Clinico-epidemiological profile of cardiac admissions at a district level hospital in South Africa: a cohort study

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Masters in Medicine (MMed)

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Declaration

I, Lillian Lize Engelbrecht, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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Signed on 2 Feburary 2024

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Dedication

To my son, William, who was only 8 months old when I started this process. This, and everything else I do in this life, is for you.

To my husband and fiercest supporter, Nicholas: for your unwavering encouragement and copious cups of coffee,

and lastly, to my parents: thank you for a providing a foundation of love and support that sustains me daily.

Journal ready manuscript

Clinico-epidemiological profile of cardiac admissions at a district level hospital in South Africa: a cohort study

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Abstract

Background

Nineteen percent of all deaths during 2016 in South Africa (SA), were due to cardiovascular disease. Despite this notable burden, research describing cardiac admissions at the district level is limited and thus, area-specific studies are warranted to provide a perspective on SA's unique population of rich genetic, geographic, social, and cultural diversity. The aim of this study was to describe the epidemiological and clinical characteristics, associated risk factors and outcomes of cardiac patients admitted to a district level hospital in SA, in order to fill the void within currently available literature.

Methods

We conducted a retrospective records review of all patients admitted to Victoria Hospital Wynberg with a primary cardiac diagnosis, between 1 September 2020 to 30 November 2020. Data were transcribed onto a bespoke data collection form and captured into the Victoria Internal Medicine Research Initiative (VIMRI) electronic registry. The study was approved by UCT HREC (048/2022), the Western Cape Government and Victoria Hospital Board.

Results

Our cohort consisted of 218 patients (52.8% male) with a mean age (SD) of 60 years (±14.6), and an age range from 22 to 95 years. Acute decompensated heart failure, together with acute coronary syndrome, were responsible for 87.4% of all admissions. The mean length (SD) of stay was 4 days (±3.5 days). Most prevalent risk factors among admitted patients included hypertension (76%), cigarette smoking (55%) and diabetes (42.7%). Amongst diabetics, 27.3% were considered to have acceptable diabetic control (HbA1c ≤7%). Most frequently reported precipitants for hospital admission were prior inadequate therapy, discontinuing chronic medication, uncontrolled hypertension, disease progression, and ongoing substance use. Twenty-one percent of the cohort were transferred to cardiology for further management and specialist intervention. The inpatient mortality rate was 9.2%, and one-year mortality rate was 18.8%. Readmission within six months was reported amongst 30.8% of our cohort.

Discussion and Conclusion

Our study provides important insight into the clinico-epidemiological profile of cardiac admissions at a public district level hospital in SA. We report notable rates of morbidity, readmission, and mortality together with a high prevalence of well-known cardiovascular risk factors of hypertension, diabetes mellitus and cigarette smoking. While the in-hospital and one-year mortality rates are notable, but not too unexpected when compared to available data, we nevertheless recommend programmes focused on improving adherence to treatment and optimization of heart failure therapy at a primary care level, as means to reduce rates of poor adherence, suboptimal anti-failure therapy and poor glycaemic control observed in our cohort.

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Abstract ***(shortened version as per CVJA guidelines of 150 words, for publication purposes)***

Despite the burden of cardiovascular disease in South Africa, research describing cardiac admissions at district level is limited. This study aimed to describe the clinico-epidemiological characteristics, risk factors and outcomes of cardiac patients admitted to a district level hospital in SA by conducting a retrospective records review of cardiac patients admitted to Victoria Hospital Wynberg between September to November 2020. Our cohort of 218 patients (52.8% male) had a mean age (SD) of 60 years (±14.6). Decompensated heart failure and acute coronary syndromes were responsible for the majority of admissions (87.4%). Hypertension (76%), smoking (55%) and diabetes (42.7%) were the most prevalent risk factors. Acceptable diabetic control was poor (27.3%). Inpatient mortality rate was 9.2%, and one-year mortality rate was 18.8%. Six month readmission rate was 30.8%. Our study provides insights into the profile of cardiac admissions at a district level SA hospital, reporting notable rates of readmission, mortality and poor adherence to chronic medication.

Introduction

Sub-Saharan Africa (SSA) is experiencing a change in its pattern of disease prevalence, with non-communicable diseases (NCDs) projected to overtake infectious diseases by 2030(1). Despite 77% of global deaths due to NCDs occuring in low-and middle-income countries, there is a dearth of research emanating from these sectors (2). According to the World Health Organization's 2016 report, 51% of all deaths in South Africa (SA) were due to NCDs, with cardiovascular diseases being the most prevalent, causing 19% of all deaths in SA in 2016 (3).

SSA's own rich genetic, geographic, social and cultural diversity, renders research from high-income country settings not necessarily generalizable. Furthermore, there is considerable variation in cardiovascular disease profiles in countries from SSA across sub-populations, thus, emphasizing the importance of area-specific studies (1). Literature profiling general cardiac admissions in SSA is limited, as highlighted in a recent review reporting admissions from 1950 to 2010(4). Aspects of cardiovascular diseases have been reported in our setting, such as the Sub-Saharan Africa Survey of Heart Failure (THESUS-HF registry) (5), the Heart of Soweto study (6), the Investigation of the Management of Pericarditis (IMPI Trial) (7) and the Global Rheumatic Heart Disease Registry (REMEDY study)(8,9), but data regarding the impact of cardiovascular disease at a district level in SA remains limited (10). Thus, documenting cardiovascular disease data in a local context, in addition to providing insight into the epidemiology and associated risk factors of the condition, is vital to guide hospital policymakers in the appropriate allocation of resources in resource-constrained settings (11).

Studies have reported on the profile of cardiovascular disease in only two district level hospitals in SA. A retrospective study conducted at GF Jooste Hospital, listed cardiovascular disease as the second-most common cause of admission (12). Diseases of the circulatory system, namely hypertensive heart disease, heart failure, stroke, and angina pectoris made up 22% of all admissions. A 2016 study conducted at Northdale Hospital in Kwazulu-Natal (13) documented the profile and management of 122 patients admitted with acute ischaemic chest pain over a six month period. Prominent modifiable cardiovascular risk factors identified were smoking (70%), diabetes (73%) and hypertension (55%). The study also determined that Northdale Hospital could expect an average of 25 acute myocardial infarctions per month, which is valuable information for policy planners in terms of resource allocation. Thus, considering SA's diverse population, additional studies are required from other regions of the country.

This cohort study sought to profile adult cardiac admissions at a district level hospital, thereby making a valid contribution to the national landscape. Furthermore, this work presents a template for future

research to guide hospital policymakers in the appropriate allocation of resources, and assist with future planning.

Objective

To conduct a retrospective observational cohort study at a district level hospital in SA, to better understand the epidemiology and clinical characteristics, including associated risk factors, of patients admitted with cardiac disease.

Methods

Study design and clinical setting

We conducted a quantitative, retrospective, observational cohort study of all the cardiac admissions from 1 September 2020 to 30 November 2020 at Victoria Hospital Wynberg (VHW), a district level hospital located in Wynberg, SA. VHW is a referral hospital for several community health care centres, general practitioners and a smaller district-level facility (False Bay Hospital) within the southern metro district health services of Cape Town. It is the the main secondary level government hospital that serves a catchment population of approximately 600,000 (14) . District hospitals support primary health care centers, and act as a gateway to more specialized care. These facilities provide support to the communities, by means of further imaging techniques, higher levels of medical expertise, and often have access to critical care facilities, though limited. VHW also acts as an academic teaching hospital affiliated with the University of Cape Town (UCT). This study was conducted under the aupices of the Victoria Internal Medicine Research Initiative (VIMRI), established in 2020.

The time period of our study was chosen as it fell between the first and second wave of the Covid-19 pandemic, and would provide us with data more specific to cardiac admissions, as the influence of the pandemic was slightly reduced. By use of an online sample size calculator (15), using a 95% confidence interval, 6% margin or error, a 50% population proportion and an estimated population of 600 000 people, we determined that an ideal sample size would be 267 admissions.

Inclusion and exclusion criteria

All adult patients admitted with a primary cardiac-related condition were eligible to be included in the study. A primary cardiac-related condition pertains to any illness that affects a part of the heart, ie pericardium, myocardium, cardiac valves, coronary arteries and electrical circuit. We excluded those initially admitted as cardiac patients, but later found to have been misdiagnosed on admission (ie. primary pulmonary pathology, malignancy, infection). Patients with a known cardiac condition that did not result or contribute to the current admission were not included.

Case definition and data collection

A data collection form (addendum A) was designed in collaboration with the Victoria Internal Medicine Research Initiative (VIMRI) team. Data were retrieved from medical records and transferred to a RedCap purpose designed database by a team of VIMRI data collectors. Where necessary, outstanding data were sourced from various electronic medical records. One-year survival was documented according to available electronic records. The list of included cardiac conditions are described in addendum B.

Statistical analysis

Data were analysed using STATA software®(16). Normally distributed continuous data are presented as means with standard deviations (SDs), and non-Gaussian distributed variables as medians plus ranges. Categorical data are presented as percentages. Case fatality rate was calculated upon discharge and at one year post-discharge.

Ethical Considerations

The University of Cape Town Human Research Ethics Committee granted ethics approval for this study (HREC REF 048/2022). Permission was obtained to use the VIMRI RedCap® database housed at VHW (HREC: R043/2020) for our data entry. Permission to conduct this study was granted by the Western Cape Government and Victoria Hospital Board.

Results

Baseline patient characteristics and risk factor profile on admission

Two hundred and eighteen patients were enrolled into our registry between 1 September 2020 to 30 November 2020. Eighteen of these patients were readmitted a second time, while one patient had three admissions during the study period; therefore there were 238 cardiac admissions in total. Two patients from our initial cohort were excluded from our study, as the cause of their chest pain syndrome was found to be non-cardiac in nature.

Table 1 shows the baseline clinical characteristics of the cohort. The mean age (SD) of the cohort was 60 years (±14.7 years). The mean age of affected males (56 years; SD, 13.3 years) was lower when compared to females (64 years; SD, 15.1 years). Ages of patients on admission ranged from 22 to 95 years, with 52.2% of our cohort being 60 years or older. There was a slight male preponderance in our cohort of 52.8%. Almost half of our cohort (47.8%) fell within the economically active bracket, defined as the group of people between the ages of 15 and 64 who are willing and able to work.

Hypertension was the most common cardiovascular risk factor (73.9%). Eighty-nine (40.4%) patients had Diabetes Mellitus, and 69 (31.7%) had dyslipidaemia. More than half of our cohort (55%) were cigarette smokers, making it the most commonly-used substance. Alcohol use was reported by 56 patients (21.2%), and 20 (9.2%) had a history of illicit drug use. Where known, 4.6% of our cohort were confirmed HIV positive. The HIV status of 129 patients (59.2%) was unknown. The body mass index (BMI)(17) was only available for 122 admissions, and ranged between 14.7 kg/m^2 (underweight) to 49.4 kg/m^2 (Obesity Class III), with the mean (27.9 kg/m^2) and median (27.4 kg/m^2) falling within the overweight classification.

Control of diabetes mellitus in cohort

The majority of diabetic patients (71.6%) had an HbA1c ≥7.1% (Figure 1). Furthermore, 39.8% of the total diabetic cohort had an HbA1c value of ≥10.1%. BMI values were documented for 50 of our 88 diabetic patients. The mean BMI of these 50 diabetic patients was 31.1kg/m^2 (Obesity Class I). 14 patients classified as Obesity Class II, with a BMI of ≥ 35 kg/m^2.

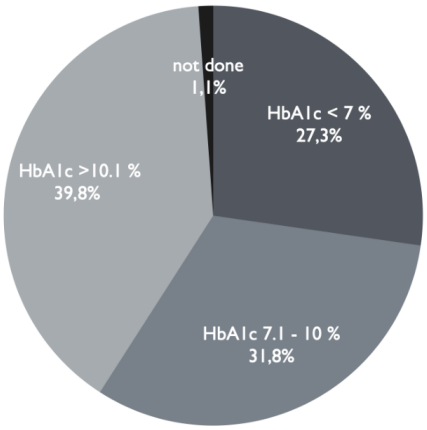

Fig 1. Glycaemic control of diabetic cohort by HbA1c values

Table 1. Baseline clinical characteristics of cardiac admissions at Victoria Hospital Wynberg, Cape Town between 1 September 2020 to 30 November 2020

Characteristics	Female	Male	Total, n, (%)
Sex, n (%)	103 (47,2%)	115 (52,8%)	218
Age (yr), mean (SD)	64 (±15.1)	56 (±13.3)	60 (±41.7)
Hypertension, n (%)	85 (52.8%)	76 (47.2%)	161 (73.9%)
Diabetes, n (%)	55 (62.5%)	33 (37.5%)	88 (40.4%)
COPD/Asthma, n (%)	23 (52.3%)	21 (47.7%)	44 (20.2%)
Dyslipidaemia, n (%)	37(53.6%)	32 (46.4%)	69(31.7%)
HIV, n (%)			
HIV Positive	2 (20%)	8 (80%)	10 (4.6%)
HIV negative	31(39.2%)	48 (60.8%)	79 (36.2%)
HIV status unknown	70 (54.3%)	59 (45.7%)	129 (59.2%)
Known VHD, n (%)	7 (100%)	0 (0%)	7 (3.2%)
Known IHD , n (%)	36 (53.7%)	31 (46.3%)	67(30.7%)
Known CCF, n (%)	28 (62.2%)	17 (37.8%)	45 (20.6%)
Known CKD, n (%)	11 (40.7%)	16 (59.3%)	27 (12.4%)
Smoker, n (%)	41(34.2%)	79 (65.8%)	120 (55%)
Alcohol use, n (%)	3 (6.5%)	43 (93.5%)	46 (21.1%)
Illicit drug use, n (%)	4 (20%)	16 (80%)	20 (9.2%)
Total Admissions (including readmissions)	115 (48.3%)	123 (51.7%)	238
STEMI, n (%)	13 (30.2%)	30(69.8%)	43 (18.1%)
NSTEMI/UA, n (%)	26 (45.6%)	31 (54.4%)	57 (23.9%)
Decompensated HF, n (%)	63 (57.8%)	46 (42.2%)	109 (45.8%)
Dysrhythmia, n (%)	10 (52.6%)	9 (47.4%)	19 (8%)
Pericardial effusion, n(%)	1 (25%)	3 (75%)	4 (1.7%)
Other, n (%)	2 (33.3%)	4 (66.7%)	6 (2.5%)
Mean length of stay, days (SD)	4	4	4 (±3.5)
Discharged, n (%)	80 (50.6%)	78 (49.4%)	158 (66.4%)
Demised in hospital, n (%)	14 (70%)	6 (30%)	20(9.2%)
Demised within 12 months from discharge, n (%)	16 (76.2%)	5 (23.8%)	21 (9.6%)
Referred to Cardiology, n (%)	16 (31.4%)	35 (68.6%)	51 (21.4%)

COPD = Chronic Obstructive Pulmonary Disease; HIV = Human Immunodeficiency Virus; VHD = Valvular Heart Disease; IHD = Ischaemic Heart Disease; CCF = Congestive Cardiac Failure; CKD = Chronic Kidney Disease; STEMI = ST-segment elevation Myocardial Infarct, NSTEMI = non ST-segment elevation Myocardial Infarct; UA= Unstable Angina Pectoris

Diagnosis and precipitants on admission

This study documents acute decompensated heart failure (45.8%), together with acute coronary syndromes (42%), as being responsible for 87.4% of all cardiac admissions. Of our cohort, males were significantly younger than females (mean age of 56 years vs 65 years).

Other diagnoses included dysrhythmias, pericarditis, chest pain syndrome (not due to an acute coronary syndrome) and hypertensive urgency. The most frequently reported precipitant for hospital admission was prior inadequate therapy (50 cases), discontinuing chronic medication (31 cases), uncontrolled hypertension (26 cases), disease progression (14 cases), and ongoing substance use (9 cases).

Acute decompensated Heart Failure (ADHF)

Within the Acute decompensated Heart failure (ADHF) subset, hypertension (34.9%), diabetes (22.7%) and cigarette smoking (20.2%) were the top three cardiovascular risk factors identified, echoing the risk factor profile of the total cohort. The mean length of stay for an ADHF admission was 5 days, but length of admission ranged from 1 to 24 days. 41 heart failure admissions were prevalent cases, and 68 were index cases.

Echocardiograms were performed for 35.8% (39/109) of our acute decompensated heart failure admissions. Of note, 79.5% of these echocardiograms showed a reduced ejection fraction (<50%), and 20.5% (8/39) showed a preserved ejection fraction (>50%). This data was primarily collected as part of a potential future study to be conducted by another VIMRI member, and was therefore not analysed further at the time of this particular study.

The use of chronic anti-failure therapy on admission is demonstrated in Fig 2. The most frequently used drug was a diuretic, followed by an angiotensin converting enzyme inhibitor (ACE-I) or angiotensin receptor blocker (ARB) (used by 38%), beta blocker (29%) and an aldosterone receptor antagonist (14%). More than a quarter (28%) of all heart failure admissions, were not on any medication on admission.

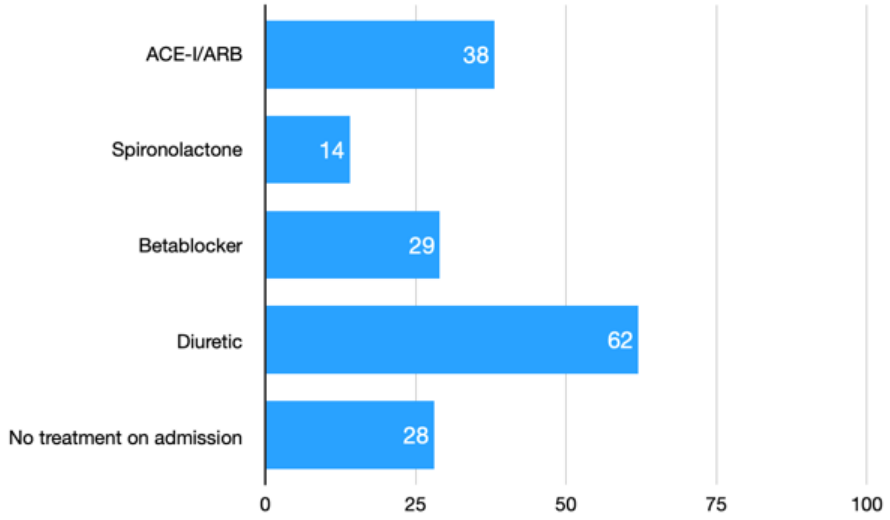

Fig 2. **Anti-heart failure treatment use on admission, illustrated as a % of all Heart Failure admissions**
ACE-I/ARB: Angiotensin Converting Enzyme Inhibitor/Angiotensin Receptor Blocker

As 41/109 (37.6%) of all heart failure admissions were prevalent cases, their medication use on admission was further analysed as shown in Figure 3 below. This was done to allow for a fair analysis, as index cases would not be expected to be on adequate anti-failure treatment on admission. These findings are further elaborated on in the discussion section.

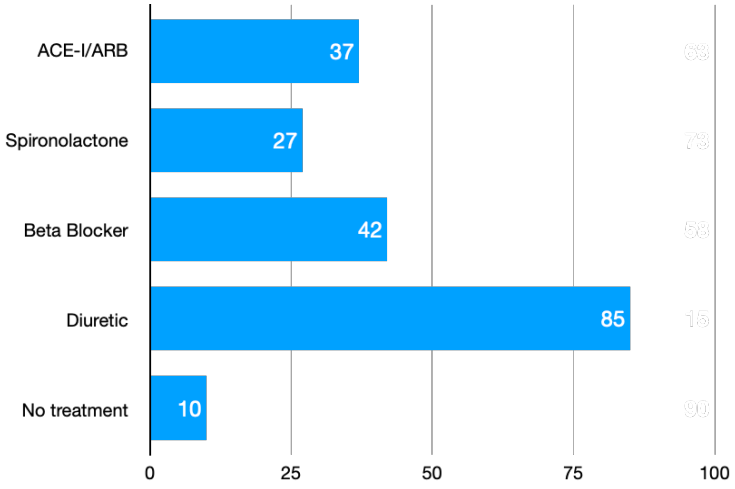

Fig 3. **Anti-heart failure treatment use on admission, illustrated as a % amongst prevalent cases.**

ACE-I/ARB: Angiotensin Converting Enzyme Inhibitor/Angiotensin Receptor Blocker

Acute Coronary Syndrome (ACS)

42% of all admissions were due to an acute coronary syndrome (ACS), of which non-ST segment elevation myocardial infarcts (NSTEMI) and unstable angina pectoris comprised 57%, and ST-segment elevation myocardial infarcts (STEMI) 43%. Of the 100 ACS patients admitted, 49 were discharged home, 42 were referred to Cardiology, 7 demised, one was referred to Medicine at Groote Schuur Hospital (GSH), and one signed a refusal of hospital treatment form (RHT).

Length of admission, outcomes, rehospitalisation, and mortality rate

The mean (SD) length of hospital stay was 4 days (±3.5), with a range of 1 to 26 days. Most of the patients (64%) had uncomplicated hospital admissions and were discharged home. Fifty-five patients were transferred to GSH for tertiary level care. Fifty one (21.4% of total admissions) were referred to Cardiology, and four patients were referred to the Groote Schuur Hospital (GSH) Internal Medicine team. Two patients signed a refusal of hospital treatment (RHT) form, one was given a weekend pass-out and demised at home, and one patient was referred to a Tuberculosis hospital.

The in-hospital mortality rate was 9.2% (20/218 patients). Data at 1 year post discharge were found for 131 patients (66.2% of surviving cohort). One hundred and ten patients were confirmed alive one year post admission (50.5% of total cohort). There were a further 21 patients who demised within one year from admission. Therefore, 18.8% of our cohort had demised within one year from their admission date.

Nineteen patients (8.7%) were readmitted within the three-month study period, one of which was readmitted twice. 61 patients were readmitted to a medical ward within 6 months from their initial discharge, making the six month re-admission rate 30.8% (61/198).

Discussion

This study documents acute decompensated heart failure, together with acute coronary syndromes, as being responsible for 87.4% of all cardiac admissions to a district hospital in Cape Town. Chronic management of co-morbidities (especially diabetes) was suboptimal, with an underuse of optimal anti-failure treatment within our ADHF admissions. Our cohort identified hypertension, smoking and diabetes as the leading risk factors. Furthermore, the well-documented link between obesity and cardiovascular risk (18), was reiterated, with the mean BMI of our diabetic cohort being classified as obese(17). The mean age of patients with Heart failure was 61.8 years, which is older when compared to observations from other registries in SSA (6,19–21). Since much of the available data from reference registries comes from predominantly black African communities, with race impacting the aetiology and age of onset of cardiac disease, it would have been helpful to have collected data on the race of our patient population, in order to determine whether this could be a contributing factor towards the difference in age profile. Readmission and mortality rates were also notable.

The mean length of stay of 4 days was shorter than similar published studies reporting length of stays ranging from 4 to 13 days (22–27). This may be explained by bed pressure resulting in premature hospital discharges, or because more complicated patients requiring lengthier admissions generally get referred to a tertiary level of care. During the 3-month period, 51 patients were referred to the Cardiology High Care Unit at Groote Schuur Hospital (GSH). This translates to a cardiac referral to GSH every second day. Comparative data regarding cardiac referrals from other district and regional hospitals to GSH was not found. The inpatient mortality rate of 9.2% is slightly higher than the mean inpatient mortality rate of 8% from a systematic review of heart failure in low-and middle-income countries published in 2014 (28) but lower when compared to other similar studies (25,26). Most available mortality data were from studies looking only at heart failure, as opposed to cardiac admissions as a group, making comparisons difficult (28).

The use of chronic heart failure therapy on admission was sub-optimal (Figure 2) with 28% of all patients admitted with heart failure, not on any medication. Even though the pandemic had an impact on management, it's worthwhile noting that Szymanski et al (27) previously demonstrated an even lower rate of beta blocker use (26.7%) between 2012 to 2014, when outpatient services were not being impacted by a global pandemic. The most frequently used drug on admission was a diuretic (62%), the first line agent used in cases of acute decompensation to assist with symptom control by alleviating fluid overload and lowering blood pressure. Diuretics however have not been found to reduce mortality (24). When comparing the medication use on admission of all HF cases to prevalent HF cases medication use (Fig 2 and 3), there was a slight increase in use of beta blockers (29% vs 42%), spironolactone (14% vs 27%) and diuretics (62% vs 85%) in the prevalent group, which is to be expected. ACE-I/ARB usage was similar in both groups (38% vs 37%). This could be explained by the use of this class of drugs as a commonly prescribed anti-hypertensive, as well as being essential in the management of heart failure. The overall use of optimal anti-failure treatment in those patients known with pre-existing heart failure prior to admission, is still concerningly low. This requires further research to establish whether this problem is predominantly due to inadequate medical optimization and prescription, difficulty accessing medication, or patient related factors such as intolerance to certain drugs or poor adherence.

Diabetic control was poor, with 71.6% of our diabetic cohort not meeting the glycaemic control target of an HbA1c $\leq$7%, as outlined by the SEMDSA (Society for Endocrinology, Metabolism and Diabetes of South Africa) guidelines (29). HbA1c level has been identified as an independent risk factor for developing cardiovascular disease, with the mortality risk directly proportional to the HbA1c value (30). The poor glycaemic control of our cohort is likely multifactorial (inadequate treatment prescribed, poor diet, poor adherence, limited education, poor understanding, and socioeconomic difficulties), and requires further research to identify specific factors influencing poor adherence within this community.

A previous study documented clinical characteristics of heart failure patients at a tertiary facility, Groote Schuur Hospital, in Cape Town (27)), demonstrate the value of area-specific studies. These findings as regards the top cardiovascular risk factors are consistent with other findings (6,19–21), thus emphasising the important contribution of these modifiable cardiovascular risk factors towards cardiac disease(27).

Admission was predominantly precipitated by suboptimal medical treatment, either by means of prior inadequate therapy, discontinuation of chronic medication or uncontrolled hypertension. This demonstrates a need for primary care level interventions focused on optimization of chronic therapy and improvement of adherence to treatment. Adherence is a multifactorial issue, influenced by health education, patient understanding, socioeconomic and psychosocial difficulties, concomitant substance abuse, food insecurity and patient beliefs surrounding disease and its treatment (31). At one year from initial admission, we could only find data for 131 of our patients by means of searching electronic records and/or blood results. Though there are various potential reasons why there is such a lack of data, any suggestions would merely be hypothesising, and a further substudy may be of more use to identify the reasons. One also needs to acknowledge the impact the Covid-19 pandemic had on primary level follow up at the time of our study. Not only were these services drastically downscaled, but the fear within the community of contracting and spreading the virus significantly impacted on health seeking behaviour, as described in a qualitative study conducted in 2021 (32).

Our main hypothesis for a cardiac patient (that was once ill enough to require hospitalization) not requiring any further health care or follow up for a 29-month period since initial admission (1 December 2020 to 30 April 2023), is most likely due to demise outside of the hospital setting. We would have liked to search death registries to confirm the true one-year mortality rate of our cohort, but unfortunately did not have access to the applicable records. Further investigation of our hypothesis that the mortality rate of our cohort at one year could be as high as 49.5% (108/218), would be extremely valuable. This would have important implications on how patients and families are counselled on prognosis, and serve as motivation for healthcare workers to pursue improved outcomes for their cardiac patients.

This study was the first of its kind and provides valuable insights about the community of cardiac patients served by VHW, however, it has certain limitations. Our sample size was small, and intentionally district specific, therefore data cannot be generalized to the South African population as a whole. We did not include the race of our patients, which may have added epidemiological strength to our study. Collecting data from medical records has inherent challenges when compared with directly gathering information by means of a questionnaire at the bedside. Data on blood pressure readings on admission would have been valuable in determining hypertensive control but was unfortunately omitted from the data collection form. Furthermore, one cannot ignore the time frame that our study took place, and one needs to consider the impact Covid-19 had on service provision in general (for all non-Covid related illnesses), access to healthcare, as well as the effects the infection itself had on the cardiovascular system (33).

Conclusion

Our study provides important insight into the clinico-epidemiological profile of cardiac admissions at a public district level hospital in SA, highlighting notable morbidity, readmission, and mortality. The high prevalence of well-known cardiovascular risk factors of hypertension, diabetes mellitus and cigarette smoking coupled with poor adherence, suboptimal anti-failure therapy and poor glycaemic control contributed to hospitalization and provides justification for improved basic cardiovascular disease management with particular focus on adherence to treatment, and optimization of heart failure therapy at primary care level. This is especially important given the negative impact not only the financial wellbeing of families of affected breadwinners, but also on the economy of SA as a whole due to associated time off work during illness, and potential long-term morbidity.

Author contributions:

Lillian Engelbrecht drafted the manuscript, managed the data collection, data entry and data analysis. Dr Nasief van der Schyff and Prof Mark Engel supervised the study and contributed to the study design and final manuscript.

Conflicts of interest: none.

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Addendum A: Data Collection sheet

OPERATIONAL DATABASE

Patient sticker:					
Date of admission:				**Date of discharge:**	
New Admission		**Readmission**	**<12/12**	**Reason**	
			<6/12		
			<3/12		
CO-MORBIDITIES:					
Hpt		Dyslipidaemia		Hx of VHD	
DM		Smoking Hx		Hx of CKD	
COPD		Illicit Drug Use		Hx IHD	
Asthma		Ethanol		Hx CCF	
Height		Weight		Waist circumferenct	
HIV positive		HIV negative		HIV unknown	
CD4 count					
				HbA1c <6.5	
ARV Naive				HbA1c 6.6 - 10	
ARV defaulter				HbA1c >10.1	
ARV 1st line				HbA1c value	
ARV 2nd line					
CURRENT ADMISSION DIAGNOSIS:					
STEMI		NSTEMI		Unstable angina	
Acute Decomp HF		Heart Block		Cor Pulomanale	
Atrial Fibrillation		Atrial Flutter		Other SVT	
VT		Pericardial effusion			
PRECIPITANT:					
Uncontrolled/ Malignant Hypertension				Sepsis	
Defaulted Medication				Arrhythmias	
Prior Inadequate Therapy				Anaemia	
Pulmonary embolism				Thyrotoxicosis	
Pregnancy/ post partum				Electrolyte abnormalities	
				Other	
COMPLICATIONS:					
Cardiogenic shock		Stroke		Renal failure	
GIT Bleed		Death		Other	
ECG:					
SR		AF		AFL	
Other SVT		VT		STE	
STD		AV Block		Other	
Trop I	Positive	**Trop T**	<40	**Delta Trop**	<25%
	Negative		40-100		>25%
	Not done		>100		Not done
			Not done		
ECHO:					
EF ≥ 50%		EF 40-49%			
EF 30-39%		EF ≤ 29%			
RWMA	YES		NO		
Pericardial effusion	YES		NO		
Valvular disease:					
MS		AS		TR	
MR		AR		Other	
OUTCOME:					
Discharged		Demised			
Referred GSH cardiology		Referred Other			
Referred GSH Medicine		RHT			
MEDICATION ON ADMISSION:					
ACE inhibitor		ARB		Beta Blocker	
Calsium channel blocker		Furosemide		Hydrochlorothiazide	
Spironolactone		Aspirin		Warfarin	
Clopidogrel		Statin		Metformin	
Sylphonyl urea		Insulin		PPI	
Nitrates					

Addendum B: List of included cardiac conditions

Diseases affecting the Pericardium
- Pericarditis
- Pericardial effusion

Diseases affecting the Electrical Circuit
- Atrial fibrillation
- Atrial flutter
- Other Supraventricular Tachycardia
- Ventricular Tachycardia
- Heart Block

Diseases affecting the Coronary Arteries
- Unstable Angina Pectoris
- Non-ST segment elevation myocardial infarct
- ST-segment elevation myocardial infarct

Diseases affecting the Myocardium
- Myocarditis
- Myopathy
- Heart Failure of any cause

Diseases affecting the cardiac valves
- Congential
- Rheumatic Heart Disease
- Infective Endocarditis
- Degenerative valve disease

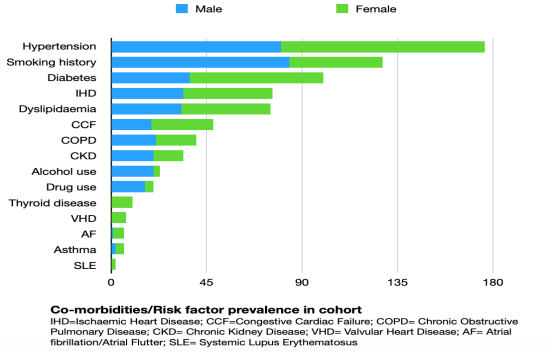
Addendum C: Poster Presentation accepted at the 77th Brazilian Congress of Cardiology October 2022

Clinico-epidemiological profile of cardiac admissions at a district level hospital in South Africa: a cohort study

Engelbrecht, LL; van der Schyff, N; Engel, ME
University of Cape Town, South Africa

Introduction:

Sub-Saharan Africa (SSA) is experiencing a change in its pattern of disease prevalence, and it's been projected that non-communicable diseases (NCD) will overtake infectious diseases by 2030. Knowledge of the NCD profile is essential to guide practice and inform policy. Despite more than 80% of deaths from NCDs worldwide occurring in low-to-middle-income countries (LMICs), the majority of documented research is from first world countries. Given SSA'sown rich genetic, geographic, social and cultural diversity, there is a need for more locally relevant epidemiological studies.



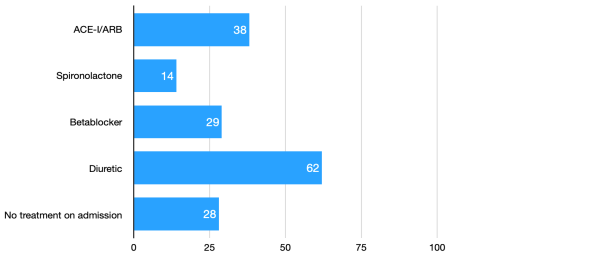
Co-morbidities/Risk factor prevalence in cohort
IHD=Ischaemic Heart Disease; CCF=Congestive Cardiac Failure; COPD= Chronic Obstructive Pulmonary Disease; CKD= Chronic Kidney Disease; VHD= Valvular Heart Disease; AF= Atrial fibrillation/Atrial Flutter; SLE= Systemic Lupus Erythematosus

Objectives:

We sought to document the clinical and epidemiological characteristics of patients admitted with cardiac disease at a district-level, 71 medical bed, hospital.

Methods:

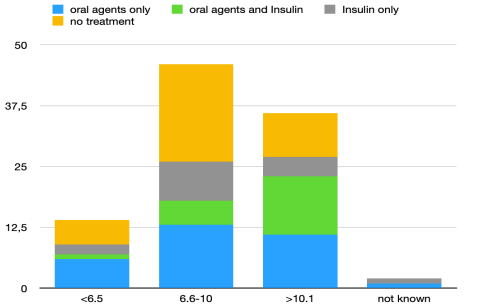
We conducted a retrospective review of all patients admitted with a primary cardiac diagnosis between 1 September 2020 to 30 November 2020. Data were transcribed onto a bespoke data collection form and captured into the VIMRI (Victoria Internal Medicine Research Initiative) Registry.
UCT HREC approval: 048/2022



Anti-heart failure treatment use on admission, illustrated as a % of all Heart Failure admissions
ACE-I/ARB: Angiotensin Converting Enzyme Inhibitor/Angiotensin Receptor Blocker

Results:

We collected data from 238 cardiac admissions. The mean age of our cohort was 60 years (SD ±14.79), with an age range between 22 to 95 years. The length of stay ranged from <24 hours to 26 days, with a median length of 3 days. The top 3 cardiovascular risk factors were hypertension (76%), smoking (55%), and diabetes (42.7%) . More than a third (36.2%) of diabetic patients had a glycated haemoglobin (HbA1c) > 10.1%. The majority of admissions were due to acute decompensated heart failure (45.8%) and acute coronary syndromes (40.1%). Admissions were most often precipitated by prior inadequate therapy (29%), defaulting medication (17.8%) or uncontrolled hypertension (14.8%). More than a quarter (28%) of heart failure admissions were not on any chronic therapy prior to admission. There was a 6.7% readmission rate noted during the three month period, and the inpatient mortality rate was 7.8%.



Diabetic control by HbA1c value and diabetic therapy used in cohort on admission
HbA1c: Glycated Haemoglobin

Discussion/Conclusion:

Cardiovascular disease (CVD) affects a wide range of ages, with a significant inpatient mortality rate. Diabetic control and anti-heart failure therapy was suboptimal amongst our patients.

Implications of this research:

Our study found that poor control of the most common cardiovascular risk factors (namely hypertension and diabetes) was associated with CVD requiring hospitalization. Our study reiterated the strong link between CVD and hypertension, smoking and diabetes. Thus, the importance of targeted interventions for hypertension, smoking and diabetes, particularly at the primary health care level, is emphasized in order to reduce morbidity and mortality.

Addendum D: HREC letter

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room 45 E-52-E-Floor- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-enquiries@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

31 January 2022

HREC REF: 048/2022

Dr N van der Schyff
Department of Medicine
Victoria Hospital, Wynberg
Email: Naslef.vanderschyff@uct.ac.za
Student: lillylize@gmail.com

Dear Dr van der Schyff

PROJECT TITLE : CLINICO-EPIDEMIOLOGICAL PROFILE OF CARDIAC ADMISSIONS AT A DISTRICT LEVEL HOSPITAL IN SOUTH AFRICA: A COHORT STUDY (MMED DEGREE - DR LILLIAN ENGELBRECHT)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

This approval is subject to strict adherence to the HREC recommendations regarding research involving human participants during COVID -19, dated 17 March 2020: 06 July 2020 & 01 July 2021.

Approval is granted for one year until the 28 February 2023.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Dr Lillian Engelbrecht will also be involved in this study.

Please quote the HREC REF 048/2022 in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637. Institutional Review Board (IRB) number: IRB00001938 NHREC-registration number: REC-210208-007
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2020), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938) **This serves as notification of annual approval, including any documentation described below.**			
☑ Approved	Annual progress report	Approved until/next renewal date	28/02/2024
☐ Not approved	See attached comments		
Signature Chairperson of the HREC/ Designee		Date Signed	2/2/2023

Note: Please email this form and supporting documents (if applicable) in a combined pdf file to hrec-enquiries@uct.ac.za.
Please clarify your plan for research-related activities during COVID-19 lockdown.
Please use the latest form found on our website:
http://www.health.uct.ac.za/fhs/research/humanethics/forms

HUMAN RESEARCH ETHICS COMMITTEE
20 FEB 2023
HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

Comments to PI from the HREC

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	8 February 2023		
HREC REF Number	048/2022	Current Ethics Approval was granted until	28/2/2023
Protocol title	Clinico-epidemiological profile of cardiac admissions at a district level hospital in South Africa: a cohort study		
Protocol number (if applicable)			
Are there any sub-studies linked to this study?	☐ Yes	☑ No	
If yes, could you please provide the HREC Reference number for all sub-studies? **Note:** A separate FHS016 must be submitted for each sub-study.			
Principal Investigator	Dr Nasief van der Schyff		

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

Addendum E: Cardiovascular Journal of Africa (CVJA) Instructions to Authors

ARTICLE SUBMISSION

All categories of manuscripts for the Cardiovascular Journal of Africa must be submitted on-line to OJS. You will be assigned your own password and user name. This will allow complete interaction between the editor and authors. Internally, reviewers will be approached to review material in their field of expertise and assigned with similar interaction. All information will be entirely protected and confidential.

All submissions should be written in a clear and succinct manner, following the style of the Journal. Title page should include a descriptive title; authors' surname and forename, address of each author and full address, telephone, fax and e-mail contacts for the corresponding author. In text: tables and figures are either inserted as part of sentence, for example Table 1, or in parentheses, for example (Fig. 1). Each table should carry a descriptive heading.

OJS will clearly indicate which aspects of the submission must be supplied off-line (**download off-line document**). This must be provided to the Journal by mail (PO Box 1013, Durbanville, South Africa, 7551) or e-mail to **info@clinicscardive.com**

All images MUST be at or above intended display size, with the following image resolutions: Line Art 800 dpi, Combination (Line Art + Halftone) 600 dpi, Halftone 300 dpi Image files also must be cropped as close to the actual image as possible.

Preferred Image Format

Image Format	.tif
Image Width	Greater than or equal to intended display size
Colorspace	RGB
DPI	500+
Alpha Channels	None
Layers	Flattened

Alternative Image Format

Image Format	.jpg
Image Width	Greater than or equal to intended display size
Colorspace	RGB
DPI	500+
Compression Quality	Maximum

References numbered in the order of appearance in the text, according to Vancouver style. For articles: Author AB, Author C, Author M. The title of the article. Abbreviated journal title 1999; 14: 172–183. For book chapters: Author AB, Author CD. The title of the chapter. In: Editor A, Editor BC, ed. Title of the book, 2nd edn. Location: Publisher, 1999: 133 –139. DOI Numbers / PMID (Pubmed ID / PMC ID) must be added to all references to facilitate tagging for PubMed Central.

Original articles: Title page as above. Abstract (150 words) a short inclusive statement suitable for direct electronic abstracting, identifying the purpose of the study, key methods, the main results and the main conclusion. Keywords: maximum of six keywords for indexing. Introduction: concise description of background, sufficient for the non-specialist to appreciate the context of the work. Clear statement of the purpose of the study. Methods: a brief description of study design, procedures, analytical techniques and statistical evaluation. Results: a clear account of the study findings using quantitative language where possible and cross-referenced to tables and figures. Discussion: an interpretation of the study placed within the context of current knowledge, leading to specific conclusions where possible. Acknowledgements. References, figures and tables as above.

Reviews

Title page as above. Abstract (150 words) setting out the scope, key messages and conclusions of the review. Body of text liberally partitioned with headings and subheadings leading to a synopsis with conclusions at the end. Key messages in a separate box itemising two to five short principal statements. Acknowledgements, references, tables and figures as above.

Other articles should adopt a concise style consistent with similar articles previously published in the journal. Manuscripts should include a title page, and appropriate subheadings for text. Style of tables, figures and references as above.

Figures be sent to us in a high resolution JPEG format, but they MUST be sent separately from the Word

document. If not in high resolution JPEG, then PowerPoint will do.

OJS will clearly indicate which aspects of the submission must be supplied off-line (**download off-line document**). This must be provided to the Journal by mail (PO Box 1013, Durbanville, South Africa, 7551) or e-mail to **info@clinicscardive.com**

The status of progression of the peer-review system will be directly accessible by authors. The OJS system is particularly useful to authors and reviewers as there is a direct link to PubMed for viewing all related articles on the subject matter.

Submitted manuscripts must be supplied with a covering letter with any additional information that may be helpful to the editor, such as the type or format of article that the manuscript represents. If the manuscript has been submitted previously to another journal, it is helpful to include the previous editor's and reviewers' comments with the submitted manuscript, along with the authors' responses to those comments. Copies of any permission to reproduce published material, to use illustrations or report information about identifiable people, or to name people for their contributions must accompany the manuscript.

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Material submitted for publication in the Cardiovascular Journal of Africa is accepted on condition that it has not been published elsewhere. The management reserves the copyright of the articles published. Aspects of cardiovascular medicine related to Sub-Saharan Africa will be encouraged.
Authors submitting papers to CVJA should also register as a reviewer as a quid pro quo for authors for reviewers reviewing your submission. If authors do not register as reviewers it may be taken in consideration when deciding on acceptance and rejection, and the time of publication. We do try not to call on a reviewer more that once a year but in rare circumstances it may be twice.

ONLINE FIRST ARTICLES

Addendum F: List of abbreviations (In order of appearance)

SA - South Africa
VIMRI - Victoria Internal Medicine Research Initiative
UCT HREC - University of Cape Town Human Resources Ethics Committee
SD - Standard deviation
SSA - Sub-Saharan Africa
NCD - Non-communicable Disease
VHW - Victoria Hospital Wynberg
HIV - Human Immunodeficiency Virus
BMI - Body Mass Index
HBA1c - Haemoglobin A1c
COPD - Chronic Obstructive Pulmonary Disease
VHD - Valvular Heart Disease
IHD - Ischaemic Heart Disease
CCF - Congestive Cardiac Failure
CKD - Chronic Kidney Disease
CVJA - Cardiovascular Journal of Africa
STEMI - ST-elevation Myocardial Infarct
NSTEMI - non-ST-elevation Myocardial Infarct
ADHF - Acute Decompensated Heart Failure
ACE-I - Angiotensin-converting Enzyme Inhibitor
ARB - Angiotensin II Receptor Blocker
ACS - Acute Coronary Syndrome
GSH - Groote Schuur Hospital
RHT - Refusal of Hospital Treatment
SEMDSA - Society for Endocrinology, Metabolism and Diabetes of South Africa