Republic of Ghana

2024 FOCUSED UPDATE OF THE 2019 NATIONAL GUIDELINES FOR THE MANAGEMENT OF CARDIOVASCULAR DISEASES

PREFACE

Cardiovascular diseases continue to pose serious challenges to the health of Ghanaians and the health system because of increasing risk factors such as hypertension, diabetes, and high cholesterol. The government and partners continue to provide the necessary support to fight this menace to minimize its effect. In line with the efforts, in 2019 the Ministry of Health, the Ghana Health Service, and other stakeholders developed the first National Guidelines for the Management of Cardiovascular Diseases to direct the care of patients with cardiovascular diseases. These guidelines have led to the development of training manuals and facilitators guides for nurses, physician assistants, and doctors across the country.

Since the launch of the guidelines, there have been various capacity-building interventions in Ghana and new recommendations based on current scientific data. This has led to policy changes, new recommendations for risk management, cardiac arrest response, and changes in hypertension, stroke, and heart failure management, among others. The focused update showcases these relevant advances in CVD capacity building and management which have significant impact on policy and patient outcomes.

The 2024 focused update is an addendum to the 2019 National Guidelines for the Management of Cardiovascular Diseases but not a replacement for the management of patients with cardiovascular diseases. In addition, this focused update of the National Guidelines for the Management of Cardiovascular Diseases recommends the use of existing documents and structures of the Ministry of Health, to ensure that CVD best practices are institutionalized and sustained in Ghana.

ACKNOWLEDGEMENT

We wish to acknowledge the following for their commitment to develop these training guidance documents to ensure consistent training for all healthcare professionals in Ghana:

MINISTRY OF HEALTH

Hon. Kwaku Agyeman-Manu MP, Minister for Health
Alhaji Hafiz Adam, Chief Director
Dr. Baffour Awuah, NCD Advisor to the Minister of Health

GHANA HEALTH SERVICE

Dr. Patrick Kuma-Aboagye, Director General
Dr. Anthony Ofosu, Deputy Director General
Dr. Lawrence Ofori-Boadu, Acting Director, Institutional Care Division
Dr. Mary Efua Commeh, Acting Program Manager, NCD Control Program

TECHNICAL TEAM

Prof. Isaac Kofi Owusu, Consultant Cardiologist, Komfo Anokye Teaching Hospital
Prof. Vincent Boima, Consultant Nephrologist, Korle-Bu Teaching Hospital
Dr. Alfred Doku, Consultant Cardiologist, Korle-Bu Teaching Hospital
Dr. Lambert Appiah, Consultant Cardiologist, Komfo Anokye Teaching Hospital
Dr. Collins Kokuro, Consultant Cardiologist Komfo-Anokye Teaching Hospital
Dr. Francis Agyekum, Consultant Cardiologist, Korle-Bu Teaching Hospital
Dr. Aba Folson, Consultant Cardiologist, University of Health and Allied Health Sciences
Dr. Allen Steele-Dadzie, Consultant Family Physician Specialist, Finney Hospital and Fertility Centre
Dr. Dzifa Ahadzi, Consultant Cardiologist, Tamale Teaching Hospital
Dr. Seth Nani, Cardiologist and Senior Specialist, Greater Accra Regional Hospital
Dr. Fiifi Duodu, Neurologist and Senior Physician Specialist, Korle Bu Teaching Hospital
Dr. Felix Awindaogo, Cardiology Fellow, Korle-Teaching Hospital

STAKEHOLDERS

Dr. Nii Okai Addy, Medical Officer, Ahmadiyya Hospital Techiman, Bono Region
Dr. Benjamin Asare, Medical Officer, Sunyani Teaching Hospital, Bono Region
Ms Lawrencia Akayientey, Nurse, Sunyani Teaching Hospital, Bono Region
Mr. Felix Oppong, Nurse, Techiman Holy Family Hospital, Bono East Region
Dr. Kofi Amoako Obeng-Frimpong, Medical Officer, Techiman Holy Family Hospital, Bono East Region
Dr. William Arthur, Senior Physician specialist, Koforidua Regional Hospital, Eastern Region
Ms. Sylvia Phaphali Adzitey, Nurse, Tamale Teaching Hospital, Northern Region
Dr. Joshua Abugah, Medical Officer, Tamale Teaching Hospital, Northern Region

Dr. Boakye Assad, Medical Officer, Nkwanta Hospital, Oti Region
Ms. Rosina Amarquaye, Nurse, Nkwanta Hospital, Oti Region
Dr. Dominic Akaateba, Physician Specialist, Upper West Regional Hospital, Upper West Region
Mr. Christian Amoh, Nurse, Nandom Hospital, Upper West Region
Dr. Awudu Bukari, Medical Officer, Nandom Hospital, Upper West Region
Mr. Kofi Ntiri, Physician Assistant, Amamorley Health Centre, Greater Accra Region
Ms. Joyce Ankomah, Physician Assistant, Atumatim Health Centre, Ashanti Region
Ms. Ruth Pamford, Physician Assistant, Tema General Hospital, Greater Accra Region
Mr. Asenso Kodom, Physician Assistant, Drobo Health Centre, Bono Region
Mr. Sebastian Tuie, Physician Assistant, Villa Regina Health Centre, Upper East Region
Dr. Emmanuel Anafo, Resident, Internal Medicine, Korle-Bu Teaching Hospital and Upper East Regional Hospital, Upper East Region
Dr. Jameela Khalid, Physician Specialist, Effia Nkwanta Regional Hospital, Western Region
Dr. Aba Amoasiwah Ghansah, Medical Officer, Weija-Gbawe Municipal Hospital, Greater Accra Region

GIZ GHANA HEART INITIATIVE TEAM

Dr. Brigitte Jordan-Harder, Senior Technical Advisor, Germany
Dr. Alfred Doku, Project Director, Ghana
Mr. Fionn Harnischfeger, Senior Project Manager, Germany
Ms. Jannike Schwarz, Junior Project Manager, Germany
Ms. Juliette Edzeame, Project Manager, Ghana
Ms. Kwatetso Honny, Technical Advisor, Ghana
Mr. David Danso-Mainoo, Technical Advisor, M&E, Ghana
TMs. Marisa Broni, Junior Technical Advisor, Ghana
Ms. Alberta Ewuziwaa Acquah, Administrative Specialist, Ghana

The Ghanaian Society of Cardiology for technical support

CONTENT

ABBREVIATIONS

ABPM Ambulatory Blood Pressure
ACC America College of Cardiology
ACCP America College of Clinical Pharmacology.
ACEi Angiotensin Converting Enzyme Inhibitor
ACLS Advanced Cardiac Life Support
ACS Acute Coronary Syndrome
AHA American Heart Association
ARB Angiotensin Receptor Block
ARNI Angiotensin Receptor Neprilysn Inhibitor
ASCVD Atherosclerotic Cardiovascular Disease.
ASPC American Society for Preventive Cardiology.
BLS Basic Life Support
BP Blood Pressure
BNP Brain Natriuretic Peptide
CAD Coronary Artery Disease
CCB Calcium Channel Blocker.
CKD Chronic Kidney Disease
CT Computer Tomography
CTPA CT Pulmonary Angiogram.
CV Cardiovascular
CVD Cardiovascular Disease
DBP Diastolic Blood Pressure
ECG Electrocardiogram.
ESC European Society of Cardiology
ESRD End Stage Renal Disease
GHI Ghana Heart Initiative
GHS Ghana Health Service

HBPM	Home Blood Pressure Monitoring
ICP	Intracranial Pressure
ISH	International Society of Hypertension
LCD	Liquid-Crystal Display
LDL	Low Density Lipoprotein
LED	Light-Emitting Diode
LMWH	Low Molecular Weight Heparin
MOH	Ministry of Health
MRA	Mineralocorticoid Receptor Antagonist.
MRI	Magnetic Resonance Imaging
NCD	Non communicable disease
NIHSS	National Institutes of Health Stroke Scale
NLA	National Lipid Association
NT	proBNP- N-terminal pro–B-type Natriuretic Peptide
PCI	Percutaneous Intervention
PCNA	Preventive Cardiovascular Nurses Association
PE	Pulmonary Embolism
SBP	Systolic Blood Pressure
SGLT2I	Sodium Glucose Transporter 2 inhibitor
TIA	Transient Ischaemic Attack
TID	Type I Diabetes Mellitus
T2D	Type 2 Diabetes Mellitus
UFH	Unfractionated Heparin
WHO	World Health Organization

LIST OF FIGURES

LIST OF TABLES

Preamble

Available evidence keeps growing because of the rapidity with which data is accruing from clinical trials, hence guidelines like the 2019 National Guidelines for the Management of Cardiovascular Diseases must evolve to accommodate the new evidence with the purpose of guiding healthcare professionals in the application of the best diagnostic or therapeutic strategies for optimal patient care. The National Guidelines for the Management of Cardiovascular Diseases are intended to be standardized for cardiovascular healthcare delivery within the country and to provide a reference guideline document for other jurisdictions of medical practice.

The National Guidelines for the Management of Cardiovascular Diseases seeks to promote evidence-based medical practice in Ghana and it is intended for use by the targeted cadre of health workers involved in the diagnosis and management of cardiovascular disease in Ghana. The guidelines do not override the clinical judgment of clinicians managing patients.

The focused updates were necessitated by available evidence pending the next complete update of the 2019 National Guidelines for the Management of Cardiovascular Diseases hence these updates give recommendations based on the 2019 guidelines.

Table 1: Classes of Recommendation

Class of Recommendation	Definition	What it means
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, and effective.	Is recommended or indicated
Class II. Conflicting evidence and/or a divergence of opinion about the usefulness/ efficacy of the given treatment or procedure		
Class IIA	Weight of evidence/opinion is in favor of usefulness/efficacy.	Should be considered
Class IIB	Usefulness/efficacy is less well established by evidence/opinion.	Maybe considered
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	Is not recommended

Table 2: . Level of Evidence

Level of evidence	
Level of evidence A	Data derived from multiple randomized clinical trials or meta-analyses
Level of evidence B	Data derived from single randomized clinical trial or large non-randomized studies
Level of evidence C	Consensus of the experts and/or small studies, retrospective studies, registries

Levels of care of the Ghanaian health system

The levels of care and facilities available vary from region to region. The Essential Medicine List (EML) of Ghana has 7 categories of prescription to bring clarity to the medicine that can be prescribed at various levels. These categorizations include:

Level A Community-based health planning and services (CHPS; the lowest level)

Level M Midwifery

Level B1 Health center without doctor

Level B2 Health center with doctor

Level C District hospital

Level D Regional/Teaching Hospital

Level SM Specialist medicines

To enhance ease of recommendation of therapy at various levels of care in Ghana, the stake-holders recommended the following levels for this CVD guideline:

Table 3: Levels of care for Management Recommendations

Level of care	Recommendations
Level 0	For all levels
Level 1	Health facility without a doctor
Level 2	Health facility with a doctor
Level 3	Health facility with a physician specialist or family physician
Level 4	Health facility with cardiologists and highly sophisticated equipment

Update Methodology

The members of the update committee were selected to represent healthcare professionals involved in research, training of medical professionals and daily care of patients.
The committee is comprises of cardiologists, nephrologists, neurologists, family physicians, pulmonologists, critical care physicians, endocrinologists, medical officers, and as well as nurses. The update committee engaged in a meticulous evaluation of current evidence available for diagnostic and therapeutic approaches for the management of CV disease and weighed the risk-benefit ratio of every recommendation before inclusion in the update. The update team was segregated into smaller groups that worked on different aspects of the 2019 national CVD guidelines, the completed work of the various groups was aggregated and the whole work was vetted before dissemination.

Even though the guidelines represent a compendium of evidence-based medicine, the decision with regards to individual patient management must be responsibly done by the health professional with recourse to clinical understanding of the condition being managed and giving special consideration to:

1. The specific situation of the patient and the best clinical evidence that best fits the patient for optimal outcome.
2. The country-specific health regulations, indications by the governmental drug and medical practice regulatory agencies, national standard treatment guidelines where applicable.

Introduction to the CVD Update.

Several randomized controlled trials have been published since the publication of the 2019 National Guidelines for the Management of Cardiovascular Diseases which necessitated the update of some aspects of the management of CV diseases. The 2024 Focused Update addresses key changes in recommendations for the management of CV disease. Recent evidence up to 30th September 2023 was considered. Major randomized controlled clinical trials, meta-analyses, and other national guidelines were discussed, and the practice-changing evidence was included when they were deemed fit for beneficial clinical outcomes. Experts in the update committee worked on evidence in the areas of their specialization. Some trials and guidelines discussed included CHANCE[1] and POINTS[2] trial for antiplatelets use in stroke, 2023 ESC Guidelines for the management of endocarditis[3], acute coronary syndromes[4], diagnosis and treatment of acute and chronic heart failure[5], management of cardiomyopathies[6], management of cardiovascular disease in patients in diabetes[7], 2023 ESH Guidelines for the management of arterial hypertension[8] endorsed by the International Society of Hypertension (ISH), 2020 Australian guideline for prevention, diagnosis and management of acute rheumatic fever and rheumatic heart disease[9], 2022 AHA/ACC/HFSA

Guideline for the Management of Heart Failure[10], 2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the Management of Patients With Chronic Coronary Disease[11] among other recent publications on cardiovascular diseases.

The update committee focused on the practicality of the evidence in the Ghanaian/ sub-Saharan African medico-jurisdiction, considering all the challenges facing medical practice in developing countries yet not compromising on the standard of care. The focus was to ensure that all the recommendations will positively impact on morbidity and mortality. All the current recommendations are synergistic with the recommendations of the 2019 National Guidelines for the Management of Cardiovascular Diseases.

RECOMMENDED UPDATES FOR THE NATIONAL GUIDELINES FOR CARDIOVASCULAR DISEASES MANAGEMENT 2024.

1. Cardiovascular Disease burden and capacity building in Ghana.

Low-middle income countries (LMICs) are experiencing a transition of disease burdens, emerging from infectious diseases to non-communicable diseases(NCDs) described as an epidemiological transition[12]. Ghana in recognition of the overwhelming burden of NCDs has made efforts to curb the menace caused by NCDs, one of these plans was the 2011 Ghana's NCD policy which was revised in March 2022 to align the country's NCD policy with the global strategies culminating in 2022 national non-communicable diseases policy and strategy. The burden of the epidemiological transition in Ghana is described succinctly by the Institute for Health Metrics and Evaluation with an analysis of disease trends from 1990 to 2019 which demonstrates that non-communicable diseases like stroke transitioned from the 5th commonest cause of death to the 2nd commonest cause of death in the country. Ischemic heart disease moved from the position of 7th to the 5th commonest cause of death in Ghana[13].

The organogram for the health sector NCD prevention and control has cardiovascular disease under the NCD Control Programme of Ghana Health Service, and the development of the maiden national cardiovascular diseases management guidelines was with the NCD Control Programme and other key partners to mitigate the devastating effects of cardiovascular diseases on the wellbeing of the populace. The concerted effort in the

implementation of the NCD strategy has led to the development of other guidelines like the national diabetes guidelines which were launched in 2023 by the MOH. In order to achieve the objectives of the national NCD policy, there is the NCD steering committee under the Ministry of Health tasked to provide leadership in the development of policies and action plans on NCDs, advocate and support legislation that facilitates healthy lifestyle, build or mobilize financial, human resource capacity and logistical support for NCDs and to strengthen partnership within the health sector and between non-governmental, civil society organizations, the private sector and the community to promote healthy lifestyles. Ghana has adopted the WHO Package of Essential Noncommunicable Disease Interventions (PEN) to help scale up essential NCD services and reduce the burden of diseases through primary health care. The WHO PEN emphasizes the need for integrated healthy lifestyle and self-care (Table 4) counselling at the primary care life. This ensures the client is an integral part of CVD prevention and management.

Scientific evidence has further established low-density lipoprotein (LDL) as well as other

Table 4: Recommendations for Self-Care for CVDs and Risk factors

Raised blood pressure	**Heart failure**
Self-measurements with affordable technologies	Need for cardiac rehabilitation, including graded exercise, weight measurement, and adjustment of diuretics
Diabetes Mellitus	**Need for anticoagulation**
Self-monitoring of blood sugar (T1D and T2D) and adjusting the dose of insulin (e.g. T1D)	Self-monitoring of blood anticoagulation (e.g. Warfarin) levels with affordable technologies and adjusting drug dosage

In 2023, the NCD Control Program and Institutional Care Division of GHS in collaboration with WHO set up the CVD Technical Working Group to provide technical expertise to support the prevention and management of CVD in Ghana.

The first national guidelines on cardiovascular disease management were published in 2019 and were widely circulated to help clinicians deliver evidence-based management for cardiovascular disease at the various levels of health care in the country. There has been the development of an electronic app called the "Akomacare" App available for Android and IOS operating systems. National CVD management training manuals for nurses, physician assistants, and doctors have been developed from the 2019 CVD management guidelines and has been used in CVD management training since 2020. To ensure sustainability and ease of CVD management trainings, an eLearning model for CVD management training is being developed and will be piloted and rolled out in the last quarter of 2024. In addition, the National CVD Support and Call Centre has been set up since 2021 to provide top-side technical support for CVD care across Ghana.

- ***This focused update of the national CVD management guidelines recommends the use of these existing documents and structures of the Ministry of Health, to ensure that CVD management best practices are institutionalized and sustained in Ghana.***

2. Risk factors for Cardiovascular Diseases.

low-density lipoprotein (Apo) B as the precursors of the atherosclerotic process. Elevated LDL and other atherogenic lipoproteins have been demonstrated to be causally related to atherosclerosis and lowering their levels decrease CV events[14]. Newer categories of risk have been introduced to allow for the prevention of CV events. The medications available have been expanded to include drugs like small interfering RNA(siRNA), e.g. Inclisiran, that reduces hepatic proprotein convertase subtilisin/kexin 9 (PCSK9) synthesis in order to effectively treat and prevent CV events[15].

- ***The focused update of the national CVD management guidelines has included the new version of the WHO/ISH risk prediction chart to be used for risk assessment.***

Below is a diagram of the new chart showing laboratory based and non-laboratory-based charts.

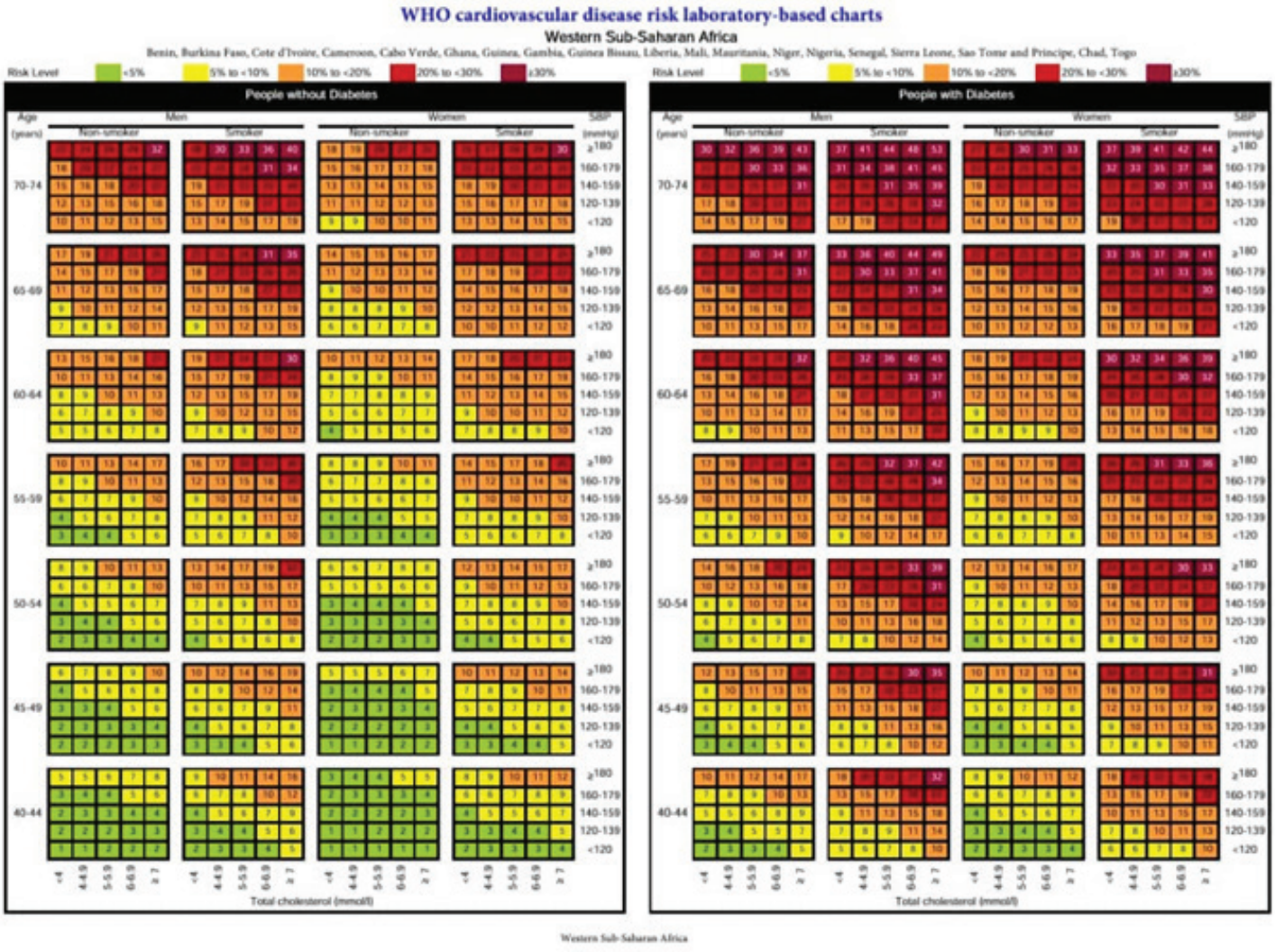


Figure1: WHO risk chart for West Africa: laboratory-based chart (with lipid levels).

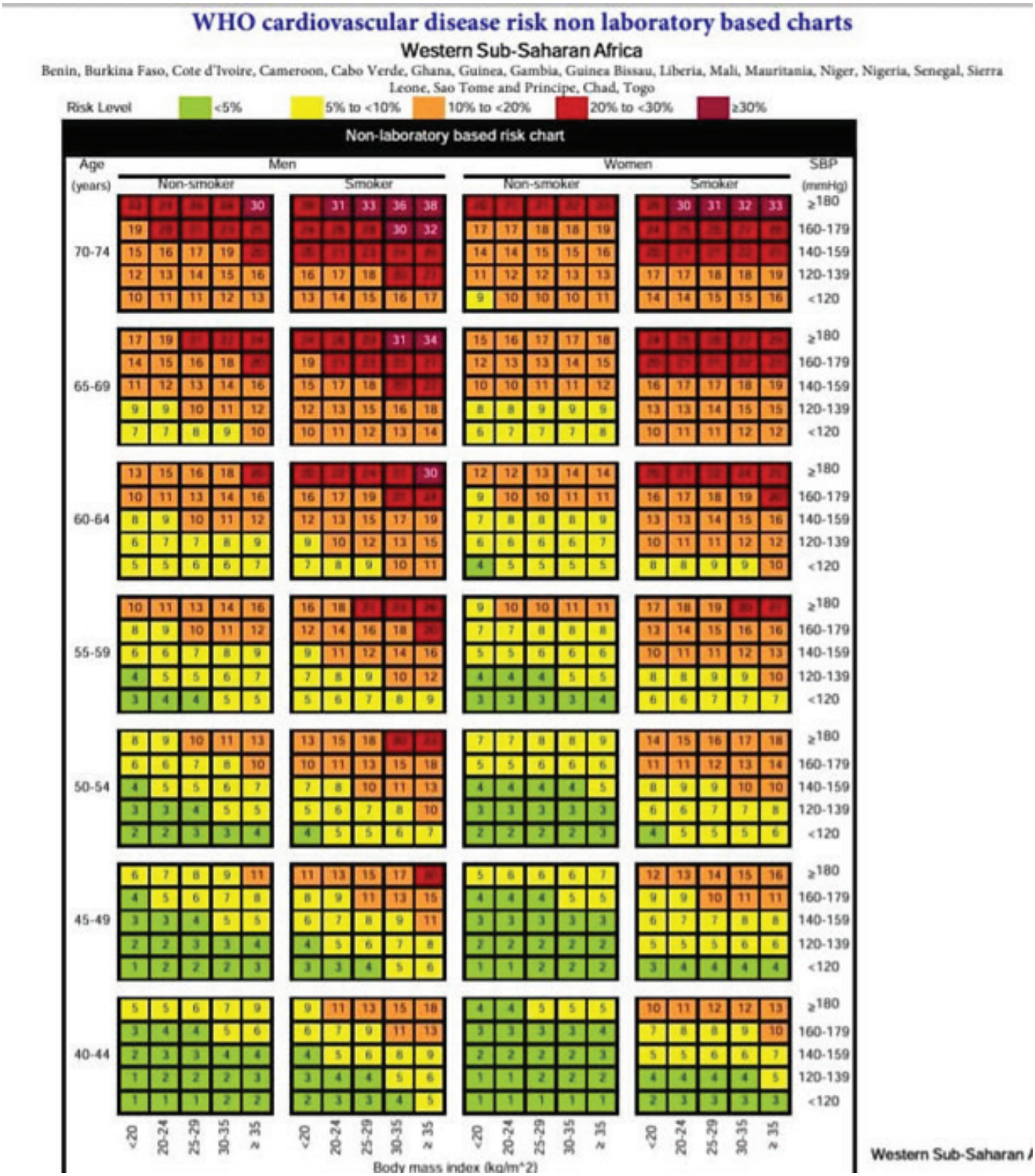


Figure 2: WHO Risk chart for West Africa: non-laboratory-based chart (without lipid levels).

Table 4: Update for CVD risk

Guidelines ref	Current Guideline (2019)	Recommended update (2024)
Section 2.2.2	World Health Organization/International Society of Hypertension (WHO/ISH) risk prediction chart	The new version of the WHO/ISH risk prediction chart to be used for risk prediction[16]. See figure 1 and 2.
Section 2.2.4 Table 9	Risk categorization and LDL levels: • Very high-risk: <1.8 mmol/l or a reduction of at least 50% • High-risk: <2.6 mmol/l or a reduction of at least 50% • Low to moderate risk: <3.0 mmol/l	Updated risk categories are[15]: • Very high risk; <1.4mmol/l (to include those with established CVDs who need secondary prevention) • High risk: < 1.8mmol/l or ≥50% reduction from baseline • Moderate risk: 2.6 mmol/l • Low risk: 3.0mmol/l
Section 2.2.4.	Primary Prevention- Management of elevated lipid levels.	Inclisiran is added as one of the lipid-lowering drugs[15]
Section 2.2.4.	In patients with established ASCVD, the recommendation is that the "lower the better" when it comes to cholesterol management. The goals of treatment are LDL-C below 1.8 mmol/l or >50% LDL-C reduction, when the target level cannot be reached	Patients with established ASCVD are categorized as "very high risk". The recommended LDL-C target for this category is less than 1.4mmol/l or >50% LDL-C reduction, when the target level cannot be achieved[15].
Page 34 Management of dyslipidemias	In very high-risk ASCVD patients • Add Ezetimibe to the patient's maximally tolerated statin therapy if the LDL-C level remains ≥1.8 mmol/l • If the LDL-C level on a maximally tolerated statin and Ezetimibe remains ≥ 1.8 mmol/l, a PCSK9 inhibitor can be added	IIn very high-risk ASCVD patients • Add Ezetimibe to the patient's maximally tolerated statin therapy if the LDL-C level remains ≥1.4 mmol/l • If the LDL-C level on a maximally tolerated statin a nd Ezetimibe remains ≥ 1.4 mmol/l, a PCSK9 inhibitor can be added[15]

3. Cardiac Arrest.

Sudden cardiac deaths occur in over three people million annually worldwide[17], mostly occurring outside of a healthcare facility setting, with a survival being less than 8%[18]. Emergency systems are being developed in many African countries including Ghana to help manage emergencies like cardiac arrest, an example is the National Ambulance Service (NAS) in 2004[19]. Several training of individuals by various organizations and projects like the Ghana Heart Initiative (GHI) in BLS and ACLS have been instituted to equip individuals in the country to manage cardiac arrest. The development of the 2019 National Guidelines for the Management of Cardiovascular Diseases[20] made available a structured algorithm to guide the management of cardiac arrest in the country. The current updates basically add more recent information to the existing recommendation to improve the outcome of patients with cardiac arrest.

Table 5: Update on Cardiac Arrest

Guideline ref	Current Guidelines	Recommended Updates
		Adult bradycardia algorithm has increased the atropine dose to 1mg from 0-5-1mg.
Page 53. Further explanation for the algorithm for ACLS		Giving medications intravenously is preferred over intraosseous route.
		The following are recommended in the updated guidelines[21]. • It is reasonable to use physiological indicators such as arterial blood pressure or endtidal CO2 to monitor CPR quality. The goal of EtCO2 is greater than 10mmHg but ideally greater than 20mmHg. • Early administration of epinephrine is recommended. ◢ As soon as appropriate in a non-shockable rhythm ◢ It may be reasonable to administer epinephrine after initial defibrillation attempt has failed cardiac arrest with a shockable rhythm. • Double sequential defibrillation for refractory shockable rhythm has not been established as a useful modality of management. • Cardiac arrest survivors are recommended to have multimodal rehabilitation assessment and treatment for physical, neurologic,
Page 53. Further explanation for the algorithm for ACLS	Quantitative waveform capnography: If PETCO2 <10 mmHg, attempt to improve CPR quality	

		cardiopulmonary, and cognitive impairments before discharge • For Pregnant women with cardiac arrest the focus should be on: ◢ High-quality CPR ◢ Avoidance of aortacaval compression by left lateral uterine displacement. ◢ Fetal monitoring should not be undertaken during cardiac arrest in pregnancy because of likely interference with resuscitation. ◢ Continuous fetal monitoring for bradycardia during targeted temperature management as a potential complication.

4. Hypertension.

Hypertension is the main driver of the cardiovascular disease epidemic in Africa including Ghana[22]. Many studies have demonstrated hypertension as the leading cause or risk factor for heart failure[23,24], stroke[25] and ESRD[26] in Ghana.

Table 6: Update on Hypertension

5.1.1(iii) Classification. Table 25	Classification in 2019 guidelines which have been updated. • Grade III Hypertension: SBP ≥180 and/or DBP 100-109mmHg.	The classification in the 2019 guidelines has been modified to include the following changes: • Grade III Hypertension: SBP ≥180 and/or DBP ≥ 110mmHg[27]. • Isolated diastolic hypertension: SBP <140 and DBP ≥90mmHg[27].
Table 26. Risk factors for primary hypertension.		The risk factors for primary hypertension have been expanded in the updated guidelines and this includes: • Weight gain or loss in the past • History of erectile dysfunction

		• Sleep history, snoring, sleep apnea. • Distress or eustress at work or at home. • Long-term cancer survivor[27]
5.1.3 Clinical presentation	Symptoms and signs of hypertension	Personal history has been included in the clinical presentation and it includes[27]: • Time of the first diagnosis of hypertension, including records of any previous medical screening, hospitalization • Stable or rapidly increasing BP • Recordings of current and past BP values by self-BP measurements • Current/past antihypertensive medications including their effectiveness and intolerance. • Adherence to therapy for previous hypertension in pregnancy/preeclampsia ***Drug treatments or use (other than antihypertensive drugs).*** The updated guideline has included additional drugs that predispose to hypertension[27]. • Paracetamol (acetaminophen) • Immunosuppressive drugs • Anticancer drugs • Nasal vasoconstrictor
	Screening and case finding not emphasized in the 2019 guidelines.	**Screening vs case finding in the detection of hypertension has been included in the updated guidelines.** • Case finding or opportunistic screening for hypertension is recommended in all adults.

		• Regular BP measurements are recommended in adults from the age of 40 years or earlier in patients at high risk. • In individuals without hypertension, intervals for repeated BP measurement should be scheduled depending on the BP level, the risk of hypertension, and CV risk. • In patients with high risk, annual follow-up is recommended. Opportunistic screening refers to the practice of identifying and assessing individuals during routine health care encounters or at other public places like barber shops and pharmacy shops even if the primary reason is unrelated to pressure concerns in individuals ≥ 18 years
Section 5.1.5	Confirmation of diagnosis is not covered in the 2019 guidelines	**Confirming the diagnosis of hypertension** • A rise in office BP (SBP 140mmHg or DBP 90mmHg) should be confirmed by at least two to three visits due to the fluctuation of blood pressure, unless the BP values noted during the initial visit are noticeably raised (grade 3 hypertension) or the CV risk is considerable, including the existence of HMOD (hypertension mediated organ damage).

		• To validate the diagnosis of hypertension and identify BP phenotypes, ABPM, HBPM or data should be gathered whenever practical when office BP is elevated. • When office BP data visits yield inconsistent results, ABPM and/or HBPM may be particularly crucial
Section 5.1.5	BP devices were mentioned but a detailed section on the devices for BP measurement was not emphasized in the 2019 guideline.	Section on devices for BP measurement has been included in the updated guidelines[27]. • Automatic electronic, upper-arm cuff devices are recommended for office and out-of-office BP measurement (home and ambulatory) • Hybrid manual auscultatory devices with LCD or LED display, or digital countdown, or shock-resistant aneroid devices can be used for office BP measurement if automated devices are not available. • When BP cannot be measured by an upper arm cuff device, a validated electronic wrist-cuff device may be used. • Only properly validated devices should be used. • Cuffless BP devices should not be used for the evaluation or management of hypertension in clinical practice. • Only properly validated devices should be used. • Cuffless BP devices should not be used for the evaluation

		or management of hypertension in clinical practice.
Section 5.1.5	BP measurement in the health facility.	Office BP measurement[27] • Office BP is recommended for diagnosis of hypertension because it is the one method by which hypertension-related risk, benefits of antihypertensive treatment, and treatment-related BP thresholds and goals are based. • It is recommended to diagnose hypertension during at least 2 separate office visits (within 4 weeks) unless office BP indicates grade 3 hypertension (≥180/110 mmHg) or patients present with hypertension related symptoms or there is evidence of HMOD or CVD • At the first office visit, BP should be measured in both arms. A consistent between-arm SBP difference >15-20 mmHg suggests atheromatous disease and is associated with increased CV risk. All subsequent measurements should be made on the arm with the highest BP readings. • Out-of-office BP is a source of multiple BP-related information before and during treatment. It is therefore recommended to obtain additional information on BP values by ABPM or HBPM or both if available

	Elevated BP with target organ damage, preclinical CVDs, or established CVDs (secondary prevention). Extended screening of organ damage was not succinctly documented.	**Extended screening for HMOD has been included[27]:** • Echocardiography • Carotid and femoral pulse wave velocity or branchial ankle pulse wave doppler • Carotid artery ultrasound • Coronary artery calcium scan • Abdominal aorta ultrasound • Kidney ultrasound • Ankle Branchial Index • Retina microvasculature • Cognitive function (MMSE). • Brain imaging (CT, MRI).
5.1.5 MANAGEMENT OF HYPERTENSION RELEVANT FOR ALL LEVELS OF CARE	The recommended BP levels are: • BP <140/90 mmHg in all patients provided treatment is well tolerated, BP target can be lowered to 130/80 mmHg or less in most patients. • Patients <65 years: the recommended target SBP ranges between 120-129 mmHg. • Patients ≥65 years: the recommended target SBP ranges between 130-139 mmHg. • Patients ≥80 years: the recommended SBP target ranges between 130–139 mmHg if tolerated. • The recommended DBP target is <90 mmHg irrespective of age and level of risk or comorbidities. ◢ **NB:** Tight blood pressure control or low targets in the elderly put them at risk of syncope and kidney disease	Recommendations and statements[27] • Patients 18 to 64 years old: The goal is to lower office BP to < 130/80mmHg. • Patients 65 to 79 years old: The primary goal of treatment is to lower BP to < 140/90mmHg. ◢ However, lowering BP to below 130/80mmHg can be considered if treatment is well tolerated. • Patients 65 to 79 years old with ISH: The primary goal of treatment is to lower SBP in the 140 to 150 mmHg range. ◢ A reduction of office SBP in the 130 to 139 mmHg range may be considered if well tolerated, albeit cautiously if DBP is already below 70 mmHg.

		• Patients ≥80 years: Office BP should be lowered to a SBP in the 140 to 150 mmHg range and to a DBP < 80 mm Hg. ◢ A reduction of office SBP between 130 to 139 mmHg may be considered if well tolerated, albeit cautiously if DBP is already below 70 mmHg
		Additional safety recommendations[27] • Target for SBP and DBP should be individualized in frail patients. • Do not aim to target office BP below 120mmHg or DBP below 70mmHg. SBP should still be lowered albeit cautiously, if on-treatment SBP is still well above values. • In patients with low office DBP, below 70 mmHg, SBP should be still lowered, albeit cautiously, if on-treatment SBP is still well above target values. • Reduction of treatment can be considered in patient aged 80 years or older with a low SBP (< 120 mmHg) or in the presence of severe orthostatic hypotension or a high frailty level
5.1.7 RESISTANT HYPERTENSION		Update on the treatment of resistant hypertension[27]: • In patients not controlled on ACEi/ARBs + CCB + thiazide/ thiazide like Diuretics with

		CKD Stage 1-3, i.e. eGFR≥ 30ml/min/1.73m2 add (i). Spironolactone(preferred) or other MRA or (ii) Beta-blocker or Alpha-1 blocker or (iii) Centrally acting agent. Consider renal nerve denervation if eGFR >40ml/min/1.73m2. • In patients not controlled on ACEi/ARBs + CCB + Loop diuretics with CKD Stage 4-5(not on dialysis), i.e. eGFR< 30ml/min/1.73m2 add (i). Chlorthalidone (preferred) or other thiazide/thiazide-like diuretic or (ii) Beta-blocker or Alpha-1 blocker or (iii) Centrally acting agent. Consider renal nerve denervation if eGFR >40ml/min/1.73m2 ◢ Diuretic use: Use Thiazide /thiazide-like diuretic if eGFR >45 ml/min/1.73 m2. ◢ Consider transition to Loop diuretic if eGFR is between 30 to 45 ml/min/1.73 m2. ◢ Use loop Diuretic if eGFR <30 ml/min/1.73 m2 ◢ MRA contraindicated if eGFR <30 ml/min/1.73 m2 ◢ Caution if eGFR <45 ml /min/1.73 m2 or serum potassium >4.5 mmol/l.

5. Stroke

The concept of epidemiological transition with regard to the causes of mortality has seen stroke over the period 1990-2019 become the leading cause of mortality in Ghana[13]. The initial national CVD management guidelines among many interventions were to help curb adverse effects of stroke by facilitating best evidence management protocols for stroke. As observed in many guidelines across clinical practices, sections of the national CVD management guidelines for Ghana are being updated to reflect current stroke management recommendations.

Table 7: Update on stroke.

5.2.3 (iic) Management according to level of care. Health facility without a doctor/ with a doctor	• Use iv Furosemide if patient is a known CKD or has renal impairment. • Oral Acetazolamide 250mg bd can be added if CT scan shows acute hydrocephalus	• The recommendation for IV furosemide and oral acetazolamide in the 2019 guidelines has been deleted. • Hypertonic saline 300mls of 3% over 15 to 30 mins. Use hypertonic saline in patients with known CKD or renal impairment[28,29].
5.2.3 iiic. Treatment of Head CT scan confirmed infarct: Health with a facility Specialist		Tissue window (evidence of viable brain tissue) is recommended as part of the indications for thrombolysis. This refers to patients who present with a wake-up stroke or after the recommended time window of 4.5 hours, provided MRI of the brain doesn't show irreversible brain damage[30,31].
5.2.3 (iiib). Non-laboratory investigations.		• Non-contrast head CT scan is recommended as first-line imaging. • MRI should be done if patient presents after the time window (< 4.5 hrs) to determine tissue viability for possible thrombolysis[30].

	Use of Antiplatelets	Double antiplatelet (Aspirin 75 and clopidogrel 75) use is only recommended for the first 3 weeks and then use only clopidogrel afterward for secondary prevention) for high risk TIA(ABCD2 score >4 or minor stroke(NIHSS < 5)[1,2]
	Pharmacological management of Raised ICP	In the management of raised ICP, the recommendation for the use of Furosemide and Acetazolamide in the 2019 guidelines should be replaced with IV hypertonic saline 300mls of 3% over 15-30mins[28,29.]
5.2.3 (3d) Head CT scan confirmed hemorrhage	Statins- Early introduction of statins has significantly improved 30-day survival rate following bleeding events. Patients who received statins are more likely to be discharged home than those who did not	The recommendation for early introduction of statins to improve 30-day survival rate following bleeding events and increase the probability of discharge home than those who did not receive statins has been excluded from the updated recommendation.

6. Heart Failure

Heart failure has been documented as the most common CVD in Ghana[32]. The classification of heart failure has been modified over the years and current classification based on the Left Ventricular (LV) ejection fraction helps to choose the appropriate medication to improve management outcome[5]. The management of heart failure has evolved over the years with current data supporting the use of four foundational drugs for heart failure with reduced ejection fraction namely, ARNIs/ACEi/ARBs, Beta Blockers, MRAs, and SGLT2Is to reduce mortality and hospitalization[33]. The SGLT2Is have also been found to reduce the combined risk of worsening heart failure or cardiovascular death among patients with heart failure and a mildly reduced or preserved ejection fraction[34,35].

Table 8: Update on heart failure

5.4.1	Clinical diagnosis of HF can be generally classified based on whether it is associated with a reduced left ventricular ejection fraction or preserved ejection fraction.	Classification of HF • HF can be classified into three distinct phenotypes. i.e. heart failure with reduced ejection fraction (HFrEF), heart failure with mildly reduced ejection fraction (HFmrEF), and heart failure with preserved ejection fraction (HFpEF) based on the ejection fraction.
(iii) Classification of heart failure	**i.** Heart failure with reduced ejection fraction (HFrEF) with LVEF <50%. **ii.** Heart failure with preserved ejection fraction (HFpEF) with LVEF 50% or more. [36]	HF is also divided into distinct phenotypes based on the measurement of left ventricular ejection fraction (LVEF) (iiic) Classification of HF according to LVEF **i. HF with reduced ejection fraction (HFrEF)** – symptomatic HF with LVEF ≤40% **ii. HF with mildly reduced ejection fraction (HFmrEF)** – symptomatic HF with LVEF 41-49%

		iii. **HF with preserved ejection fraction (HFpEF)** – symptomatic HF with LVEF ≥50% iv. **HF with improved ejection fraction (HFimpEF)** – a new classification which is distinctly defined as symptomatic HF with a baseline LVEF ≤40%, a ≥10-point increase from baseline LVEF, and a second measurement of LVEF >40%[37]
5.4.4 Aspects of Management	Diagnosis of heart failure with reduced ejection fraction (HErEF) requires 3 conditions to be satisfied: • Typical symptoms of HF. • Typical signs of HF. • LVEF below 50% on Echocardiogram Diagnosis of mildly reduced ejection fraction was not captured. The diagnosis of heart failure with preserved ejection fraction requires 4 conditions to be satisfied: • Typical symptoms of HF • Typical signs of HF • LVEF 50% on Echocardiogram • Presence of structural heart disease and/or diastolic dysfunction	Diagnosis of HFrEF[33]: • Symptoms with and/or without signs of HF. • LVEF ≤ 40% on echocardiogram The diagnosis of heart failure with mildly reduced ejection fraction requires 3 conditions to be satisfied[33]: • Typical symptoms of HF • Typical signs of HF • LVEF 41 – 49% Diagnosis with heart failure with preserved ejection fraction HFpEF respectively to • LVEF ≥ 50% on echocardiogram • Evidence of structural and/or functional cardiac abnormalities and/or raised natriuretic peptides (NPs) ◂ (BNP ≥ 35 pg/mL or NT-proBNP ≥ 125 pg/mL)[33]

5.4.5 Management according to level of care **(ii)** facility with a doctor	Acute heart failure laboratory investigation. • Full blood cell count • Fasting blood sugar • BUE/Creatinine	**Acute Heart Failure Investigations** • Full blood cell count • Fasting blood sugar • BUE/Creatinine • Liver function test • Glycated Hb • NT-proBNP/ BNP • Echocardiography
(iii) facility with a Physician Specialist	Diuretics - LOE B In patients with resistant oedema (and ascites), a combination of a loop and a thiazide (e.g. Bendroflumethiazide 2.5–10mg daily orally) or thiazide-like diuretic (Metolazone 2.5–10mg daily orally) may be needed to achieve adequate diuresis.	• Diuretic therapy important to reduce congestion. • This include Furosemide and for resistant cases Metolazone and Hydrochlorothiazide may be combined; Bumetanide and Torsemide are other options.
(iv) facility with a cardiologist	Chronic HF • Diuretic • ACE-I/ARB/ARNI • MRA • Beta-blockers Management of patients with anemia and heart failure	• Patients in cardiogenic shock with no evidence of coronary artery disease, pulmonary embolism or hypovolemia, short-term intravenous inotropic support with Dobutamine 0.5-1mg/kg/min should be given as continuous infusion. • ACE-I/ARB if the patient has high blood pressure with potassium < 5.2 mmol/l. • Digoxin if the patient has a sinus rhythm or atrial fibrillation with a heart rate > 100 bpm with potassium > 3.5 mmol/l The foundational disease modifying medications recommended for management of chronic HFrEF to

		reduced HF hospitalization and death are[33]: • ACEi • Beta blocker • MRA • Dapagliflozin/Empagliflozin • ARNI as a replacement for ACEi in ambulatory patients with HFrEF, who remain symptomatic despite optimal treatment. ***NB:*** Recommended for patients who cannot tolerate ACE-I or ARNI because of serious side effects[33] ***NB:*** Start initial doses of all four disease-modifying drugs in patients admitted with HFrEF before discharge. Additional drugs to be considered as clinically indicated[38]. • Isosorbide dinitrate/hydralazine • Ivabradine • Digoxin • Soluble guanylate cyclase inhibitors • Cardiac myosin activator • Refer to a cardiologist for evaluation. **Refer to Tables 1 and 2** • Table of medication and dosages with eplerenone and SGLT-2i In patients with HFmrEF start SGLT2-I before discharge if there is no contraindication. Management of heart failure with mildly reduced or preserved ejection fraction to reduce HF hospitalization of CVD death.

		• An SGLT2 inhibitor (dapagliflozin or empagliflozin)[5]. Heading changed to Management of patients with iron deficiency with/without anemia and heart failure • Intravenous iron supplementation is recommended in symptomatic patients with HFrEF and HFmrEF, and iron deficiency (Ferritin <100ng/ml or 100-300ng/ml if transferrin saturation is <20%), to alleviate HF symptoms and improve quality of life[39,40]. • Intravenous Ferric carboxymaltose / Ferric derisomaltose may be used in the management of iron deficiency anaemia[39,40]

7. Venous Thromboembolism

Pulmonary embolism as a component of venous thromboembolism (VTE) is the third most common cause of death among cardiovascular diseases after acute coronary syndrome and stroke[41]. There has been new data directing the management of VTE in recent years which forms the basis of the updates of the VTE recommendation in the national guidelines for management of cardiovascular diseases.

Table 9: Update on venous thromboembolism

Section	**Current Guidelines (2019)**	**Recommended updates**
5.5.3	In the absence of immediate CT-PA and/or echocardiogram, administer IV bolus unfractionated heparin 5000-7500 IU in the average adult and refer	In the absence of immediate CT-PA and/or echocardiogram, administer initial therapeutic dose of the available parenteral anticoagulation per body weight (LMWH or UFH) and refer.
5.5.3. iii. Pharmacological treatment	Massive PE: Thrombolysis ◂ Thrombolytic therapy is recommended for PE patients with shock who remain hemodynamically unstable after initial preferred anticoagulation and supportive therapy	Systemic thrombolytic therapy is recommended for high-risk PE(Massive PE)[42]
	NON-MASSIVE PE Patients with non-massive PE require further risk stratification after the diagnosis of PE has been confirmed. In these patients, a risk assessment should begin with a validated clinical score, preferably the Pulmonary Embolism Severity Index (PESI) or simplified PESI (sPESI).	NON-MASSIVE PE It is recommended that in patients with acute PE without hemodynamic instability are further stratified into intermediate- and low-risk categories. In addition to clinical indicators[42]: • Patients who show evidence of both RV dysfunction (on echocardiography or CTPA) and elevated cardiac biomarker levels, particularly cardiac troponin are classified into

		the sub-massive (intermediate) high-risk category. • In patients in whom the RV appears normal on echocardiography orCTPA, and/or who have normal cardiac biomarker levels, belong to sub-massive (intermediate) low-risk category. • It is recommended that rescue thrombolytic therapy is initiated for patients with sub-massive PE on anticoagulation who deteriorate hemodynamically[42]
5.5.4 (ii). Patients with cancer.	LMWH is usually preferred in patients with VTE and cancer.	Edoxaban and rivaroxaban should be considered as an alternative to weight-adjusted subcutaneous LMWH in patients without gastrointestinal cancer[42].

8. Acute Rheumatic Fever

Acute rheumatic fever (ARF) is rarely diagnosed in African patients resulting in presentation of patients in the late stages of RHD with the severe complications occurring at early ages with increased high morbidity and mortality in young patients[43]. This signifies the importance of preventative strategies to be instituted as well as focused identification of risk factors and early diagnosis and management of group A beta-hemolytic streptococcus infection.

Table 10: Update on Acute Rheumatic Fever

5.6.1	No risk factors stated.	Risk factors for ARF as Section iv under the introduction List risk factors[9] • Living in an ARF-endemic setting • Family or household recent history of ARF/RHD • Household overcrowding • Poverty • Lower socio-economic status • Personal history of ARF/RHD • Aged 5–15 years (peak years for ARF) • Female sex • Low level of awareness
(ii) Facility with Doctor (iii) Facility with physician specialist/ cardiologist	LABORATORY INVESTIGATION • Full blood cell count • Blood cultures • Erythrocyte sedimentation rate (ESR) • C-reactive protein (CRP	LABORATORY INVESTIGATION • Full blood cell count • Blood cultures • Erythrocyte sedimentation rate (ESR) • C-reactive protein (CRP • ECG • CXR • Throat swab (before giving antibiotics): culture for GAS • Antistreptococcal serology: Anti Streptolysin O titer and anti-DNase B titers which may be repeated in two weeks if the result is not confirmatory[9] • Consider steroids for carditis

9. Rheumatic Heart Disease.

Rheumatic heart disease(RHD) is still a significant cause of cardiovascular morbidity and death in the early years of life in many low and middle-income countries[44,45]. Despite the significant morbidity and mortality associated with RHD, it is a preventable heart condition. Reducing the burden of rheumatic heart disease involves the prevention of rheumatic fever, and advanced RHD care involving tertiary cardiology and cardiac surgery services as well as health policy involving national health systems and international collaboration[46]. Since rheumatic heart disease is mostly diagnosed in childhood and teenage years, transition of care in the management of rheumatic heart disease ensures a coordinated management plan to prevent interruption of care from childhood into adulthood[9]. Below is a diagram depicting a model for assessing and reporting the burden of rheumatic heart disease[47], Figure 3

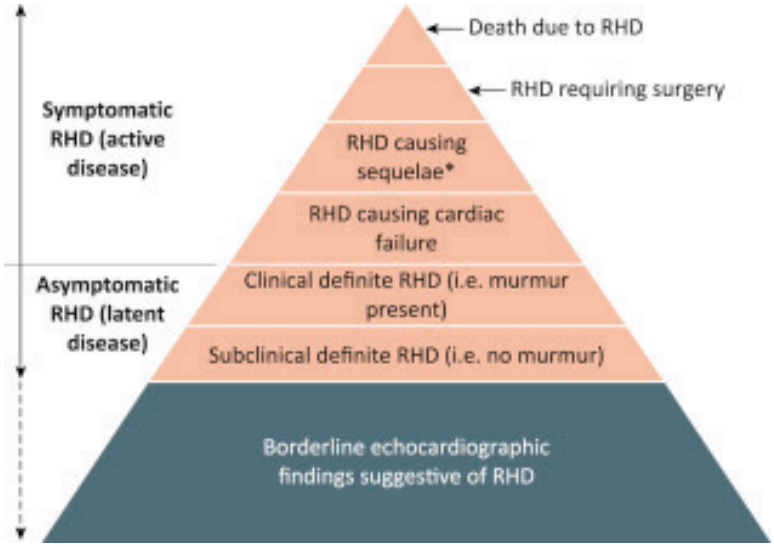


Figure 3: Model for assessing and reporting the burden of rheumatic heart disease[47].

Table 11: Update on rheumatic heart disease

Section 5.7.8	**Transition of care.** Transition of care was not included in the 2019 guidelines.	**Transition of care.** Transition of care deals with the lack of well-coordinated passage of care from childhood to adulthood which can put patients at risk of being lost to follow-up and suffering preventable and significant morbidity. • Pediatrics patients with RHD should have a coordinated transition from pediatrics to adult cardiology care[9].
5.7.9	Management of pregnancy patients	Pregnant patients • A pregnant woman with

		suspected or confirmed RHD should be referred to a specialist[9] (GRADE 1A).

10. Infective Endocarditis

Infective endocarditis (IE) poses a public health challenge for Ghana. After the publication of the 2019 national guidelines for the management of CVDs, new credible data have been published which necessitates an update of the current guidelines to guide the management of infective endocarditis in the country, for instance, different clinical scenarios for those at risk has emerged[3] and needs to be factored into the current management of infective endocarditis.

Table 12: Update on infective endocarditis

5.8.1 Introduction (iii)	Risk factors. • Congenital heart defects • Rheumatic valvular disease • Degenerative heart disease including calcific aortic stenosis due to either a bicuspid valve, Marfan's syndrome, or syphilitic disease. • Mitral valve prolapses. • Prosthetic (artificial) valve	Risk factors replaced with High-risk and intermediate-risk [3]. High-risk • Previous history of IE • Patients with surgically implanted prosthetic valves • Patients with congenital heart disease • Patients with ventricular assist devices as destination therapy Intermediate risk • Rheumatic heart disease (RHD) • non-rheumatic degenerative valve disease • congenital valve abnormalities including bicuspid aortic valve disease
Etiology of IE and classification	• Native (natural) valve endocarditis (NVE). • Prosthetic (artificial) valve endocarditis (PVE). • Intravenous drug abuse (IVDA) endocarditis • Nosocomial (hospital-acquired) endocarditis	Cardiovascular implanted electronic devices (CIED) infective endocarditis[3] added to the previous classes in the 2019 guidelines. • Native (natural) valve endocarditis (NVE). • Prosthetic (artificial) valve endocarditis (PVE). • Intravenous drug abuse (IVDA) endocarditis

		• Nosocomial (hospital-acquired) endocarditis
5.8.6 Prevention	Antibiotic prophylaxis is recommended only for the highest-risk patients during certain high-risk procedures.	General statements under preventions. • Antibiotic prophylaxis is recommended in patients at high risk of IE undergoing oro-dental procedures[3]. • Systemic antibiotic prophylaxis may be considered for high-risk patients undergoing an invasive diagnostic or therapeutic procedure of the respiratory, gastrointestinal, genitourinary tract, skin, or musculoskeletal systems[3].

11. Chest Pain, Coronary Artery Disease and Myocardial Infarction.

Coronary artery disease is broadly classified into acute coronary syndrome and chronic coronary syndrome. Chronic coronary disease can have long, stable periods but can also become unstable at any time, usually due to an acute atherothrombotic event precipitated by plaque rupture, fissuring or erosion. Even though the disease is termed chronic, it is often progressive meaning it carries serious potential consequences even in seemingly clinically silent periods. The dynamic nature of the CAD process results in various clinical presentations[48]. The diagram below depicts the progression of chronic coronary syndrome[48].

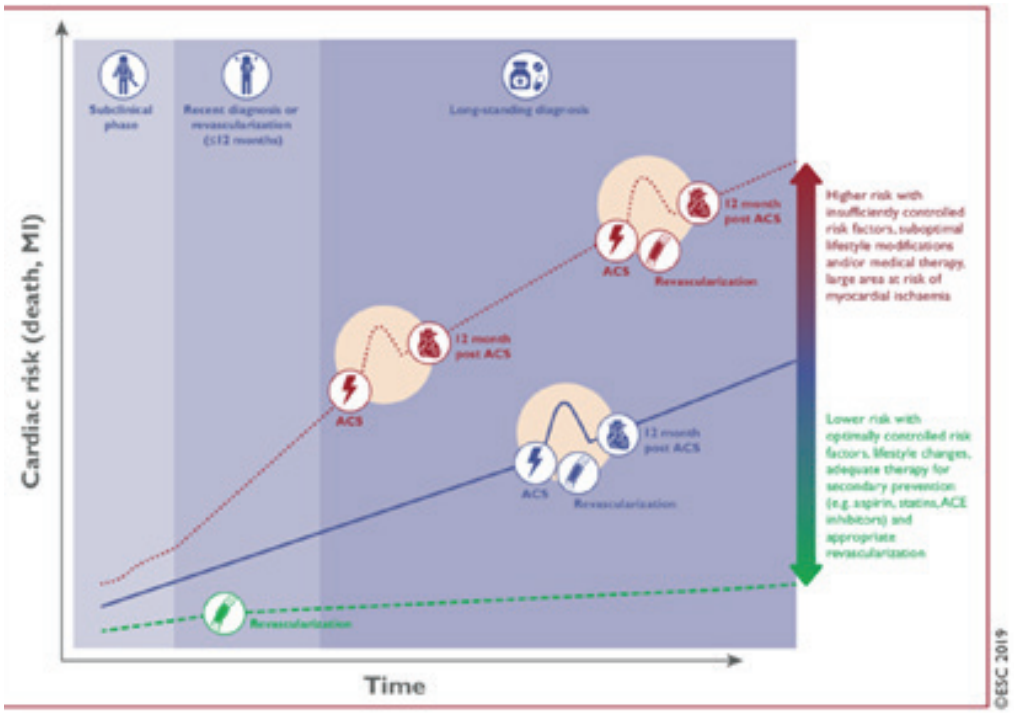
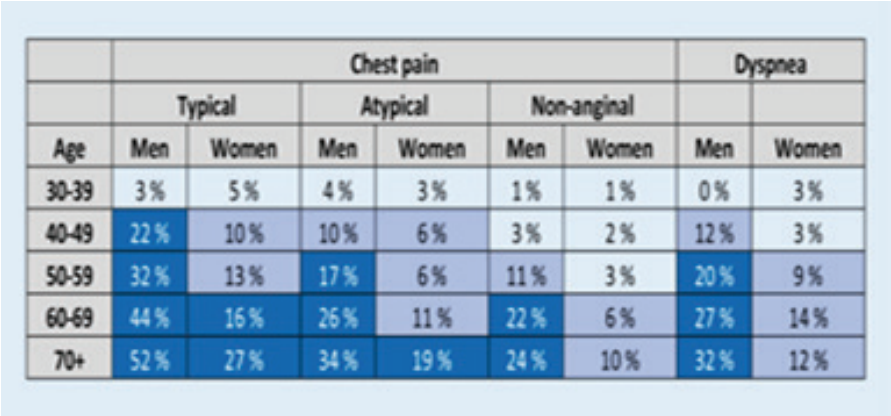


Figure 4: Progression of chronic coronary syndrome[48]

An updated pretest probability (PTP) assessment has been introduced which considers age, sex, and symptoms as well as the presence or absence of dyspnea. The updated PTP for obstructive coronary artery disease prevents overestimation of the pretest probability with a percentage of less than 15% indicating a low pretest probability[48]. It is safe to defer routine testing in patients with PTP <15%, thus reducing unnecessary procedures and costs. Below is a diagram of the updated pretest probability[48]. Modifiers of the PTP estimate including ECG changes, LV dysfunction suggestive of ischemia, and coronary calcium by CT scan can be used to improve estimations of the PTP of obstructive CAD.



	Chest pain						Dyspnea	
	Typical		Atypical		Non-anginal			
Age	Men	Women	Men	Women	Men	Women	Men	Women
30-39	3%	5%	4%	3%	1%	1%	0%	3%
40-49	22%	10%	10%	6%	3%	2%	12%	3%
50-59	32%	13%	17%	6%	11%	3%	20%	9%
60-69	44%	16%	26%	11%	22%	6%	27%	14%
70+	52%	27%	34%	19%	24%	10%	32%	12%

Figure 5: Update pretest probability for obstructive CAD

Table 13: Update on chronic coronary syndrome

5.3	Chest pain, coronary artery disease, and myocardial infarction	• Coronary artery diseases replaces the previous description
(iii) Pathophysiology	Not stated in the previous 2019 guidelines. • Coronary artery atherosclerosis results in plaque formation starting with fatty streaks and gradually leading to overt obstructive plaque. Thus, atherosclerosis of coronary arteries, also referred to as coronary artery disease (CAD), may lead to fixed obstruction of the coronary arteries or dynamic obstruction when there is plaque rupture or erosion resulting in thrombus formation and coronary vasospasm. Fixed severe obstructions usually result in myocardial ischemia due to reduced blood supply, which if prolonged and severe gives rise to stable ischemic heart disease. On the other hand, acute coronary vasospasm or dynamic obstructions would usually lead to myocardial injury and if prolonged and severe, result in myocardial infarction or cell death	In addition • Atherosclerosis is a chronic progressive inflammatory condition driven by cardiovascular disease risk factors such as hypertension, diabetes mellitus, smoking, dyslipidemia, etc[48]. This leads to plaque formation with progressive narrowing of the coronary artery vessels (chronic coronary syndrome) or disruption of the plaque which can lead to acute thrombotic obstruction of the coronary vessel lumen (acute coronary syndrome). The highlighted sections are captured in the 2019 edition.

5.3.2 Stable coronary syndrome		• The title stable coronary syndrome has been changed to chronic coronary syndrome[48]
5.3.2 (i) Clinical presentation		Patients with chronic coronary syndrome may present with different clinical scenarios[48]. i. Angina pectoris and or dyspnea ii. Heart failure or LV dysfunction iii. Symptomatic or asymptomatic post-ACS <1 yr or recent revascularization. iv. Symptomatic or asymptomatic patients after >1 yr of diagnosis or revascularization. v. Symptomatic or asymptomatic patients with spastic or microvascular disease vi. Asymptomatic patients detected during screening.
5.3.2 (iib)Pre-test risk assessment of patients presenting with chest pain	**1. Age:** The older the patient, the more likely the patient has significant coronary artery disease **2. Type of Pain:** Typical angina presentation is more likely to be due to CAD. Non-anginal chest pain, fleeting chest pain, pins and needles are less likely due to CAD **3. Gender:** Males are more likely to have coronary artery disease compared to females below menopausal age	Gender has been changed to sex[48] This means that an elderly male with typical chest pain has a higher probability of having coronary artery disease. CAD pretest probabilities (%) in patients with stable chest pain symptoms have been deleted and replaced by the table below shown above in the introductory section[48]:
		The term non-laboratory investigation has been deleted. • CT coronary angiogram added as part of the investigations[48]. • CT coronary angiogram is recommended for patients with intermediate pretest probability in whom CAD cannot be

		excluded by clinical assessment alone[48]. • Modifiers including coronary calcium burden by CT scan, Ischemic ECG changes, and LV dysfunction due to ischemia can be used to determine the clinical likelihood of obstructive coronary artery disease. The reference "Family physician" has been deleted. Dose of oral trimetazidine corrected to 35mg 12hrly or once daily[48].

12. Acute Coronary Syndrome

Current evidence suggests that acute coronary syndrome should be considered a spectrum, which encompasses both non-ST-elevation (NSTE)-ACS and ST-elevation MI (STEMI)[49]. The spectrum covers Unstable angina, NSTEMI, and STEMI. The rapid initial assessment of these patients should consider the type of ECG abnormality whether there is ST segment elevation or not, clinical presentation of the patient, and the hemodynamic stability of the patient. The decision for revascularization needs to be taken early if there are indications to salvage the myocardium because time is muscle to prevent complications. Ghana has seen a rise in the number of centers with percutaneous coronary interventions and coronary artery bypass graft capabilities hence prompt diagnosis and referral to these centers if indicated should be the goal for clinicians across the country. The Ghana Heart Initiative (GHI) and partners MOH, GHS, and Korle-Bu Teaching Hospital in the bid to coordinate care for cardiovascular emergencies including ACS have set up National Cardiovascular Disease Support and Call Center with cardiologists on call to help in the management of emergencies like ACS. ZZ

Table 14: Update on acute coronary syndrome

5.3.6 (via) Management Facility without a doctor		Laboratory investigation • Acquisition of the laboratory investigation should not delay institution or initial management or referral. • 12-lead ECG should be obtained within 10mins[49]. • CKMB as a biomarker has been deleted because the use of biomarkers other than troponins for the diagnosis of ACS is not recommended unless troponins are not available[49].

5.3.6 (vib) With doctor/physician specialist	Administration of morphine not stated in the 2019 guidelines.	**PAIN MEDICATION** • IV Morphine 5mg-10mg should be considered to relieve the chest pain. • Co-administration with IV Metoclopramide 10mg to mitigate the negative effects of morphine
5.3.6 (ivb and ivc)	**ANTICOAGULATION (LOE A)** Heparin 4,500 to 5,000 units iv bolus or 60-80 units per kg iv bolus followed by 18 units per kg per hour infusion for 72 hours	The following are the recommended updates in ACS[49]: • UFH bolus (weight-adjusted i.v. bolus during PCI of 70–100 IU/kg) is recommended in patients undergoing PCI. • Enoxaparin should be considered as an alternative to UFH in patients with STEMI undergoing Primary PCI. • Bivalirudin with a full-dose post-PCI infusion should be considered as an alternative to UFH in patients with STEMI undergoing primary PCI. • Enoxaparin should be considered for patients with NSTE-ACS in whom early invasive angiography (i.e. within 24 h) is likely. • Fondaparinux is recommended for patients with NSTE-ACS in whom early invasive angiography (i.e. within 24 h) will not be carried out. • Cessation of parenteral anticoagulation should be considered immediately after an invasive procedure. Discharge after Primary PCI • Low-risk patients should be considered for discharge

		home 48–72 h after uncomplicated primary PCI in acute coronary syndrome[50].

13. Arrhythmias

The current update is mainly on atrial fibrillation and cardiac arrest from either bradycardia or tachycardia which has been covered largely in the section on cardiac arrest above.

Atrial fibrillation (AF) is the commonest sustained arrhythmia. Global prevalence of atrial fibrillation (AF) has increased remarkably over the years, currently, there are approximately 60 million cases of heart failure[51]. The management of atrial fibrillation should revolve around the consideration of avoidance of stroke with anticoagulation, better symptom control and cardiovascular risk, and co-existing disease management like hypertension and diabetes mellitus[52].

Table 15: Update on atrial fibrillation

Section	Current Recommendation	Updated recommendation
	Clinical assessment	Clinical assessment of stroke risk, symptom status, burden of AF, and evaluation of substrate(LA dilatation and fibrosis) should be considered in all atrial fibrillation patients, to inform treatment decision-making and facilitate optimal management of AF patients[52].
	Screening: This is not in the current recommendation.	Opportunistic screening for AF by pulse taking or ECG rhythm strip is recommended in patients ≥65 years of age[52]. Hypertensive patients are recommended to have opportunistic screening.
	This is not emphasized in the current guidelines.	Lifestyle modifications during the management of AF that should be considered are: Blood pressure control, weight loss, avoidance of alcohol excess, physical activity (except excessive endurance exercise), cessation of smoking[52]

Section 5.9.5 (iic)	Give anticoagulant if CHA2DS2VASc score is ≥ 1. A high HAS-BLED score (≥3) is not an indication for withholding anticoagulant therapy in patients in whom it is indicated (CHA2DS2VASc ≥1 in males/≥2 in females or in patients with mitral stenosis)	Recommendations for anticoagulation: Recommended update • Novel oral anticoagulants (NOACs) are recommended in preference to VKAs in patients who meet the eligibility criteria for anticoagulation. ◢ Exception to this are patients with mechanical heart valves or moderate-to-severe mitral stenosis[52] • Patient with low stroke risk (CHA2DS2-VASc score = 0 in men, or 1 in women) should not be offered antithrombotic therapy[52] • Stroke prevention with oral anticoagulation is recommended in AF patients with CHA2DS2-VASc score ≥2 in men or ≥3 in women[52]. • Oral anticoagulation should be considered for stroke prevention in AF patients with a CHA2DS2-VASc score of 1 in men or 2 in women, considering the net clinical benefit and patient's values and preferences[52]. • If a Vitamin K antagonist like warfarin is used, a target INR of 2.0 - 3.0 is recommended, with individual TTR ≥70%[52]. • Refer patient with contraindication to cardiologist for management.
PHARMACOLOGICAL TREATMENT Table 79: Oral anticoagulant therapy	Rivaroxaban • 20mg daily as maintenance dose Apixaban • 5mg twice daily as maintenance dose. Dabigatran • 150mg twice daily as maintenance dose. Edoxaban is not mentioned in the current guidelines.	Rivaroxaban[52] • Reduced dose if CrCl 15 - 49 mL/min Apixaban • 5mg twice daily as maintenance dose but reduced dose to 2.5mg twice daily to be used if at least 2 of 3 criteria: • Age ≥80 years • Body weight ≤60 kg • Serum creatinine ≥1.5 mg/dL (133 mmol/L) Dabigatran. • 150mg twice daily as maintenance dose but reduced dose to Dabigatran 110 mg b.i.d. in patients with: • Age ≥80 years • Concomitant use of verapamil, or increased bleeding risk.

		Edoxaban • 60 mg once daily as maintenance dose but reduced to 30mg once daily when any of these are present: ◢ CrCl 15 - 50 mL/min ◢ Body weight <_60 kg ◢ Concomitant use of dronedarone, cyclosporine, erythromycin, or ketoconazole
Section 5.9.6 Figure 37	Atropine 0.5mg for sinus bradycardia	Adult bradycardia algorithm has increased the atropine dose to 1mg from 0-5mg.

References

1. Wang Y, Wang Y, Zhao X, Liu L, Wang D, Wang C, et al. Clopidogrel with Aspirin in Acute Minor Stroke or Transient Ischemic Attack. N Engl J Med [Internet]. 2013 Jul 4 [cited 2023 Nov 11];369(1):11–9. Available from: https://www.nejm.org/doi/full/10.1056/nejmoa1215340

2. Johnston SC, Easton JD, Farrant M, Barsan W, Conwit RA, Elm JJ, et al. Clopidogrel and Aspirin in Acute Ischemic Stroke and High-Risk TIA. N Engl J Med [Internet]. 2018 Jul 19 [cited 2023 Nov 11];379(3):215–25. Available from: https://www.nejm.org/doi/-full/10.1056/nejmoa1800410

3. Delgado V, Ajmone Marsan N, de Waha S, Bonaros N, Brida M, Burri H, et al. 2023 ESC Guidelines for the management of endocarditis. Eur Heart J [Internet]. 2023 Aug 25 [cited 2023 Nov 11];44(39). Available from: https://pubmed.ncbi.nlm.nih.gov/37622656/

4. Byrne RA, Rossello X, Coughlan JJ, Barbato E, Berry C, Chieffo A, et al. 2023 ESC Guidelines for the management of acute coronary syndromes. Eur Heart J [Internet]. 2023 Oct 12 [cited 2023 Nov 11];44(38). Available from: https://pubmed.ncbi.nlm.nih.gov/37622654/

5. McDonagh TA, Metra M, Adamo M, Gardner RS, Baumbach A, Böhm M, et al. 2023 Focused Update of the 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) With the special contribution of the Heart Failure Association (HFA) of the ESC. Eur Heart J [Internet]. 2023 Oct 1 [cited 2023 Nov 11];44(37):3627–39. Available from: https://dx.doi.org/10.1093/eurheartj/ehad195

6. Arbelo E, Protonotarios A, Gimeno JR, Arbustini E, Barriales-Villa R, Basso C, et al. 2023 ESC Guidelines for the management of cardiomyopathies. Eur Heart J. 2023 Oct 1;

7. Marx N, Federici M, Schütt K, Müller-Wieland D, Ajjan RA, Antunes MJ, et al. 2023 ESC Guidelines for the management of cardiovascular disease in patients with diabetes. Eur Heart J [Internet]. 2023 Aug 25 [cited 2023 Nov 11];44(39). Available from: https://-pubmed.ncbi.nlm.nih.gov/37622663/

8. Mancia(Chairperson) G, Kreutz(Co-Chair) R, Brunström M, Burnier M, Grassi G, Januszewicz A, et al. 2023 ESH Guidelines for the management of arterial hypertension The Task Force for the management of arterial hypertension of the European Society of Hypertension: Endorsed by the International Society of Hypertension (ISH) and the European Renal

Association (ERA). J Hypertens [Internet]. 2023 Dec 21 [cited 2023 Nov 12];41(12). Available from: https://pubmed.ncbi.nlm.nih.gov/37345492/

9. Ralph AP, Noonan S, Wade V, Currie BJ. The 2020 Australian guideline for prevention, diagnosis and management of acute rheumatic fever and rheumatic heart disease. Med J Aust [Internet]. 2021 Mar 1 [cited 2023 Nov 12];214(5):220–7. Available from: https://onlinelibrary.wiley.com/doi/full/10.5694/mja2.50851

10. Heidenreich PA, Bozkurt B, Aguilar D, Allen LA, Byun JJ, Colvin MM, et al. 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure. J Card Fail [Internet]. 2022 May 1 [cited 2023 Nov 12];28(5):e1–167. Available from: https://pubmed.ncbi.nlm.nih.gov-/35378257/

11. Virani SS, Newby LK, Arnold S V., Bittner V, Brewer LPC, Demeter SH, et al. 2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the Management of Patients With Chronic Coronary Disease: A Report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines. Circulation [Internet]. 2023 Aug 29 [cited 2023 Nov 12];148(9):e9–119. Available from: https://pubmed.ncbi.nlm.nih.gov/37471501/

12. McKeown RE. The Epidemiologic Transition: Changing Patterns of Mortality and Population Dynamics. http://dx.doi.org/101177/1559827609335350 [Internet]. 2009 May 8 [cited 2023 Dec 19];3(1_suppl):19S-26S. Available from: https://journals.sagepub.com/-doi/10.1177/1559827609335350

13. Ghana | The Institute for Health Metrics and Evaluation [Internet]. [cited 2023 Dec 29]. Available from: https://www.healthdata.org/research-analysis/health-by-location/profiles/ghana

14. Ference BA, Ginsberg HN, Graham I, Ray KK, Packard CJ, Bruckert E, et al. Low-density lipoproteins cause atherosclerotic cardiovascular disease. 1. Evidence from genetic, epidemiologic, and clinical studies. A consensus statement from the European Atherosclerosis Society Consensus Panel. Eur Heart J [Internet]. 2017 Aug 21 [cited 2024 Jan 4];38(32):2459–72. Available from: https://dx.doi.org/10.1093/eurheartj/ehx144

15. Mach F, Baigent C, Catapano AL, Koskina KC, Casula M, Badimon L, et al. 2019 ESC/EAS guidelines for the management of dyslipidaemias: Lipid modification to reduce cardiovascular risk. Atherosclerosis [Internet]. 2019 Nov 1 [cited 2023 Dec 27];290:140–205. Available from: http://www.atherosclerosis-journal.com/article/S0021915019314595/fulltext

16. WHO updates Cardiovascular Risk Charts [Internet]. [cited 2023 Dec 27]. Available from: https://www.who.int/news/item/02-09-2019-who-updates-cardiovascular-risk-charts

17. Chen M, Wang Y, Li X, Hou L, Wang Y, Liu J, et al. Public Knowledge and Attitudes towards Bystander Cardiopulmonary Resuscitation in China. Biomed Res Int [Internet]. 2017 [cited 2024 Jan 14];2017. Available from: /pmc/articles/PMC5359437/

18. Sasson C, Rogers MAM, Dahl J, Kellermann AL. Predictors of Survival From Out-of-Hospital Cardiac Arrest. Circ Cardiovasc Qual Outcomes [Internet]. 2010 Jan [cited 2024 Jan 14];3(1):63–81. Available from: https://www.ahajournals.org/doi/abs/10.1161/CIRCOUTCOMES.109.889576

19. Zakariah A, Stewart BT, Boateng E, Achena C, Tansley G, Mock C. The birth and growth of the National Ambulance Service in Ghana. Prehosp Disaster Med [Internet]. 2017 Feb 1 [cited 2024 Jan 14];32(1):83–93. Available from: https://www.cambridge.org/core/journals/prehospital-and-disaster-medicine/article/abs/birth-and-growth-of-the-national-ambulance-service-in-ghana/564DEFA7D77E523DFBCA9EA62B837269

20. NATIONAL GUIDELINES FOR THE MANAGEMENT OF CARDIOVASCULAR DISEASES Republic of Ghana.

21. CPR and ECC Guidelines | American Heart Association CPR & First Aid [Internet]. [cited 2024 Jan 7]. Available from: https://cpr.heart.org/en/resuscitation-science/cpr-and-ecc-guidelines

22. Organization WH. The world health report 2002: reducing risks, promoting healthy life [Internet]. 2002 [cited 2024 Jan 6]. Available from: https://books.google.com/-books?hl=en&lr=&id=epuQi1PtY_cC&oi=f-nd&pg=PR9&ots=N5E2cSEdTi&sig=jGBtd-2OhwNB_rci8mafaVCC9UU

23. Amoah AGB, Kallen C. Aetiology of Heart Failure as Seen from a National Cardiac Referral Centre in Africa. Cardiology [Internet]. 2000 Jun 1 [cited 2024 Jan 6];93(1–2):11–8. Available from: https://dx.doi.org/10.1159/000006996

24. Kofi Owusu I, Adu-Boakye Y. Prevalence and Aetiology of Heart Failure in Patients Seen at a Teaching Hospital in Ghana. 2013;

25. Owolabi MO, Sarfo F, Akinyemi R, Gebregziabher M, Akpa O, Akpalu A, et al. Dominant

modifiable risk factors for stroke in Ghana and Nigeria (SIREN): a case-control study. Lancet Glob Heal [Internet]. 2018 Apr 1 [cited 2024 Jan 6];6(4):e436–46. Available from: http://www.thelancet.com/article/S2214109X18300020/fulltext

26. Boima V, Dwomoa A, Osafo C, Tannor E, Awuku AY, Plange-Rhule J, et al. SAT-017 End Stage Renal Disease in Ghana. Kidney Int Reports [Internet]. 2019 Jul 1 [cited 2024 Jan 6];4(7):S8. Available from: http://www.kireports.org/article/S2468024919302347/fulltext

27. Mancia G, Kreutz R, Brunström M, Burnier M, Grassi G, Januszewicz A, et al. 2023 ESH Guidelines for the management of arterial hypertension The Task Force for the management of arterial hypertension of the European Society of Hypertension: Endorsed by the International Society of Hypertension (ISH) and the European Renal Association (ERA). J Hypertens [Internet]. 2023 Dec 1 [cited 2023 Dec 29];41(12):1874–2071. Available from: https://pubmed.ncbi.nlm.nih.gov/37345492/

28. Venkatasubramanian C, Lopez GA, O'Phelan KH, Venkatasubramanian C, Lopez G, Sarwal A, et al. Emergency Neurological Life Support: Fourth Edition, Updates in the Approach to Early Management of a Neurological Emergency. Neurocrit Care [Internet]. 2020 Apr 1 [cited 2023 Dec 29];32(2):636–40. Available from: https://link.springer.com/article/10.1007/s12028-019-00810-8

29. Sessler CN, Gosnell MS, Grap MJ, Brophy GM, O'Neal P V., Keane KA, et al. The Richmond Agitation–Sedation Scale. https://doi.org/101164/rccm2107138 [Internet]. 2012 Dec 20 [cited 2023 Dec 29];166(10):1338–44. Available from: www.atsjournals.org

30. Thomalla G, Simonsen CZ, Boutitie F, Andersen G, Berthezene Y, Cheng B, et al. MRI-Guided Thrombolysis for Stroke with Unknown Time of Onset. N Engl J Med [Internet]. 2018 Aug 16 [cited 2023 Dec 29];379(7):611–22. Available from: https://www.nejm.org/doi/10.1056/NEJMoa1804355

31. Campbell BCV, Ma H, Ringleb PA, Parsons MW, Churilov L, Bendszus M, et al. Extending thrombolysis to 4·5–9 h and wake-up stroke using perfusion imaging: a systematic review and meta-analysis of individual patient data. Lancet [Internet]. 2019 Jul 13 [cited 2023 Dec 29];394(10193):139–47. Available from: http://www.thelancet.com/article/S0140673619310530/fulltext

32. Appiah LT, Sarfo FS, Agyemang C, Tweneboah HO, Appiah NABA, Bedu-Addo G, et al. Current trends in admissions and outcomes of cardiac diseases in Ghana. Clin Cardiol [Internet]. 2017 Oct 1 [cited 2024 Jan 7];40(10):783–8. Available from: https://onlinelibrary.wi-

ley.com/doi/full/10.1002/clc.22753

33. McDonagh TA, Metra M, Adamo M, Baumbach A, Böhm M, Burri H, et al. 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. Eur Heart J [Internet]. 2021 Sep 21 [cited 2023 Dec 20];42(36):3599–726. Available from: https://-pubmed.ncbi.nlm.nih.gov/34447992/

34. Solomon SD, de Boer RA, DeMets D, Hernandez AF, Inzucchi SE, Kosiborod MN, et al. Dapagliflozin in heart failure with preserved and mildly reduced ejection fraction: rationale and design of the DELIVER trial. Eur J Heart Fail [Internet]. 2021 Jul 1 [cited 2024 Jan 7];23(7):1217–25. Available from: https://onlinelibrary.wiley.com/doi/full/10.1002/ejhf.2249

35. Anker SD, Butler J, Filippatos G, Ferreira JP, Bocchi E, Böhm M, et al. Empagliflozin in Heart Failure with a Preserved Ejection Fraction. N Engl J Med [Internet]. 2021 Oct 14 [cited 2024 Jan 7];385(16):1451–61. Available from: https://www.nejm.org/doi/10.1056/NEJ-Moa2107038

36. Atherton JJ, Sindone A, De Pasquale CG, Driscoll A, MacDonald PS, Hopper I, et al. National Heart Foundation of Australia and Cardiac Society of Australia and New Zealand: Guidelines for the Prevention, Detection, and Management of Heart Failure in Australia 2018. Hear Lung Circ [Internet]. 2018 Oct 1 [cited 2021 Jun 3];27(10):1123–208. Available from: https://pubmed.ncbi.nlm.nih.gov/30077227/

37. Bozkurt B, Coats AJS, Tsutsui H, Abdelhamid CM, Adamopoulos S, Albert N, et al. Universal definition and classification of heart failure: a report of the Heart Failure Society of America, Heart Failure Association of the European Society of Cardiology, Japanese Heart Failure Society and Writing Committee of the Universal Definition of Heart Failure. Eur J Heart Fail [Internet]. 2021 Mar 1 [cited 2023 Dec 20];23(3):352–80. Available from: https://onlinelibrary.wiley.com/doi/full/10.1002/ejhf.2115

38. McDonagh TA, Metra M, Adamo M, Gardner RS, Baumbach A, Böhm M, et al. 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. Eur J Heart Fail [Internet]. 2022 Jan 1 [cited 2023 Dec 20];24(1):4–131. Available from: https://onlinelibrary.wiley.com/doi/full/10.1002/ejhf.2333

39. Kalra PR, Cleland JGF, Petrie MC, Thomson EA, Kalra PA, Squire IB, et al. Intravenous ferric derisomaltose in patients with heart failure and iron deficiency in the UK (IRONMAN): an investigator-initiated, prospective, randomised, open-label, blinded-endpoint trial. Lancet [Internet]. 2022 Dec 17 [cited 2023 Dec 23];400(10369):2199–209. Available from:

http://www.thelancet.com/article/S0140673622020839/fulltext

40. Ponikowski P, Kirwan BA, Anker SD, McDonagh T, Dorobantu M, Drozdz J, et al. Ferric carboxymaltose for iron deficiency at discharge after acute heart failure: a multicentre, double-blind, randomised, controlled trial. Lancet [Internet]. 2020 Dec 12 [cited 2023 Dec 23];396(10266):1895–904. Available from: http://www.thelancet.com/article/S0140673620323394/fulltext

41. Goldhaber SZ, Bounameaux H. Pulmonary embolism and deep vein thrombosis. Lancet [Internet]. 2012 May 12 [cited 2024 Jan 14];379(9828):1835–46. Available from: http://www.thelancet.com/article/S0140673611619041/fulltext

42. Konstantinides S V., Meyer G, Bueno H, Galié N, Gibbs JSR, Ageno W, et al. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS): The Task Force for the diagnosis and management of acute pulmonary embolism of the European Society of Cardiology (ESC). Eur Heart J [Internet]. 2020 Jan 21 [cited 2024 Jan 14];41(4):543–603. Available from: https://dx.doi.org/10.1093/eurheartj/ehz405

43. Mocumbi AO. Rheumatic heart disease in Africa: is there a role for genetic studies? Cardiovasc J Afr [Internet]. 2015 Mar 1 [cited 2024 Jan 8];26(2 H3Africa Suppl):S21. Available from: /pmc/articles/PMC4569864/

44. Essop MR, Nkomo VT. Rheumatic and nonrheumatic valvular heart disease: Epidemiology, management, and prevention in Africa. Circulation. 2005 Dec;112(23):3584–91.

45. Marijon E, Mirabel M, Celermajer DS, Jouven X. Rheumatic heart disease. Lancet [Internet]. 2012 Mar 10 [cited 2024 Jan 8];379(9819):953–64. Available from: http://www.thelancet.com/article/S0140673611611719/fulltext

46. Watkins D, Zuhlke L, Engel M, Daniels R, Francis V, Shaboodien G, et al. Seven key actions to eradicate rheumatic heart disease in Africa: the Addis Ababa communiqué. Cardiovasc J Afr [Internet]. 2016 May 1 [cited 2023 Mar 18];27(3):184. Available from: /pmc/articles/PMC5125265/

47. Zühlke LJ, Steer AC. Estimates of the Global Burden of Rheumatic Heart Disease. Glob Heart [Internet]. 2013 [cited 2024 Jan 8];8(3):189–95. Available from: https://globalheartjournal.com/articles/10.1016/j.gheart.2013.08.008

48. Neumann FJ, Sechtem U, Banning AP, Bonaros N, Bueno H, Bugiardini R, et al. 2019 ESC Guidelines for the diagnosis and management of chronic coronary syndromes. Vol. 41, European Heart Journal. Oxford University Press; 2020. p. 407–77.

49. Byrne RA, Rossello X, Coughlan JJ, Barbato E, Berry C, Chieffo A, et al. 2023 ESC Guidelines for the management of acute coronary syndromes: Developed by the task force on the management of acute coronary syndromes of the European Society of Cardiology (ESC). Eur Heart J [Internet]. 2023 Oct 12 [cited 2023 Dec 26];44(38):3720–826. Available from: https://dx.doi.org/10.1093/eurheartj/ehad191

50. Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). Eur Heart J [Internet]. 2018 Jan 7 [cited 2024 Jan 31];39(2):119–77. Available from: https://dx.doi.org/10.1093/eurheartj/ehx393

51. Elliott AD, Middeldorp ME, Van Gelder IC, Albert CM, Sanders P. Epidemiology and modifiable risk factors for atrial fibrillation. Nat Rev Cardiol [Internet]. 2023 Jun 1 [cited 2024 Jan 17];20(6):404–17. Available from: https://pubmed.ncbi.nlm.nih.gov/36600003/

52. Hindricks G, Potpara T, Kirchhof P, Kühne M, Ahlsson A, Balsam P, et al. 2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS): The Task Force for the diagnosis and management of atrial fibrillation of the European Society of Cardiology (ESC) Developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC. Eur Heart J [Internet]. 2021 Feb 1 [cited 2024 Jan 17];42(5):373–498. Available from: https://dx.doi.org/10.1093/eurheartj/ehaa612