## ABSTRACTS SA HEART® CONGRESS 2024

### Changes in low-density lipoprotein profile is associated with cardiac abnormalities in tumour-bearing mice

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**Background:** The mechanisms associated with cancer-induced cardiac alterations are poorly understood. In this regard, dyslipidaemia is often observed in breast cancer patients and associated with a poorer prognosis. However, low-density lipoprotein (LDL) particles subclass distribution and its possible association with cardiac outcome in cancer patients is unknown.

**Objectives:** To investigate an association between changes in LDL particles subclass distribution and cardiac dysfunction in tumour-bearing mice.

**Method:** E0771 (breast cancer) cells were injected subcutaneously in the mammary fat pad of female C57/Bl6 mice (6 - 8 weeks old). Tumours became palpable 9 days after inoculation, and 5 weeks later, mice were euthanised. The control (C, n=17) and tumour (T, n=20) groups were considered. Cardiac function was assessed by echocardiography at baseline (B) and at endpoint (E). LDL particles subclass distribution was determined in serum using the Lipoprint<sup>®</sup> system. Platelet-activating factor-acetylhydrolase (PAF-AH) activity, an LDL-associated enzyme with anti-inflammatory and anti-thrombotic functionalities, was measured with an enzymatic assay.

**Results:** Tumour-bearing mice had reduced left ventricular anterior wall (LVAW) thickness [diastole:  $0.81 \pm 0.03$ mm (B) vs.  $0.63 \pm 0.05$ mm (E) and systole:  $1.18 \pm 0.05$ mm (B) vs.  $0.87 \pm 0.06$ mm (E); p < 0.05.

**Conclusion:** In mice, breast cancer induced cardiac abnormalities by reducing left ventricular wall thickness. The shift in the LDL subclass distribution towards large correlated with cardiac abnormalities and a change in LDL-associated enzyme activities. Our data suggest a role for the measurement of LDL particles subclasses as a potential biomarker to assess the risk of cardiovascular disease (CVD) in cancer patients. Further work will be undertaken to assess the possible role of LDL particles in the increased risk of CVD in cancer patients.

### Analysis and impact of non-cardiac comorbidities on in-hospital outcomes of adult patients with heart failure with reduced, mildly reduced, and preserved ejection fraction: A case-control study

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**Background:** Non-cardiac comorbidities are common among patients with heart failure (HF) and may affect the outcomes. However, among hospitalised patients with HF, the prevalence of non-cardiac comorbidities based on HF phenotypes and their impact on in-hospital outcomes remains unknown.

**Objectives:** To determine the prevalence of non-cardiac comorbidities in patients with HF with reduced, mildly reduced, and preserved ejection fractions (HFrEF, HFmrEF, and HFpEF) and to elucidate the impact of these comorbidities on in-hospital outcomes.

**Method:** This multicentre, prospective, case-control study recruited adult patients with HF admitted between 21 February 2023 - 30 November 2023 in Johannesburg, South Africa. Information on 10 non-cardiac comorbidities (chronic kidney disease, obesity, diabetes mellitus, anaemia, retroviral infection, chronic obstructive pulmonary disease, dyslipidaemia, thyroid disorders, systemic lupus erythematosus, and cancer) in addition to baseline clinical characteristics and outcomes was collected. Participants were categorised based on their left ventricular ejection fraction and number of non-cardiac comorbidities as 0, 1, 2, and  $\geq$ 3. Univariate logistic and multivariate regression analyses were performed with in-hospital mortality as the dependent variable and clinical, electrocardiographic, and echocardiographic parameters as independent variables.

**Results:** There were 406 patients and 50 controls (mean age,  $55.7 \pm 15.8$  years vs.  $39.26 \pm 11.40$  years (p<0.001) respectively. Sixty one patients had HFrEF, HFmrEF 15%, and HFpEF occurred in 21% of the patients. All 10 non-cardiac comorbidities were more prevalent in patients with HF. Non-cardiac comorbidities included chronic kidney disease (46%), obesity (45%), diabetes mellitus (40%), anaemia (33%), retroviral infection (21%), chronic obstructive pulmonary disease (19.1%), dyslipidaemia (11%), thyroid disorders (10.1%), systemic lupus erythematosus (4.5%), and cancer (4.4%). Anaemia, obesity, and CKD were more prevalent in patients with HFpEF than in those with other HF subtypes. In-hospital mortality occurred in 3.5 % [95% confidence interval (CI): 2.0%-5.7%] and differed significantly among the LVEF phenotypes (p<0.001). Patients with  $\ge 2$  non-cardiac comorbidities had worse in-hospital outcomes.

**Conclusion:** Non-cardiac comorbid conditions are prevalent in patients with HF, differ according to the HF phenotype, and are associated with poor in-hospital outcomes. Future research should focus on identifying effective strategies to manage these comorbidities and improve patient outcomes.

#### A landscape analysis of paediatric and congenital heart disease services in Africa

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Background: There is geographic disparity in the provision of Paediatric and Congenital Heart Disease (PCHD) services. Combined, North America and Western Europe account for 74% of the world's cardiothoracic surgical capacity. In contrast, Africa accounts for only 1% of total global capacity. However, PCHD training and service provision in Africa has increased. As such, we conducted a cross-sectional electronic survey to evaluate PCHD services in Africa.

Method: Respondents were selected by purposive sampling and included paediatric and adult cardiologists and cardiothoracic surgeons, paediatricians, and medical officers, involved in PCHD care. The survey included respondent, institution and national-level gueries related to human and infrastructure resources for paediatric cardiology, cardiac catheterisation, and cardiothoracic surgery. Institutions were ranked according to a composite score based on recommendations for low- and middle-income PCHD services.

Results: There were 124 respondents from 96 institutions in 45 African countries. Aggregated country data showed that 34 (78%) countries had some form of cardiac service, of these 18 (40%) provided a full PCHD service including interventional paediatric cardiology and paediatric cardiac surgery, 9 (20%) provided paediatric cardiac surgery services but no interventional paediatric cardiology service and 1 provided an interventional paediatric cardiology service but no cardiac surgery. Ten countries (22%) had no PCHD service. There were 0.04 (IQR: 0.00 - 0.13) paediatric cardiothoracic surgeons per million population and 0.18 (IQR: 0.03 - 0.35) paediatric cardiologists per million population. Thirteen (29%) countries report having both paediatric cardiology and cardiothoracic surgery Fellowship training programmes.

Conclusion: Only 18 (40%) of surveyed countries were able to provide a full PCHD service including cardiac surgery and interventional catheterisation, demonstrating inadequate care for African children with heart disease. Additionally, the number of paediatric cardiologists and cardiothoracic surgeons is below international population-based recommendations. Only Libya and Mauritius have the recommended 2 paediatric cardiologists per million population, and no country has the recommended 1.25 cardiothoracic surgeons per million population. No institution met all criteria for a level 5, national-level PCHD referral centre and only 8/87 (9.2%) met all criteria for a level 4 or regional PCHD referral centre. Furthermore, there is a significant shortage of fellowship training programmes which must be addressed if PCHD capacity is to be increased.

#### Long-term outcomes of patients with dextro-transposition of the great arteries after balloon atrioseptostomy at the Uganda Heart Institute: A 10-year review

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Background: Dextro-transposition of the great arteries (d-TGA) is one of the critical congenital heart defects (CHD) requiring early intervention in life to avert death. Performing Raskind balloon atrioseptostomy (BAS) is standard practice in critically-ill neonates with d-TGA having restrictive interatrial communication. This ensures adequate mixing and improves oxygen saturations before definitive surgery, which may be in the form of arterial or atrial switch procedure, depending on the status of left ventricular conditioning.

Objectives: To describe long-term outcomes of patients with d-TGA after BAS at the Uganda Heart Institute (UHI).

Method: This was a retrospective chart review of all patients with d-TGA who underwent BAS procedure at the UHI from January 2014 - June 2024. Results: A total of 30 cases with d-TGA underwent BAS at UHI during the study period. The median follow-up period was 5 years (range: 3 months - 9 years). Males comprised 73.3% of cases (n=22). The majority of cases had intact ventricular septum (n=21, 70%). The mean weight at the time of BAS was 3.35kg (range: 2.6 - 4.5). The median age at BAS was 3.5 weeks (range: 12 hours - 10 weeks). All BAS procedures were successful. Complications during the BAS procedure occurred in 2 cases (6.7%): One case had several episodes of supraventricular tachycardia that resolved with treatment and the other had persistent bradycardia and demised 12 hours after the procedure from aspiration. The rest of the cases (n=29, 96.7%) were discharged alive after the BAS. In the long term 6 cases (20%) were lost to follow-up and 10 (33.3%) remain alive and unoperated. The remaining 13 cases (43.3%) underwent definitive surgery (arterial switch procedure, n=5; atrial switch procedure=8). All surgeries were performed abroad except 1 arterial switch procedure done at the UHI during a visiting team mission with the child succumbing due to post-operative bleeding. The rest of the operated children are all alive, none has undergone re-intervention. One patient who had atrial switch procedure has significant systemic venous baffle obstruction.

**Conclusion:** Immediate outcomes following BAS for cases with TGA at the UHI are excellent. However, access to definitive surgical repair remains limited due to lack of local capacity.

#### A 4-year review of infective endocarditis in Namibia

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**Background:** Infective endocarditis (IE) remains a major public health concern. Contemporary data is needed to understand the epidemiology and outcomes of IE in low-resource settings.

Objectives: To describe the clinical characteristics and outcomes of patients with IE in Namibia.

Method: Prospective observational study of patients presenting to Windhoek Central Hospital with definite or possible IE from August 2021 - February 2024.

**Results:** Thirty seven patients were enrolled, median age 36 years and 70% lived more than 700km from a centre capable of performing cardiac imaging and surgery. Most frequent clinical manifestations of IE were arthritis (83.8%), heart failure (75.7%), clubbing (75.7%), fever (63.9%), and neurological sequelae (43.2%). Risk factors were rheumatic heart disease (n=22, 8 had previous valve surgery), congenital heart disease (n=9, no previous surgery), previous IE (n=2, 1 had a previous valve replacement), recent history of hospitalisation (n=3) and recent dental procedures without prophylactic antibiotics (n=2). No patient had a history of illicit intravenous drug use. IE was predominantly left sided. The only 3 patients with right sided IE had left heart involvement. Prosthetic valve endocarditis accounted for 24.3% (n=11) and occurred late. All transthoracic echocardiograms revealed vegetations (100%) causing regurgitant lesions in 89.2%, stenosis in 27%, perforations in 18.9%, root abscesses in 8% and fistulae in 2.7%. The causative organism was identified in only 11 patients (29.7%): Streptococcus species (n=4), enterococcus faecalis (n=4), staphylococcal species, Coxiella burnetti, and Bartonella henslae (each n=1). Each patient received appropriate duration of intravenous antibiotics. All patients had indication for IE surgery, only 23 were operated. Eight patients died (21%). Six were too high risk by for surgery. These patients had presented late with severe disease and died during index hospitalisation.

**Conclusion:** IE remains a life-threatening disease. This cohort highlights the challenge of late, severe presentation of IE and the urgent need to improve assessment and access to definitive diagnostics and treatments for IE in Namibia.

### A battle of the sexes: Differences in cardiac pathophysiology between male and female obese (ob/ob) mice

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**Background:** Obesity is a global concern and a major risk factor for cardio-metabolic disease development. On a cellular level, obesity is associated with oxidative and endoplasmic reticulum (ER) stress, leading to cardiomyocyte dysfunction and death. Laboratory rodents are commonly used to model human diseases to understand these underlying molecular mechanisms of disease progression to inform novel treatment strategies. Previous studies emphasised the basic biological differences between males and females, yet the majority of metabolic animal studies include only male rodents. This underrepresentation of female rodents results in a sex bias that could have major implications for human health.

**Objectives:** This study aimed to investigate the sex-specific cardiac pathophysiological differences, especially pertaining to oxidative and ER stress, using the popular ob/ob (obese) mouse model of cardio-metabolic dysfunction.

**Method:** Male and female ob/ob mice were compared to their age- and sex-matched C57BL/6 healthy controls (n=9-10/group). Weekly body weight and fasting blood glucose (FBG) measurements were obtained from 10 - 16 weeks of age. Following euthanasia (16 weeks), plasma samples were collected for brain natriuretic peptide (BNP) measurements (ELISA). Hearts were weighed and prepared for protein quantification (western blot) and lipid peroxidation measurements (TBARS).

**Results:** In both sexes, ob/ob mice had greater body weights (p<0.001) and FBG levels (p<0.001). Female ob/ob mice displayed increased heart weights (p<0.001) and plasma BNP levels (p=0.0588), which was not observed in the males. Cardiac lipid peroxidation remained unchanged in both sexes; however cardiac superoxide dismutase I (SODI) antioxidant levels were decreased (p<0.01) in the ob/ob males and unchanged in the ob/ob

females. Lastly, cardiac C/EBP Homologous Protein (CHOP) levels (ER stress-mediated apoptosis) were increased (p<0.05) in the ob/ob females, but unchanged in the males.

Conclusion: Although ob/ob males and females displayed overt obesity and hyperglycaemia, only the ob/ob females showed evidence of cardiovascular disease at 16 weeks. Furthermore, molecular differences on the level of oxidative and ER stress between males and females were noted. These sexspecific differences in cardiac pathophysiology observed in this study supports the inclusion of both males and females in animal studies of obesity and cardio-metabolic disease.

#### A novel 3D-cardiovascular model for rapid, high-throughput drug-screening applications

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Background: Three-dimensional (3D) in vitro cell culture models hold great promise for cardiotoxicity screening, because of increased intercellular communication, gap junctions between cells, and extracellular matrix (ECM) that lacks in traditional monolayer cells.

Objectives: The objective of this study was to utilise a 3D cardiomyoblast spheroid model to study drug uptake, cellular signalling and mitochondrial dynamics in hyperlipidemic-induced insulin resistance spheroids treated with and without metformin.

Method: Rat cardiomyoblast cells were cultured under standard conditions and seeded at 4 × 105 cells / spheroid in ultra-low adherence plates with either control media (CM; 25mM DMEM, 10% FBS, 1% pen / strep) or IR media (IRM; 0.05mM palmitic acid, 0.025mM oleic acid, 100nM insulin, and CM) for 72 hours and treated with and without metformin for an additional 24 hours. The spheroids were harvested for mRNA expression levels (G6PD, PFK2, Cpt1) with guantitative PCR, and protein and phosphorylation level determination for metabolism (Akt, mTOR, PGC1-alpha) and mitochondrial dynamics (MFN2, Opa1, Drp1, LC3I/II) with western blotting. Surface and cellular ultrastructure were imaged with scanning and transmission electron microscopy (SEM and STEM), and drug uptake was determined with liquid chromatography-mass spectrometry (LC-MS).

Results: Metabolic manipulation decreased spheroid size, impacted surface morphology, and increased mitochondrial biogenesis and fragmentation. It also decreased phospho-Akt and phospho-mTOR compared to control spheroids, supporting an IR-phenotype. Metformin uptake was confirmed with LC-MS. Metabolic activity significantly increased in response to IRM but did not change in response to metformin, although increasing metformin concentration significantly decreased mitochondrial superoxide production.

Conclusion: This study established a rapid, high-throughput cardiomyoblast spheroid model that responds to metabolic and drug treatments, and resulted in measurable changes in metabolism, mitochondrial dynamics, and viability. Therefore, this model provides a viable and improved alternative to traditional monolayer models for cardiotoxicity studies.

### Adding insult to injury: A sex-specific investigation of chronic stress on heart function after regional ischaemia

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Background: Chronic stress is an important risk factor for cardiometabolic diseases, but the underlying mechanisms responsible for sex-based differences in stress-related cardiometabolic complications remain poorly understood. This study investigated whether chronic stress triggers sexdependent cardiac dysfunction in isolated rat hearts exposed to regional ischaemia.

Objectives: To identify potential sex-based mechanisms of chronic stress on heart function pre- and post-simulated ischaemia.

Method: Ten-week-old male and female Wistar rats underwent chronic restraint stress (CRS) for 4 weeks (I hour daily) vs. matched controls. Blood samples were collected before and after the CRS protocol for the analysis of various circulating biomarkers. Ex vivo isolated hearts were then subjected to regional ischaemia (25 minutes), and functional parameters were assessed.

Results: Compared to controls, chronic restraint stress (CRS) males displayed decreased plasma brain-derived neurotrophic factor (BDNF) levels (p<0.05), while CRS females exhibited elevated plasma adrenocorticotropic hormone (ACTH) (p<0.01) and reduced corticosterone (p<0.001) alongside lower serum estradiol (p<0.001) and estradiol / progesterone ratio (p<0.01). Of note, CRS females showed increased serum cardiac troponin T (p<0.05) and tumour necrosis factor-alpha (TNF- $\alpha$ ) (p<0.01) with suppressed interleukin (IL)-1 $\alpha$ , IL-1 $\beta$ , IL-6, and IL-10 levels (p<0.05) when compared to controls. Ex vivo Langendorff perfusions revealed that CRS female hearts displayed impaired post-ischaemic functional recovery for baseline stroke volume (p<0.01), work performance (p<0.05), aortic output (p<0.05), coronary flow (p<0.01), and overall cardiac output (p<0.01) when compared to matched controls and CRS males (p<0.05). High-resolution respirometry analysis on frozen ischaemic and non-ischaemic tissue

revealed altered mitochondrial respiratory dynamics in CRS males vs. controls, with minimal effects in females. Downstream proteomics analysis of the female hearts revealed distinct proteome profiles between non-ischaemic and ischaemic zones, and between control and CRS groups.

**Conclusion:** Our findings reveal intriguing sex-specific responses at both the systemic and functional levels in stressed hearts. Here, the dysregulation of stress hormones, pro-inflammatory state, and potential underlying cardiomyopathy in females following the stress protocol renders them more prone to damage following myocardial ischaemia. Moreover, unique proteomic profiles of reperfused samples highlight potential preclinical mechanisms for the increased risk for adverse cardiac events in chronically stressed individuals observed in clinical settings.

### Prevalence associated factors and effect on short-term outcome of hyponatremia among HF patients admitted at National Cardiac Institute

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**Background:** Hyponatremia is a common electrolyte imbalance seen in patients with heart failure (HF), and previous studies have found hyponatremia to independently predict short- and long-term poor outcomes regardless of the primary HF cause or health status of the patient. However, the prevalence of hyponatremia and its association with clinical outcomes among HF patients has not been studied in Tanzania.

**Objectives:** The objective of the study is to determine the prevalence, associated factors and effect on short-term outcomes of hyponatremia among patients admitted with HF at the National Cardiac Institute.

**Method:** This was a hospital-based prospective cohort study in which patients admitted at JKCI with a diagnosis of HF were consecutively recruited and followed-up for a period of 1 month. The sample size required was 348 patients. Structured questionnaire was used to collect information on demographic characteristics as well as clinical profile. Plasma sodium concentration was analysed within 24 hours of admission for all patients included in the study. Hyponatremia was defined as serum sodium concentration of <135mmol/L, and was classified as mild (130 - 134mmol/L), moderate (125 - 129mmol/L) and profound (<125mmol/L). Patients were followed up for in-hospital outcomes that included coronary care unit admission, length of hospital stay, in-hospital mortality, and hospital overstay, as well as one 30 days outcomes.

**Results:** In total, 348 participants with HF were enrolled. Mean age (SD) of the cohort was 51.7 (18.7) years, and 159 (45.7%) were males. In this population, hyponatremia at admission was present in more than half (60.3%, 95%CI=54.99-65.5) of participants. Hyponatremia was associated with poorer in-hospital outcomes.

**Conclusion:** In this study findings, prevalence of hyponatremia among HF patients at admission was high, estimated number over half of patients admitted with HF at JKCI. Recommend need to routinely screen patients with HF for presence of electrolyte abnormalities specifically hyponatremia and provide intervention when needed.

#### Identifying appropriate sites for timely reperfusion of STEMI in South Africa using isochrone maps

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**Background:** A disparity regarding access for STEMI patients to hospitals with cath labs is observed in South Africa across regions with differing population densities. This may be explained by paucity of surveillance data, a shortage of cardiologists, and a lack of structured referral pathways for STEMI management. There is a need to identify under-resourced areas and barriers to timely access to STEMI treatment facilities.

**Objectives:** The objectives are to assess the coverage of public and private P-PCI facilities, specifically in remote and under-resourced areas, and to identify locations for additional PCI facilities. It also investigates the dispersion of regional, tertiary and district public hospitals, and identifies hospitals for stand-alone fibrinolysis / pharmaco-invasive approach, to assist PCI-capable hospitals in establishing structured regional referral networks.

Method: Maptitude Mapping Software 2023 (Caliper Corporation, 1172 Beacon St., Suite 300 Newton MA 02461, USA) was utilised for the isochrone modelling and map visualisation. Distance and drive-time attributes for accurate and precise isochrone modelling were sourced from the Maptitude data package for South Africa and OpenStreetMap place names. Travel times were measured and visualised as drive-time rings (minutes) superimposed on a population density layer.

**Results:** Approximately 70% of the South African population live in underserviced areas regarding optimal STEMI care – these are the Northern Cape, Limpopo, large parts of the North West, KwaZulu-Natal, and the Eastern Cape. Seven regional hospitals were identified for an upgrade to a PCIcapable hospital (Upington, Vryburg, Thoyandou, Bethlehem, Newcastle, Komani, and Lusikisiki) to ensure intervention within 90 minutes after symptoms onset or diagnosis of STEMI. Twenty eight tertiary hospitals were earmarked for lysis, in addition to all regional hospitals and specific district hospitals in remote areas with low population densities.

**Conclusion:** The maps and geospatial analyses add value by establishing what could be done to improve STEMI management in South Africa. The primary aim is to turn non-pPCI centres into 24/7 pPCI centres. The current focus is to ensure that mandatory resources are available, that all role players are suitably trained and that quality metrics are applied for the best outcome for STEMI patients.

### Outcomes of pregnant women with congenital heart disease attending a multi-disciplinary cardio-obstetric clinic in Cape Town, South Africa

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Background: Congenital heart disease (CHD) patients are at risk for cardiovascular complications during pregnancy. Despite being the leading cause of maternal death in high-income settings, evidence from low- and middle-income countries is lacking. We aimed to characterise outcomes of pregnant women with CHD referred to a multi-disciplinary combined cardio-obstetric clinic (CCOC), between 2017 - 2023.

Objectives: (1) To characterise the obstetric and cardiac outcomes in women with CHD/RHD attending the multidisciplinary cardio-obstetric clinic. (2) To investigate the maternal and foetal outcomes among women with CHD/RHD. (3) To identify the prevalence of pre-existing conditions in women with CHD/RHD

Method: Pregnant women with CHD were invited and consented to participate in the PROTEA (partnerships for children with heart disease) registry. Demographics, obstetric and surgical history, WHO classification, and pre-partum, peri-partum, and post-partum complications and events were recorded.

Results: Fifty eight participants were enrolled over 7 years; median age was 27 years (IQR: 24 - 32). Median booking BMI was 27 (IQR: 23 - 35), with 29% overweight (BMI: 25.0 - 29.9), and 34% obese (BMI ≥30). Predominant diagnoses included Ventricular Septal Defect 33% (20/61 total diagnoses), Tetralogy of Fallot 20%(12/61), Atrial Septal Defect 15%(9/61), Pulmonary Stenosis 5%(3/61), Aortic Coarctation 5% (3/61), and Atrial Ventricular Septal Defect 3% (2/61). Forty participants (69%) had a history of cardiac surgery. Most (98%, 57/58) participants had pre-existing cardiac diagnoses, however only 53% (31/58) of participants received pre-pregnancy counselling. In multigravida participants, 58% (14/24) had a history of obstetric complications, with 75% (18/24) of pregnancies complicated by spontaneous abortion (9), therapeutic abortion (6), or intrauterine death (3). Comorbidities included angina (9), hypertension (7), asthma (4) and HIV (3). At enrolment, 23% (13/57) of participants presented in NYHA heart failure class 2, 9% in class 3, and 2% in class 4. During their pregnancies, 19% (11/58) experienced obstetric complications for which 21% (12/58) required admission. Additionally, 12% (7/58) were admitted for cardiac complications. Median gestational age at delivery was 38 weeks (IQR: 35 - 40), 44% by elective caesarean section, 7% by emergency caesarean section. There were no maternal events during delivery; 2 experienced infective complications post-delivery. There were 0 maternal mortalities, 2 foetal mortalities and 0 neonatal mortalities.

Conclusion: Despite suboptimal preconceptual counselling in our population of pregnant women, we present excellent outcomes for pregnant women with a variety of CHD diagnoses treated in a multi-disciplinary cardio-obstetric clinic. Future interventions should optimise preconceptual counselling, awareness of healthy weight and consolidation of the multi-disciplinary heart team approach.

#### Can antibiotics inhibit the progression of abdominal aortic aneurysms? A meta-analysis of randomised controlled trials

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Background: Antibiotics may protect against chlamydophila pneumoniae, implicated in abdominal aortic aneurysm (AAA) development, and inhibit matrix metallopeptidase-9, neutrophils, cytotoxic T cells, and other inflammatory markers associated with AAA.

Objectives: This meta-analysis synthesizes data from randomised controlled trials (RCTs) to evaluate antibiotics' impact on AAA progression.

Method: This meta-analysis followed the Cochrane Handbook for Systematic Reviews of Interventions guidelines. We searched PubMed, Embase, Cochrane Library, Web of Science, and Scopus until 15 May 2024. We included RCTs involving patients with small AAAs (diameter <55mm for males and <50mm for females) treated with antibiotics vs. placebo, reporting changes in AAA maximum transverse diameter. Mean difference (MD) and risk ratio (RR) compared outcomes.

Results: Six RCTs with 497 patients (49.9%) in the antibiotic group and 498 (50.1%) in the placebo group were included. There was no significant difference in AAA progression at a mean follow-up of 2.2 years (MD=-0.28mm/year; 95% CI [-0.92, 0.36], p=0.39), with macrolides (MD=-0.62mm/year; 95% CI [-1.39, 0.14]), or tetracyclines (MD=0.22m/year, 95% CI [-0.54, 0.97]). No differences were found in mortality or AAA rupture (RR=0.93, 95% CI [0.69, 1.25], p=0.62). Subgroup analyses showed no differences for macrolides (RR=0.89, 95% CI [0.59, 1.36]) and tetracyclines (RR=0.93, 95% CI [0.69, 1.25]).

Conclusion: Macrolides and tetracyclines do not significantly inhibit the progression of small AAA.

### Global trends and networks in the last 20 years of rheumatic heart disease research: A bibliometric analysis

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**Background:** Despite advances in eliminating rheumatic heart disease (RHD) in some parts of the world, RHD remains endemic in low- and middleincome countries. Tackling this burden requires a global effort and a multidisciplinary approach. Bibliometrics, the statistical analysis of bibliographic data, may illustrate the landscape of RHD research at present.

**Objectives:** To perform a bibliometric analysis of the last 20 years of RHD research.

**Method:** RHD-related documents published between 2004 - 2023 were extracted from Scopus, as was a comparison group of documents between 1984 - 2003. The Bibliometrix package of R was used to generate bibliometric statistics and perform conceptual analyses.

**Results:** The 2004 - 2023 search yielded 12 028 documents, with an annual growth rate of 4.5%. International collaboration was observed in 18%. In contrast, 4 938 articles were published in 1984 - 2003, with a growth rate of 1.45% and a lower rate of international co-authorship (2.8%). The USA produced the most scientific outputs. Of the 10 most influential articles, most were reviews or guidelines. Only 1 of these papers, the REMEDY study, was led by a team outside of Australia, USA or Europe. A wide global network was observed, in sharp contrast to 1984 - 2003, a period of markedly less international cooperation. The USA, UK, Australia, France and South Africa were the top 5 ranking countries in terms their influence on other networks. The University of Cape Town was the most productive institution; network analysis uncovered a complex system of universities, hospitals and medical schools that clustered somewhat along geographical lines. Of the top 25 authors, 14 / 25 were from lower- or middle-income countries and 8 were from Africa. Thematic mapping revealed follow-up and cross-sectional studies concerning treatment outcomes and epidemiology as core, well-developed topics. Prevention, control and epidemiology in Africa and studies in children and adolescents were less well-developed. Immunology has become a niche field over time, whereas the genetics of RHD has become less of a niche area.

**Conclusion:** The past 20 years has seen a rapid expansion in RHD-related scientific outputs and global collaborative efforts. Although USA dominates in scientific outputs, low- and middle-income countries are well represented in RHD networks.

#### Mobitz type I heart block: A retrospective descriptive review from Tygerberg Hospital, Western Cape

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**Background:** The practice of pacing patients with Mobitz type 1 atrioventricular (AV) block that present with symptomatic bradycardia or who are older than 65 years of age is well established. There is limited evidence that guides the management of younger asymptomatic patients presenting with Mobitz 1 AV block.

Objectives: To describe the natural history of Mobitz I AV block in patients aged 45 - 64 years, and to assess the need for pacing.

**Method:** This was a retrospective descriptive analysis conducted at Tygerberg Hospital, Cape Town, South Africa. Patients with electrocardiograms (ECG) showing Mobitz type I AV block in 2016 were followed up after 6.5 years to observe the natural history of unpaced patients.

**Results:** A total of 15 141 ECGs and 1 506 cardiology admissions were screened. Fifteen patients with Mobitz type 1 AV block were identified and reviewed. There was a near even male to female distribution, 8:7, with a mean age of  $59.4 \pm 17.8$  years. Six patients were aged 45 - 64, and their unpaced (n=5) 5-year survival rate was 80%. One patient died, but the cause of death was end stage heart failure and not progression of heart block.

**Conclusion:** Both this study and other notable publications in this field feature small sample sizes. Caution is therefore warranted in drawing definitive conclusions. Nevertheless, our findings suggest a potentially more benign natural history for Mobitz I AV block in this age group compared to existing literature.

### Pericardial segmentation: A proposed model to quantify disease burden

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**Background:** Cardiovascular magnetic resonance imaging (CMR) has the unique ability to evaluate pericardial tissue characteristics that underpin constrictive haemodynamics. A pericardial segmentation model that can be applied to accurately quantify reversible and non-reversible burden of pericardial constriction would have important clinical implications and is currently lacking.

**Objectives:** To develop a pericardial segmentation model that is validated against anatomic specimens and can be acquired using standard CMR views, while maintaining equal weighting of individual segments for each ventricle to ensure ease of use.

**Method:** Post-mortem cardiac specimens of presumed healthy individuals with non-cardiac cause of death were studied at the Tygerberg Division of Forensic Medicine. Measurements were obtained on standard cardiac short-axis forensic dissection slices. The percentage pericardial cover for individual LV and RV segments were directly measured and compared to an idealised pericardial segmentation model in which respective LV and RV segments are identical in size, and can be acquired on standard CMR views.

**Results:** A total of 100 cardiac specimens with equal gender distribution were assessed. On average, the LV and RV contributed 49.9% and 50.1% of the total ventricular surface area respectively. The LV surface area was well represented by those 11 segments of the standard 16-segment American Heart Association model with abutting pericardium (4.51  $\pm$  0.2% pericardial cover per segment). The RV surface area was best represented by 9 equal ventricular segments (5.54  $\pm$  0.3% pericardial cover per segment). The difference in the measured pericardial cover for the LV and RV, compared to the idealised model, respectively showed a mean difference of 0.04% and 0.02% per segment.

**Conclusion:** We have developed a pericardial segmentation model that is validated against anatomic specimens, is easy to acquire on standard CMR views and is simple to interpret, as respective LV and RV segments are of equal size. This model will allow clinicians to evaluate individual pericardial segments to accurately quantify pericardial disease burden.

#### Outcomes of infective endocarditis surgery in Angola: Initial experience of a young local team

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**Background:** Infective endocarditis (IE) involving multiple cardiac valves is uncommon. The majority of echocardiographically demonstrated endocarditis occurs on a single valve; the involvement of 2 valves occurs much less frequently, and triple- or quadruple-valve involvement is extremely rare.

**Objectives:** Here, we describe and analyse our results in patients with endocarditis in one of newest cardiovascular services in sub-Saharan Africa. **Method:** A retrospective database review was carried out from January 2022 - June 2024.

**Results:** A total of 26 patient with endocarditis. The mean age was  $30 \pm 15$ -years-old varying from 6 to 55; 18 were female (69.2%). Nineteen (73.1%) cases of valve involvement were observed, of which 8 (30.8%) were mitroartic, 6 (23.1%) mitral, 1 (3.8%) aortic and 4 (15.4%) tricuspids. In another 7 (26.9%) cases, valve prostheses were involved (5 [19.2%] biological prostheses in the mitral position and 1 [3.8%] in the aortic position) and 1 [3.8%] case of ventricular septal defect (VSD). The mean ejection fraction was  $63\% \pm 14$  (81 - 22%). The mean EUROSCORE II was 10.96% (3.04 - 39.34). The mean pulmonary artery pressure was  $42 \pm 13$ mmHg (25 - 63mmHg). All patients with mitral or mitral-aortic valve involvement underwent valve replacement. Two mitral-aortic patients underwent the Ozaki procedure. Fifty percent of patients with tricuspid valve involvement underwent valve replacement using biological mitral prosthesis, the other 50% underwent valve repair. All patients with affected prostheses underwent replacement of the prosthesis for a new one. The patient with an interventricular septal defect underwent correction with a bovine pericardial patch. The mean cardiopulmonary bypass time was  $102 \pm 36$ min (45 - 175 minutes) with mean cross-clamping time of  $91 \pm 32$  minutes (39 - 197 minutes). The extubation time was 19 hours 59 minutes  $\pm 55$  hours 34 minutes. The mean intensive unit care and hospital length of stay were  $4 \pm 3$  (2 - 4) and  $60 \pm 45$  (196 - 30) days, respectively. The mortality was 11.5%.

**Conclusion:** Multivalvular endocarditis is not a rarity in our reality. Valve replacement is the most common treatment in cases of endocarditis with valve involvement. In 50% of cases was not possible to preserve the tricuspid valve. The Ozaki procedure is safe and reproducible in some cases of endocarditis.

#### Ozaki procedure for adolescents and young adults with rheumatic heart disease

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**Background:** Many adolescents and young adults with rheumatic heart disease (RHD) require cardiac surgery due to the lack of primary prevention. As known, repair is better than replacement. Although the Ozaki procedure is an alternative for aortic valve disease, little is known about it in this population.

**Objectives:** To describe our initial experience in treating adolescents and young adults with severe rheumatic aortic valve using the Ozaki technique. **Method:** A retrospective database review was carried out from June 2022 - May 2024 to analyse our results of Ozaki procedure for adolescents and young adults with RHD.

**Results:** A total of 7 adolescents or adults with RHD underwent Ozaki procedure. The mean age was  $18 \pm 2$ -years-old varying from 15 - 20; 5 were male (71.4%). All of them had severe aortic valve regurgitation. In addition, 5 (71.4%) had mitral valve (MV) regurgitation and 1 (14.3%) had ventricular septal defect (VSD). The mean ejection fraction was  $66\% \pm 4$  (61 - 72%). The mean EUROSCORE II was 1.74% (0.75 - 3.18). The mean pulmonary artery pressure was  $42 \pm 24$ mmHg (14 - 84mmHg). Five underwent MV replacement, in 1 was necessary tricuspid repair, and 1 (14.3%) underwent VSD closure; only 1 underwent isolated Ozaki procedure. The mean cardiopulmonary bypass time was  $171 \pm 38$  minutes (122 - 223 minutes) with mean cross-clamping time of  $159 \pm 34$  minutes (115 - 205 minutes). The extubation time was 4 hours  $20 \pm 27$  minutes. The mean intensive unit care and hospital length of stay were  $2 \pm 1$  (2 - 4) and  $18 \pm 7$  (10 - 32) days, respectively. No mortality was registered. The mean follow-up time was  $14 \pm 7$  months. Five presented trivial or no regurgitation. Two presented severe regurgitation requiring aortic valve replacement.

**Conclusion:** Ozaki procedure is a safe and reproducible procedure for adolescents and young adults with RHD. Although the results are encouraging, should be observed with caution. Long follow-up is required.

#### Atrial strain: A potentially sensitive marker for cardiovascular disease in HIV-infected persons

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**Background:** People living with HIV-infection (PLWH) have a higher risk of cardiovascular disease (CVD), with evidence of early cardiac abnormalities secondary to inflammation. Detecting these abnormalities is hindered by limited access to advanced imaging. The long-term impact of these abnormalities and their interaction with antiretroviral treatment (ART) are still unclear. The ability of left atrial (LA) strain analysis to detect early cardiac abnormalities has not been fully investigated.

**Objectives:** We set out to evaluate if the assessment of LA function by means of strain analysis can be utilised for the detection of underlying subtle cardiovascular disease in persons.

Method: ART naïve persons with HIV-infection were recruited, along with HIV-uninfected, age- and sex-matched controls. All patients and controls underwent comprehensive 2D transthoracic echocardiography including atrial strain analysis. The HIV group commenced ART and was reassessed 9 months later. LA strain was measured and compared using both paired and unpaired samples t-test as appropriate.

**Results:** Thirty three ART-naïve HIV-infected participants and 22 HIV-uninfected controls were included. Following 9 months of antiretroviral therapy (ART), all HIV-infected participants completed follow-up assessments. Compared to controls, ART-naïve individuals demonstrated significantly reduced peak atrial longitudinal strain (PALS or reservoir function) (28.35  $\pm$  6.51 vs. 34.52  $\pm$  6.48, p=0.00012), Compared to the controls, after 9 months on ART the PALS essentially normalised (34.52  $\pm$  6.48 vs. 37.05  $\pm$  4.21, p=0.13).

**Conclusion:** Subclinical myocardial abnormalities may be evident at the time of HIV diagnosis, indicated by abnormal atrial strain prior to ART initiation. Short-term administration of ART resulted in improvements in atrial reservoir function. The left atrium (LA) plays a crucial role in modulating left ventricular (LV) filling, suggesting that LA strain assessment could serve as an early indicator of subclinical cardiovascular dysfunction in PLWH. Strain analysis of LA function may represent a valuable tool for detecting and following up underlying cardiovascular disease in this population.

### Assessment of ventricular function in paediatric patients with chronic kidney disease using multiple echocardiography modalities

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Background: Cardiovascular disease (CVD) is the most common cause of mortality and morbidity in children with chronic kidney disease (CKD). CVD in children with CKD may be subclinical. Transthoracic echocardiogram (TTE) evaluation of ventricular function is crucial in the diagnosis, management, and prognosis of CVD. Echocardiography is the primary tool in the assessment of cardiovascular structure and function with newer methods providing more accurate assessments and early detection of subclinical systolic and diastolic dysfunction.

Objectives: The study aimed to describe biventricular function using multiple echocardiographic modalities in children with CKD.

Method: A retrospective, descriptive analysis of transthoracic echocardiography data for CKD patients attending renal clinic at Nelson Mandela Children's Hospital (NMCH) was performed. Permission to utilise existing data from the NMCH cardiology and renal database was granted by the Medical Advisory Committee of the hospital. Data source included clinical notes and echocardiography reports. Data for ventricular function was obtained using current American guidelines for M-mode, pulsed and tissue dopplers and 2D strain.

Collected data was entered onto Excel spreadsheet and analysed using Excel statistical package for basic descriptive statistics.

Results: A total of 10 children with CKD (70% girls, 30% boys; age range: 7 - 18 years [mean=11.4, standard deviation=0.96]) were enrolled. All children had hypertension and stage 5 CKD on dialysis (60% haemodialysis, 30% peritoneal, 10% combination of haemodialysis and peritoneal). Forty percent (40%) of children had reduced LV systolic function. Diastolic dysfunction was present in all children. Regional wall motion abnormalities (RWMA) were present in 90% of children (hypokinesia 88%, akinesia, and dyskinesia equally distributed [77.8%]).

Conclusion: Children with hypertension and stage 5 CKD presents with significant diastolic dysfunction and notable RWMA before the onset of overt systolic dysfunction.

#### Implanted device-related infection: An analysis of the impact of additional preventative measures on the rate of device-related infection at Tygerberg Hospital

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Background: Cardiac implantable electronic devices (CIED), such as pacemakers, implantable cardioverter defibrillators, and cardiac resynchronisation therapy devices, are indicated in patients with brady- and tachyarrhythmias or advanced systolic heart failure. The burden of cardiovascular disease continues to increase globally, thus the amount of CIED implantations increases, and so does the risk of developing CIED-related infection. The Division of Cardiology at Tygerberg Hospital has identified an increase in device-related infection and subsequently implemented a range of additional preventative measures aimed at reducing the frequency of device-related infection.

Objectives: To determine whether there was a decrease in the rate of CIED-related infection by comparing the rates before and after implementing additional preventative measures.

Method: This retrospective study was conducted in the Division of Cardiology at Tygerberg Hospital, Bellville, South Africa. We included 239 patients in our pre-preventative measures group (control group), who received a CIED-related procedure between January 2022 - December 2022. A 3 month period followed to monitor for uptake of and adherence to the additional preventative measures that had been implemented. One hundred and four patients were then recruited for the post-preventative measures group (study group), who received CIED-related interventions between March 2023 - September 2023.

Results: Ten of the 239 patients in the control group developed CIED-related infection and 3 of the 104 patients in the study group developed CIEDrelated infection (4.18% vs. 2.88%; p=0.76). Within the first 6 months since the last CIED-related procedure, 4 patients in the control group developed infection, compared to none in the study group (2% vs. 0%; p=0.32).

Conclusion: This interim analysis failed to demonstrate a statistically significant reduction in CIED-related infection following the implementation of a range of additional measures aimed at reducing infection rates. The absence of infections in the first 6 months after receiving a CIED-related procedure in the study group may be a chance finding but is worth pursuing in a larger cohort. The study is therefore on-going with an emphasis on improving the adherence to the measures implemented to reduce infection.

### Electrocardiographic parameter changes of newly-diagnosed HIV-infected persons: A prospective cohort study before and after the initiation of antiretroviral treatment

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**Background:** People living with HIV-infection (PLWH) are at an elevated risk of cardiovascular disease (CVD) with early cardiac abnormalities often linked to inflammation. Advanced imaging limitations hinder the detection of these abnormalities. The long-term impact of these abnormalities and their interaction with antiretroviral treatment (ART) remain unclear. The capability of the 12-lead electrocardiogram (ECG) to detect and monitor subtle myocardial abnormalities in newly diagnosed PLWH has not been thoroughly investigated.

**Objectives:** We set out to evaluate subtle cardiovascular abnormalities using the ECG that could be used to detect and track subclinical CVD in PLWH.

**Method:** ART-naive PLWH were recruited alongside HIV-uninfected, age- and sex-matched controls. All participants underwent a standard 12-lead ECG using a MAC 2000 unit (General Electric, USA). The HIV group commenced ART and was reassessed 9 months later. Heart rate, QT-interval (QT), and corrected QT-interval (QTc) were measured and compared using one-way ANOVA and paired samples t-test as appropriate.

**Results:** Eighty five ART naïve participants and 22 HIV-uninfected controls were recruited. Seventy three HIV-infected participants completed 9 months follow-up. The QTc showed a trend to be longer in the ART naïve group compared with controls ( $419 \pm 22$ ms vs.  $410 \pm 23$ ms; p=0.06). This difference was not evident after 9 months of ART. A significant decrease in the heart rate was observed when comparing the ART naïve group and the 9 months ART group (73 ±15bpm vs. 64 ± 13bpm; p<0.001). Correcting for the decreased heart rate, the QTc of the 9 months ART group was 7ms shorter compared to the ART naïve group (95% CI: -2 to -12ms; p=0.004).

**Conclusion:** A trend towards a longer QTc was observed in newly diagnosed, ART-naive PLWH compared to controls. After 9 months of ART, the QTc reduced significantly, suggesting a favourable electrophysiological effect of ART on the heart, potentially due to decreased myocardial inflammation. Further research is needed to explore the potential role of this electrical biomarker in the prospective evaluation of myocardial inflammation.

#### Our founding fathers and the heart diseases they brought to South Africa

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**Background:** Cardiomyopathies are a leading cause of heart failure in South Africa, yet significant knowledge gaps persist. To address this, the IMHOTEP (African Cardiomyopathy and Myocarditis Registry Programme) was established to clinically and genetically characterise South African cardiomyopathy patients. Our research identified several probands sharing the same variant, indicating potential founder variants, potentially introduced by the various European colonisations.

**Objectives:** (1) Screen and validate core family members of probands with 3 recurrent variants using High Resolution Melt (HRM) and Sanger sequencing. (2) Design primers for microsatellite markers and conduct microsatellite analysis on probands and their families. (3) Construction and analysis of haplotypes. (4) Trace founder variants genealogically using vital statistical records.

**Method:** Clinical and baseline data of probands and their family members were recorded upon enrolment in IMHOTEP. Allele frequencies were determined via gnomAD and ClinVar. Variant classifications were determined by using the American College of Medical Genetics (ACMG) guidelines. Haplotypes were constructed using a combination of single nucleotide polymorphisms (SNPs) and microsatellites, with 3 informative microsatellite markers designed for each variant. Genealogical tracing was performed using standard methods, and all data were stored on Legacy v.9.0.

**Results:** Three potential founder variants were identified: PKP2 c.1162C>T in 12 probands and 29 family members, BAG3 c.925C>T in 3 probands and 8 family members and LMNA c.568C>T in 3 probands and 3 family members. All 3 variants were found in individuals of European and mixed-race ancestry. These recurrent variants are pathogenic / likely pathogenic according to ACMG criteria. Allele frequencies ( $\leq 0.00001$ ) supported the founder effect possibility. Common haplotypes emerged for all 3 variants. Genealogical tracing was successful for families with the PKP2 c.1162C>T variant and a family with the BAG3 c.925C>T variant. We successfully traced families harbouring the PKP2 c.1162C>T variant to their 17th century progenitors.

**Conclusion:** Our research provides evidence of the founder effect for PKP2 c.1162C>T, BAG3 c.925C>T, and LMNA c.568C>T variants. We genealogically traced the PKP2 c.1162C>T variant to the 17th century, suggesting a French or Dutch origin.

#### Bartonella endocarditis: An important cause of blood culture-negative endocarditis in South Africa

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**Background:** The Duke diagnostic criteria for the diagnosis of infective endocarditis has recently been modified. The revision recognises Bartonella species as an important and identifiable cause of blood culture-negative endocarditis (BCNE). There is a paucity of epidemiological, clinical, echo-cardiographic, and outcome data in Bartonella endocarditis with only a few case series reported worldwide.

**Objectives:** Provide a comprehensive description of 30 cases identified with Bartonella endocarditis managed at Tygerberg Hospital, Bellville, South Africa.

**Method:** The Tygerberg Endocarditis Cohort Study is an on-going prospective study evaluating the impact of a standardised protocol for organism detection in patients with infective endocarditis. Data captured between 1 October 2019 - 1 May 2023 were evaluated and a comprehensive description of 30 cases with Bartonella endocarditis is presented.

**Results:** Fifty eight patients were identified with BCNE during the study period. Of these, 30 patients (51.7%) were identified with Bartonella endocarditis. Seven patients (23.3%) were either homeless or lived in informal housing. Seventeen patients (76.6%) were identified with an alcohol-use disorder. Eight patients (26.6%) were infected with human immunodeficiency virus (HIV). Patients typically presented symptomatic with advanced valvular destruction. Blood serology for Bartonella was positive (1 $\geq$ 256) in all patients. Valvular tissue was available for polymerase chain reaction (PCR) testing in 18 cases. Of these, Bartonella quintana was identified in 16 cases and Bartonella henselae in 1 case. The most common isolated valve lesion on echocardiography was severe aortic regurgitation (n=13;43.3%). Surgery was successfully performed in 22 (60%) patients. The 1-, 3- and 6-month mortality in the operated cohort was 0%, 4.5% and 4.5% respectively. In the unoperated cohort with a surgical indication for surgery (n=7), the mortality was 100%.

**Conclusion:** In this contemporary study of IE in South Africa, we report Bartonella as the most common cause of BCNE (51.7%). The patient risk factors together with the clinical- and echocardiographic-features were often consistent with the reported literature of a subacute onset and highly destructive endocarditis. Most patients in this study were managed surgically and had a good outcome. This study highlights the importance of Bartonella infection in our region and the need to routinely perform serology and PCR in BCNE.

### Time to reperfusion therapy for ST-elevation myocardial infarction patients: An analysis of the Tygerberg STEMI Registry

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**Background:** The mortality rate of patients with ST-elevation myocardial infarct (STEMI) is directly related to time to reperfusion. The majority of patients within the Tygerberg Hospital (TBH) referral network present at facilities where percutaneous coronary intervention (PCI) is not available and are treated with a pharmaco-invasive strategy.

**Objectives:** This study assessed STEMI care within the TBH referral network, focusing on the time-intervals delaying reperfusion for patients undergoing a pharmaco-invasive strategy or primary percutaneous coronary intervention (PCI).

**Method:** All patients presenting with STEMI within the TBH referral network are referred to TBH for definitive care and entered into the STEMI database. This is a retrospective analysis of STEMI patient data from 1 June 2023 - 31 May 2024. Time intervals recorded included the times from onset of chest pain to first medical contact (FMC), FMC to primary-PCI, FMC to thrombolysis and failed thrombolysis to rescue-PCI.

**Results:** Three hundred patients were included, with in-hospital mortality in 28 patients (9.3%). The median time from onset of chest pain to FMC was 3 hours (IQR: 5.3 hours). The majority of patients (247) underwent a pharmaco-invasive strategy (82.3%), with 215 (87%) being successfully reperfused with thrombolytic therapy. The time from FMC to lysis in patients treated with a pharmaco-invasive strategy was 63 minutes (IQR: 90 minutes). Of the 215 participants that had successful thrombolysis, 208 had PCI post-thrombolysis 27 hours (IQR: 35.7 hours) after FMC. Patients with unsuccessful thrombolysis (32) received rescue PCI 5 hours (IQR: 3 hours) after failed lysis. A primary PCI strategy was utilised in 16 patients. The time to reperfusion

in patients presenting at TBH (4 patients) was 46 minutes(IQR: 42 minutes) compared to 8.2 hours (IQR: 8.2 hours) in patients received from facilities who referred patients without administering lytic therapy. Patients categorised as auto-reperfused or missed STEMI (37) had PCI 49.2 hours (IQR: 38.8 hours) after FMC.

**Conclusion:** Patients presenting with STEMI within the TBH referral network are predominantly managed with a pharmaco-invasive strategy, culminating in early PCI in the majority of patients. Time from FMC to lysis (62 minutes) is outside the guideline recommendation of 30 minutes. Other major delays targeted for improvement include patient delays (chest pain to FMC), time from failed lysis to rescue-PCI and time to primary-PCI for patients from facilities not administering lytic therapy.

### The character of infective endocarditis at Chris Hani Baragwanath Academic Hospital: A large tertiary hospital in South Africa

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**Background:** Infective endocarditis is the infection and inflammation of cardiovascular structures, including the endocardium and valves (both native and prosthetic). There is a paucity of data regarding this condition from sub-Saharan Africa, including South Africa.

**Objectives:** To characterise the clinical manifestations of this potentially deadly condition at Chris Hani Baragwanath Academic Hospital, a large tertiary referral facility that serves the community of Soweto and surrounding areas.

Method: Consecutive, consenting patients above the age of 18 presenting to Chris Hani Baragwanath Academic Hospital with a clinical diagnosis of infective endocarditis were recruited for the study.

**Results:** Over a 10 month period, 39 patients were recruited to the study. The mean age was  $34,5 (\pm 10,2)$  years. 85% were male. 13% of participants suffered from hypertension, 74% were smokers, and 56% were HIV positive. Of those living with HIV, only 43% were on antiretroviral treatment. Eight percent of participants had previous infective endocarditis, whilst 3% had previous cardiac surgery. A staggering 69% of patients were persons who inject drugs. In 49% of participants, Staphylococcus aureus was the causative organism. In 28% of cases, blood cultures were negative. Thirteen percent of cases were complicated by embolisation to the brain, whereas in 26% of cases embolisation to the lung was documented. Whilst the majority were treated with antibiotics, 15% of patients underwent surgery as well.

**Conclusion:** These preliminary results from Chris Hani Baragwanath Academic Hospital, show that most of our patients with infective endocarditis are young males, who use intravenous recreational drugs. Staphylococcus aureus was the most common causative organism. Most of the patients were treated medically with antibiotics. Only 15% underwent surgery.

## Distribution and frequency of congenital heart disease in patients with genetic syndromes or dysmorphism at Charlotte Maxeke Johannesburg Academic Hospital over a 10-year period

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**Background:** Congenital heart disease (CHD) is the most common birth defect, occurring in 9 per 1 000 births worldwide, and is a significant contributor to morbidity and mortality. Approximately one third of patients with CHD have an underlying genetic cause or association, yet South African data on these associations remains limited.

**Objectives:** To describe the prevalence and types of CHD in dysmorphic and syndromic patients presenting to Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) Paediatric Cardiology, and to identify associations between CHD subtypes and syndromes and isolated major congenital abnormalities within this cohort.

Method: A retrospective analysis of an existing paediatric cardiology database and patient records from January 2010 - December 2020 at a tertiary hospital in Johannesburg, South Africa. Participants were aged birth to 16 years old with dysmorphic features, confirmed genetic syndromes or isolated major congenital abnormalities.

**Results:** A total of 1 024 patients were enrolled in the study, with a median age of 41 days at diagnosis, and gender distribution of 56% male and 44% female. Documented deaths accounted for 7% of the cohort, with the highest proportion occurring in patients with cyanotic CHD (31% of this subgroup). CHD was diagnosed in 37% (n=379) of patients, with a predominance of acyanotic (82%) over cyanotic (18%) CHD. The commonest lesion

overall was ventricular septal defect (VSD) (31%), followed by atrioventricular septal defect (AVSD) (25%). A genetic syndrome was diagnosed in 48% of patients, the commonest being trisomy 21 (T21) (27%). The highest frequency of CHD was found in trisomy 18 (T18) (94% of patients). Patients with isolated major congenital abnormalities had a CHD incidence of 7%.

Conclusion: This study offers insight into the clinical epidemiology of CHD in syndromic children and those with isolated major congenital abnormalities, emphasising the need for timely CHD screening in these patients. Further research on CHD in specific syndromes would enhance our understanding of these associations.

#### Analysis of patients undergoing electrophysiology studies (EPS) at Chris Hani Baragwanath Academic Hospital (CHBAH): A large tertiary hospital in South Africa

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Background: For many years, electrophysiology studies (EPS) has only been accessible to patients in the private healthcare sector in South Africa (SA). For indigent patients dependent on the public healthcare sector, this service is scarce, with the capability existing only within 1 or 2 tertiary hospitals. We established an EPS programme at Chris Hani Baragwanath Academic Hospital (CHBAH) in 2019 just before the COVID pandemic, which negatively impacted on its progress. Post-COVID we continued and have since made great strides providing EPS to poor indigent patients unable to afford private healthcare.

Objectives: To characterise and analyse the profile of patients undergoing EPS at CHBAH, a large tertiary hospital in Soweto, Sout Africa, which also serves other rural provinces in South Africa.

Method: Retrospectively reviewed all records of patients who underwent EPS over a 4-year period (2019 - 2023). We used appropriate statistical tools to analyse demographic, clinical, echocardiographic, and electrocardiographic data in order to understand the profile of patients requiring EPS.

Results: A total of 60 patients (Q 63%), age 44,1 ± 15.5, underwent EPS over this period. The indications for EPS were: AVNRT (28%); Atrial flutter (23%); WPWS (22%); Unspecified SVT (15%); AVRT (3%); and VT (9%). 87% were in NYHA functional class 1; 10% were in NYHA functional class 2; and 3% were in functional class 3. During the arrhythmic episode, the heart rate was 174.2 ± 27. In terms of procedural outcome, 55 (92%) patients were successfully ablated and in 4 (7%) patients the procedure was unsuccessful. Over a period of up to 4 years, 54 (90%) patients have remained clinically well without recurrence, 5 (8%) patients have reported being unwell due to development of heart failure and 1 (2%) has demised due to an unspecified cause.

Conclusion: EPS is feasible with high success rate even in resource constrained environment and can make a big difference to patients' symptoms and outcome. Consistent with the literature, we found a predominance of females in our cohort. Most of our patients had AVNRT and had quite a high success rate of ablation.

#### The effects of Aspalathus linearis (Rooibos) in Angiotensin II-induced hypertrophy and apoptosis

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Background: Cardiovascular diseases are a growing global concern especially in developing countries such as South Africa. Medicinal plants such as Aspalathus linearis (Rooibos) are gaining attention as alternative therapeutic agents for chronic diseases of lifestyle in this context. Rooibos is a shrub-like plant that has been associated with several health benefits including cardioprotective effects. In isolated cells, it improved high glucose-induced apoptosis and in isolated perfused hearts it reduced infarct size. However, rooibos has never been tested against cardiomyoblast hypertrophy and apoptosis.

Objectives: The aim of this study was to investigate the effects of rooibos (RB) against Angiotensin II (ANG-II) induced hypertrophy and apoptosis. Method: Undifferentiated H9C2 cardiomyoblasts were treated with Ang-II (20µM), RB (100µM) and ANG-II+RB for 48 hours, n=3. The following experimental procedures were performed: HPLC analysis and IC-50 of the rooibos extract, cell size, cell viability, superoxide (SOD) activity, catalase (CAT) activity, levels of oxidative stress (TBARS), ATP levels, high-resolution respirometry as well as western blotting for markers of hypertrophy, apoptosis, and mitochondrial energetics.

Results: Rooibos attenuated the effects of Angiotensin-II by reducing cell size (p<0.01) and increasing cell viability (p<0.01), ATP levels (p<0.05) and SOD activity (p<0.05). Rooibos did not affect CAT activity (p>0.05). Rooibos reduced the expression of Bax (p<0.05), a marker of apoptosis and VDAC1 (p<0.01), a mitochondrial gatekeeper. Rooibos also restored complex 1-linked leak respiration (p<0.05), beta oxidation (p<0.05) and glucose oxidation related oxidative phosphorylation (p<0.05).

Conclusion: Rooibos counteracts Angiotensin II-induced hypertrophy and apoptosis via the improvement of antioxidant pathways and mitochondrial energetics.

### Comparing non-invasive Qp/Qs and mean pulmonary artery pressure to aemodynamic measurements in complete atrioventricular septal defects

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**Background:** An atrioventricular septal defect is a congenital heart defect that has a common AV valve off setting with a large atrial and ventricular defect. Untreated, patients are at a risk of developing pulmonary vascular obstructive disease and Eisenmenger syndrome. Echocardiography can now estimate the presence and severity of pulmonary hypertension with good correlation shown in some studies to invasive assessment.

**Objectives:** Compare non-invasive echocardiographic measurement of mean pulmonary artery pressures and Qp/Qs to cardiac catheterisation estimation of patients with AVSD to determine operability of patients.

**Method:** Twelve patients with complete AVSDs undergoing cardiac catheterisation had echocardiograms done before catheterisation under sedation or general anaesthesia. Qp/Qs and mean PA pressure were measured according to established guidelines using both modalities.

**Results:** The study involved a total of 12 patients. Five patients (41%) with incomplete data (absence of TR jet for analysis in patients suspected to have Eisenmenger) were not included in the final analysis. There were comparable Qp/Qs and mean pulmonary artery pressure values obtained invasively and non-invasively for all the patients. There was 100% similarity in the interpretation (operable vs. inoperable) of data obtained from both methods.

**Conclusion:** The preliminary findings suggest consistency in interpretation of Qp/Qs and mean PA pressure between echocardiography diagnostic cardiac catheterisation in this group. More robust studies are required to confirm these findings.

#### Heart failure in South Africa: When to refer a patient for LVAD?

#### Willie Koen

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**Background:** Heart failure remains an increasing dilemma in the world. Although cardiac transplantation has demonstrated excellent outcomes over the years, this is limited due to donor organ supply. However, LVAD implantation has now outcomes that are equal to transplantation at least in the first 2 years. The attraction to VAD technology is that it is readily available and does not require anti-rejection medication. For these reasons, 3 times more LVADs are implanted internationally than transplantation. This treatment is also available in South Africa and has gained significant momentum in Cape Town.

**Objectives:** To demonstrate that the outcomes of VAD implantation in South Africa compare favourable with that of the international community. To review the indications of LVAD implantation with referring cardiologists. To give an update on the management and echo guidance in the optimisation of device performance.

Method: A review of 100 VAD implants in Cape Town over a 24-year period. To review international guidelines for LVAD implantation. An update of ongoing management and echo findings will be visited. New development and research avenues will be discussed.

**Results:** This demonstrated that the outcomes of a single centre VAD programme in Cape Town compare favourable with that of the international community. Significant less VADs are implanted per capita in South Africa than internationally. The current international guidelines for LVAD referral are heart failure patients with more than one of the following: >3 admissions over a 12-month period, EF <25%, inotropic dependance, progressive end-organ dysfunction, absence of RV dysfunction.

**Conclusion:** VAD treatment is available in South Africa with satisfactory outcomes. More patients in South Africa can benefit from this treatment and guidelines for referral should be considered. VAD implantation is an excellent option in the management of end-stage heart failure especially in the presence of poor organ referral numbers.

### Prevalence of lower extremity arterial disease in people with HIV attending Parirenyatwa Centre of Excellence Clinic

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**Background:** HIV is a chronic inflammatory state that is associated with the accelerated development of atherosclerosis and an increased risk of myocardial infarction and stroke due to HIV- and drug-related factors. Lower extremity arterial disease (LEAD) heralds the presence of atherosclerosis in the coronary and cerebral arteries. LEAD is easy to screen for by use of the ankle-brachial index (ABI).

**Objectives:** Primary: Determine the prevalence of LEAD in people with HIV (PWH) attending Parirenyatwa Centre of Excellence Clinic (PCOEC). Secondary: Identify socio-demographic and clinical factors associated with LEAD.

Method: PWH aged 18 years and above were consecutively recruited into a cross-sectional study. Critically-ill patients and individuals with lower limb swelling, ulcers, or amputation were excluded. Baseline demographic and clinical data were collected. Blood pressure, height, and weight were measured. Random blood glucose was measured in non-diabetic participants. Intermittent claudication was assessed by the use of the Edinburgh claudication

questionnaire. An 8Hz vascular Doppler probe was used to determine the ABI. LEAD was defined as an ABI less than or equal to 0.9. The prevalence of LEAD was determined. Univariate and multiple logistic regression analyses were performed to identify significant and independent factors associated with LEAD, respectively.

Results: Two hundred and ten participants were recruited. The mean age was 43 years. Two-thirds of the participants were female (n=139). 63.8% of the participants had been on antiretroviral therapy (ART) for a median duration of 9 years and 68.6% were on first-line ART. The prevalence of LEAD was 15.7%. Independent factors associated with LEAD were age (OR 1.05, 95% CI [1.02-1.09], p=0.005), smoking (OR 4.7, 95% CI [2.36-7.58], p=0.039), obesity (OR 3.72, 95% CI[1.28-10.85] p=0.016), and hypertension (OR 1.11, 95% CI[1.14-2.08], p=0.004).

Conclusion: The prevalence of LEAD at PCOEC in adults aged 18 years and above was 15.7%. LEAD was associated with traditional risk factors for atherosclerosis. There was no independent association between LEAD and HIV- or ART-related variables i.e. duration since HIV diagnosis, viral load, CD4 count, duration on ART, current ART regimen, exposure to drugs, and protease inhibitors.

#### Glucocorticoids alleviate inflammation but do not improve left ventricular diastolic dysfunction in collagen-induced arthritic rats

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Background: Systemic inflammation in rheumatoid arthritis (RA) significantly contributes to left ventricular (LV) diastolic dysfunction. Although glucocorticoids (GCs) are effective in managing RA inflammation, their long-term use may affect cardiovascular disease risk. There is limited direct evidence on the impact of GC treatment on the inflammation-induced LV function impairments.

Objectives: This study investigated the effects of GCs on LV function in a collagen-induced arthritis (CIA) rat model.

Method: Sprague Dawley rats were divided into control, CIA, GC, and CIAGC groups (n=10 each). The CIA group received bovine type-II collagen, while the CIAGC and GC groups were administered 10mg/kg prednisolone daily for 6 weeks. At termination, circulating high-sensitivity C-reactive protein (hs-CRP) concentrations were measured by ELISA. LV function was assessed using echocardiography and LV collagen accumulation was assessed histologically using the picrosirius red stain.

Results: The hs-CRP concentration was lower in the CIAGC group compared to the CIA group (p=0.02). LV mass indexed to body weight was higher in the CIA group compared to the control (p=0.01) and GC groups (p=0.02), however no differences were observed between the CIA and CIAGC groups (p=0.11). Compared to controls, all groups had lower lateral e' and e'/a' ratios (p<0.01). Compared to controls, all groups had higher relative wall thickness (p<0.05), E/e' ratios (p<0.01), and collagen area fraction (p<0.05). No differences were observed between the CIA and CIAGC groups for all echocardiographic and histological markers.

Conclusion: Systemic inflammation induced concentric hypertrophy, impaired LV relaxation, and increased LV filling pressures. GC treatment reduced inflammation but did not improve LV geometry or function.

### Infective endocarditis-associated glomerulonephritis and renal failure in a child with ventricular septal defect

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Background: Acute renal failure associated with infective endocarditis (IE) is reported to occur in approximately 10% of paediatric IE cases. Mechanisms underlying the renal failure include infection-related immune complex glomerulonephritis, haemodynamic instability from sepsis and heart failure, renal infarction from septic emboli, and renal cortical necrosis.

Objectives: To describe the outcome of a patient known with a small ventricular septal defect (VSD) who developed infective endocarditis complicated by immune-complex mediated glomerulonephritis and acute renal failure.

Method: We retrospectively reviewed all the patient's hospital records.

Results: An 8-year-old female, previously well, with a background history of trisomy 21, restrictive perimembranous VSD and well-controlled hypothyroidism on levothyroxine, was referred for evaluation of non-specific constitutional symptoms. On admission, she was pale, febrile, tachypnoeic, tachycardic, hypertensive, and had a petechial rash prominent in the lower limbs, hepatosplenomegaly, and a 3/6 ejection systolic murmur. Her initial blood results showed elevated inflammatory markers and impaired renal function which subsequently peaked at a urea of 25.2mmol/L and creatinine 265µmol/L. After echocardiography showed vegetations on the tricuspid valve and moderate tricuspid regurgitation, a diagnosis of infective endocarditis with associated immune-complex glomerulonephritis was made (based on low C3 / C4 and absence of renal infarcts on ultrasound). She had 4 negative blood cultures and 1 which grew Staphylococcus hominis. A multidisciplinary discussion recommended surgery for resection of vegetations, tricuspid

valve and VSD repair rather than dialysis as the appropriate treatment to resolve the renal impairment. Surgery was done after 3 weeks of renal-adjusted doses of antibiotics. A good repair was achieved, with minimal post-operative tricuspid regurgitation and no residual VSD. Post-operatively, she completed a total of 6 weeks antibiotics and her renal function improved to a urea of 10.9mmol/L and creatinine 103µmol/L. She was discharged on post-operative day 24 with a plan to review in 1 month with repeat renal function tests.

**Conclusion:** Antibiotic treatment and surgery can successfully resolve renal dysfunction in patients with infective endocarditis-associated renal failure, without the need for dialysis.

### Co-supplementation with coenzyme Q10 and simvastatin protects cultured heart cells against dyslipidemia-induced oxidative damage

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**Background:** Dyslipidemia remains a key factor contributing to cardiovascular complications in individuals with type 2 diabetes (T2D). Current medications such as statins are effective at lowering cholesterol to improve cardiovascular outcomes in people with dyslipidemia. However, long-term use of statins has been associated with the depletion of coenzyme Q10 (CoQ10), an important intracellular antioxidant and mitochondrial membrane component found in abundance within heart cells, which may explain increased oxidative stress-associated damage within the myocardium in individuals with T2D.

**Objectives:** Is to explore whether supplementation with CoQ10 can enhance the therapeutic efficacy of simvastatin in protecting against oxidative stress-associated damage in cultured heart cells.

**Method:** Here, H9c2 cardiomyoblasts, a widely utilised experimental model to study heart cell physiology, were pre-treated with CoQ10 (2.5µg/ml) and simvastatin (2.5µM) before exposure to palmitic acid (0.25mM) for 24 hours. Thereafter, prominent markers of oxidative stress and cellular damage were evaluated, including mitochondrial oxidative capacity, reactive oxygen species (ROS) production, intracellular antioxidants, and apoptotic markers. Cholesterol content and lipid peroxidation were other markers that were analysed following the supplementation of heart cells with CoQ10 and simvastatin.

**Results:** Co-supplementation with CoQ10 was effective in protecting against dyslipidemia-associated oxidative damage in cultured heart cells. This was associated with improved efficacy of simvastatin in reducing cholesterol levels, and lipid peroxidation products, while also improving mitochondrial respiration, and decreasing oxidative stress-induced cellular damage following the exposure to palmitic acid. Reduction of toxic ROS was associated with enhanced mRNA expression of nuclear factor erythroid 2-related factor 2 (Nrf2), an essential antioxidant response element. Moreover, this study uniquely demonstrated the ability of CoQ10 supplementation to directly decrease mRNA expression levels of lanosterol synthase, suggesting that CoQ10 may regulate cholesterol production without compromising endogenous CoQ10 biosynthesis.

**Conclusion:** Preliminary findings suggest that CoQ10 supplementation could provide cardioprotective benefits by potentially improving the efficacy of statins in alleviating dyslipidemia-associated oxidative damage in cultured heart cells. However, further research, including in vivo studies, is essential to confirm these observations and determine the most effective treatment protocols.

### Filamin-C (FLNC) as a cause of disease in a large South African family diagnosed with restrictive cardiomyopathy

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**Background:** Restrictive cardiomyopathy (RCM) is a rare cause of cardiomyopathy in developed countries, although its prevalence may be more common in certain tropical regions. The aetiology of RCM remains poorly understood and may result from inherited or acquired predispositions and disease, or a combination thereof. Familial RCM usually has autosomal dominant inheritance, with most identified genes encoding sarcomere or Z-disk proteins. This study aimed to determine the disease-causing variant in this South African family diagnosed with RCM. **Objectives:** We exome sequencing to detect the variant.

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Method: A South African family was screened at Groote Schuur Hospital. The DNA of the affected individuals was captured and amplified using the TWIST Library Kit and run on the NovaSeq 6000 platform. Pathogenic variants were selected according to the ACMG / AMP guidelines. Primers were designed, and the Sanger sequencing method was used for variant validation. Segregation analysis was performed after the disease-causing variant was identified.

Results: The family was initially diagnosed with Noonan syndrome-associated cardiomyopathy based on suggestive clinical findings. However, panel screening for Noonan's found no causative gene. The diagnosis was revised, and an alternative cause of RCM was considered. Exome sequencing found a heterozygous missense FLNC c.6031G>A (p.Gly2011Arg) variant in all affected individuals. The variant is located in the FLNC protein R18 Ig-loop of the rod 2 domain and has been associated with severe RCM.

Conclusion: This study highlights that accurate clinical phenotyping is critical for identifying pathogenic genetic variants. Our research successfully identified the disease-causing variant in a South African family with RCM. This discovery will aid in identifying other family members at risk and facilitate early diagnosis and treatment.

#### A case of refractory atrial flutter in a Fontan patient

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Background: Intra-atrial reentry tachycardia (IART) is the most common arrhythmia seen following total cavo-pulmonary connection (TCPC) which can result in heart failure, stroke, or sudden cardiac death. Catheter ablation can be attempted but recurrence is common. Atrial pacing, to prevent premature atrial ectopics that could trigger IART, in combination with high-dose sotalol and atrial anti-tachycardia pacing (ATP) has been described as an effective management option.

Objectives: To outline the clinical outcome of a patient with TCPC and IART managed at Red Cross War Memorial Children's Hospital (RCWMCH). Method: A case review of patient management over a 9-year period.

Results: The patient was diagnosed at age 2 years with pulmonary atresia / intact ventricular septum. Initial management was with a left modified Blalock-Taussig-Thomas (LMBTT) shunt. Radiofrequency perforation of the pulmonary valve was unsuccessful. Attempted bi-ventricular repair with RV-PA reconstruction at age 3 years failed. This was followed by a pulmonary artery band and central shunt. At age 4 years, a bidirectional Glenn shunt was performed with takedown of the central shunt. The LMBTT shunt was occluded with a vascular plug. At age 8 years, a fenestrated, external conduit TCPC was performed, followed by stenting of a left pulmonary artery stenosis. She developed recurrent IART at age 10 years. Aspirin was changed to warfarin, and cardioversion performed twice. Due to IART recurrence, sotalol was added. IART was suppressed but led to sinus node dysfunction and bradycardia. Discontinuing sotalol resulted in IART recurrence. Ablation was not possible as no 3D electroanatomical mapping is available at RCWMCH. A transvenous atrial pacemaker was implanted through the Fontan fenestration. High-dose sotalol and warfarin were continued. At medium-term follow-up, transvenous atrial pacing, combined with high-dose sotalol has been successful in preventing further IART.

Conclusion: High-dose sotalol in combination with atrial pacing can successfully prevent IART post-TCPC.

#### Transcatheter interventions in the management of ventricular septal defects: A 20-year single centre South African experience

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Background: Ventricular septal defects (VSDs) are one of the most common congenital heart defects. Traditionally, VSDs have been closed surgically. However, since the first reports of transcatheter VSD closures in 1988, percutaneous VSD closure has increasingly become an alternative to surgical closure.

Objectives: Describing the characteristics and outcomes of children who underwent percutaneous VSD closure at Chris Hani Baragwanath Academic Hospital.

Method: A retrospective, descriptive analysis was conducted at Chris Hani Baragwanath Academic Hospital in South Africa to evaluate patients who underwent transcatheter VSD closure between 2003 and 2023.

Results: There were 22 patients who underwent transcatheter VSD closure, 13 (59%) females and 9 (41%) males. Successful closure was achieved in 19/22 (86%). Of the 3/22 (14%) who did not have successful closure, I went for surgery, I had a spontaneous closure during follow up and I is still being followed up. Most of the VSDs were muscular 18/22 (82%) with the remaining 4/22 (18%) being perimembranous VSDs. Complications included transient mild aortic regurgitation and tricuspid regurgitation (3/12), transient residual VSD flow through the device in (4/12), transient arrhythmias (2/12), a clot in the right ventricle during the procedure which resolved with heparin infusion (1/12), transient left ventricular dysfunction (1/12) and 1 child (1/12) developed asymptomatic premature ventricular contractions 6 years later. There were no complications in the remaining 10/22 (45%).

Conclusion: With careful selection of patients, percutaneous VSD closure is a safe procedure in our setting with good outcomes and minor complications in most cases.

#### Afterload mismatch: A state of decompensation from progressive aortic stenosis disease

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**Background:** Afterload mismatch (AM) in severe aortic stenosis (AS) refers to the maintenance of a high gradient (>40mmHg) despite a low left ventricular ejection fraction (LVEF<50%). The mechanism underlying the low LVEF in AM is not known, nor is its place in the natural history of severe AS disease.

**Objectives:** To characterise left ventricular (LV) remodelling, function and afterload in AM compared to patients with high-gradient severe AS and preserved LVEF using cardiovascular magnetic resonance (CMR) imaging.

**Method:** Participants with high-gradient severe AS were prospectively recruited from Tygerberg Academic Hospital and divided into 2 groups based on LVEF below (AM) or above 50%. Those with other haemodynamically significant valve lesions, structural heart diseases, and / or significant coronary artery disease were excluded. All participants underwent CMR imaging using a Siemens Magnetom Aera 1.5 T scanner for evaluation of LV geometry, function and end-systolic wall stress (ESWS). Images were post-processed using Circle Cardiovascular Imaging (CVI42) software.

**Results:** Of 50 patients with high-gradient severe AS, 18 (36%) had AM (LVEF  $27 \pm 9\%$ ) and 32 (64%) had NEF (LVEF  $67 \pm 9\%$ ). Significantly larger (LVEDVi 125 ± 26 vs. 75 ± 16ml/m<sup>2</sup>; p<0.0001) and heavier [LVMi 105(31) vs. 73(30)g/m<sup>2</sup>; p<0.0001)] ventricles were observed in AM. Non-invasive ESWS was significantly higher in AM (175 ± 69 vs. 78 ± 28 ×103 dynes/cm<sup>2</sup>; p<0.0001) and correlated inversely with LVEF (r=-0.74 with 95% CI -0.86 to -0.55; p<.0001). More severe stenosis was observed in AM (AVA 0.49 ± 0.2 vs. 0.7 ± 0.2cm<sup>2</sup>; p=0.0006 and mean gradient 60 ± 12 vs. 55 ± 18mmHg; p=0.1) that correlated with higher degrees of LV remodelling (AVA and LVEDVi r=-0.47 with 95% CI -0.69 to -0.17; p=0.004 and AVA and LVMi r=-0.46 with 95% CI -0.69 to -0.14; p=0.005) and ESWS (AVA and ESWS r=-0.49 with 95% CI -0.71 to -0.19; p=0.003).

**Conclusion:** AM was characterised by more severe degrees of AS and more advanced LV remodelling. Adaptive LVH is likely outweighed by the excessively high afterload in AM resulting in decompensation characterised by a self-perpetuating cycle of increased ESWS, cavity dilation, and reduced LVEF.

#### Infantile pericardial teratoma

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**Background:** Teratomas are rare congenital tumours that are derived from the embryonic germ cell layers. They mainly occur in the sacrococcygeal area but the anterior mediastinum is the most common extragonadal site. Cardiac teratomas are mostly found extracardiac in the intrapericardial space. They frequently present with cardiac tamponade and cardiovascular collapse.

Objectives: We present a rare case of a 3-month-old infant with a pericardial teratoma who presented with cardiac tamponade.

**Method:** A 3-month-old girl presented to our hospital with severe respiratory distress. On examination she was apyrexial, in severe respiratory distress, hypotensive with weak volume pulses. She was in CCF, with a displaced apex beat, soft heart sounds, a tachycardia with an S3 gallop rhythm, and no audible murmur. HIV, cardiotoxic viruses and TB were excluded. A CXR showed a mediastinal mass, cardiomegaly with opacification of the entire left lung. An echocardiogram showed massive pericardial effusion with features of cardiac tamponade and a cystic mass in the pericardial sac. An urgent pericardiocentesis was done and she was optimised for surgery. Pericardial fluid analysis showed a transudate fluid. Chest CT scan showed a mediastinal mass with enhancing septations and calcifications. CRP, BHCG and AFP levels were normal.

**Results:** Intraoperatively there was a smooth and lobulated mass covering the right atrium and ventricle which was adherent to the ascending aorta. The mass was successfully dissected and completely excised. Gross histological assessment showed a well circumscribed and nodular tumour. Microscopically, a teratoma with elements derived from all 3 germ cell layers was seen. Approximately 2% of the tissue was composed of immature neural tissue with no features of malignancy. Postoperatively the patient improved remarkably and echocardiogram showed no residual teratoma or pericardial effusion. Follow up BHCG and AFP remained normal.

**Conclusion:** Intrapericardial teratomas are rare pericardial tumours of infancy and usually present with pericardial effusion like in our patient. They are usually benign and total resection is usually the definitive treatment. They require follow up to exclude recurrence and malignant transformation.

#### Rheumatic heart disease control programmes in Africa: A systematic review

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**Background:** Rheumatic heart disease (RHD) is a significant cause of heart failure globally. Sub-Saharan Africa accounts for 23% of RHD cases worldwide, with the highest prevalence rate of 8.64 cases per 1 000 people. To address the diverse challenges in prevention and management of RHD in African countries, it is crucial to establish and subsequently monitor RHD programmes in each country. This approach aligns with the 2018 World Health Assembly Resolution on Rheumatic Fever and Rheumatic Heart Disease.

Objectives: This review aims to provide a comprehensive mapping of RHD control programmes within the WHO AFRO region.

**Method:** Five databases were searched from January 2012 - February 2024 for published reviews. The data were categorised and analysed according to the 25 domains of the Core Conceptual Framework for Comprehensive Rheumatic Heart Disease Control Programmes. To reduce bias, article screening, data, and critical appraisal were conducted in duplicate.

**Results:** We retrieved 49 reviews conducted in 38 of the 47 AFRO countries with 22 countries reporting burden of disease data. Of the 16 countries reporting RHD prevalences from school-based studies, 3 countries (Namibia, Nigeria and Cote d'Ivoire) were classified as being at low-risk populations for RHD. Twenty two countries had evidence of tertiary cardiac services, with only 7 reporting local teams with RHD-specific services. Ten countries reported either partial or full reliance on surgical services external to the country. Notably, South Africa was the only country with published primary and secondary prevention guidelines for RHD.

**Conclusion:** This comprehensive mapping of RHD Control Programmes in Africa indicates that no single country provided sufficient information across all 25 domains; I I countries had no published information in any domain, thus highlighting the numerous gaps in profiling the RHD programmes in the AFRO region, emphasising the need for more data. A search of primary studies would be useful to identify information not included in a review. Further, this review of reviews provides a framework for future formal studies or targeted supplementary data collection. Conducting interviews with key contacts in each country is recommended to assist in mapping the scope and effectiveness of RHD programmes.

#### Chemotherapy-induced cardiotoxicity: Targeting the ferroptosis pathway as a therapeutic option

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**Background:** Post-transfusion iron (Fe) overload is a common reaction in cancer therapy due to (i) regular blood-transfusions to treat anemia, (ii) the absence of a Fe secretion physiological mechanism and (iii) the use of Fe-chelating chemotherapeutics, like doxorubicin (Dox). Excessive Fe levels promote cardiac Dox-retention by forming Dox-Fe complexes which trigger Fe-induced oxidative damage via the ferroptosis pathway.

**Objectives:** To investigate the role of a polyphenolic compound C (CC) against ferroptosis as a therapeutic target of chemotherapy-induced cardiotoxicity (CICT) and its effect on the efficacy of cancer treatment.

**Method:** An in vitro model of CICT was established by treating H9c2 cells with either Dox  $(0.5\mu$ M) or co-treatment with CC  $(1\mu$ M) plus Dox  $(0.5\mu$ M) for 6 days. The in vitro data were validated in a neoplastic animal model, whereby mice were intraperitoneally treated with 5mg/kg Dox or co-treated with 25mg/kg CC plus 5mg/kg Dox for 5 weeks. The suitability of CC in the management of CICT and cancer therapy were determined through gene expression studies by quantifying markers of ferroptosis [ferritin, transferrin, carbonyl reductase 1 (CBR1), ROS, lipid peroxidation, glutathione (GSH), GPx4 and NOX], oxidative phosphorylation and cell death. Tumour progression and survival outcomes were also monitored.

**Results:** In vitro data analysis shows that CC exhibits anti-ferroptosis effects against CICT by scavenging hydroxyl radicals ( $24.08 \pm 3.87 \text{ vs. } 32.81 \pm 5.28$ ) and lipid peroxides ( $38.50 \pm 2.05 \text{ vs. } 80.50 \pm 1.66$ ) via GSH ( $17.52 \pm 1.11 \text{ vs. } 7.13 \pm 1.01$ ) activity relative to Dox-treatment. As a co-treatment, CC additionally improved oxidative phosphorylative parameters [ATP-linked respiration ( $23.92 \pm 0.86$ ), maximal-respiration ( $12.77 \pm 0.21$ ), and respiratory control ( $36.86 \pm 7.82$ )]. These preliminary benefits were further shown by the differential expression of ferritin, transferrin, CBR1, GPx4 and NOX in mice co-treated with CC relative to the Dox-treated animals. The anti-ferroptosis effect of CC were confirmed through the reduction of p53 expression. In vivo findings also revealed that Dox's anti-tumour effects were augmented by CC co-treatment, as seen from increased tumour-regressions ( $513.7 \pm 526.7 \text{ vs. } 638.6 \pm 599.6$ : Dox-treatment) and survival outcomes.

**Conclusion:** The data offers promising scientific insights into the therapeutic benefits of CC which was not limited to its cardioprotection, through the ferroptosis pathway, but were also shown in its ability to enhance the efficacy of cancer treatment.

#### Risk profile and early outcomes for female TAVI patients in South Africa

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**Background:** TAVI implants have been available for >10 years in SA and data has been collected since 2014 in a national registry. **Objectives:** Evaluating local TAVI outcomes against international best practise using data captured in the SHARE TAVI registry, can provide an evidence base to inform appropriate patient selection in subgroups such as females.

**Method:** Clinical and demographic data of 4 249 aortic stenosis patients (pts) has been captured into a national web-based prospective registry, outcomes are reviewed at 30 days and annually (to 10 years) post-implant (VARC2 definitions). From September 2014 - June 2024, 2 996 of these patients received TAVI implants, aggregated procedural and 30-day outcomes data from all 31 participating sites has been analysed by sex.

Results: Patient populations and outcomes are similar to other registries and studies (GARY, Corevalve, PARTNER 1) in early TAVI programmes.

Female pts are less represented in TAVI implant data in SA, 41.45% (n=1242/2996), and the percentage of females has gradually dropped from 52.94% in 2014 to 39.9% in 2023. Females are on average slightly older than males, 79.964 vs. 78.854 years, have higher STS risk score 6.139% vs. 5.329% and are more often frail 28% vs. 19% of men. Most comorbidities occur similarly between sexes, exceptions are: **Females:** Prior CABG 9.18%, permanent pacemaker 6.84%, extracardiac arteriopathy 9.02%, DM 20.13%. **Males:** Prior CABG 27.31%, permanent pacemaker 11.97%, extracardiac arteriopathy 16.99%, DM 26.97%. Females have higher mean gradient across valve (49.25 vs. 46.62mmHg), and more pts in NYHA class III+IV (61.22% vs. 55.75%). Lower procedural success in females (96.86%) vs. 97.95% in males is partly due to higher female intraprocedural mortality 1.93% vs. 0.68%, and similarly 30-day mortality 6.04% vs. 3.71% is higher in females. Mortality outcomes by 1-year (11.93% vs. 12.71%) and 2-year (22.10% vs. 23.16%) favour females. **Conclusion:** Differences in baseline echo measurements, risk scores, comorbidities and periprocedural outcomes between sexes do not always track to obvious changes in longer term outcomes, and further study of this data is needed to review additional factors influencing mortality outcomes between sexes.

#### Valve longevity and long term 8-year outcomes for TAVI patients in South Africa

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Background: TAVI implants have been available for >10 years in SA and data has been collected since 2014 in a national registry.

**Objectives:** Evaluating local TAVI outcomes against international best practise using data captured in the SHARE TAVI registry, can provide an evidence base to inform national health policy and improve access to appropriate care.

**Method:** Clinical and demographic data of 4 249 patients (pts) has been captured into a national web-based prospective registry since 2014, outcomes are reviewed at 30 days and annually (to 10 years) post-implant (VARC2 definitions). Eight-year post-TAVI outcomes are available for 173 patients from September 2014 - June 2016, implanted at 11 sites, 16.2% were implanted in public hospitals.

**Results:** Patient populations and outcomes are similar to other registries and studies (GARY, Corevalve, PARTNER I) in early TAVI programmes (Schaafsma, et al. 2022). Risk scores are higher than more recent cohorts, because of earlier guideline recommendations that TAVI only be available to inoperable or high-risk patients. STS 7.602  $\pm$  8.442%. Log Euroscore 22.236  $\pm$ 14.818%. Euroscore II 6.622  $\pm$ 4.898%. Procedural success of 91.9% and 2.89% intraprocedural mortality, and 1-year mortality of 18.5% have previously been reported for this group. 2- and 5-year mortality are 30.0% and 59.0% respectively. 24.85% of patients survived to 8 years. Mortality cause is currently unavailable in 45.4% of deceased patients (n=59/130), and must be assumed to be of cardiac origin, cardiac mortality is specified in 22.3% (n=29/130), while COVID 3.08% (n=4/130) and other non-cardiac causes 29.23% (n=38/130) account for the remainder of the deceased patients. 3/173 (1.73%) patients have had a second TAVI implant, at 8, 7, and 4 years after the first TAVI. The patient with the 4-year gap survived for a further 3 years after the 2nd TAVI, and the other 2 patients are still alive after their 2nd procedure earlier this year.

**Conclusion:** Despite their higher operative risk, SA's earliest TAVIs had good outcomes and survival over the longer term, with nearly 25% of patients alive at 8 years post implant. Patients requiring further aortic valve intervention are uncommon, but still have good outcomes post the 2nd implant. Local registry data may be used to support access to TAVI as AS treatment in SA, SHARE TAVI data evidences clear benefit to patients with TAVI implants i.t.o. life expectancy across all risk categories, and high procedural success and extended life expectancy benchmark favourably with international best practice.

## Exploring mitochondrial function in people living with HIV: Preliminary findings from the Mito-SAKen Study

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**Background:** HIV-infection has been associated with altered mitochondrial function, and it is well known that mitochondrial dysfunction can lead to metabolic disturbances. However, the role of mitochondria in HIV-associated cardiometabolic disease (CMD) is poorly described in sub-Saharan African populations.

Objectives: To explore mitochondrial function in PLWH with and without CMD.

**Method:** Participants were recruited from a clinic in Worcester, and divided into 4 sub-groups based on HIV and CMD status: HIV- / CMD- (n=28), HIV- / CMD+ (n=33), HIV+ / CMD- (n=32), HIV+ / CMD+ (n=34). CMD was defined as  $\geq$ 3 of the following: obesity, hypertension, diabetes, low HDL, high triglycerides, smoking, high CRP. Medical history, anthropometric and blood pressure measures were obtained, and blood and urine samples collected for biochemistry. Mitochondrial function analyses were performed in peripheral blood mononuclear cells via high-resolution respirometry (HRR) on an Oroboros<sup>®</sup> O2K instrument.

**Results:** The cohort is young (~39.5 years), consisting of ~72% females and ~60% smokers. HRR showed that routine respiration (0.00 [0.0 - 0.07] vs. 2.11 [0.4 - 3.4] pmol/min/10<sup>6</sup> cells/mL; pmol/min/10<sup>6</sup> cells/mL; p=0.008) were lower in HIV+ vs. HIV-. The following mitochondrial parameters were impaired in CMD+ vs. CMD- participants: Electron Transport System capacity (ETS): 0.32 (0.13 - 0.82) vs. 0.7 (0.27 - 1.41) pmol/min/10<sup>6</sup> cells/mL (p=0.007); beta-oxidation-linked oxidative phosphorylation (OxPhos): 0.17 (0.01 - 0.62) vs. 0.53 (0.11 - 1.05) pmol/min/10<sup>6</sup> cells/mL (p=0.005); complex II-linked OxPhos: 0.24 (0.01 - 0.62) vs. 0.47 (0.06 - 1.22) pmol/min/10<sup>6</sup> cells/mL (p=0.03); and glycerophosphate dehydrogenase respiration: 0.12 (0.0 - 0.53) vs. 0.39 (0.10 - 1.08) pmol/min/10<sup>6</sup> cells/mL (p=0.01). Routine respiration was lower in HIV+CMD- and HIV+CMD+ vs. HIV-CMD- and HIV+CMD+ vs. HIV-CMD- (p=0.01). Glycerophosphate dehydrogenase respiration was lower in HIV+CMD+ vs. HIV-CMD+ vs. HIV-CMD- (p=0.04).

**Conclusion:** Our preliminary data suggest that HIV-infection, CMD and HIV-associated CMD exert inhibitory effects on oxygen consumption in various mitochondrial respiration states. These results warrant further investigations to assess whether altered mitochondrial function acts as a mechanism in the development of CMD in PLWH.

#### A cross-sectional study of patients with prosthetic mitral valves at a tertiary centre in Johannesburg

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**Background:** There is a high incidence of rheumatic valvular heart disease involving the mitral valve in Soweto, Johannesburg. Many of these patients go on to have mitral valve replacement (MVR). Data regarding clinical and echocardiographic characteristics of patients with prosthetic mitral valves is scarce in South Africa.

**Objectives:** To document the clinical and echocardiographic profiles of contemporary patients with MVR.

**Method:** Clinical, electrocardiographic, and echocardiographic data in these patients were collected prospectively from March 2020 - August 2021 at Chris Hani Baragwanath Academic Hospital prosthetic valve clinic.

**Results:** The study included 186 participants with a median age of 52 years (IQR: 41 - 60). Ninety six percent were of black African ethnicity (79% female). The median body mass index (BMI) among participants was 27 (IQR: 23.5 - 30.4), with 29% of participants classified as obese (BMI greater than 30kg/m<sup>2</sup>). Eighty two percent of patients had New York Heart Association class I dyspnoea. The most common complications were atrial fibrillation (AF, 39%), stroke (23%), and heart failure (HF, 25%). There were 2 cases of prosthetic valve thrombosis, 2 cases of prosthetic valve endocarditis, 2 of paravalvular regurgitation, and 1 structural valve deterioration. Seventy percent of patients had subtherapeutic international normalised ratios (INR), with a median INR of 2.55 (IQR: 2.03 - 2.92). Forty seven percent of patients had a left ventricular ejection fraction (EF) of less than 40%. Seventy four percent of participants were on some combination of guideline-directed medical therapy for HF with reduced EF, although only 12% were on at least 3 medications. Pulmonary hypertension was present in 37% of patients, with a median pulmonary artery systolic pressure of 28.5mmHg (IQR: 17 - 41). **Conclusion:** The contemporary patients with MVR were middle-aged obese females with significant atrial fibrillation burden, residual left ventricular

dysfunction, and subtherapeutic INR.

# Changes in cerebral haemodynamics and tissue oxygenation during hypothermic reduced-flow compared with moderate hypothermia with full-flow cardiopulmonary bypass during cardiac surgery in neonates

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**Background:** Neurologic injuries remain a problem in neonates and infants undergoing cardiac surgery with cardiopulmonary bypass. The most important risk factor with high incidence is inadequate oxygen supply to the brain. This study investigates the effect of temperature and pump flow during cardiopulmonary bypass on cerebral oxygenation and perfusion.

**Objectives:** We hypothesised that moderate hypothermia and full-flow CPB will improve cerebral haemodynamics and oxygenation in neonates undergoing arterial switch operation (ASO).

**Method:** Newborns (n=20) with D-Transposition of great arteries (D-TGA) undergoing primary surgery were randomised to receive either deep hypothermic reduced-flow CPB (T<20°C, CPB-flow 100ml/kg/min, Group 1) or moderate hypothermia with full-flow (T=28°C, CPB-flow 180 - 200ml/ kg/min, Group 2). Regional cerebral tissue oxygen saturation (rSO2) by near-infrared spectroscopy and cerebral blood flow velocity (CBFV) using paediatric transcranial Doppler sonography were measured at defined stages during surgery and CPB.

**Results:** After onset of cardiopulmonary bypass (CPB), there was a continuous increase in rSO2, reaching maximum values at the lowest temperature with significant differences between groups (p<0.05). After CPB, rSO2 was lower in Group I compared to Group 2. The difference reached a significant value at the end of the operation (p<0.05). During rewarming and offset of CPB, mean maximum velocity (Vmean) and pulsatility index (PI) differed significantly between Groups (p<0.05). At the end of CPB, an initially reduced diastolic flow velocity pattern was present, resulting in higher PI and lower Vmean in Group I.

**Conclusion:** In summary, this study shows that regional cerebral oxygenation and intracranial haemodynamics are significantly influenced by temperature and pump flow. Measured indices of cerebral blood flow velocity and cerebral oxygen saturation were significantly improved after full-flow CPB with moderate hypothermia compared with deep hypothermic reduced-flow CPB in neonates with transposition of the great arteries.

#### Cholesterol pericardial effusion in a 12-year-old girl

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**Background:** Cholesterol pericarditis is a rare a form of chronic pericardial effusion characterised by high concentrations of cholesterol, cholesterol crystals, or both in the pericardial space. It can present as constrictive pericarditis, cardiac tamponade, or an asymptomatic course. Differential diagnoses of chronic pericardial effusion include hypothyroidism and systemic lupus erythematosus.

**Objectives:** We present a rare case of cholesterol pericardial effusion.

**Method:** A 12-year-old girl presented with a silent large heart referred by a local clinic. She had a cough, shortness of breath, malaise for a period of 4 days. She had been losing weight over the last few months. She was previously treated for pulmonary tuberculosis (PTB) in 2018 for 6 months and was HIV negative. Her mother was on PTB treatment for 3 months. Family history of hypercholesterelemia was not explored and serum levels of cholesterol were not measured. She had no clinical symptoms of connective tissue disease. Chest X-ray showed a large heart and was referred to Dora Nginza for further management. On examination she had severe thinness, was saturating at 100% on face mask oxygen, and mildly tachypneic. The heart sounds were muffled. An echocardiogram showed a large pericardial effusion with no evidence of cardiac tamponade. Pericardiocentesis was performed, and about 170ml of blood-stained fluid was aspirated. She was started on TB treatment and steroids. Post pericardiocentesis, she developed a large pneumopericardium. A differential diagnosis of hydatid cyst was suspected and computed tomography (CT) of the chest was done to exclude the cyst. The CT chest showed large pneumopericardium with no cysts. Evidence of malignancy and TB was negative in the pericardial fluid. A pericardial window was done. Histology demonstrated cholesterol crystal and foamy macrophages containing cholesterol with no evidence of TB. The patient was well after the surgery, was discharged on TB treatment while awaiting histology result but she was lost to follow up.

**Results:** A 12-year-old girl with a silent large heart was referred to Dora Nginza Hospital by local clinic. She presented with cough, shortness of breath, malaise for 4 days. She has been losing weight over the last few months. She was previously treated for pulmonary tuberculosis (PTB) in 2018 for 6 months and was HIV negative. Her mother was on PTB treatment for 3 months. Family history of hypercholesteremia was not explored and serum cholesterol and thyroxine levels were not done. She had no clinical symptoms of connective tissue disease. Chest X-ray showed a large heart and was referred to Dora Nginza for further management. On examination she had severe thinness, she was saturating at 100% on face mask oxygen and mildly tachypneic. The heart sounds were muffled. Echocardiogram showed a large pericardial effusion with no evidence of cardiac tamponade. Pericardiocentesis was performed and about 170ml of blood-stained fluid was aspirated. She was started on anti-TB treatment and steroids. Post pericardiocentesis, she developed a large pneumopericardium. A hydatid cyst was suspected and computed tomography (CT) of the chest was done to exclude the cyst. CT chest showed large pneumopericardium with no cysts. Evidence of malignancy and TB were negative on the pericardial fluid. Pericardial window was done. Histology demonstrated cholesterol crystal and foamy macrophages containing cholesterol and there was no evidence of TB was negative. Patient was well after the surgery, was discharged on TB treatment while awaiting histology result but she was lost to follow up.

Conclusion: This case represents a rare presentation of pericardial effusion in children. Very few cases have been reported in literature.

#### Radiation safety culture: A mobile appplication

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Background: The occupational radiation safety culture was researched and evaluated (2019 - 2021) with an audit checklist at 3 cath labs for optimal compliance, especially regarding wearing dosimeters, protective devices, methods to optimise occupational radiation protection and exposure to the eyes, thyroid, hands, and feet of the team. The audit checklist tool successfully determined areas at each site where improvements are needed to optimise the safety culture in terms of the radiation protection principles of distance, time, shielding, and dose monitoring. The practical site recommendations of I site will be shared.

Objectives: To maintain and optimise a radiation safety culture, using a mobile application to engage all staff in a regular review process.

Method: (1) The standards of the radiation safety culture audit checklist criteria were benchmarked to measure the radiation safety culture (habits) (2) The checklist was converted into a mobile application (2021 - 2023) with report features by involving application specialists and physicists. (3)The mobile application was piloted at 3 sites. A dedicated administrator (radiographer / cardiologist) had access to all the reports embedded in the application.

Results: (1) The mobile application engaged all staff in a regular review of measurable actions, recording technical factors such as tube angulation, exposure factors, distance from the X-ray source, fluoroscopy duration, and lead shielding thickness. The dose was measured with real-time dosimeters. (2) The staff received feedback to indicate compliance by means of a progress meter on the application. (3) The progress meter indicated the gaps in radiation protection actions and occupational exposure monitoring during interventional procedures. (4) The results tracked the progress of distance, time, shielding, and dose monitoring. (5) The satisfaction survey indicated awareness of daily radiation safety habits and radiation exposure to staff.

Conclusion: By engaging all staff, the application can improve compliance, and maintain real-time optimisation of radiological techniques, and best practice radiation safety techniques.

#### Characteristics of heart failure with a preserved ejection fraction in black South African patients

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Background: Heart failure with a preserved ejection fraction (HFpEF) is common in the elderly (≥75 years) and associated with arterial stiffness. The mean age of HFpEF presentation is lower (40 - 55 years) in sub-Saharan Africa. No clinical study has been conducted on HFpEF in identifying and characterising this phenotype at a younger age, moreover in a South African black population where the risk of HFpEF is 2 times higher than in other ethnic groups.

Objectives: This study investigated the characteristics of HFpEF in a black South African population, the biochemical markers that predict HFpEF and cardiac structural changes in this HF phenotype.

Method: Sixty six participants with HFpEF and 213 controls were enrolled. All participants gave informed consent and completed a standardised questionnaire. Echocardiographic, anthropometric, central haemodynamic measurements, pulse wave velocity (PWV), and biomarker analysis were done. Results: The mean age of HFpEF participants was 54.88 ± 13.51 years. Most of the participants (76%) were between 20 and 64 years, while only 24% were older. HFpEF participants were hypertensive, and more obese with increased incidence of alcohol consumption. PWV was increased in HFpEF (9.97 ± 2.78m/s) when compared to participants without HFpEF (6.11 ± 2.18m/s), p<0.0001. There were no significant associations between central haemodynamic parameters, N-terminal pro B-type natriuretic peptide (NT-proBNP) (p=0.9746), and galectin-3 (p=0.2166). NT-proBNP, but not galectin-3, was associated with left ventricular hypertrophy (p=0.0002) and left atrial diameter (p=0.0005).

Conclusion: HFpEF in South Africa is predominant in obese young to middle-age individuals with arterial stiffness and who consume alcohol regularly. NT-proBNP could be used to diagnose HFpEF, however, should be interpreted with caution in populations with a high prevalence of obesity.

## Determining the normal range of left ventricular tract (LVOT) diameters by 2D echocardiography of Patients according to height: Lessons learnt from a false start

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**Background:** Left ventricular outflow tract (LVOT) diameter is a crucial measurement in echocardiographic assessment of aortic stenosis. LVOT measurements are challenging if image quality is poor. Knowing the expected LVOT range for a specific patient will be useful. We set out to determine the correlation between LVOT diameter and patient height in a South African population and to provide a reference range for the predicted LVOT measurement in a patient of a known height

**Objectives:** (1) Determine the range and distribution of LVOT diameters in a South African population. (2) Determine the mean LOT diameter for a specific patient. (3) Determine the correlation between patient height and LVOT diameter:

**Method:** This retrospective study was conducted in the Division of Cardiology at Tygerberg Hospital. One thousand consecutive patients, assessed between January 2022 - June 2024, in whom the LVOT could be accurately measured by echocardiography and who's height had been recorded on the echocardiography request form were included. The LVOT measurements were performed in the parasternal long axis view.

**Results:** The cohort included 449 males and 555 females. The mean LVOT diameter was 21mm (+1.8mm) (males 21mm; females 20mm). The recorded mean height was 167cm (+8.3cm) (males 174cm; females 164cm). When determining the median LVOT diameter for every height category it was noted that 47% of all patients clustered in only 10 heights namely 150cm, 155cm, 160cm, 165cm, 170cm, 175cm, 180cm, 185cm, 190cm and 195cm. The clear implication of estimated heights meant that a correlation analysis, as well as determining the median LVOT diameter for every height category, would be invalid.

**Conclusion:** The data provides reference values for the spectrum of LVOT diameters in a South African population. However, the data could not be used to determine the correlation between height and LVOT diameter nor range of LVOT diameters for a given height. The distribution of the heights recorded in this busy echocardiography service clearly indicate that in many cases the heights filled in on the request forms were estimates rather than measured values with major implications for indexed measurements e.g. indexed aortic valve area. We recommend implementing a policy of measuring patients in your echocardiography service and not relying on the heights provided by the referring clinician. To achieve the original objectives of this study we have initiated a prospective version of this study.

#### Autonomic imbalance, vegetative stress and anxiety in women with heart rhythm disturbances

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**Background:** Heart rate variability (HRV) is currently considered to be a relevant indicator of the autonomic nervous system (ANS) function. Autonomic imbalance is associated with various pathological conditions not only somatic but also psychological.

**Objectives:** The purpose of the study was to assess the state of the ANS activity and the level of anxiety in women with atrioventricular nodal reentrant tachycardia (AVNRT).

**Method:** Thirty-five women with AVNRT, no pharmacologically treated, (mean age 47) were included in the research group. The control group consisted of 35 women (mean age 45) who had no history of any heart rhythm disturbances. In all subjects, other diseases that could potentially affect ANS activity and mental status had been excluded. All of the subjects had 24-hour ECG monitoring with Holter's method in order to evaluate the ANS, based on HRV with frequency analysis and also underwent psychological assessment in order to calculate level of vegetative stress using the State-Trait-Anxiety-Inventory (STAI XI and X2-Test) as well as by the Perceived Stress Scale (PSS-10).

**Results:** ANS activity showed higher LF, LF/HF and lower TP value in AVNRT group, but they were not statistically significant (p>0.05). Women with AVNRT declared significantly higher (p<0.05) emotional tension and stress (PSS-10). The level of anxiety, understood as a transient state of the individual (STAI X1), was also higher in AVNRT women, but not statistically significant. An association between ANS activity and reported feelings of emotional tension in the group with AVNRT was found. Higher LF spectral power and a higher LF/HF power ratio positively correlate with increased feelings of stress understood as a state and trait, while HF spectral power showed a negative relationship with the measured variables (STAI X1, STAI X2). Furthermore, we found no statistically significant correlation between HRV indices and subjective stress experience (PSS-10).

**Conclusion:** (1) Women with AVNRT tend to have autonomic system imbalance with an advantages of sympathicotonia. (2) The increase in perceived emotional tension in women with heart rhythm disturbances depends on the cardiac autonomic profile expressed by the relative or absolute predominance of the sympathetic nervous system.