

# Evaluation of the SUNHEART Cardiology Outreach Programme

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## INTRODUCTION

South Africa has a population of 52.98 million people.<sup>(1)</sup> Approximately 80% of the population depends on the public health care system for access to health care.<sup>(1)</sup> For cardiac care, the population is served by approximately 170 cardiologists, most of whom work in the private sector.<sup>(2)</sup> Large challenges face the public health care system which is responsible for providing cardiac care, particularly advanced cardiac care, to the vast majority of the population. Tertiary hospitals in the state healthcare system carry the responsibility of providing access to specialised cardiac care for this population. Current demand for these services however outstrips capacity and bottlenecks to referrals into tertiary services lead to increasing waiting times. The South African healthcare system is also geographically challenged; a substantial proportion of patients requiring advanced cardiac care live in rural areas, far from advanced cardiac care services and with limited public transport options to reach these services. South Africa and the Western Cape are not unique in this respect, as most healthcare systems in the world face an increase in the cardiovascular disease burden and the cost to provide these services.

An accepted approach to minimising bottlenecks at tertiary referral hospitals is to decentralise the service in a so-called

## ABSTRACT

**Introduction:** The demand for advanced cardiac care and specialised interventions is on the increase and this results in bottlenecks and increased waiting times for patients who require advanced cardiac care. By decentralising cardiac care, and using a hub-and-spoke model, the SUNHEART Outreach Programme of cardiovascular care aims to improve access to advanced cardiac care in the Western Cape. Tygerberg Hospital is the central hub, with the first spoke being Paarl Hospital.

**Objective:** To determine the value of the SUNHEART Outreach Programme to the public health care system.

**Methods:** An audit of patients accessing the Outreach Programme was performed for the period May 2013 - May 2014 and consequently compared to a historical cohort of patients accessing the health care system during the preceding 6 months, from October 2012 - April 2013. Access to advanced cardiac care was measured in time to initial evaluation, time to definitive diagnosis or intervention and patient compliance with appointments. The value to the health care system was also assessed by performing a cost analysis of transport of patients and health care workers, as well as compliance with appointments. We documented the spectrum of disease requiring advanced cardiac care to guide future interventions.

**Results:** Data of 185 patients were included in the audit. Sixty four patients were referred to tertiary care from October 2012 - April 2013 and 121 patients were referred to the outreach facility from May 2013 - May 2014. There was a significant reduction in waiting times with the median days to appointment of the historical cohort being 85 days compared to 18 days in the Outreach Programme cohort ( $p < 0.01$ ). Patient compliance with appointments was significantly superior in the Outreach Programme cohort (90% vs. 56%;  $p < 0.01$ ). Valvular (36.5%) and ischaemic heart disease (35.5%) were the major pathologies requiring access to cardiac care services. Transport costs per patient treated was significantly reduced in the outreach programme cohort (R118,09 vs. R308,77).

**Conclusion:** Decentralisation of services in the form of an Outreach Programme, with a central hub, improves access to advanced cardiac care by decreasing waiting time, improving compliance with appointments and decreasing travel costs. SAHeart 2015;12:82-86

hub-and-spoke model.<sup>(3,4)</sup> The SUNHEART Outreach Programme of cardiovascular care was launched by the Division of Cardiology of Stellenbosch University at Tygerberg Hospital to perform just this role. The Division of Cardiology at Tygerberg Hospital (tertiary level) fulfills the role of hub with the secondary level hospitals, in more rural areas, acting as spokes in this model. The secondary hospitals in this system are the main gateways for patient referrals for advanced diagnostic and interventional services. The initiative was launched at Paarl Hospital (secondary level hospital) as the first of these spokes. Paarl Hospital provides medical care to a population of more than 600 000 people.<sup>(5)</sup>

Cardiologists from the hub, or tertiary hospital, visit the outreach facility once per month. Patients are referred from the secondary service to the monthly on-site cardiology outreach service which is held at the secondary hospital. Patients are evaluated by medical officers and general physicians at the secondary service and those, requiring the opinion of a specialist cardiologist, are evaluated at the outreach facility with the referring doctor present. Historically these patients would have been referred to the outpatient department at the tertiary hospital. The evaluation of patients at the outreach facility ensures transfer of knowledge and instant feedback to health care workers, improving clinical and advanced skills such as acquisition and interpretation of electrocardiograms (ECG), exercise electrocardiograms (sECG) and echocardiograms. By creating adequate infrastructure, and through the training of healthcare workers, a substantial proportion of patients historically referred to tertiary hospitals will now have access to advanced cardiac care at their local hospitals. Patients requiring services such as angiography at the tertiary hospital will be referred and treated by the outreach cardiologist at the hub. This ensures optimal use of both human resources and infrastructure at tertiary level.

Potential benefits of this system include improved likelihood of patients being managed at the correct level of care required to address their disease, shorter waiting times, a reduction of bottlenecks at tertiary centres, minimising duplication of tests, decreasing pressure on transport services and cost reduction.<sup>(6,7,8)</sup>

## METHODS

The aim of this study was to audit the pilot phase of the SUNHEART Outreach Programme (outreach cohort) and compare it to a control cohort of patients managed with the previous system (historical cohort). The study population (both cohorts) consisted of patients originating from within the Paarl Hospital area referred for evaluation by a cardiologist. No acute or inpatient referrals were included.

Cardiologists from the tertiary hospital provide their services, for one day per month, at the outreach facility. Patients are evaluated, special investigations are reviewed and both formal and bedside teaching is done to improve clinical and advanced skills – including acquisition and interpretation of electrocardiograms (ECG), exercise electrocardiograms (sECG) and echocardiograms. Patients attending medical outpatients at the outreach facility, or one of its referring hospitals, are initially assessed by the attending medical officers and general physicians. They complete the work-up for patients requiring the opinion of a specialist cardiologist prior to the visit by the visiting cardiologist. Work-up generally includes a full clinical assessment followed by the necessary investigations available which include ECGs, appropriate blood tests, echocardiograms and sECGs. Previously these patients could only gain access to advanced cardiac care through referral to a tertiary hospital. By creating an adequate infrastructure, and through the training of healthcare workers, a substantial proportion of patients historically referred to tertiary hospitals now have access to advanced cardiac care at their local hospital and are managed at the outreach facility. The visiting cardiologist identifies appropriate patients requiring transfer to the hub for more specialised investigations such as transoesophageal echocardiograms, angiography and other interventions. Patients, who then need to travel to the hub, have their stay limited to a day procedure or a short stay admission with a clear plan for future management on discharge.

Patient records and referral letters of outpatients referred from Paarl to the Cardiology outpatient clinic at Tygerberg Hospital (TBH), from October 2012 - March 2013, were reviewed and this cohort serves as the historical cohort. Patient records of patients referred to the outreach facility, from May 2013 - May 2014, were reviewed and serve as the outreach programme cohort.

The following data were collected from these 2 cohorts:

- Patient demographics including age, gender, geographic location.
- Diagnosis (both at time of referral and after assessment by cardiology).
- Treatment (both at time of referral and after assessment).
- Special investigations namely blood tests, ECGs, sECGs and echocardiograms.
- Time, in days, from referral to appointment date.
- Time, in days, from referral to diagnostic tests/therapy limited to the hub/tertiary hospitals (trans-oesophageal echocardiography, angiography, percutaneous coronary intervention, cardiac surgery).
- Compliance to appointment dates.

The 2 cohorts were compared to assess the value of the Outreach Programme to the:

- Patients - by measuring time to appointment, time to definitive diagnosis or intervention and compliance with appointment dates. These were used as surrogates to evaluate access to advanced cardiac care.
- Healthcare system - by doing the cost analysis described below and patient compliance.

Cost of visit to the tertiary hospital (historical cohort) was calculated as a composite of current cost of public transport, taxi services and private transport. No adjustment for the additional time spent by patients to travel to the tertiary hospital, in terms of loss of income, was made - data not available.

Outreach specific costs were the transport cost for 93km, as per the Western Cape Government remuneration guidelines, and the occupation specific rate of the travel time of health care workers to the outreach facility (60min). It was accepted that the time to evaluate a patient and infrastructure costs are equal at both facilities.

The statistical analysis was done by a statistician at the Stellenbosch University Biostatistics Unit. Data were collected and analysed using Microsoft Excel 2010 software. Data were not normally distributed and reported as a median with interquartile range. P-values were calculated using the two sample Wilcoxon rank-sum (Mann-Whitney) test.

Ethical approval was granted by the Health and Research Ethics Committee of the University of Stellenbosch (Ethics Reference #: S14/10/239).

## RESULTS

The data of 185 patients were included in the audit. Sixty four patients (historical cohort) were referred directly to the tertiary center (Hub) from October 2012 - April 2013 and 121 patients (outreach programme cohort) were referred to and assessed at the Outreach facility (Spoke) from May 2013 - May 2014.

	Historical Cohort n(%)	Outreach Cohort n(%)
Overall	64	121
Gender		
Male	32	59
Female	32	62
Age in years (mean)	49.3 (SD 13.2)	49.9 (SD14.2)

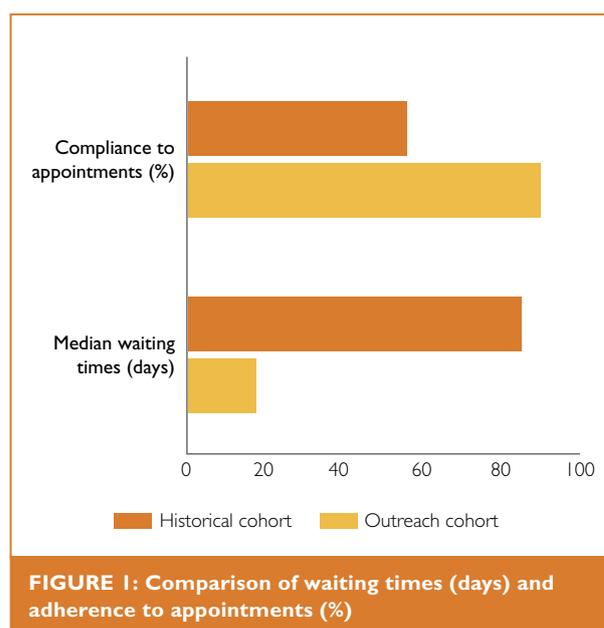
The demographic data of both cohorts are depicted in Table 1, with no statistical difference between the 2 groups. Of the patients evaluated at the outreach facility, the majority (80/121; 66%) live in Paarl.

Waiting times (median in days) were significantly reduced from 85 - 18 days on comparing the two cohorts ( $p < 0.01$ ). The interquartile range (25 - 75 percentiles) was between 63 and 104 days for the historical cohort compared to 8 and 31 days for the outreach programme cohort. Time, in days, to definitive diagnosis or intervention in the outreach cohort was calculated as a median of 30 days with an interquartile range of 14 - 49 days (Table 2/Figure 1).

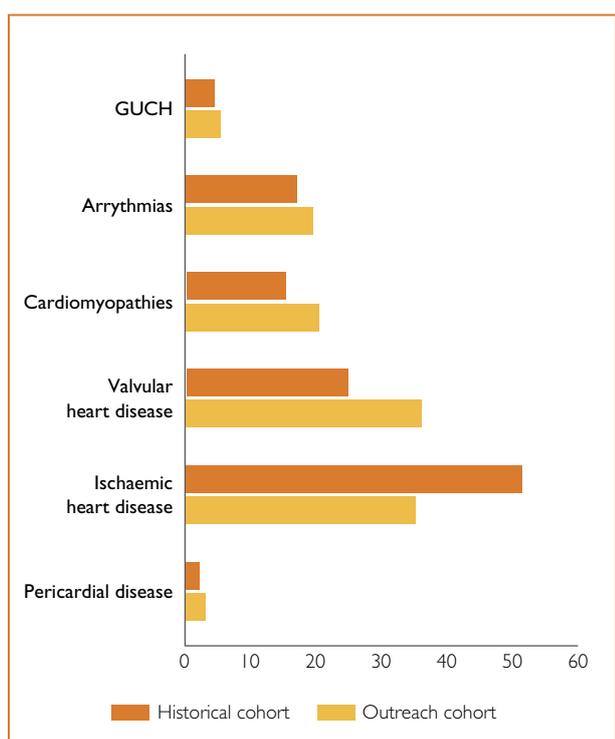
Patient compliance with appointments was significantly superior in the outreach programme cohort (90% vs. 56%:  $p < 0.01$ ).

**TABLE 2: Comparison of waiting times and compliance with clinic dates**

	Historical Cohort n(%)	Outreach Cohort n(%)	p-value
Overall	64	121	
Waiting time (median in days)	85	18	$< 0.01$
25 percentile	63	8	
75 percentile	104	31	
Time to definitive diagnosis/ intervention	-	30	
25 percentile	-	14	
75 percentile	-	49	
Compliance	36(56.3)	108(90)	$< 0.01$



**FIGURE 1: Comparison of waiting times (days) and adherence to appointments (%)**



**FIGURE 2: Disease states**

GUCH: Grown-Up Congenital Heart disease.

	n(%)
Angiography/Percutaneous coronary intervention	57 (58.8)
Transoesophageal echocardiography	21 (19.4)
Holter ECG	3 (2.8)
Ablation	4 (3.7)
Fluoroscopy	1 (0.9)
Invasive haemodynamic assessment	3 (2.78)
Pacemaker	1 (0.9)

Investigation	n(%)
Blood tests	102 (94.4)
ECG	106 (98.2)
sECG	37 (33.3)
Echocardiograms	69 (63.9)

compared to the historical cohort (Figure 1). Forty of 121 (33%) of patients accessing the outreach programme did not need referral to the hub and could complete diagnosis and treatment at the outreach facility. Seventy of the 80 (87.5%)

patients seen at the outreach facility, requiring transfer to tertiary care (Hub) for further investigations or interventions, attended on the correct date, with a median hospital stay of 2 days.

Valvular (36.6%) and ischaemic heart disease (35.5%) constituted the major burden of disease (Figure 2).

Correspondingly, the main indications for transfer to tertiary care (Hub) was angiography, with or without intervention, and trans-oesophageal echocardiography as part of the work-up leading up to valvular heart surgery (Table 3).

Investigations done at Paarl Hospital are set out in Table 4. This represents tests at the time of referral. In cases where the appropriate tests had not been done before the visiting cardiologist's evaluation, it was performed on the day of outreach evaluation.

The transport cost per patient treated was significantly reduced in the outreach programme cohort (R118.09 vs. R308.77).

**DISCUSSION**

The SUNHEART Cardiology Outreach Programme is a novel system of delivering effective advanced cardiac care. This audit of the pilot phase of the programme initiated at Paarl Hospital, indicates that the programme decreases waiting times, both to initial assessment and diagnostic/interventional therapy, increases compliance to appointments and leads to a substantial decrease in patients referred to the tertiary facility.

Using the hub-and-spoke model to decentralise cardiac services, the outreach facility serves as an entry point into the system, preventing the bottlenecks that typically formed with the previous system. This is evident when looking at the waiting times. This audit has shown a significant improvement in time to assessment and treatment, with some patients waiting only a few days to be seen by the visiting cardiologist and having their procedures done in less than a week.

Compliance with appointments is an important determinant of successful patient care and is important in ensuring optimal use of scarce human and infrastructure resources. A reduction in the travel requirements and decreased need for use of patient transport services, reduced costs significantly and likely improved patient compliance. Patient compliance, with appointments at the outreach facility, was 90% compared to the historical cohort of only 56%. Although many factors may have influenced compliance to appointments, it is likely that accessing advanced cardiac care with the familiarity of your referring physician, the proximity of the outreach facility and the decrease in travel logistics/cost were likely contributors to the improved

compliance. Compliance of patients which required transfer to the hub for further investigations or procedures also approached 90%. This might be attributed to the improved knowledge of patients and health care workers at the outreach facility and improved satisfaction with services provided.

Earlier diagnosis and treatment has been shown to be an important determinant of outcome in a wide variety of cardiovascular disease. It may be reasonable to expect that the reduction in time to diagnosis and treatment demonstrated in this audit are likely to reduce adverse outcomes, should this be expanded to the population at large. The effect of information transfer and "upskill" of health care workers should not be underestimated and will further contribute to improved patient care and outcome. Access to advanced cardiac care was also increased, with more patients accessing cardiac care at the outreach facility and increasing capacity at the hub or tertiary level.

There was a significant decrease in travel cost involved in managing each of these patients at the outreach facility in this study. Other contributors to cost, such as minimising the duplication of special investigations, infrastructure costs and providing a specialised service in a less specialised environment (e.g. impact of number of staff per patient treated and salary level of health care workers) were not assessed in this study.

Bedside teaching and ongoing management of more patients requiring input from a cardiac specialist greater patient numbers will improve local healthcare providers' skill and efficacy in managing cardiac patients. This will significantly contribute to improved patient care and outcome.

### CONCLUSION

Decentralisation of services, in the form of an outreach facility with a central hub, improves access to advanced cardiac care by decreasing delay in accessing the service and improving compliance with appointments. It decreases travel costs and the number of patients requiring transport services.

This study has identified the need for an in depth cost analysis comparing these 2 models of delivering advanced cardiac care.

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**Conflict of interest: none declared.**

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