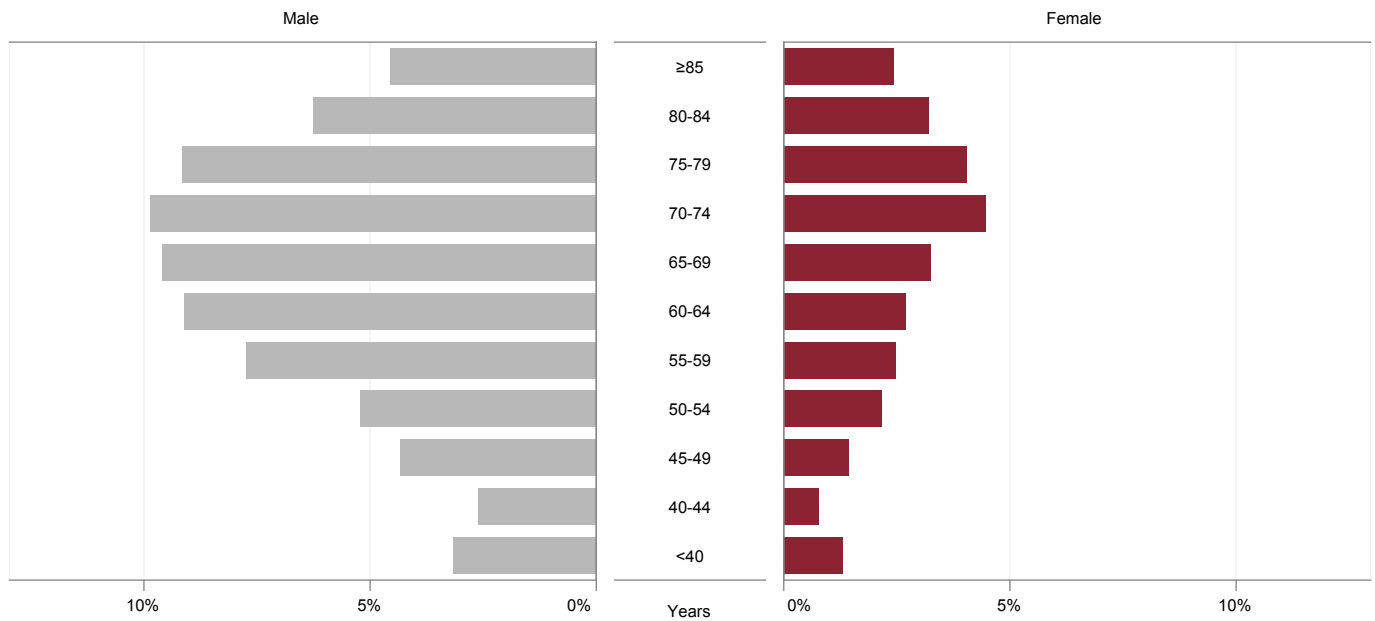
% of total with HFrEF (n=3,910)

Figure 5:   *Proportion of HFrEF referrals by gender and age group*
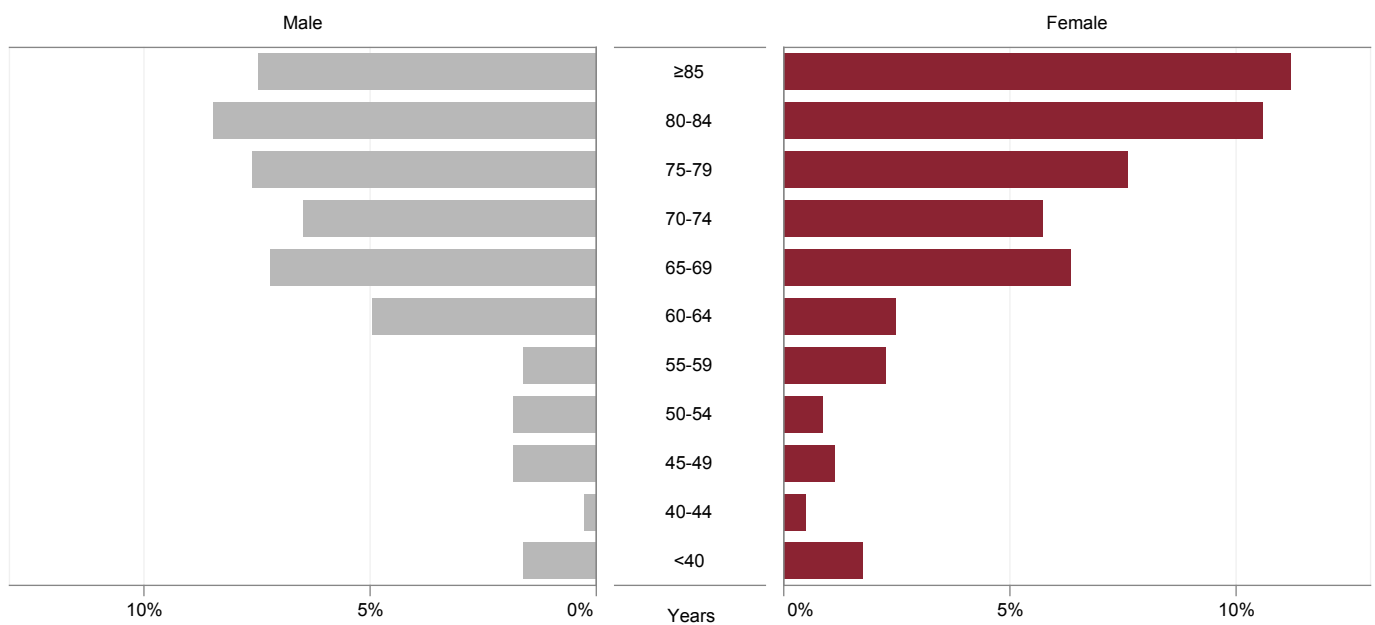
% of total with HFpEF (n=802)

Figure 6:   *Proportion of HFpEF referrals by gender and age group*

Heart Failure Support Services

5.5 Summary of patient characteristics

Patient characteristics from all referrals to a HFSS is shown below.

Table 13:   Summary of patient characteristics

Characteristic	Summary
Participating HFSS	21
New referrals	4,878
Referrals from South East Queensland	84.9%
Referral source:	
Inpatient	70.0%
Outpatient	20.4%
Another HFSS	6.6%
Primary care	3.0%
Age (median years):	
All (median, range by service)	69 (58–78) years
Male vs Female	68 vs 72 years
ATSI* vs other	56 vs 70 years
HFrEF† vs HFpEF‡	68 vs 76 years
Age group:	
80 years and over	20.7%
Males	67.6%
ATSI*	5.3%
HFrEF†	80.2% (57.5% male)
HFpEF‡	16.4% (8.1% male)

*   Aboriginal and Torres Strait Islander

†   Heart failure with reduced ejection fraction

‡   Heart failure with preserved ejection fraction

6   Clinical indicators

The number of clinical indicators collected was intentionally limited to allow pragmatic data entry as part of routine clinical practice. The five clinical indicators selected are shown in Table 14.

The target benchmark for all indicators was set at 80%, except for 5b (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.[28]

Table 14:   Clinical indicators

Indicator #	Process measures
1	First clinical review: Timeliness of follow-up by a HFSS for inpatient and outpatient referrals
	1a) First clinical review within 2 weeks for inpatient referrals
	1b) First clinical review within 4 weeks for non-acute referrals
2	Left ventricular ejection fraction assessed within 2 years of referral to HFSS
3	Prescription of angiotensin-converting-enzyme inhibitor (ACEI) or angiotensin II receptor blockers (ARB) for patients with HFrEF
	3a) ACEI/ARB prescription at hospital discharge
	3b) ACEI/ARB prescription at time of first clinical review
4	Prescription of guideline recommended beta blockers for HFrEF (Bisoprolol, Carvedilol, Metoprolol sustained release, or Nebivolol)
	4a) Beta blocker prescription at hospital discharge
	4b) Beta blocker prescription at time of first clinical review
5	Beta blocker review and titration
	5a) Beta blocker titration review within six months of first clinical review
	5b) Beta blocker clinical guideline target dose achieved at time of titration review
	5c) Beta blocker clinical guideline target or maximum tolerated 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 by phone, clinic or home visit. Patients were excluded if they died, were referred to another HFSS, declined follow-up or could not be contacted, as well as other reasons outlined in Table 15.

1a   First clinical review by Heart Failure Support Service within 2 weeks of hospital discharge or date of referral if after 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 appropriate timeframe chosen for this intervention was review within two weeks of hospital discharge or date of referral after recent hospitalisation.

Of the 3,413 patients referred from an acute setting, 79% received a clinical review by a HFSS within two weeks of hospital discharge.
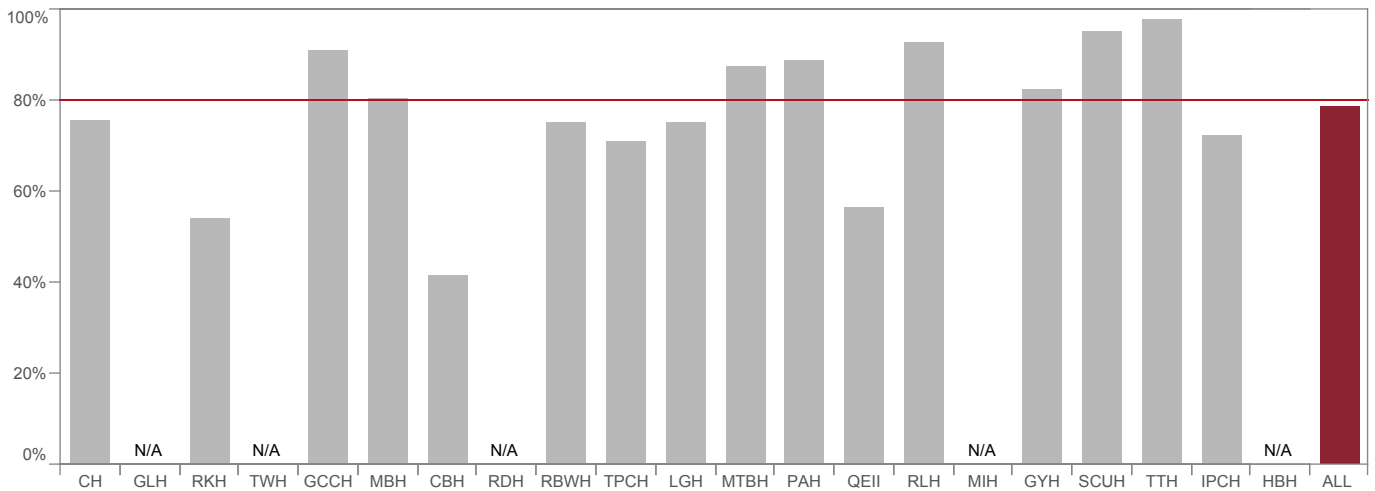
N/A = Eligible referrals ‹20

Figure 7:   Inpatients who received first HFSS clinical review within 2 weeks of hospital discharge

Table 15:   Inpatients receiving first HFSS clinical review within 2 weeks of hospital discharge

	n	%
Eligible for analysis	2,378	
Achieved benchmark	1,867	78.5
Benchmark not achieved	511	21.5
Ineligible	988	
Referred to another HFSS	566	
Patient declined service	126	
Patient could not be contacted, lives out of area or repeated failure to attend	125	
Patient deceased	55	
Referred to another service (e.g. cardiac rehabilitation or community nursing)	47	
HF no longer prime issue (palliative care, high care nursing home etc.)	43	
Medical follow-up only (GP, private or public physician)	19	
HFSS at capacity workload	7	
Other reason	47	
Total inpatient referrals	**3,413**	

Heart Failure Support Services

1b   First Heart Failure Support Service clinical review within 4 weeks for non-acute referrals

For non-acute patients, the Statewide HF Steering Committee determined four weeks following referral to be the recommended timeframe for first clinical review.

Referrals for 1,465 patients came from non-acute services, of which 82% received a clinical review within four weeks of referral.
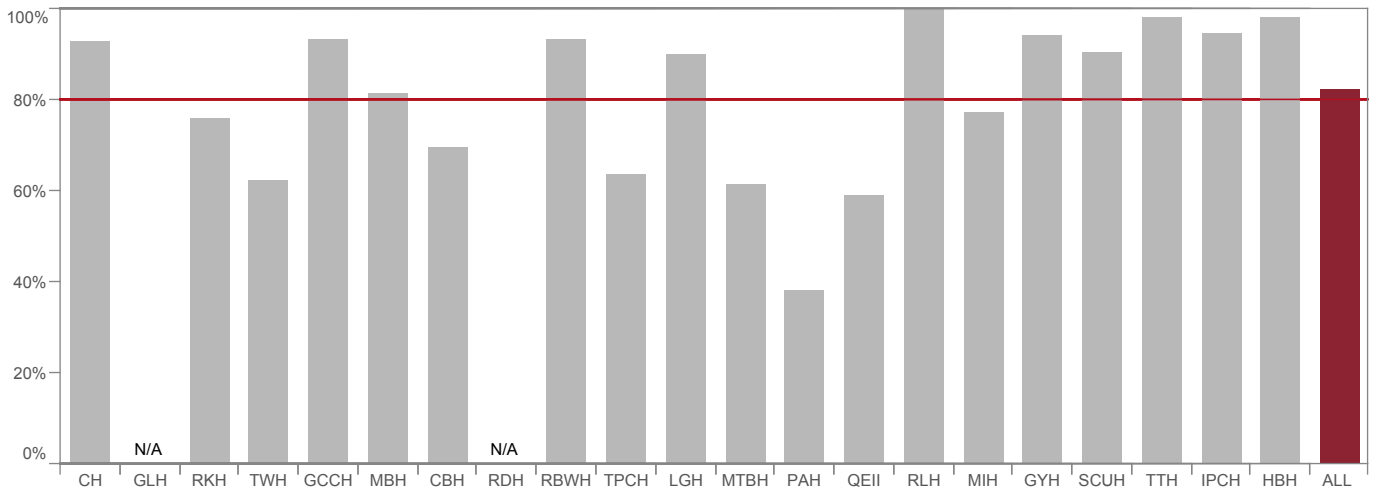
N/A = Eligible referrals <20

Figure 8:   Proportion of non-acute patients who received first HFSS clinical review within 4 weeks of referral

Table 16:   Non-acute patients receiving first HFSS clinical review within 4 weeks of referral

	n	%
Eligible for analysis	1,327	
Achieved benchmark	1,094	82.4
Benchmark not achieved	233	17.6
Ineligible	138	
Patient could not be contacted, lives out of area or repeated failure to attend	42	
Patient declined service	38	
Referred to another HFSS	23	
HF no longer prime issue (palliative care, high care nursing home etc.)	10	
Patient deceased	8	
Medical management with no support service (not advised)	4	
Referred to another service (e.g. cardiac rehabilitation or community nursing)	4	
Other reason	9	
Total non-acute patients	1,465	

Heart Failure Support Services

6.2 Left ventricular ejection fraction (LVEF) assessed within 2 years of referral to HFSS

Australian clinical guidelines recommend that all patients with heart failure should have an assessment of left ventricular function.[27] In 96% of cases, LVEF was assessed within two years of referral to HFSS.
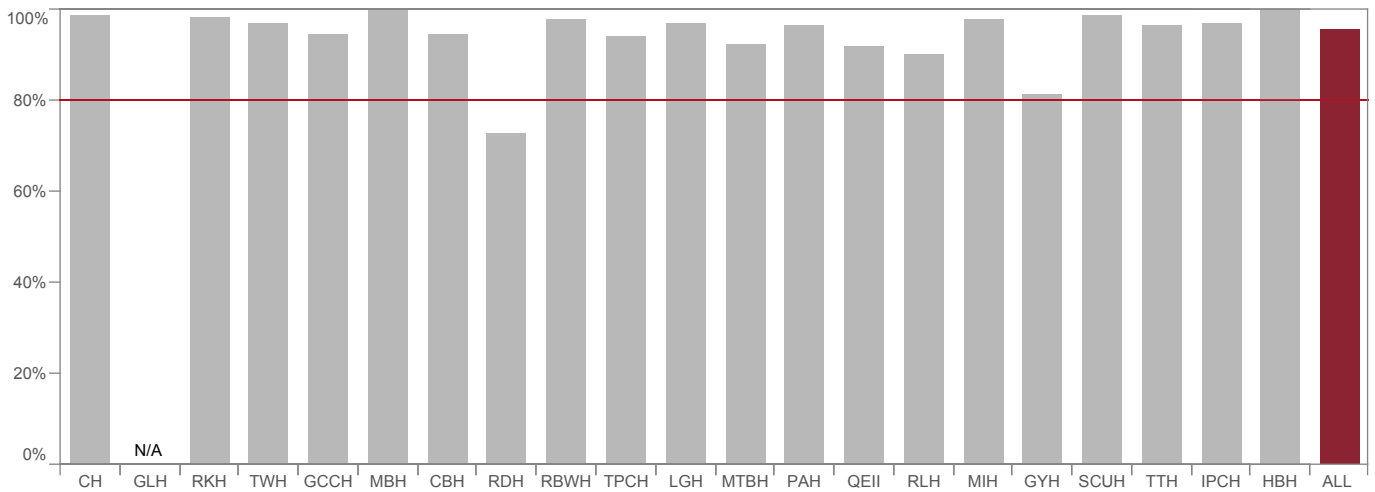
N/A = Eligible referrals ‹20

Figure 9: Proportion of all patients who had LVEF assessed within two years of referral to HFSS

Table 17: Patients who had LVEF assessed within two years of referral

	n	%
Eligible for analysis	4,878	
Achieved benchmark	4,657	95.5
Benchmark not achieved	221	4.5
Ineligible	N/A	
Total referrals	**4,878**	

Heart Failure Support Services

6.3 Prescription of ACEI or ARB for patients with HFrEF

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

3a ACEI or ARB prescription for HFrEF at hospital discharge

In 2018, 92% of patients referred to a HFSS were prescribed an ACEI or ARB therapy on hospital discharge.
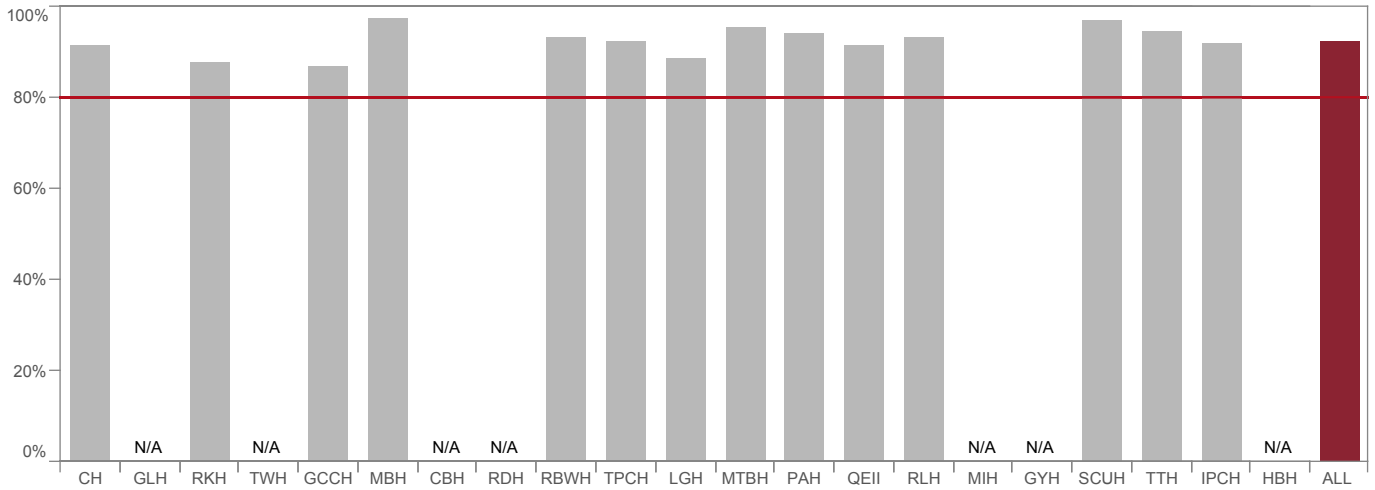
N/A = Eligible referrals <20

Figure 10: Proportion of patients who were on ACEI or ARB therapy at time of hospital discharge

Table 18: Inpatients on ACEI or ARB at time of hospital discharge

	n	%
Eligible for analysis	2,513	
Achieved benchmark	2,315	92.1
Benchmark not achieved	198	7.9
Ineligible	896	
Not HFrEF	655	
Documented contraindication*	156	
LV function assessment not available	85	
Incomplete data	4	
Total inpatient referrals	**3,413**	

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

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

At the time of first clinical review, the target for prescription of ACEI or ARB was met for 91% of patients.
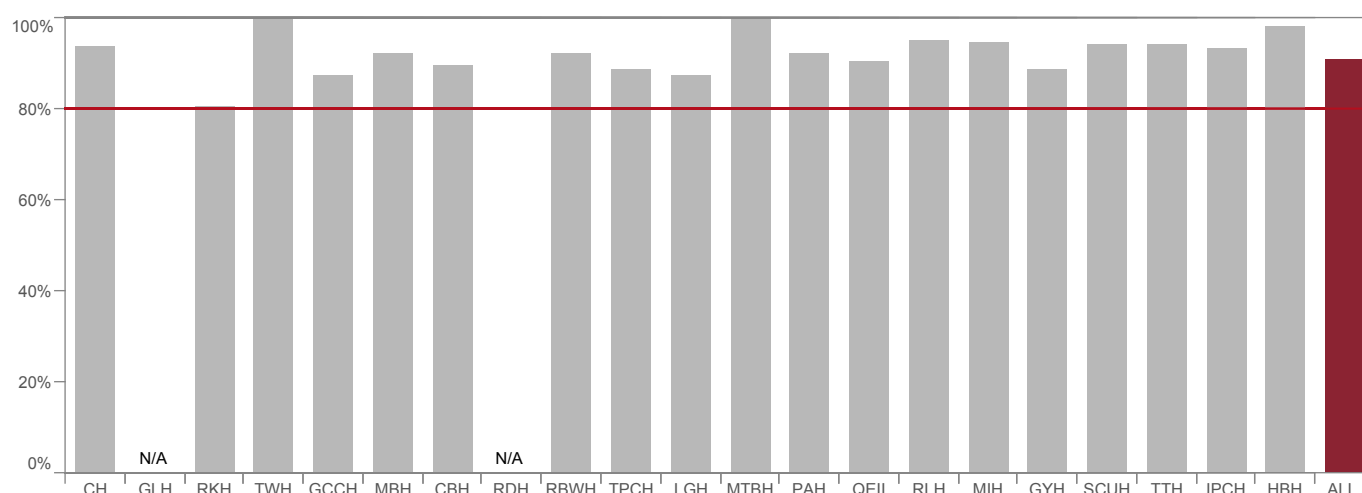
N/A = Eligible referrals <20

Figure 11: Proportion of patients on ACEI or ARB therapy at time of first clinical review by site

Table 19:   Patients on an ACEI or ARB at first clinical review

	n	%
Eligible for analysis	2,920	
Achieved benchmark	2,656	91.0
Benchmark not achieved	264	9.0
Ineligible	1895	
Not HFrEF	663	
Referred to another HFSS	589	
Patient could not be contacted, lives out of area or repeated failure to attend	167	
Patient declined service	164	
Patient deceased	63	
Documented contraindication*	60	
LV function assessment not available	55	
HF no longer prime issue (palliative care, high care nursing home etc.)	53	
Referred to another service (e.g. cardiac rehabilitation or community nursing)	51	
Medical follow-up only (GP, private or public physician)	23	
HFSS at capacity workload	7	
Other reason	56	
Incomplete data	7	
Total referrals	**4,878**	

*   Adverse reaction to ACEI or ARB, palliative intent to treatment, pregnancy, eGFR <30 mL/min, 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 symptomatic patients unless contraindicated or not tolerated.[27] 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

In 2018, 90% of acute referrals were reported to be on a guideline recommended beta blocker at the time of discharge from hospital.
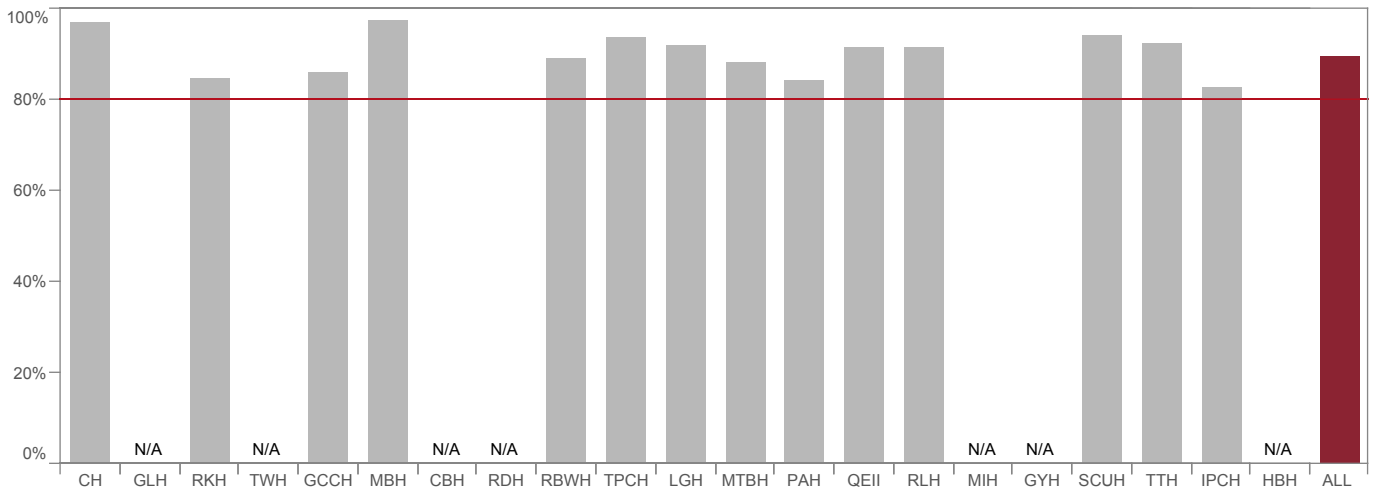
N/A = eligible referrals ‹20

Figure 12: Proportion of patients on guideline recommended beta blocker at hospital discharge by site

Table 20:   Patients on guideline recommended beta blocker at hospital discharge

	n	%
Eligible for analysis	2,598	
Achieved benchmark	2,328	89.6
Benchmark not achieved	270	10.4
Ineligible	811	
Not HFrEF	655	
LV function assessment not available	85	
Documented contraindication*	71	
Incomplete data	4	
Total inpatient referrals	**3,413**	

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

Heart Failure Support Services

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

In 2018, 91% of referrals to HFSS were reported to be on a guideline recommended beta blocker at the time of first clinical review.
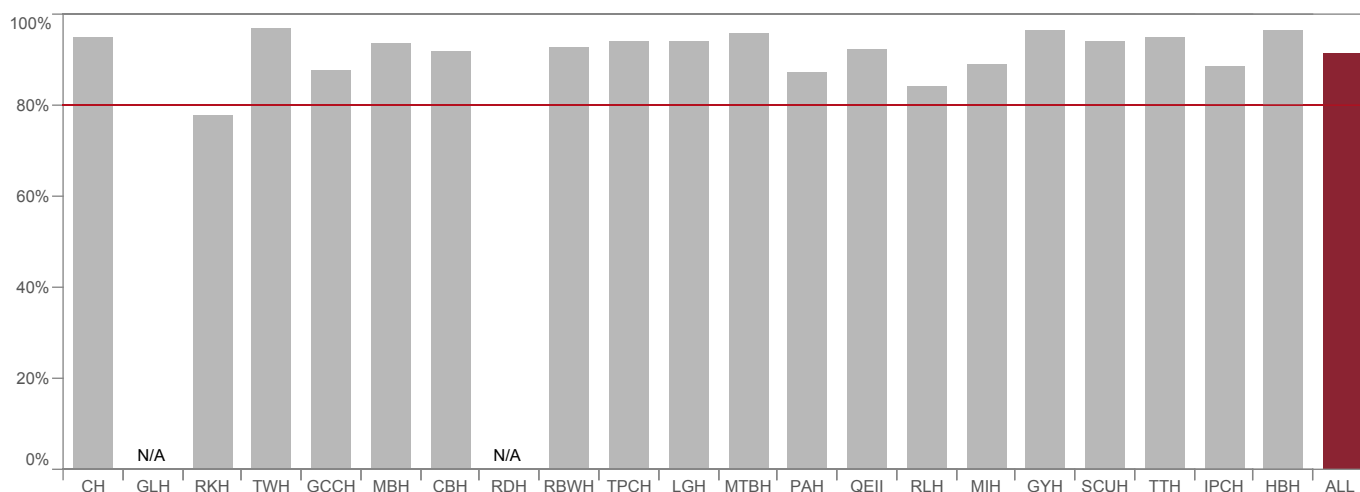
N/A = Eligible referrals <20

Figure 13: Proportion of patients on guideline recommended beta blocker therapy at first clinical review by site

Table 21:   Patients on guideline recommended beta blocker at first clinical review

	n	%
Eligible for analysis	2,910	
Achieved benchmark	2,657	91.3
Benchmark not achieved	253	8.7
Ineligible	1961	
Not HFrEF	663	
Referred to another HFSS	589	
Patient could not be contacted, lives out of area or repeated failure to attend	167	
Patient declined service	164	
Documented contraindication*	70	
Patient deceased	63	
LV function not assessed	55	
HF no longer prime issue (palliative care, high care nursing home etc.)	53	
Referred to another service (e.g. cardiac rehabilitation or community nursing)	51	
Medical follow-up only (GP, private or public physician)	23	
HFSS at capacity workload	7	
Other reason	56	
Incomplete data	7	
Total referrals	**4,878**	

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

6.5   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.

5a   Beta blocker titration review conducted within six months of first HFSS clinical review

In 2018, 67% of patients received a beta-blocker titration review at six months from referral or at the time of deactivation from the HFSS (whichever is sooner).
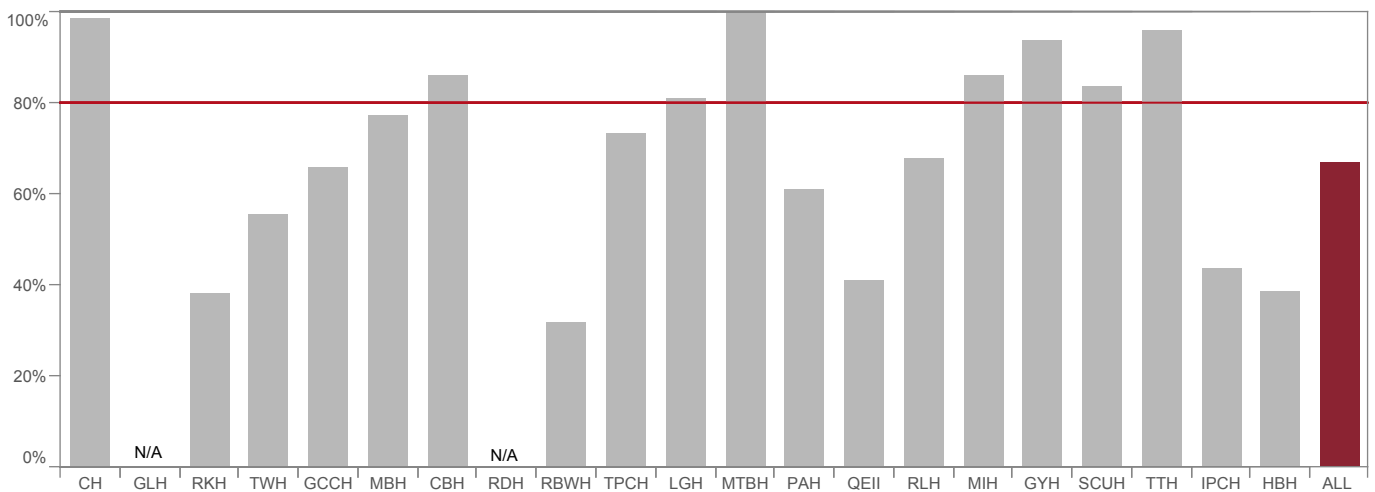
N/A = Eligible referrals <20

Figure 14: Proportion of patients who had a beta blocker titration review conducted within six months by site

Table 22:   Patients who had a beta blocker titration review within six months

	n	%
Eligible for analysis	1,449	
Achieved benchmark	967	66.7
Benchmark not achieved	482	33.3
Ineligible	1978	
Not HFrEF	636	
Patient on target dose at the time of referral	590	
Patient declined service	111	
Patient could not be contacted, lives out of area or repeated failure to attend	95	
Medical follow-up only (GP, private or public physician)	90	
Referred to another HFSS	89	
Documented contraindication*	84	
Patient deceased	78	
LV function not assessed	74	
HF no longer prime issue (palliative care, high care nursing home etc.)	27	
Patient at max tolerated dose	20	
Referred to another service (e.g. cardiac rehabilitation or community nursing)	5	
Other reason	79	
Incomplete data	48	
Total	**3,475**	

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

5b   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 32% of referrals within 6 months, with only one site exceeding the benchmark (see Figure 15).

Daily target doses are:

• Carvedilol 50–100 mg

• Metoprolol sustained release 190 mg

• Bisoprolol 10 mg

• Nebivolol 10 mg
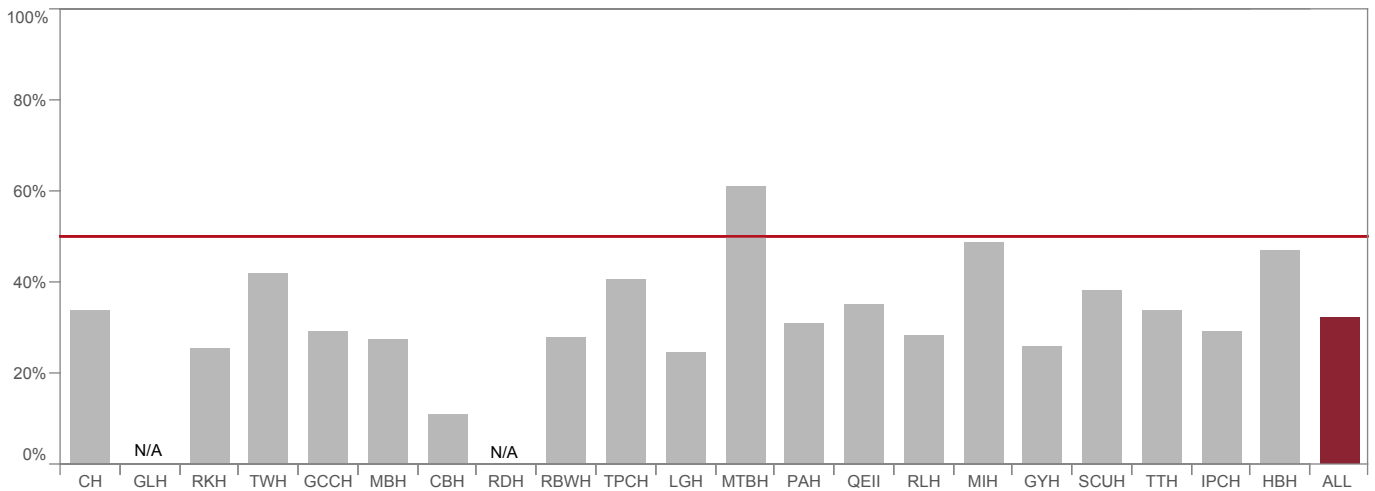
N/A = Eligible referrals <20

Figure 15: Proportion of patients who achieved target beta blocker dose at time of titration review by site

Table 23: Patients who achieved target beta blocker dose at time of titration review

	n	%
Eligible for analysis	1,449	
Achieved benchmark	1,046	72.2
Benchmark not achieved	403	27.8
Ineligible	N/A	
Total titration reviews conducted	**1,449**	

Heart Failure Support Services

5c 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 medical judgement balancing the harm and benefit of up-titration. The number 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%.
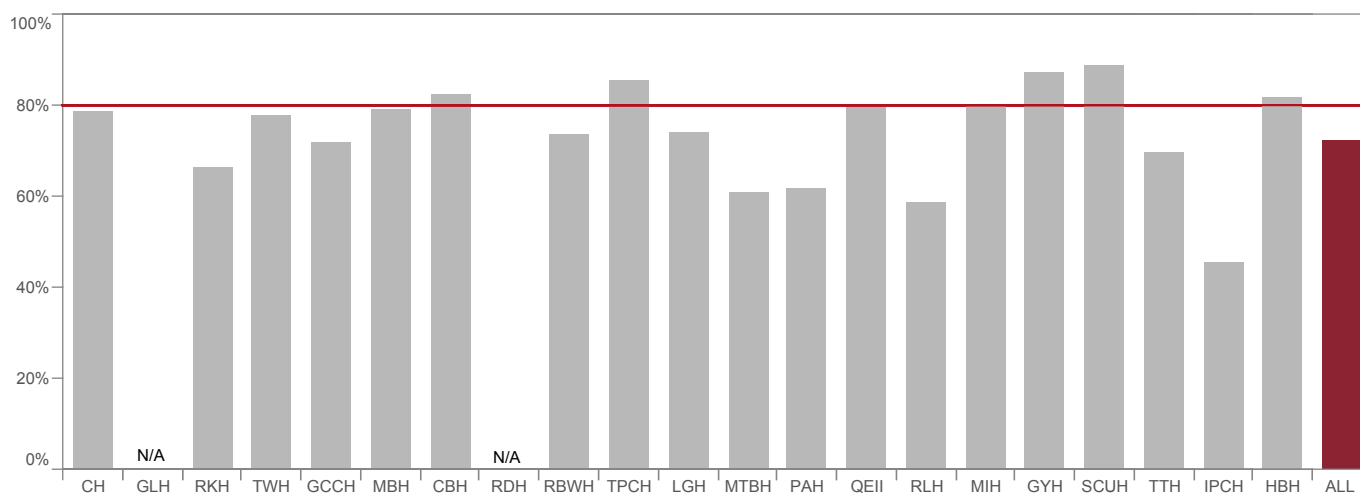
N/A = Eligible referrals ‹20

Figure 16: Proportion of patients who achieved target beta blocker dose or maximum tolerated dose at time of titration review

Table 24: Patients who achieved target or maximum tolerated beta blocker dose at time of titration review

	n	%
Eligible for analysis	1,449	
Achieved benchmark	470	32.4
Benchmark not achieved	979	67.6
Ineligible	N/A	
Total titration reviews conducted	**1,449**	

Heart Failure Support Services

6.6 Summary of clinical indicators

Table 25: Summary of clinical process indicator performance by site

HHS	HFSS	Clinical Indicator achievement %									
		1a	1b	2	3a	3b	4a	4b	5a	5b	5c
Cairns and Hinterland	Cairns Hospital	75	93	99	91	94	97	95	99	34	79
Central Queensland	Gladstone Hospital	–	–	–	–	–	–	–	–	–	–
	Rockhampton Hospital	54	76	98	88	81	85	78	38	26	66
Darling Downs	Toowoomba Hospital	–	63	97	–	100	–	97	56	42	78
Gold Coast	Gold Coast Community Health	91	93	95	87	87	86	88	66	29	72
Mackay	Mackay Base Hospital	81	81	100	97	92	97	94	77	27	79
Metro North	Caboolture Hospital	41	70	95	–	90	–	92	86	11	82
	Redcliffe Hospital	–	–	73	–	–	–	–	–	–	–
	Royal Brisbane and Women's Hospital	75	93	98	93	93	89	93	32	28	74
	The Prince Charles Hospital	71	63	94	92	89	94	94	73	40	85
Metro South	Logan Hospital	75	90	97	89	87	92	94	81	25	74
	Mater Adult Hospital	88	62	92	95	100	88	96	100	61	61
	Princess Alexandra Hospital	89	38	96	94	93	84	88	61	31	62
	Queen Elizabeth II Hospital	57	59	92	91	90	91	92	41	35	80
	Redland Hospital	93	100	90	93	95	92	84	68	28	59
North West	Mt Isa Hospital	–	77	98	–	94	–	89	86	49	80
Sunshine Coast	Gympie Hospital	82	94	81	–	89	–	96	94	26	87
	Sunshine Coast University Hospital	95	91	99	97	94	94	94	84	38	89
Townsville	Townsville Hospital	98	98	96	95	94	92	95	96	34	69
West Moreton	Ipswich Community Health	72	94	97	92	93	83	88	44	29	46
Wide Bay	Hervey Bay Hospital	–	98	100	–	98	–	97	39	47	82
Statewide		**79**	**82**	**96**	**92**	**91**	**90**	**91**	**67**	**32**	**72**

Legend:

1a Follow-up of acute patients within 2 weeks (Benchmark: 80%)

1b Follow-up of non-acute patients within 4 weeks (Benchmark: 80%)

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

3a Angiotensin-converting-enzyme inhibitor or angiotensin II receptor blockers prescription at hospital discharge (Benchmark: 80%)

3b Angiotensin-converting-enzyme inhibitor or angiotensin II receptor blockers 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 Beta blocker titration status review at six months post referral (Benchmark: 80%)

5b Beta blockers achievement of guideline recommended target dose (Benchmark: 50%)

5c Beta blockers achievement of guideline recommended target dose or maximum tolerated dose (Benchmark: 80%)

Heart Failure Support Services

7 Patient outcomes

Heart failure hospitalisations are associated with subsequent increased risk of mortality and recurrent hospitalisation. Support from multidisciplinary HF disease management programmes (such as Queensland's HFSS) and adherence to recommended therapies are associated with improved post-discharge outcomes.

7.1 Methods

This analysis used the previously reported 2017 patient cohort from the QCOR HFSS HERO registry to examine the early (30 day) and one year clinical outcomes (rehospitalisation and mortality) among patients referred to HFSS. This was performed using probabilistic data linkage from 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 2017 were included. Where patients had multiple referrals to a HFSS during this period, the earliest admission of the calendar year was considered as 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 26. Survival curves were constructed using the Kaplan–Meier method and cumulative incidence function (CIF) was used to estimate the risk of all-cause and HF related re-hospitalisation 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 with 25th and 75th percentiles and mean values. Categorical variables were summarised as frequencies and percentages.

Table 26: 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

In 2017 there were 3,207 inpatient referrals, and of these 96% were successfully linked via the QHAPDC. There were 460 patients who were ineligible for readmission and mortality analysis for various reasons shown in Table 27. A further 52 patients (1.7%) did not have complete follow up of 365 days to allow DAOH analysis.

Table 27:   Eligibility criteria for patient outcome indicators

	n	%
Total 2017 inpatient referrals	**3,207**	**100**
Ineligible at index admission		
Duplicate patient record	218	6.8
Died during index admission	21	0.7
Not a Queensland resident	53	1.7
Index admission is not overnight	26	0.8
Transferred to private hospital	25	0.8
No linkage data available	117	3.7
Included in readmission and mortality analysis	**2,747**	**85.7**
Ineligible at subsequent admission over 1 year		
Transferred to private hospital	47	1.5
Moved outside of Queensland	5	0.2
Included in days alive and out of hospital analysis	**2,695**	**84.0**

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 1.7% and 14.3%. The Kaplan-Meier survival analyses below (Figures 17–19) suggest that older age was associated with increased mortality rates at all time points and particularly at 12 months.

Table 28:   Cumulative all-cause unadjusted mortality rate from 30 to 365 days after index discharge date

	30 days n (%)	90 days n (%)	180 days n (%)	365 days n (%)
Total deaths identified	46 (1.7)	122 (4.4)	218 (7.9)	393 (14.3)
Died during subsequent admission*	22 (0.8)	48 (1.7)	78 (2.8)	147 (5.4)
All other deaths	24 (0.9)	74 (2.7)	140 (5.1)	246 (9.0)
Total at risk	**2,701 (98.3)**	**2,625 (95.6)**	**2,529 (92.1)**	**2,354 (85.7)**

*   Data available for Queensland public hospitals only removed fullstop

Table 29: Cumulative all-cause unadjusted mortality by patient characteristic

|	Total patients n	30 days n (%)	90 days n (%)	180 days n (%)	365 days n (%)
Gender					
Male	1,777	22 (1.2)	66 (3.7)	135 (7.6)	246 (13.8)
Female	970	24 (2.5)	56 (5.8)	83 (8.6)	147 (15.2)
Age group					
<65 years	939	5 (0.5)	18 (1.9)	33 (3.5)	57 (6.1)
65–74 years	710	11 (1.5)	22 (3.1)	48 (6.8)	88 (12.4)
≥75 years	1,098	30 (2.7)	82 (7.5)	137 (12.5)	248 (22.6)
Heart failure phenotype					
HFrEF	2,098	32 (1.5)	84 (4.0)	142 (6.8)	257 (12.2)
HFpEF	519	8 (1.5)	25 (4.8)	57 (11.0)	109 (21.0)
Missing/unsure	130	6 (4.6)	13 (10.0)	19 (14.6)	27 (20.8)
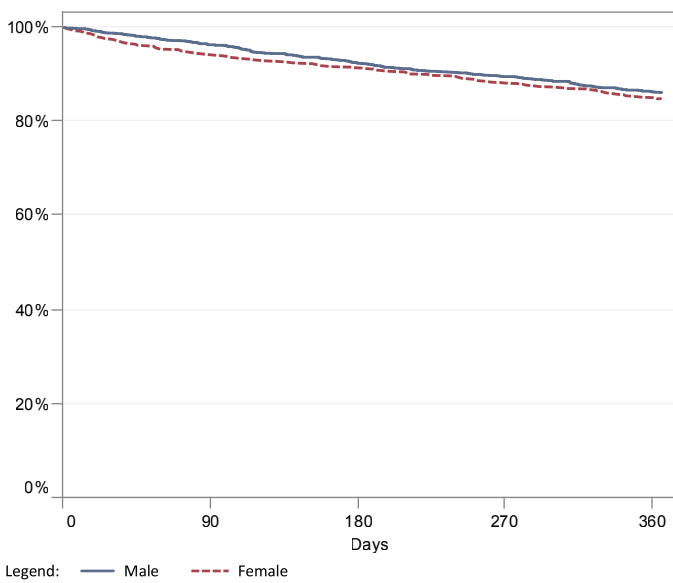
Figure 17: Heart failure survival by gender
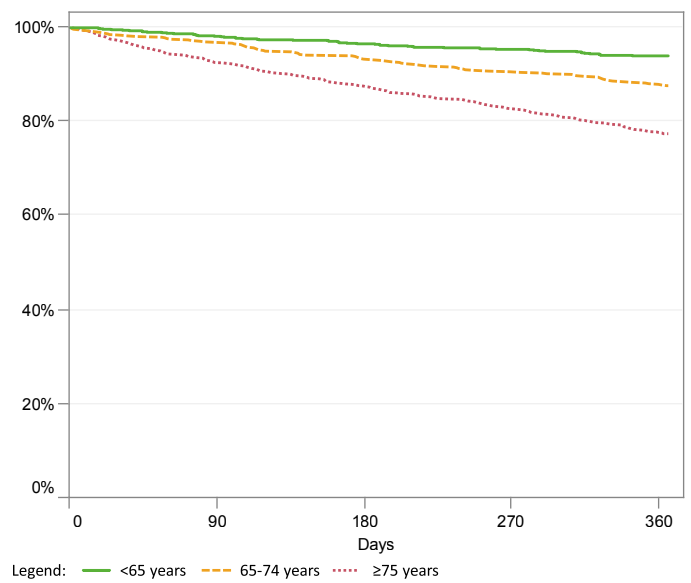
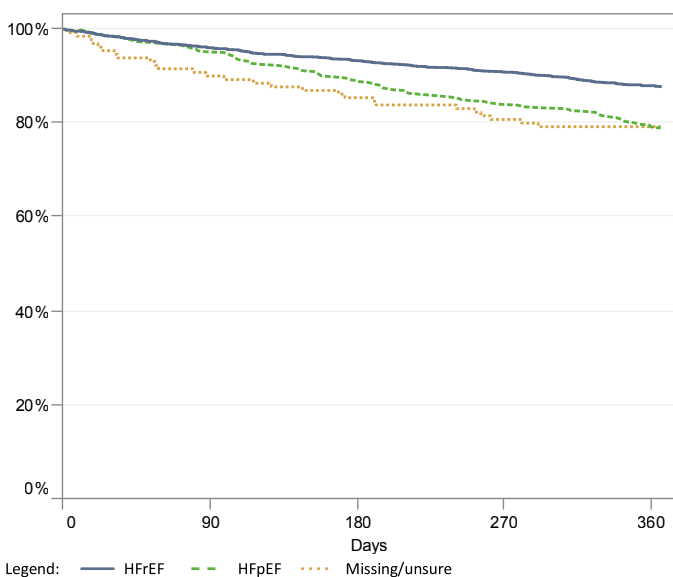Figure 18: Heart failure survival by age group

Figure 19: Heart failure survival by phenotype

Heart Failure Support Services

7.2.2   All-cause and heart failure rehospitalisation

Cumulative incidence curves for all-cause and HF hospitalisation are shown in Figure 20 and 21. Of the 2,747 eligible patients referred to HFSS during 2017, the unadjusted rate of all-cause hospitalisation was 17.8% at 30 days, increasing to 57.0 % at 365 days. Hospitalisations relating to HF (as identified by discharge diagnosis coding) were 5.6% and 24.2% at 30 days and one year respectively.

The overall risk of hospitalisation or death within 12 months post the index admission was 58.1% (Figure 22). Almost one-third of patients referred to a HFSS were rehospitalised at least two times in the subsequent 12 months (Table 30).

Table 30:   Number of rehospitalisations per patient over one year since discharge

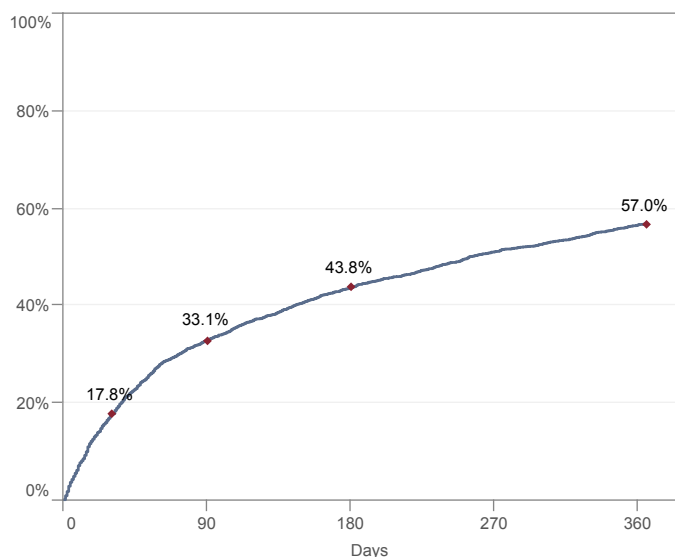| Total in 1 year	All-cause n (%)	Heart failure n (%)
0	1,222 (44.5)	2,134 (77.7)
1	637 (23.2)	387 (14.1)
2	370 (13.5)	137 (5.0)
3	196 (7.1)	47 (1.7)
4	134 (4.9)	20 (0.7)
≥5	188 (6.8)	22 (0.8)

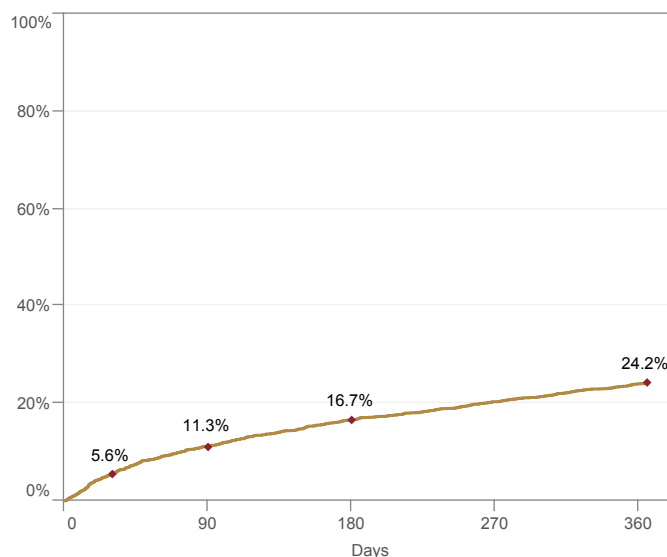*Figure 20: Cumulative incidence of all-cause rehospitalisation*

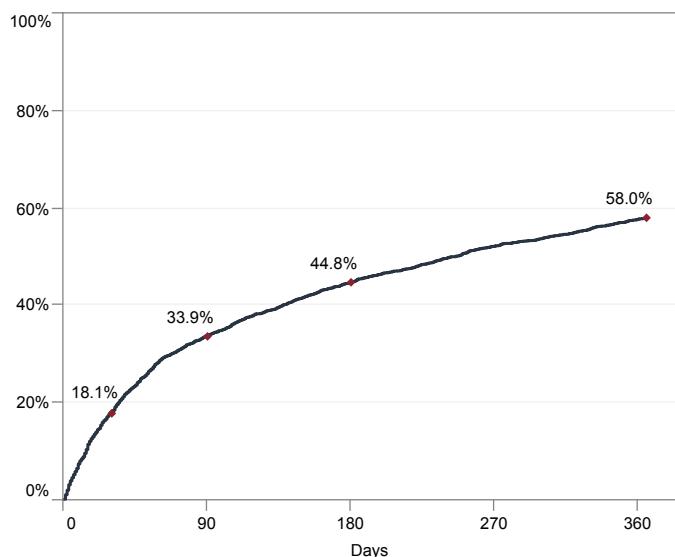*Figure 21: Cumulative incidence of heart failure rehospitalisation*

Figure 22: Cumulative incidence of all-cause rehospitalisation or death

Heart Failure Support Services

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 43% of patients survived more than a year without rehospitalisation with a median of 363 days for the whole group. The mean DAOH was 328.3, which equates to over 98,000 days lost due to death or hospitalisation over 12 months in 2,695 patients.

The box and whisker plots in Figure 24 illustrate the distribution of scores for different characteristics. The median of the data is close to 365 for most categories (the box shows the middle 50% of scores). The whiskers stretching to the right illustrate that many patients spent subsequent time in hospital or died. The DAOH was much lower for patients who were over 75 years old or had an uncertain heart failure phenotype or HFpEF compared to other characteristics.
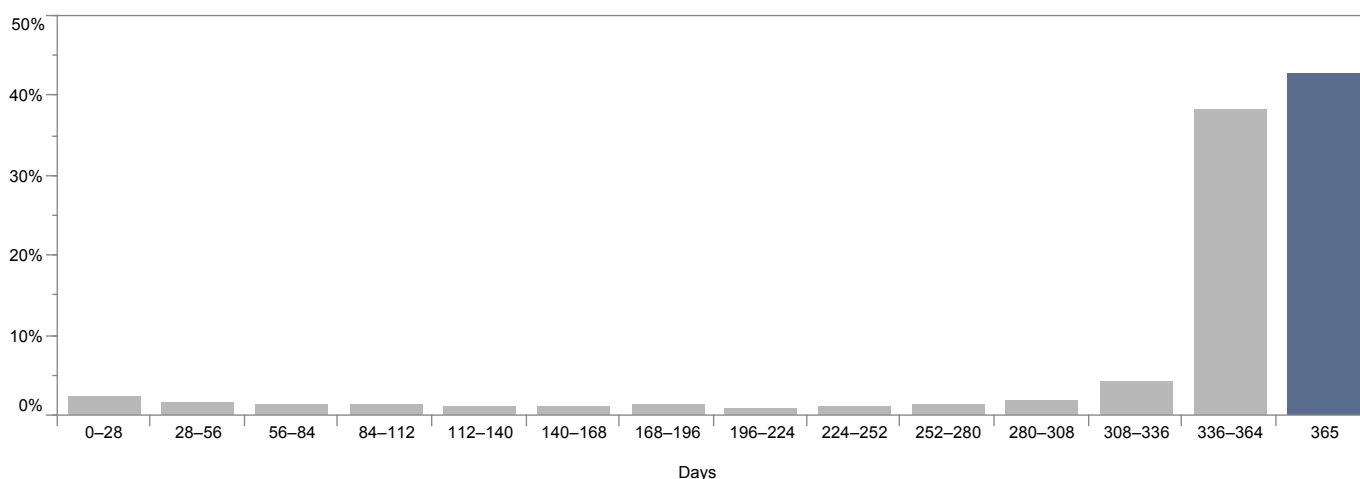
Figure 23: Days alive and out of hospital within one year after hospital discharge

Table 31:   Days alive and out of hospital within one year of discharge by patient characteristics

Characteristic	Detail	n	Mean	Median (IQR)
Sex	Male	1,750	330.3	364 (351–365)
	Female	945	324.5	362 (347–365)
Age group	<65	929	346.8	365 (359–365)
	65–74	699	333.1	363 (350–365)
	≥75	1,067	309.0	359 (322–365)
HF phenotype	HFrEF	2,068	333.4	364 (353–365)
	HFpEF	500	313.2	358 (328–365)
	Missing/unsure	127	303.3	359 (312–365)
Statewide		**2,695**	**328.3**	**363 (349–365)**
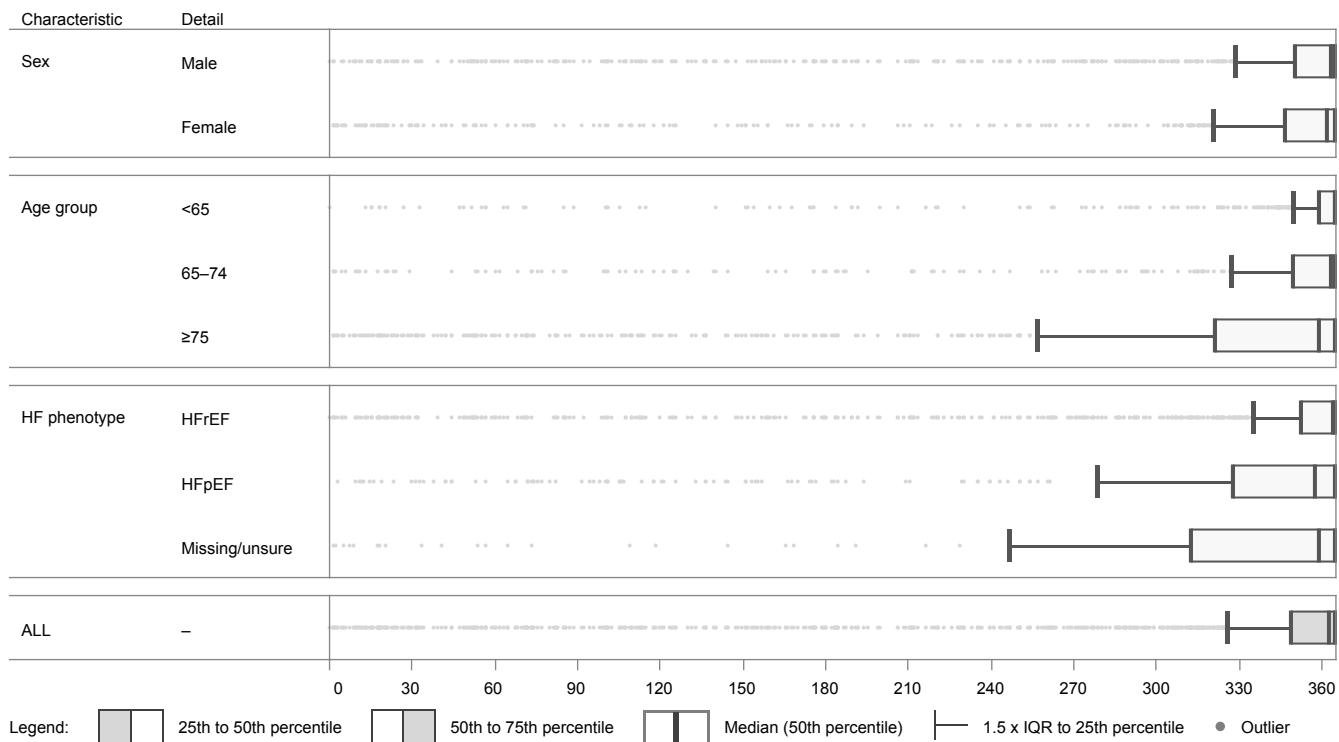
Mean, median and interquartile range (IQR) are given in days

Figure 24: Days alive and out of hospital within one year of discharge by patient characteristics

8 Conclusions

This annual report captured information on patient referrals to 21 Queensland Heart Failure Support Services.

Referrals for Aboriginal and Torres Strait Islander patients grew by 40% this year comparative to 2017. The reason for this change may be due to better identification of Indigenous status. While improved cardiovascular disease survival of Indigenous Queenslanders[29] may contribute to an increase in the prevalence of heart failure, it is unlikely that this would happened suddenly in one year.

As with previous reports, most referrals to HFSS are for patients with HFrEF, even though evidence suggests that patients with HFpEF also benefit from support. Barriers to HFpEF referrals, could be due poor case finding and limited resources to grow caseloads. Further characterisation of heart failure beyond HFrEF and HFpEF would assist in understanding the treatment needs and outcomes of the cohort.

As prescribing practices for ACEI/ARB and beta blockers have remained consistently high over the three years of reporting, it may be timely to measure the use of other agents where there is likely to be room for improvement. Furthermore, information is needed about non-pharmacological care including cardiac implantable electronic devices (CIED) and exercise training.

Monitoring beta blocker use over 6 months continues to be a challenge with most sites (despite active education and support) not achieving benchmarks. Whilst the rate of titration to maximal tolerated dose approaches the 80% benchmark, there is concern that 33% of patients did not have a beta blocker review and that the definition of "maximal tolerated" relies on clinical judgement. As target dose is a more objective measure it would help in planning if reasons for not achieving target in the 6 month timeframe were provided.

Patient outcomes continue to illustrate the burden of the disease with 55% of patients spending additional time in hospital after their index admission. Unadjusted outcomes for the HFpEF phenotype are significantly poorer compared to the HFrEF. The current data set does not allow risk adjustment of the outcomes thus limiting the ability to discern independent associations. As unmeasured confounders may influence the observed associations, comparisons of patient outcomes across individual sites was intentionally avoided.

9   Recommendations

Update data collection to:

- Introduce a new clinical indicator regarding mineralocorticoid receptor antagonists (MRA) prescription (underway for 2019 cohort).

- Expand clinical indicators for prescription of ACEI or ARB to include angiotensin receptor-neprilysin inhibitors (ARNI) as an acceptable alternative (underway for 2019 cohort).

- Further characterise HF phenotypes to include HF with associated valvular disease and right heart failure (underway for 2019 cohort).

- Provide reasons for not achieving beta blocker target dose in 6 months (underway for 2019 cohort).

- Record the use of cardiac implantable electronic devices (CIED) (under development for 2020 cohort).

- Include a clinical indicator related to exercise training.

- Collect covariates to allow for risk-adjustment of patient outcomes.

Quality improvement activities:

- Develop systems of care to improve the review and titration of medications post hospital discharge and to address variances in clinical performance.

New recommendations:

- Support HFSS to improve beta blocker titration by: promoting nurse and pharmacist facilitation of titration (when managed by GP); advocating for more pharmacy and nurse practitioner involvement in care; and providing systems to track patients under titration and for generating titration plans.

- Introduce targeted non-pharmacological interventions known to improve quality of life and relieve symptoms; for example, exercise therapy and psycho-social support.

- Measure outcomes for all patients regardless of referral source (i.e. for outpatient as well as inpatient referrals).

Heart Failure Support Services

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Heart Failure Support Services Audit

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Glossary

6MWT	Six Minute Walk Test
ACC	American College of Cardiology
ACEI	Angiotensin Converting Enzyme Inhibitor
ACOR	Australasian Cardiac Outcomes Registry
ACS	Acute Coronary Syndromes
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
ATSI	Aboriginal and Torres Strait
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
CH	Cairns Hospital
CHF	Congestive Heart Failure
CI	Clinical Indicator
CR	Cardiac Rehabilitation
CRT	Cardiac Resynchronisation Therapy
CS	Cardiac Surgery
CV	Cardiovascular
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
FdECG	First Diagnostic Electrocardiograph
FTR	Failure To Rescue
GAD	Generalized Anxiety Disorder
GCCH	Gold Coast Community Health
GCUH	Gold Coast University Hospital
GLH	Gladstone Hospital
GP	General Practitioner
GYH	Gympie Hospital
HBH	Hervey Bay Hospital (includes Maryborough)
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
HSQ	Health Support Queensland
IC	Interventional Cardiology
ICD	Implantable Cardioverter Defibrillator
IHT	Inter-hospital Transfer
IPCH	Ipswich Community Health
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
MRA	Mineralocorticoid Receptor Antagonists
MTHB	Mater Adult Hospital, Brisbane
NCDR	The National Cardiovascular Data Registry
NOAC	Non-Vitamin K Antagonist Oral Anticoagulants
NP	Nurse Practitioner
NRBC	Non-Red Blood Cells
NSTEMI	Non ST-Elevation Myocardial Infarction
OR	Odds Ratio
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 Questionairre
QAS	Queensland Ambulance Service
QCOR	Queensland Cardiac Outcomes Registry
QEII	Queen Elizabeth II Hospital
QH	Queensland Health
QHAPDC	Queensland Hospital Admitted Patient Data Collection
RBC	Red Blood Cells
RBWH	Royal Brisbane and 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
SCCN	Statewide Cardiac Clinical Network
SCUH	Sunshine Coast University Hospital
SHD	Structural Heart Disease
STEMI	ST-Elevation Myocardial Infarction
STS	Society of Thoracic Surgery
TAVR	Transcatheter Aortic Valve Replacement
TMVR	Transcatheter Mitral Valve Replacement
TNM	Tumour, Lymph Node, Metastases
TPCH	The Prince Charles Hospital
TPVR	Transcatheter Pulmonary Valve Replacement
TTH	The Townsville Hospital
TWH	Toowoomba Hospital
VAD	Ventricular Assist Device
VATS	Video-Assisted Thoracic Surgery
VCOR	Victorian Cardiac Outcomes Registry
VF	Ventricular Fibrillation
VSD	Ventricular Septal Defect

Ongoing initiatives

Whilst continually refining and improving data collection and reporting practices for the benefit of public facilities, QCOR is also beginning the investigation of a method to collect and analyse clinical data for private healthcare facilities. Following interest from various private providers, QCOR is looking to extend its quality and safety focus to accommodate the requirements of these facilities. It is anticipated that QCOR will provide a role in the delivery of reports and benchmarking activities whilst also acting as a conduit to the various national registries in existence and development.

Cardiac outreach continues to expand in Queensland with formalised and newly funded services having commenced between Cairns and Hinterland and Torres and Cape Hospital and Health Service intending to provide cardiac care in many of these communities for the first time. Services will commence in January 2020 between Townsville and North West. The forward plan for the rollout of this model across the state has been developed in partnership with consumers and clinicians. A new system, the QCOR Outreach application has been developed to track activity, service provision and patient outcomes. This ground-up development specifically for cardiac outreach finished testing and goes live for use in late 2019.

The QCOR Structural Heart Disease module is currently in advanced stages of development with wider deployment expected in 2020. This QCOR module has been developed to provide superior procedure reporting capabilities for structural heart disease interventions, device closure, and percutaneous valve replacement and repair procedures. It will enable participation in national quality and safety activities for transcatheter aortic valve replacement as well as allow clinicians to utilise the application for collecting pre and post-procedural data in unprecedented detail. The application has been through rigorous testing with user training and further enhancements planned for the near future.

The ECG Flash initiative of the SCCN has continued to be implemented at several sites throughout 2018 and 2019. Deployment of hardware to spoke sites has been via a staged approach with uptake being varied based on local site workload and workforce. Integration of ECG Flash with workflow within hub sites continues to evolve with sites now taking the initiative to embrace and feedback to sites regarding the appropriate use of the system. Analysis of the utility of the system is beginning to take place with a focus on clinical efficacy and benefit. It is anticipated that QCOR will be able to support this new initiative through procedural linkage and outcome monitoring for the subset of patients whose clinical path utilised ECG Flash and went on to subsequent investigation or management.

Opportunities for participation in the formative stages of national registries and initiatives have been embraced by Queensland clinicians. These important initiatives which are in various stage of development will be critical to the future of clinical registries in Australia. It is anticipated that with further involvement from local stakeholders that these entities will evolve into relevant and useful tools for patient-centred reporting and outcomes.