Scientific Research Publishing

World Journal of Cardiovascular Diseases, 2025, 15(4), 213-233
https://www.scirp.org/journal/wjcd
ISSN Online: 2164-5337
ISSN Print: 2164-5329

Knowledge, Attitude, and Practice of Heart Failure Management by Physicians Practicing in Cardiology Services in Kinshasa, Democratic Republic of the Congo

Daniel K. Tonduangu[1*], M. Jacques Nsuami[2], Hippolyte N. Situakibanza[1], Nathan B. Buila[1], Eleuthère V. Kintoki[1], Benjamin Longo-Mbenza[1]

[1]Division of Cardiology and Hypertension, Department of Internal Medicine, School of Medicine, University of Kinshasa, Kinshasa, Democratic Republic of the Congo
[2]Section of Infectious Diseases, Department of Internal Medicine, School of Medicine, Louisiana State University Health Sciences Center, New Orleans, LA, USA
Email: *danieltonduangu@yahoo.fr

How to cite this paper: Tonduangu, D.K., Nsuami, M.J., Situakibanza, H.N., Buila, N.B., Kintoki, E.V. and Longo-Mbenza, B. (2025) Knowledge, Attitude, and Practice of Heart Failure Management by Physicians Practicing in Cardiology Services in Kinshasa, Democratic Republic of the Congo. *World Journal of Cardiovascular Diseases*, **15**, 213-233.
https://doi.org/10.4236/wjcd.2025.154020

Received: March 4, 2025
Accepted: April 25, 2025
Published: April 28, 2025

Abstract

Objective: This paper aims to assess the knowledge of the European Society of Cardiology (ESC) guidelines for the diagnosis and treatment of heart failure (HF), and to describe the attitude towards and the practice of HF management by physicians who practice in cardiology services in Kinshasa, Democratic Republic of the Congo (DRC). **Methods:** In April 2022, a trained interviewer visited all Kinshasa hospitals and healthcare facilities where adult cardiology services are provided to solicit voluntary participation of providers of those services in this study. Knowledge of the ESC guidelines for the diagnosis and treatment of HF among respondents and their attitude towards and practice of HF management were recorded on a nominal scale. Data were summarized as percentages and reported separately between 14 cardiologists and 24 general practitioners. Chi-square tests were used for all comparisons. Significance level was set at $p < 0.05$. **Results:** All cardiologists (100.0%) and 83.3% of general practitioners ($p = 0.276$) refer to guidelines of the ESC in their standard practice. The overall knowledge of the ESC guidelines for the diagnosis and treatment of HF among cardiologists was very good, but more needs to be done to improve that knowledge among general practitioners. For example, there was a significant difference between cardiologists and general practitioners in the knowledge of HF management of patients with iron deficiency (71.4% vs. 37.5%, respectively; $p < 0.044$) and a borderline significant difference in the knowledge of manage-

ment of patients with type 2 diabetes who develop HF (92.9% vs. 62.5%, respectively; $p < 0.059$) in a city with a high prevalence of both iron deficiency and poorly controlled type 2 diabetes. Most providers do not know the in-hospital prevalence of HF in Kinshasa (cardiologists: 46.2%; general practitioners: 55.6%), but almost all perceive that this unknown prevalence tends to increase (cardiologists: 100.0%; general practitioners: 91.3%). Nearly three quarters think that hypertension is the leading morbidity of HF in Kinshasa (cardiologists: 71.4%; general practitioners: 70.8%). Satisfaction with HF management is low: 61.5% of cardiologists and 62.5% of general practitioners are less, or not much, satisfied with how HF is managed. They attribute the non-optimal HF management in the DRC to financial, structural, and organizational factors. **Conclusions:** Survey respondents paved the way toward setting up a research agenda for starting the as yet non-existing work of systematically studying HF in Kinshasa, which should probably begin with the establishment of a national HF registry for the DRC.

Keywords

Cardiovascular Diseases, Heart Failure Management, Sub-Saharan Africa

1. Introduction

For more than five decades, the role of hypertension in the development of heart failure (HF) has been known [1]. In sub-Saharan Africa, a growing number of clinical studies have shown a high prevalence of HF among adult patients in hospital settings [2]-[4]. In most countries, hypertension is by far the most frequent comorbidity associated with HF. Hypertension was associated with 30% to 50% of HF cases in Cameroon [5] [6], 35% of cases in a multi-center study of 1294 patients in Mozambique, Nigeria, South Africa, Sudan, and Uganda [7], 42.2% to 45% of cases in Tanzania [8]-[10], 42.8% of cases in Togo [11], 45.4% of cases among 1006 HF patients observed in 9 countries [12], 48.6% to 78.5% of cases in Nigeria [13]-[15], and with 50.3% of cases in Burkina Faso [16].

In the Democratic Republic of the Congo (DRC), one study assessed the comorbidities associated with HF in 231 patients managed during hospitalizations ($n = 159$) or in outpatient consultations ($n = 72$) from November 2014 to September 2016 in Lubumbashi, the second largest city in the DRC [17]. Dilated cardiomyopathies were the most frequent comorbidity associated with HF, found in 47.6% of cases ($n = 110$), a frequency strikingly similar to the 40% to 54% reported in the neighboring Rwanda [18] [19]. Hypertension was associated with just 4.3% of HF cases ($n = 10$) in this Lubumbashi series [17]. In Mbuji Mayi, a 2-week in-hospital mortality for hypertension-related morbidities was 22.2% compared to 8.9% in-hospital mortality for non-hypertension-related causes ($p < 0.001$) [20].

Kinshasa, the capital and the largest city of the DRC with a population of 16 million [21], has a prevalence of hypertension estimated at 30.9% in 2008 [22],

increasing from 13.2% twenty-four years earlier [23]. In addition, 42% of patients prescribed anti-hypertensive medication do not adhere to treatment, and 77.5% have uncontrolled hypertension [24]. Despite the existence of these published reports [21]-[24], the risks of cardiovascular complications associated with high blood pressure in Kinshasa are less well characterized [20] [25]. The contribution of hypertension to the development of HF [5]-[17] is consequently unknown. In fact, the prevalence of HF in hospital settings in Kinshasa, its clinical characteristics, its management by local clinicians, its cost to the health care system and to society, are currently unknown.

To begin to gain an understanding of the current state of HF in Kinshasa, we started by surveying physicians who practice medicine in cardiology services in the city to assess their knowledge and to describe their attitude and practice of HF management among adult patients.

2. Methods

2.1. Survey Design

In April 2022, a trained interviewer visited all Kinshasa hospitals and healthcare facilities where cardiology services are provided to adult patients to meet all providers of those services. The interviewer introduced the purpose of the survey research to each provider, solicited their voluntary participation, and answered all their questions regarding the study and their participation. At the end of the meeting, the interviewer gave each provider a copy of a consent form and the survey questionnaire for them to take home, complete and sign at their pace. The survey questionnaire was pilot tested by two cardiologists who did not participate in the study as research subjects. These two cardiologists provided input that was incorporated in the final version to improve its clarity and simplicity of expression.

2.2. Administrative and Ethical Considerations

No payment was provided to respondents as compensation for their time of participation in this study. Providers were given sufficient time before the interviewer returned to their offices to collect the signed consent form and the completed survey questionnaire. Both documents were written in French and were approved by the Ethics Committee of the School of Public Health, Faculty of Medicine, Kinshasa University. One co-Author (MJN) translated the completed questionnaire into English for this report.

2.3. Variables of Interest

Knowledge: The following topics assessed providers' knowledge of HF, its diagnosis and management according to published guidelines of the European Society of Cardiology (ESC) [26] [27]: recommendations and classifications of HF; its symptoms, signs, and diagnosis; HF and atrial fibrillation (AF) and overall HF management and prevention; treatment recommendations for HF with reduced left ventric-

ular ejection fraction (LVEF) (HFrEF) and for HF with preserved LVEF (HFpEF); acute HF (AHF) and multidisciplinary interventions for the management of chronic HF (CHF); and recommendations for managing comorbidities in HF.

Attitude: The following topics described providers' attitude towards HF and its management in the DRC: their perception of the in-hospital prevalence of HF in Kinshasa; their perception of morbidities leading to HF in Kinshasa; their self-assessment of their level of satisfaction with HF management in Kinshasa; their perceived role of some selected factors in the non-optimal management of HF; their perceived level of importance of some selected factors in improving HF management in the DRC; and their self-assessment of the degree of influence that some selected factors have on their cardiology practice.

Practice: The following topics described the practice of HF management among respondents: how often they utilize the Framingham criteria to clinically diagnose HF; how often they utilize the classes of the New York Heart Association (NYHA) to describe the functional signs of HF; the diagnostic means they generally utilize to identify HF; any national or international guidelines to which they refer to in their standard practice; and whether they also refer to the guidelines of the ESC for their management of HF [26] [27].

2.4. Survey Respondents

A total of 46 questionnaires were distributed, of them 38 (82.6%) were returned. Of these 38 respondents, 14 (36.8%), all males, were cardiologists and 24 (63.2%) practiced medicine in cardiology services as general practitioners.

2.5. Statistical Analysis

Data were entered into a Microsoft Access database and analyzed by SPSS statistical software (IBM SPSS Statistics 25). All data were recorded on a nominal scale, summarized by descriptive statistics procedures, and reported as percentages. Knowledge, attitude, and practice of HF management were reported separately between cardiologists (n = 14) and general practitioners (n = 24). Chi-square tests were used for all comparisons. Significance level was set at $p < 0.05$. All tests were two-tailed.

3. Results

3.1. Knowledge of HF, Its Diagnosis and Management According to Published Guidelines of the ESC (Tables 1-5)

The knowledge of recommendations and classifications of HF along with the knowledge of its symptoms, signs and diagnosis are shown in Table 1. Significantly more cardiologists than general practitioners knew that there are no national guidelines for the management of HF for the DRC (92.9% vs. 47.8%, respectively; $p = 0.004$), and that at the time this study was conducted, the most recent ESC guidelines were published in 2021 (92.9% vs. 45.5%, respectively; $p = 0.008$). There were no significant differences between cardiologists and general

practitioners in the knowledge that the ESC still utilized the classes of the NYHA to characterize the functional severity of HF ($p = 0.140$), that for the ESC, classification of HF by echocardiography determines disease management ($p = 0.283$), and in the knowledge of the current ESC classification of HF by the LVEFs and the EFs thresholds ($p \geq 0.059$).

Except for significantly more cardiologists than general practitioners knowing that the ambulatory diagnosis of HF can also be made by testing B-type natriuretic peptide (BNP) or N-terminal proBNP (NT-proBNP) (85.2% vs. 20.8% respectively; $p < 0.0001$), the knowledge that ambulatory diagnosis of HF can also be made by echocardiography, that the LVEF is influenced by medical treatment and by resynchronization, and the knowledge of ESC indicators that lead to the diagnosis of HFpEF were not distributed significantly differently between the two groups ($p \geq 0.059$) (Table 1).

Table 1. Knowledge of recommendations, classifications, symptoms, signs, and diagnosis of heart failure (HF) according to the European Society of Cardiology (ESC).

Variable	Cardiologists	General Practitioners	p value*
Recommendations and classifications			
There are no national HF management guidelines for the Democratic Republic of the Congo, n = 37	13 (92.9%)	11 (47.8%)	**0.004**
The most recent ESC guidelines were published in 2021, n = 36	13 (92.9%)	10 (45.5%)	**0.008**
The ESC still utilizes the classes of the New York Heart Association to characterize the functional severity of HF, n = 36	12 (92.3%)	18 (78.3%)	0.140
Classification by echocardiography determines HF management	14 (100.0%)	21 (87.5%)	0.283
The current ESC classification of HF: HF with reduced ejection fraction, HF with moderately reduced ejection fraction, and HF with preserved ejection fraction	11 (78.6%)	14 (58.3%)	0.294
Thresholds for classifying HF by the EFLV			
HF with reduced ejection fraction (*HFrEF*): ***EF* ≤ 40%**	13 (92.9%)	18 (75.0%)	0.227
HF with moderately reduced ejection fraction (*HFmrEF*), ***EF*: 41% - 49%**	13 (92.9%)	15 (62.5%)	0.059
HF with preserved ejection fraction (*HFpEF*), ***EF* ≥ 50%**	13 (92.9%)	15 (62.5%)	0.059
Symptoms, signs, and diagnosis of HF			
The ambulatory diagnosis of HF is made by			
Echocardiography	13 (92.9%)	15 (62.5%)	0.059
Testing of BNP or NT-proBNP	12 (85.2%)	5 (20.8%)	**<0.0001**
The ejection fraction of the left ventricle (EFLV) is influenced by			
medical treatment, n = 34	14 (100.0%)	20 (100.0%)	-
resynchronization, n = 23	11 (91.7%)	8 (72.7%)	0.317
Indicators that lead to the diagnosis of HF with preserved ejection fraction			
Symptoms or signs of heart failure, n = 33	13 (100.0%)	18 (90.0%)	0.508
An EFLV greater or equal to 50%, n = 33	14 (100.0%)	18 (94.7%)	1.00
A BNP or NT-proBNP above normal thresholds (*BNP* >35 pg/ml; *NT-proBNP* > 125 pg/ml), n = 26	11 (100.0%)	15 (100.0%)	-
A functional structural abnormality, n = 21	8 (80.0%)	9 (81.8%)	1.00

*Boldface denotes a statistically significant difference.

In Table 2, the knowledge that atrial fibrillation (AF) is the most frequently associated arrhythmia in HF, that HF contributes to the development of AF and AF can be a triggering factor of HF, that the advent of AF in a patient with chronic HF is associated with worse prognosis and decompensation, that in AF the ESC guideline includes opting for a restauration of sinus rhythm by electrical or pharmacological cardioversion, and the knowledge that oral anticoagulants are associated with fewer hemorrhagic accidents, particularly intra-cranial accidents, were not distributed significantly differently between cardiologists and general practitioners ($p \geq 0.171$). However, significantly more cardiologists than general practitioners knew that in AF, the ESC guidelines remind that one considers reducing heart rate with a beta-blocker as first-choice and digoxin as second choice, and that oral anticoagulants are at least as effective as Vitamin K antagonists, ($p = 0.008$ and $p < 0.0001$, respectively; Table 2).

To preserve cardiac function, reduce or decelerate the risk towards HF, or to prevent death before the onset of symptoms, the ESC guidelines recommend considering the actions listed in Table 2: revascularization of infarctions, management of rhythm disturbances, treatment of hypertension, moderation in alcohol consumption, utilization of sodium-glucose co-transporter 2 inhibitors in type 2 diabetes, physical activity, statins in primary or secondary prevention, angiotensin-converting enzyme inhibitors (ACEIs) in systolic dysfunction, and beta-blockers in asymptomatic systolic dysfunction after a myocardial infarction. Except for the knowledge of moderation in alcohol consumption and of the utilization of sodium-glucose co-transporter 2 inhibitors in type 2 diabetes that significantly more cardiologists than general practitioners possessed ($p = 0.023$ and $p = 0.044$, respectively), the knowledge of all the other recommended actions were not distributed significantly differently between cardiologists and general practitioners ($p \geq 0.115$).

In Table 3, the knowledge of the ESC treatment recommendations for HFrEF (LVEF ≤ 40%) and for HFpEF (LVEF ≥ 50%) is shown. Significantly more cardiologists than general practitioners knew that mineralocorticoid receptor antagonists (78.6% vs. 25.0%, respectively; $p = 0.001$), ACEIs and angiotensin receptor-neprilysin inhibitors (ARNIs) (100.0% vs. 70.8%, respectively; $p = 0.033$), and sodium glucose co-transporter 2 inhibitors (85.7% vs. 20.8%, respectively; $p < 0.0001$) are first-choice recommended treatment of HFrEF. The distribution of the knowledge that beta-blockers are first-choice treatment of HFrEF was not significantly different between cardiologists (71.4%) and general practitioners (50.0%) ($p = 0.082$).

Except for the knowledge of the second-choice therapeutic class recommended in the treatment of HFrEF in patient in sinus rhythm, EF ≤ 35% and heart rate ≥ 75 beats per minute which significantly more cardiologists than general practitioners possessed (I_f channel inhibitor; $p < 0.0001$), the knowledge of other therapeutic classes and treatment options based on patient condition was not distributed significantly differently between cardiologists and general

Table 2. Knowledge of Atrial fibrillation (AF) and of heart failure (HF) prevention per the European Society of Cardiology (ESC) guidelines.

Variable	Cardiologists	General Practitioners	p value*
Atrial fibrillation (AF)			
AF is the most frequently associated arrhythmia in HF, n = 37	13 (92.9%)	17 (73.9%)	0.171
HF contributes to the development of AF and AF can be a triggering factor of HF, n = 37	14 (100.0%)	22 (95.7%)	1.00
The advent of AF in a patient with chronic HF is associated with worse prognosis and decompensation, n = 37	14 (100.0%)	22 (95.7%)	1.00
In AF, the ESC guidelines remind to consider, n = 38			
A reduction of heart rate using a beta-blocker as first-choice and digoxin as second choice	12 (85.7%)	10 (41.7%)	**0.008**
Opting for a restauration of sinus rhythm by electrical or pharmacological cardioversion (*amiodarone*)	11 (78.6%)	16 (66.7%)	0.488
Oral anticoagulants are at least as effective as Vitamin K antagonists, n = 36	14 (100.0%)	8 (36.4%)	**<0.0001**
Oral anticoagulants are associated with fewer hemorrhagic accidents, particularly intra-cranial, n = 36	12 (85.7%)	15 (68.2%)	0.432
Delaying or preventing the development of overt heart failure (HF) or preventing death before onset of symptoms			
To preserve cardiac function, reduce or decelerate the risk toward HF, the following actions can be considered as appropriate, n = 38			
Revascularization of infarctions	11 (78.6%)	15 (62.5%)	0.472
Management of rhythm disturbances	14 (100.0%)	20 (83.3%)	0.276
Treat arterial hypertension	14 (100.0%)	21 (87.5%)	0.283
Recommend moderation in alcohol consumption	10 (71.4%)	8 (33.3%)	**0.023**
Recommend utilization of sodium-glucose co-transporter 2 *inhibitors in type* 2 *diabetics* (*EMPA-REG trial*)	10 (71.4%)	9 (37.5%)	**0.044**
Recommend physical activity	13 (92.9%)	16 (66.7%)	0.115
Utilize statins in primary or secondary prevention	5 (35.7%)	13 (54.2%)	0.272
Utilize converting enzyme inhibitors in systolic dysfunction	12 (85.7%)	19 (79.2%)	1.00
Utilize beta-blockers in asymptomatic systolic dysfunction following myocardial infarction	11 (78.6%)	16 (66.7%)	0.488

*Boldface denotes a statistically significant difference.

practitioners ($p \geq 0.051$).

The knowledge of the ESC treatment recommendations for HFpEF was similarly distributed between cardiologists and general practitioners ($p \geq 0.140$) (Table 3).

The knowledge of major clinical presentations and of urgent therapeutic management of AHF in the ESC guidelines and the knowledge of multidisciplinary

Table 3. Knowledge of the European Society of Cardiology (ESC) treatment recommendations of heart failure (HF) with reduced left ventricular ejection fraction (HFrEF: LVEF ≤ 40%) and of HF with preserved left ventricular ejection fraction (HFpEF: LVEF ≥ 50%).

Variable	Cardiologists	General Practitioners	p value*
Heart failure with reduced ejection fraction (HFrEF)			
First-choice therapeutic classes recommended in the treatment of HFrEF			
Mineralocorticoid receptor antagonists	11 (78.6%)	6 (25.0%)	**0.001**
Beta-blockers	10 (71.4%)	12 (50.0%)	0.082
Angiotensin-converting enzyme inhibitors (*ACEIs*) *and angiotensin receptor-neprilysin inhibitors* (*ARNIs*)	14 (100.0%)	17 (70.8%)	**0.033**
Sodium glucose co-transporter 2 *inhibitors or Glifozines*	12 (85.7%)	5 (20.8%)	**<0.0001**
Second-choice therapeutic classes recommended in the treatment of HFrEF based on patient condition			
Diuretics in veinous congestion	9 (64.3%)	11 (45.8%)	0.272
Angiotensin 2*-receptor antagonists in intolerance of ACEIs and of ARNIs*	12 (85.7%)	16 (66.7%)	0.268
I_f *channel inhibitor in sinus rhythm*, *EF* ≤ 35%, *heart rate* ≥ 75 *beats per minute*	13 (92.9%)	5 (20.8%)	**<0.0001**
Digitalis in rapid ventricular rate despite first-choice optimal treatment	10 (71.4%)	11 (45.8%)	0.181
An implantable defibrillator should be considered in ischemic cardiopathy patients with HFrEF, n = 34	11 (78.6%)	13 (65.0%)	0.365
Cardiac resynchronization should be considered in HFrEF patients in/with, n = 35			
Sinus rhythm, left bundle branch block, QRS ≥ 150 ms	7 (50.0%)	10 (47.6%)	0.051
Sinus rhythm, left bundle branch block, QRS ≥ 130 - 149 ms	7 (50.0%)	5 (23.8%)	
Heart failure with preserved ejection fraction (HFpEF)			
HFpEF treatment is primarily preventive, n = 28	11 (91.7%)	11 (68.8%)	0.140
To date, no treatment has demonstrated a reduction in patient mortality and morbidity, n = 29	6 (46.2%)	10 (62.5%)	0.251
Preventive treatment of HFpEF aims at controlling hypertension, n = 28	12 (100.0%)	14 (87.5%)	0.492
Symptomatic treatment of HFpEF resorts to diuretics to control congestive signs, n = 30	12 (100.0%)	16 (88.9%)	0.343
Weight reduction in obese patients improves patient outcome, n = 29	13 (100.0%)	16 (100.0%)	-
Physical exercise improves symptomatology, n = 30	12 (92.3%)	13 (76.5%)	0.379

*Boldface denotes a statistically significant difference.

interventions for the management of CHF are presented in Table 4. Significantly more cardiologists than general practitioners knew that acute pulmonary oedema (92.9% vs. 58.3%, respectively; p = 0.030) and cardiogenic choc (92.9% vs. 45.8%, respectively; p = 0.004) are major clinical presentations of AHF, and that vaso-pressors (92.9% vs. 41.7%, respectively; p = 0.002) and inotropes (57.1% vs. 20.8%,

respectively; p = 0.035) may be utilized in AHF based on patient condition. The knowledge of team management interventions for the prevention and treatment of CHF was not distributed significantly differently between cardiologists and general practitioners (p ≥ 0.354).

Table 4. Knowledge of major clinical presentations and urgent therapeutic management of acute heart failure (AHF) in the European Society of Cardiology (ESC) guidelines and knowledge of multidisciplinary interventions for the management of chronic heart failure (CHF).

Variable	Cardiologists	General Practitioners	p value*
Acute heart failure (AHF)			
Major clinical presentations of AHF			
acute pulmonary oedema	13 (92.9%)	14 (58.3%)	**0.030**
cardiogenic choc	13 (92.9%)	11 (45.8%)	**0.004**
acute decompensated heart failure	5 (35.7%)	9 (37.5%)	0.912
isolated right ventricular failure	6 (42.9%)	6 (25.0%)	0.296
Urgent therapeutics that may be utilized based on the type of AHF			
oxygen therapy	14 (100.0%)	20 (83.3%)	0.276
diuretics	13 (92.9%)	18 (75.0%)	0.227
ventilatory support (*non-invasive ventilation*)	12 (85.7%)	14 (58.3%)	0.147
vasodilators (*nitrates*)	11 (78.6%)	15 (62.5%)	0.472
vasopressors	13 (92.9%)	10 (41.7%)	**0.002**
inotropes	8 (57.1%)	5 (20.8%)	**0.035**
Multidisciplinary interventions for the management of chronic heart failure (CHF)			
ESC guidelines strongly insist on the importance of etiologic diagnosis to adapt disease management, n = 34	12 (92.3%)	17 (81.0%)	0.354
Patients with HF must be encouraged to actively participate in the management of their disease, n = 36	14 (100.0%)	22 (100.0%)	-
A good life hygiene and physical exercise are recommended to improve the quality of life and reduce hospitalizations, n = 35	14 (100.0%)	19 (90.5%)	0.506
ESC guidelines urge that all patients have access to a HF multidisciplinary management plan to ensure that the condition is correctly diagnosed and followed up, n = 36	13 (92.9%)	20 (90.9%)	0.580

*Boldface denotes a statistically significant difference.

Table 5 shows the knowledge of the ESC recommendations for managing comorbidities in HF. For cardiovascular comorbidities, we assessed AF and severe aortic stenosis; for non-cardiovascular comorbidities, we assessed type 2 diabetes and anemia. For the management of patients with HF who present with AF, more cardiologists than general practitioners knew that beta-blockers are preferably

recommended for the control of heart rate (85.7% vs. 50.0%, respectively; p = 0.028), that digoxin is utilized when heart rate remains high despite beta-blockers utilization or when beta-blockers are contraindicated (78.6% vs. 45.8%, respectively; p = 0.049), that a cardioversion is recommended in emergency with rapid heart rate and hemodynamic instability (100.0% vs. 70.8%, respectively; p = 0.033)

Table 5. Knowledge of the European Society of Cardiology (ESC) recommendations for managing comorbidities in heart failure (HF).

Variable	Cardiologists	General Practitioners	p value*
Cardiovascular comorbidities			
For the management of patients with HF who present with an atrial fibrillation (AF)			
An anticoagulant treatment is recommended in CHA2DS2-VASc score ≥ 2 in men and ≥ 3 in women	8 (57.1%)	11 (45.8%)	0.501
Direct-acting oral anticoagulants are preferred over Vitamin K antagonists, except in case of mitral stenosis or of mechanical heart prosthetic valves	12 (85.7%)	16 (66.7%)	0.268
For the control of heart rate, it is recommended to preferably utilize beta-blockers	12 (85.7%)	12 (50.0%)	**0.028**
A digoxin is utilized when the ventricular rate remains high despite beta-blockers utilization or when beta-blockers are contraindicated	11 (78.6%)	11 (45.8%)	**0.049**
A cardioversion is recommended in an emergency with rapid ventricular rate and hemodynamic instability	13 (92.9%)	11 (45.8%)	**0.004**
A cardioversion is recommended in AF and persistence of symptoms of HF despite optimal treatment	11 (78.6%)	10 (41.7%)	**0.027**
In addition to an oral anticoagulant, a strategy of rhythm control including catheter ablation should be considered in patients whose symptoms and/or cardiac dysfunction are associated with AF	14 (100.0%)	7 (29.2%)	**<0.0001**
For the management of severe aortic stenosis			
A surgical treatment is recommended	7 (50.0%)	11 (45.8%)	0.804
A percutaneous implantation of an aortic valve is recommended	11 (78.6%)	9 (37.5%)	**0.014**
Non-cardiovascular comorbidities			
Recommended treatment in patients with type 2 diabetes who develop HF are *sodium-glucose co-transporter 2 inhibitors*	13 (92.9%)	15 (62.5%)	0.059
Management of anemia in patients with HF			
Patients must be periodically screened for anemia and iron deficiency	12 (85.7%)	18 (75.0%)	0.684
An iron supplementation with ferric carboxymaltose should be considered in symptomatic patients with LVEF < 45% and iron deficiency	10 (71.4%)	9 (37.5%)	**0.044**
An iron supplementation with ferric carboxymaltose should be considered in symptomatic HF patients recently hospitalized for HF with LVEF < 50% and iron deficiency	7 (50.0%)	8 (33.3%)	0.311

*Boldface denotes a statistically significant difference.

or with persistence of symptoms of HF despite optimal treatment (78.6% vs. 41.7%, respectively; p = 0.027), and that in addition to oral anticoagulation, a strategy of rhythm control including catheter ablation should be considered in patients whose symptoms and/or cardiac dysfunction are associated with AF (100.0% vs. 29.2%, respectively; p < 0.0001).

For the management of severe stenosis, significantly more cardiologists (78.6%) than general practitioners (37.5%) knew that a percutaneous implantation of an aortic valve is recommended (p = 0.014), but as many cardiologists (50.0%) as general practitioners (45.8%) knew that surgical treatment is also recommended (p = 0.804).

For non-cardiovascular comorbidities, there were 92.9% of cardiologists and 62.5% of general practitioners who knew that the recommended treatment in patients with type 2 diabetes who develop HF are sodium-glucose co-transporter 2 inhibitors (p = 0.059).

For the management of anemia in patients with HF, 85.7% of cardiologists and 75.0% of general practitioners knew that patients must be periodically screened for anemia and iron deficiency (p = 0.684), 71.4% of cardiologists and 37.5% of general practitioners knew that an iron supplementation with ferric carboxymaltose should be considered in symptomatic patients with LVEF < 45% and iron deficiency (p = 0.044), and 50.0% of cardiologists and 33.3% of general practitioners knew that an iron supplementation with ferric carboxymaltose should be considered in symptomatic HF patients recently hospitalized for HF with LVEF < 50% and iron deficiency (p = 0.311).

3.2. Attitude of Providers towards HF and Its Management in the DRC (Table 6)

Most providers do not know the in-hospital prevalence of HF in Kinshasa (cardiologists: 46.2%; general practitioners: 55.6%; p = 0.203), but almost all perceive that this unknown prevalence tends to increase (cardiologists: 100.0%; general practitioners: 91.3%; p = 0.517).

Nearly three quarters think that hypertension is the leading morbidity of HF in Kinshasa (cardiologists: 71.4%; general practitioners: 70.8%; p = 1.00), but they think other morbidities including cardiomyopathies, ischemic cardiopathies, AF, and valvular cardiopathies contribute as well. Only one third thinks rheumatism is a leading morbidity of HF in Kinshasa (cardiologists: 35.7%; general practitioners: 37.5%; p = 0.912).

Their level of satisfaction with how HF is managed is low: 61.5% of cardiologists and 62.5% of general practitioners are less, or not much, satisfied with how HF is managed.

Respondents mostly agreed that lack of health insurance in the DRC (cardiologists: 100.0%; general practitioners: 87.0%; p = 0.275), patients lack of financial means (cardiologists: 92.9%; general practitioners: 95.7%; p = 1.00), lack of equipment in health centers (cardiologists: 78.6%; general practitioners: 90.9%; p = 0.357), deficiency in continuing medical education (cardiologists: 85.7%; general

Table 6. Attitude of providers towards heart failure (HF) and its management in the Democratic Republic of the Congo (DRC).

Variable	Cardiologists	General Practitioners	p value*
In-hospital prevalence of HF in Kinshasa is, n = 31			
4% - 9%	1 (7.7%)	2 (11.1%)	0.203
10% - 20%	3 (23.1%)	2 (11.1%)	
21% - 40%	3 (23.1%)	1 (5.6%)	
41% - 75%	0 (0.0%)	3 (16.7%)	
Don't know	6 (46.2%)	10 (55.6%)	
In-hospital prevalence of HF in Kinshasa tends to, n = 37			
Increase	14 (100.0%)	21 (91.3%)	0.517
Remain the same/Don't know	0 (0.0%)	2 (8.7%)	
Primary morbid entity leading to HF in Kinshasa, n = 38			
Arterial hypertension	10 (71.4%)	17 (70.8%)	1.00
Cardiomyopathies	2 (14.3%)	5 (20.8%)	1.00
Ischemic cardiopathy	2 (14.3%)	5 (20.8%)	1.00
Atrial fibrillation/Valvular cardiopathy/Rheumatism	0 (0.0%)	5 (20.8%)	0.137
Morbidities leading to in-hospital HF in Kinshasa, n = 38			
Arterial hypertension	13 (92.9%)	23 (95.8%)	1.00
Cardiomyopathies	14 (100.0%)	19 (79.2%)	0.137
Ischemic cardiopathy	13 (92.9%)	17 (70.8%)	0.216
Atrial fibrillation	12 (85.7%)	16 (66.7%)	0.268
Valvular cardiopathy	10 (71.4%)	14 (58.3%)	0.420
Rheumatism	5 (35.7%)	9 (37.5%)	0.912
Level of satisfaction in HF management, n = 37			
Very satisfied/satisfied	5 (38.5%)	9 (37.5%)	1.00
Less satisfied/Not much satisfied	8 (61.5%)	15 (62.5%)	
Role of the following factors in the non-optimal HF management			
The lack of health insurance in the DRC, n = 37			
Strongly agree/Agree	14 (100.0%)	20 (87.0%)	0.275
Somewhat agree/Don't agree	0 (0.0%)	3 (13.0%)	
Patients lack financial means, n = 37			
Strongly agree/Agree	13 (92.9%)	22 (95.7%)	1.00
Somewhat agree/Don't agree	1 (7.1%)	1 (4.3%)	
The lack of equipment in health centers, n = 36			
Strongly agree/Agree	11 (78.6%)	20 (90.9%)	0.357
Somewhat agree/Don't agree	3 (21.4%)	2 (9.1%)	
Deficiency in continuing medical education, n = 35			

Continued

Strongly agree/ Agree	12 (85.7%)	15 (71.4%)	0.431
Somewhat agree/ Don't agree	2 (14.3%)	6 (28.6%)	
Deficiency in physicians training, n = 35			
Strongly agree/ Agree	11 (78.6%)	12 (57.1%)	0.282
Somewhat agree/ Don't agree	3 (21.4%)	9 (42.9%)	
Patients lack adherence to care for other than financial reasons, n = 34			
Strongly agree/ Agree	9 (64.3%)	11 (55.0%)	0.588
Somewhat agree/ Don't agree	5 (35.7%)	9 (45.0%)	
Level of importance to improve HF management in the DRC			
Generalization of health mutuals, n = 38			
Very important/ Important	14 (100.0%)	20 (83.3%)	0.276
Somewhat/ Less important	0 (0.0%)	4 (16.7%)	
Management of care by the State, n = 36			
Very important/ Important	12 (85.7%)	20 (90.9%)	0.634
Somewhat/ Less important	2 (14.3%)	2 (9.1%)	
Reinforcement of providers' competencies, n = 38			
Very important/ Important	13 (92.9%)	20 (83.3%)	0.633
Somewhat/ Not much important	1 (7.1%)	4 (16.7%)	
Organization of patients' education in therapies, n = 37			
Very important/ Important	12 (85.7%)	18 (78.3%)	0.687
Somewhat/ Less important	2 (14.3%)	5 (21.7%)	
Improvement of basic hospital infrastructures, n = 37			
Very important/ Important	13 (92.9%)	17 (73.9%)	0.217
Somewhat/ Less/ Not much important	1 (7.1%)	6 (26.1%)	
Maintenance of a national HF registry, n = 35			
Very important/ Important	10 (71.4%)	11 (52.4%)	0.260
Somewhat/ Less/ Not much important	4 (28.6%)	10 (47.6%)	
Granting credits to liberal professionals for the acquisition of materials, n = 36			
Very important/ Important	10 (71.4%)	11 (50.0%)	0.204
Somewhat/ Less/ Not much important	4 (28.6%)	11 (50.0%)	
Industries to lease medical equipment to hospitals/liberal cabinets, n = 36			
Very important/ Important	11 (78.6%)	4 (18.2%)	**<0.0001**
Somewhat/ Less/ Not much important	3 (21.4%)	18 (81.8%)	
Evaluate the degree of influence of the following factors in your practice			
Personal experience, n = 36			
A lot	7 (50.0%)	10 (45.5%)	0.790
Enough/ Little	7 (50.0%)	12 (54.5%)	

Continued

Professional experience, n = 34			
A lot	8 (57.1%)	6 (30.0%)	0.113
Enough/Little	6 (42.9%)	14 (70.0%)	
Internet, n = 34			
A lot	6 (42.9%)	8 (40.0%)	0.868
Enough/Little	8 (57.1%)	12 (60.0%)	
Medical Journals, n = 34			
A lot	6 (42.9%)	7 (35.0%)	0.643
Enough/Little/Very little	8 (57.1%)	13 (65.0%)	
Meetings, continuing medical education, n = 36			
A lot	7 (50.0%)	6 (27.3%)	0.166
Enough/Little/Very little	7 (50.0%)	16 (72.7%)	

*Boldface denotes a statistically significant difference.

practitioners: 71.4%; p = 0.431), deficiency in physicians training (cardiologists: 78.6%; general practitioners: 57.1%; p = 0.282), and patients lack of adherence to care for reasons other than financial (cardiologists: 64.3%; general practitioners: 55.0%; p = 0.588), play a role in the non-optimal management of HF in the DRC.

To improve management of HF in the DRC, respondents mostly agreed on the importance of generalizing health mutuals (cardiologists: 100.0%; general practitioners: 83.3%; p = 0.276), management of care by the State (cardiologists: 85.7%; general practitioners: 90.9%; p = 0.634), reinforcement of providers' competencies (cardiologists: 92.9%; general practitioners: 83.3%; p = 0.633), organization of patients' education in therapies (cardiologists: 85.7%; general practitioners: 78.3%; p = 0.687), improvement of basic hospital infrastructures (cardiologists: 92.9%; general practitioners: 73.9%; p = 0.217), maintenance of a national HF registry (cardiologists: 71.4%; general practitioners: 52.4%; p = 0.260), granting credits to liberal professionals for the acquisition of materials (cardiologists: 71.4%; general practitioners: 50.0%; p = 0.204), and industries to lease medical equipment to hospitals and to liberal cabinets (cardiologists: 78.6%; general practitioners: 18.2%; p < 0.0001).

Most cardiologists thought that their professional experience influenced their practice a lot (57.1%). The influence of personal experience, the internet, medical *Journals*, and meetings and other continuing education activities on their practice was deemed by most providers as enough to little.

3.3. Practice of HF Management in Kinshasa (Table 7)

The Framingham criteria to diagnose HF clinically was always utilized by 53.8% of cardiologists and 18.2% of general practitioners (p = 0.057), and almost all providers always utilized the classes of the NYHA to describe the functional signs

Table 7. Practice of heart failure (HF) management in Kinshasa, Democratic Republic of the Congo.

Variable	Cardiologists	General Practitioners	p value*
How often do you utilize the Framingham criteria to diagnose HF? n = 35			
Always	7 (53.8%)	4 (18.2%)	0.057
Sometimes/Never	6 (46.2%)	18 (81.8%)	
How often do you utilize the classes of the NYHA to describe the functional signs of HF? n = 38			
Always	13 (92.9%)	22 (91.7%)	1.00
Sometimes	1 (7.1%)	2 (8.3%)	
Diagnostic means you generally utilize to identify HF			
***Echocardiography*, n = 38**			
Always	13 (92.9%)	17 (70.8%)	0.216
Very often/Sometimes	1 (7.1%)	7 (29.2%)	
***Electrocardiogram*, n = 35**			
Always	9 (69.2%)	11 (50.0%)	0.267
Very often/Sometimes	4 (30.8%)	11 (50.0%)	
***Dosage of BNP or NT-proBNP*, n = 37**			
Always	6 (42.9%)	6 (26.1%)	0.470
Very often/Sometimes/Very rarely	8 (57.1%)	17 (73.9%)	
***Chest X-ray*, n = 36**			
Always	2 (14.3%)	4 (18.2%)	1.00
Very often/Sometimes/Very rarely	12 (85.7%)	18 (81.8%)	
National or international guidelines to which you refer to in your standard practice			
Of the European Society of Cardiology	14 (100.0%)	20 (83.3%)	0.276
Of the French Society of Cardiology	10 (71.4%)	9 (37.5%)	**0.044**
Of the American Heart Association	9 (64.3%)	7 (29.2%)	**0.034**
Of your institution (*Health Center*)	0 (0.0%)	5 (20.8%)	0.137
Of the Congolese Society of Cardiology	0 (0.0%)	5 (20.8%)	0.137
Of the Canadian Society of Cardiology	1 (7.1%)	1 (4.2%)	1.00
Of the Belgian Society of Cardiology	1 (7.1%)	0 (0.0%)	0.368
Do you (also) refer to the guidelines of the European Society of Cardiology (ESC) for the management of HF?			
Yes	14 (100.0%)	22 (95.7%)	1.00
Medium used to access them			
Internet	11 (78.6%)	17 (70.8%)	0.715
Scientific Journals	11 (78.6%)	8 (33.3%)	**0.007**

Continued

Continuing Medical Education	7 (50.0%)	11 (45.8%)	0.804
Staff meeting	6 (42.9%)	10 (41.7%)	0.943
International scientific meeting	12 (85.7%)	3 (12.5%)	**<0.0001**
National scientific meeting	2 (14.3%)	4 (16.7%)	1.00
From colleagues	0 (0.0%)	5 (20.8%)	0.137

*Boldface denotes a statistically significant difference.

of HF (cardiologists: 92.9%; general practitioners: 91.7%; p = 1.00).

The diagnostic means generally utilized to identify HF always included echocardiography for 92.9% of cardiologists and 70.8% of general practitioners (p = 0.216), electrocardiogram for 69.2% of cardiologists and 50.0% of general practitioners (p = 0.267), dosage of BNP or NT-proBNP for 42.9% of cardiologists and 26.1% of general practitioners (p = 0.470), and chest X-ray for 14.3% of cardiologists and 18.2% of general practitioners (p = 1.00).

All cardiologists (100.0%) and 83.3% of general practitioners (p = 0.276) refer to guidelines of the ESC in their standard practice, and significantly more cardiologists than general practitioners also refer to guidelines of the French Society of Cardiology (71.4% vs. 37.5%, respectively; p = 0.044) and of the American Heart Association (64.3% vs. 29.2%, respectively; p = 0.034). Significantly more cardiologists than general practitioners access these guidelines via scientific *Journals* (78.6% vs. 33.3%, respectively; p = 0.007) and attendance in international scientific meetings (85.7% vs. 12.5%, respectively; p < 0.0001).

4. Discussion

Unlike in other sub-Saharan African countries, there is no registry of cardiovascular diseases in the DRC that can be monitored and analyzed to elucidate the patterns of HF in local populations [5]-[19]. This study was therefore designed to begin to gain an understanding of the current state of HF in Kinshasa from descriptions that clinicians who deliver cardiology health services to adult patients in the city could provide. Their descriptions are quite informative.

The fact that there are no national guidelines for the management of HF for the DRC was known by almost all cardiologists (92.9%) but only by less than half of general practitioners (47.8%). HF management in Kinshasa cannot follow national guidelines that do not exist; it may only follow guidelines of international learned societies. The international learned society that influences practice of local providers most per the respondents' self-reports is the ESC. Providers reported also referring to guidelines of the French Society of Cardiology and of the American Heart Association. However, all cardiologists reported referring to the ESC guidelines in their standard practice [26] [27]; they indicated accessing them electronically, but more significantly than general practitioners, through subscriptions to scientific *Journals* and attendance to international scientific meetings

[28].

The overall knowledge of the ESC guidelines for the diagnosis and treatment of acute and chronic HF [26] [27] among cardiologists was very good, but more needs to be done to improve that knowledge among general practitioners. For example, there was a significant difference between cardiologists and general practitioners in the knowledge of HF management of patients with iron deficiency (71.4% vs. 37.5%, respectively; $p < 0.044$) and a borderline significant difference in the knowledge of management of patients with type 2 diabetes who develop HF (92.9% vs. 62.5%, respectively; $p < 0.059$). Both conditions, iron deficiency and poorly controlled type 2 diabetes, are highly prevalent in Kinshasa [29] [30]. The need for improvement was expressed by a general agreement among respondents that a deficiency in continuing medical education was a factor in the non-optimal management of HF (85.7% of cardiologists and 71.4% of general practitioners), and by the importance they attached to reinforcement of providers' competencies to improve HF management in the DRC (92.9% of cardiologists and 83.3% of general practitioners) [31].

Respondents' perception of cardiovascular morbidities that contribute to the development of HF in Kinshasa is consistent with registry-based published studies in sub-Saharan Africa. Where hypertension was the comorbidity most frequently associated with HF in most countries [5]-[16], dilated cardiomyopathies were the most frequent comorbidity in HF patients in Rwanda, associated with 40% to 54% of cases [18] [19], with frequencies of 19% to 35.4% in Cameroon [5], Tanzania [8], Nigeria [15], and Burkina Faso [16]. Valve disease was the most frequent comorbidity in HF patients in Ethiopia, associated with 40.8% of cases [32], with frequencies of 11.9% to 18.1% of cases in Cameroon [5], Tanzania [10] and Togo [11]. Ischemic cardiopathies were associated with 62% of HF cases in Djibouti [33] and 15.8% of cases in Ethiopia [32]. HF was attributed to rheumatism in 25% to 27% of cases in Rwanda [18] [19] and 12% to 13% of cases in Tanzania [8] and Djibouti [33].

In general, respondents were less satisfied with HF management in the DRC. They agreed that factors contributing to the non-optimal management of HF were financial (lack of health insurance, patients lacking financial means), structural (lack of equipment in health centers), and organizational (deficiency in continuing medical education, deficiency in physicians training, and patients lacking adherence to care for reasons other than financial). In these financial, structural, and organizational factors were contained what respondents deemed important to improve HF management in the DRC: generalization of health mutuals and management of care by the State; improvement of basic hospital infrastructures, industries to lease medical equipment to hospitals/liberal cabinets; reinforcement of providers' competencies, organization of patients' education in therapies, maintenance of a national HF registry, granting credits to liberal professionals for the acquisition of materials.

The information obtained in this study concerning the practice of HF manage-

ment does not necessarily reflect what respondents do. This study therefore does not address adherence to published international guidelines [28] [34]-[36], which is a limitation that can only be addressed by a retrospective chart review study. Its strength, however, is in paving the way toward setting up a research agenda for starting the as yet non-existing work of systematically studying HF in Kinshasa. This work should probably begin with the establishment of a national HF registry for the DRC [5]-[19].

Acknowledgements

The Authors would like to thank all the physicians who participated in this study and Professors Désiré Mashinda Kulimba and Jean-René M'buyamba-Kabangu for their invaluable contribution in protocol development. The assistance of Frederick Wumba, MD, with data collection is also gratefully acknowledged.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Kannel, W.B., Castelli, W.P., McNamara, P.M., McKee, P.A. and Feinleib, M. (1972) Role of Blood Pressure in the Development of Congestive Heart Failure: The Framingham Study. *New England Journal of Medicine*, **287**, 781-787. https://doi.org/10.1056/nejm197210192871601

[2] Bloomfield, G.S., Barasa, F.A., Doll, J.A. and Velazquez, E.J. (2013) Heart Failure in Sub-Saharan Africa. *Current Cardiology Reviews*, **9**, 157-173. https://doi.org/10.2174/1573403x11309020008

[3] Kraus, S., Ogunbanjo, G., Sliwa, K. and Ntusi, N.A.B. (2015) Heart Failure in Sub-Saharan Africa: A Clinical Approach. *South African Medical Journal*, **106**, 23-31. https://doi.org/10.7196/samj.2016.v106i1.10325

[4] Gtif, I., Bouzid, F., Charfeddine, S., Abid, L. and Kharrat, N. (2021) Heart Failure Disease: An African Perspective. *Archives of Cardiovascular Diseases*, **114**, 680-690. https://doi.org/10.1016/j.acvd.2021.07.001

[5] Boombhi, J., Moampea, M., Kuate, L., Menanga, A., Hamadou, B. and Kingue, S. (2017) Clinical Pattern and Outcome of Acute Heart Failure at the Yaounde Central Hospital. *Open Access Library Journal*, **4**, 1-8. https://doi.org/10.4236/oalib.1103478

[6] Amougou, S.N., Danwe, D., Hamadou, B., Jemea, B. and Jingi, A.M. (2018) Pattern and Outcome of Congestive Heart Failure in the Intensive Care Unit of the Yaoundé University Teaching Hospital: A Cross-Sectional Study. *Open Access Library Journal*, **5**, 1-8. https://doi.org/10.4236/oalib.1104247

[7] Dokainish, H., Teo, K., Zhu, J., Roy, A., AlHabib, K.F., ElSayed, A., *et al.* (2016) Heart Failure in Africa, Asia, the Middle East and South America: The INTER-CHF Study. *International Journal of Cardiology*, **204**, 133-141. https://doi.org/10.1016/j.ijcard.2015.11.183

[8] Makubi, A., Hage, C., Lwakatare, J., Kisenge, P., Makani, J., Rydén, L., *et al.* (2014) Contemporary Aetiology, Clinical Characteristics and Prognosis of Adults with Heart Failure Observed in a Tertiary Hospital in Tanzania: The Prospective Tanzania Heart Failure (TAHEF) Study. *Heart*, **100**, 1235-1241. https://doi.org/10.1136/heartjnl-2014-305599

[9] Kingery, J.R., Yango, M., Wajanga, B., Kalokola, F., Brejt, J., Kataraihya, J., *et al*. (2017) Heart Failure, Post-Hospital Mortality and Renal Function in Tanzania: A Prospective Cohort Study. *International Journal of Cardiology*, **243**, 311-317. https://doi.org/10.1016/j.ijcard.2017.05.025

[10] Hertz, J.T., Sakita, F.M., Limkakeng, A.T., Mmbaga, B.T., Appiah, L.T., Bartlett, J.A., *et al*. (2019) The Burden of Acute Coronary Syndrome, Heart Failure, and Stroke among Emergency Department Admissions in Tanzania: A Retrospective Observational Study. *African Journal of Emergency Medicine*, **9**, 180-184. https://doi.org/10.1016/j.afjem.2019.07.001

[11] Pio M, Afassinou Y, Pessinaba S, Baragou S, N'djao J, Atta B, *et al*. (2014) [Epidemiology and Etiology of Heart Failure in Lome]. *Pan African Medical Journal*, **18**, Article 183. http://www.panafrican-med-journal.com/content/article/18/183/full/

[12] Damasceno, A., Mayosi, B.M., Sani, M., Ogah, O.S., Mondo, C., Ojji, D., *et al*. (2012) The Causes, Treatment, and Outcome of Acute Heart Failure in 1006 Africans from 9 Countries: Results of the Sub-Saharan Africa Survey of Heart Failure. *Archives of Internal Medicine*, **172**, 1386-1394. https://doi.org/10.1001/archinternmed.2012.3310

[13] Ojji, D., Stewart, S., Ajayi, S., Manmak, M. and Sliwa, K. (2013) A Predominance of Hypertensive Heart Failure in the Abuja Heart Study Cohort of Urban Nigerians: A Prospective Clinical Registry of 1515 *de Novo* Cases. *European Journal of Heart Failure*, **15**, 835-842. https://doi.org/10.1093/eurjhf/hft061

[14] Ogah, O.S., Stewart, S., Falase, A.O., Akinyemi, J.O., Adegbite, G.D., Alabi, A.A., *et al*. (2014) Contemporary Profile of Acute Heart Failure in Southern Nigeria: Data from the Abeokuta Heart Failure Clinical Registry. *JACC*: *Heart Failure*, **2**, 250-259. https://doi.org/10.1016/j.jchf.2013.12.005

[15] Ansa, V., Otu, A., Oku, A., Njideoffor, U., Nworah, C. and Odigwe, C. (2016) Patient Outcomes Following After-Hours and Weekend Admissions for Cardiovascular Disease in a Tertiary Hospital in Calabar, Nigeria. *Cardiovascular Journal of Africa*, **27**, 328-332. https://doi.org/10.5830/cvja-2016-025

[16] Mandi, D.G., Bamouni, J., Yaméogo, R.A., Naïbé, D.T., Kaboré, E., Kambiré, Y., *et al*. (2020) Spectrum of Heart Failure in Sub-Saharan Africa: Data from a Tertiary Hospital-Based Registry in the Eastern Center of Burkina Faso. *Pan African Medical Journal*, **36**, Article 30. https://doi.org/10.11604/pamj.2020.36.30.19321

[17] Malamba-Lez, D., Ngoy-Nkulu, D., Steels, P., Tshala-Katumbay, D. and Mullens, W. (2018) Heart Failure Etiologies and Challenges to Care in the Developing World: An Observational Study in the Democratic Republic of Congo. *Journal of Cardiac Failure*, **24**, 854-859. https://doi.org/10.1016/j.cardfail.2018.10.008

[18] Kwan, G.F., Bukhman, A.K., Miller, A.C., Ngoga, G., Mucumbitsi, J., Bavuma, C., *et al*. (2013) A Simplified Echocardiographic Strategy for Heart Failure Diagnosis and Management within an Integrated Noncommunicable Disease Clinic at District Hospital Level for Sub-Saharan Africa. *JACC*: *Heart Failure*, **1**, 230-236. https://doi.org/10.1016/j.jchf.2013.03.006

[19] Eberly, L.A., Rusingiza, E., Park, P.H., Ngoga, G., Dusabeyezu, S., Mutabazi, F., *et al*. (2018) Understanding the Etiology of Heart Failure among the Rural Poor in Sub-Saharan Africa: A 10-Year Experience from District Hospitals in Rwanda. *Journal of Cardiac Failure*, **24**, 849-853. https://doi.org/10.1016/j.cardfail.2018.10.002

[20] M'Buyamba-Kabangu, J.-., Biswika, R.T., Thijs, L., Tshimanga, G.M., Ngalula, F.M., Disashi, T., *et al*. (2009) In-hospital Mortality among Black Patients Admitted for Hypertension-Related Disorders in Mbuji Mayi, Congo. *American Journal of Hypertension*, **22**, 643-648. https://doi.org/10.1038/ajh.2009.47

[21] (2024) DR Congo Population. https://www.worldometers.info/world-population/democratic-republic-of-the-congo-population/

[22] Bayauli, M.P., M'Buyamba-Kayamba, J., Lemogoum, D., Fagard, R., Degaute, J.P., Ditu, M.S., *et al*. (2014) Prehypertension, Hypertension and Associated Cardiovascular Risk Factors among Adult Congolese Urban Dwellers: Results of the Vitaraa Study. *World Journal of Cardiovascular Diseases*, **4**, 390-398. https://doi.org/10.4236/wjcd.2014.48049

[23] M'Buyamba-Kabangu, J., Fagard, R., Lijnen, P., Staessen, J., Ditu, M.S., Tshiani, K.A., *et al*. (1986) Epidemiological Study of Blood Pressure and Hypertension in a Sample of Urban Bantu of Zaire. *Journal of Hypertension*, **4**, 485-492-1. https://doi.org/10.1097/00004872-198608000-00015

[24] Kika, T., Lepira, F., Kayembe, P., Makulo, J., Sumaili, E., Kintoki, E., *et al*. (2016) Uncontrolled Hypertension among Patients Managed in Primary Healthcare Facilities in Kinshasa, Democratic Republic of the Congo. *Cardiovascular Journal of Africa*, **27**, 361-366. https://doi.org/10.5830/cvja-2016-036

[25] Ogah, O.S. (2012) Blood Pressure, Prevalence of Hypertension and Hypertension Related Complications in Nigerian Africans: A Review. *World Journal of Cardiology*, **4**, 327-340. https://doi.org/10.4330/wjc.v4.i12.327

[26] Ponikowski, P., Voors, A.A., Anker, S.D., Bueno, H., Cleland, J.G.F., Coats, A.J.S., *et al*. (2016) 2016 ESC Guidelines for the Diagnosis and Treatment of Acute and Chronic Heart Failure: The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure of the European Society of Cardiology (ESC). *European Heart Journal*, **37**, 2129-2200. https://doi.org/10.1093/eurheartj/ehw128

[27] McDonagh, T.A., Metra, M., Adamo, M., Gardner, R.S., Baumbach, A., Böhm, M., *et al*. (2021) 2021 ESC Guidelines for the Diagnosis and Treatment of Acute and Chronic Heart Failure: Developed by the Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure of the European Society of Cardiology (ESC). *European Heart Journal*, **42**, 3599-3726. https://doi.org/10.1093/eurheartj/ehab368

[28] N'cho-Mottoh, M.B., Coulibaly, I., Koffi, F., Angoran, I., Bamba-Kamagaté, D., Traoré, F., *et al*. (2022) Les cardiologues ouest-africains suivent-ils les «guidelines» sur la prise en charge de l'insuffisance cardiaque? *Annales de Cardiologie et d'Angéiologie*, **71**, 208-214. https://doi.org/10.1016/j.ancard.2022.08.005

[29] Kuvibidila, S., Mbela, K., Masabi, M. and Mbendi, N. (1991) Iron Status of Zairean Pregnant Women with and without Serological Markers of Hepatitis B Virus Infection. *Journal of Tropical Medicine and Hygiene*, **94**, 104-109.

[30] Fina Lubaki, J., Omole, O.B. and Francis, J.M. (2023) Poor Glycaemic Control: Prevalence, Factors and Implications for the Care of Patients with Type 2 Diabetes in Kinshasa, Democratic Republic of the Congo: A Cross-Sectional Study. *Frontiers in Clinical Diabetes and Healthcare*, **4**, Article 1241882. https://doi.org/10.3389/fcdhc.2023.1241882

[31] Davis, D.A. (1992) Evidence for the Effectiveness of CME: A Review of 50 Randomized Controlled Trials. *JAMA*, **268**, 1111-1117. https://doi.org/10.1001/jama.1992.03490090053014

[32] Abebe, T.B., Gebreyohannes, E.A., Tefera, Y.G. and Abegaz, T.M. (2016) Patients with HFPEF and HFREF Have Different Clinical Characteristics but Similar Prognosis: A Retrospective Cohort Study. *BMC Cardiovascular Disorders*, **16**, Article No. 232. https://doi.org/10.1186/s12872-016-0418-9

[33] Massoure, P.L., Roche, N.C., Lamblin, G., Topin, F., Dehan, C., Kaiser, É., *et al*. (2013)

Heart Failure Patterns in Djibouti: Epidemiologic Transition. *Médecine et Santé Tropicales*, **23**, 211-216. https://doi.org/10.1684/mst.2013.0188

[34] Komajda, M., Lapuerta, P., Hermans, N., Gonzalez-Juanatey, J.R., van Veldhuisen, D.J., Erdmann, E., *et al*. (2005) Adherence to Guidelines Is a Predictor of Outcome in Chronic Heart Failure: The MAHLER Survey. *European Heart Journal*, **26**, 1653-1659. https://doi.org/10.1093/eurheartj/ehi251

[35] Erhardt, L., Komajda, M., Hobbs, F.D.R. and Soler-Soler, J. (2008) Cardiologists' Awareness and Perceptions of Guidelines for Chronic Heart Failure. The Address Your Heart Survey. *European Journal of Heart Failure*, **10**, 1020-1025. https://doi.org/10.1016/j.ejheart.2008.08.001

[36] Shoukat, S., Gowani, S.A., Taqui, A.M., Ul Hassan, R., Bhutta, Z.A., Malik, A.I., *et al*. (2011) Adherence to the European Society of Cardiology (ESC) Guidelines for Chronic Heart Failure—A National Survey of the Cardiologists in Pakistan. *BMC Cardiovascular Disorders*, **11**, Article No. 68. https://doi.org/10.1186/1471-2261-11-68