Draft Benefit Definition: ST-Elevation Myocardial Infarct

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907E	Acute and sub-acute ischaemic heart disease including myocardial infarction and unstable angina.
Treatment:	Medical management; surgery; percutaneous procedures

Contents

Abbreviations

ASA	–	acetylsalicylic acid
BMS	–	Bare metal stent
CABG	–	coronary artery bypass grafting
CAD	–	coronary artery disease
CDL	–	chronic disease list
CHF	–	chronic heart failure
CVD	–	cardiovascular disease
DAPT	–	Dual antiplatelet therapy
DES	–	Drug eluting stent
DSP	–	Designated Service Providers
ECG	–	electrocardiogram
FFR	–	fractional flow reserve
IVUS	–	Intravascular Ultrasound Imaging
LAD	–	left anterior descending
LV	–	left ventricle
MVD	–	multivessel disease
MRI	–	magnetic resonance imaging
NSTE-ACS	–	non-ST-segment elevation acute coronary syndrome
OCT	–	Optical Coherence Tomography
OMT	–	optimal medical therapy
PCI	–	percutaneous coronary intervention
PET	–	positron emission tomography
PMB	–	prescribed minimum benefit
PTCA	–	Percutaneous transluminal coronary angioplasty
SPECT	–	single photon emission computed tomography
STEMI	–	ST-segment elevation myocardial infarction
UA	–	Unstable angina
UFH	–	Unfractionated heparin

1 Introduction

This benefit definition does not explicitly endorse one medicine/medical device within a particular therapeutic class over another. However due to the emergency nature of STEMI and to avoid delays associated with pre-authorisation and consultation with scheme formularies, this Benefit definition is highly specific on which treatment and classes may be used during ST elevation myocardial infarct (STEMI). This is to safe guard members against any possible co-payments that may arise from failure to use formularies and to protect the schemes of unplanned expenditure that may arise in a setting where it is impossible to obtain scheme authorization.

Provision must be made for appropriate exceptions where this benefit definition has been ineffective, or causes, or would cause harm to a beneficiary, without penalty to that beneficiary. Health care providers must provide written documentation for exceptions.

All patients who are treated successfully in an emergency setting must register with their scheme for chronic management of ischaemic heart disease. Scheme protocols and formularies should be developed and applied while taking into consideration evidence-based medicine, cost-effectiveness and affordability.

It should be noted that benefit definitions are a minimum set of benefits and schemes may enrich the benefits but not offer benefits less than those stated here.

It should also be noted that management of Ischaemic heart disease takes into consideration many clinical aspects of the patient. This benefit definition does not address specific circumstances of high risk and complicated patients who may need more care than specified here.

Alternatives must be made for patients in whom treatment stated here or in the scheme formulary may cause harm.

Due to high variability of clinical presentation and possible outcomes in patients with Ischaemic heart disease it was difficult to quantify frequency of tests and interventions in an acute setting.

Procedure codes serve as a guideline for billing and may not include all relevant procedure codes.

2 Scope

These benefit definitions include the management of ST-Elevation Myocardial Infarct (STEMI). The benefit definition covers out of hospital emergency care, in-hospital care and long term follow-up including secondary prevention. Coronary artery bypass graft is not included.

3 Burden of Disease

According to results of the INTERHEART study, the five most important risk factors for myocardial infarction operate similarly in different ethnic groups and geographical locations worldwide. These risk factors are smoking history, diabetes history, hypertension, abdominal obesity and the ratio of 74 apolipoprotein B to apolipoprotein A-1 (1). The emergence of risk factors for atherosclerotic vascular

disease in South Africa has been noted for several decades (2). Population based surveys in the early 1990s showed that 13-31% of the population have at least one risk factor for atherosclerotic disease. Later in the 2000s, surveys confirmed high population prevalence of hypertension, diabetes, smoking as well as a high prevalence of obesity affecting about 50% of the female population in Limpopo and Mpumalanga provinces (2). Heart disease, diabetes and stroke together constitute the second most important cause of death in the adult population in South Africa (3). Cardiovascular disease is increasing amongst all age groups in South Africa and is predicted to become the prime contributor to overall morbidity and mortality in the over 50-year age group (4).

4 Emergency Diagnosis and Care for ST-Segment Elevation Myocardial Infarct

Patients may present with a history of chest pain for more than 20 minutes. The pain may radiate to the left arm, lower jaw and neck. Sometimes, patients may present with atypical symptoms such as fatigue, nausea and vomiting, palpitations or syncope. This atypical presentation is common in the elderly, women and diabetic patients.

The key to successful management is Timely diagnosis of STEMI. ECG monitoring should be initiated as soon as possible in all patients with suspected STEMI to detect life-threatening arrhythmias and allow prompt defibrillation if indicated. A 12-lead ECG should be obtained and interpreted as soon as possible.

Management of STEMI; including diagnosis and treatment, start at the point of first medical contact. Point of first medical contact in South Africa includes general practice, emergency rooms, paramedics and other specialists other than physicians and cardiologists

STEMI is typically diagnosed when there is ST-segment elevation in two consecutive leads on the ECG.

The highest priority in STEMI is to restore coronary blood flow as soon as possible. **Due to successful outcomes associated with early intervention** (5)**; pre-authorisation should not be a pre-requisite for initiating care.**

The aim of emergency medical care is

i. To establish diagnosis using ECG and blood sampling for cardiac enzymes
ii. Initiate management depending on the logistical arrangements (ability to refer to a specialist centre without delay, scope of practice of the first contact health provider, availability of resources etc).
iii. Reduce pain

Table 1: Diagnostic and management codes in an emergency or out-of-hospital setting

Item	Description	Codes	Additional comments
ECG	General Practitioner's fee for the taking of an ECG only: Without effort: ½ (item 1232)	1228	
	General Practitioner's fee for the taking of an ECG only: Without and with effort: ½ (item 1233)	1229	
	Note: Items 1228 and 1229 deal only with the fees for taking of the ECG, the consultation fee must still be added		
	Physician's fee for interpreting an ECG: Without effort	1230	
	Physician's fee for interpreting an ECG: With and without effort	1231	
	A specialist physician is entitled to the fees specified in item 1230 and 1231 for interpretation of an ECG tracing referred for interpretation. This applies also to a paediatrician when an ECG of a child is referred to him/her for interpretation		
	Electrocardiogram: Without effort	1232	
	Electrocardiogram: With and without effort	1233	
	ECG monitoring		
Ambulance services	Ambulance code may include basic life support, intermediate or advanced life support as well as resuscitation	100,103',125,127,111,112,129,130,131,133,141,142,152,153	
Blood sampling	CKMB	4152,4153,4138	(Treatment should proceed without waiting for this results)
	Troponin (Treatment should proceed without waiting for this results)	4161	(Treatment should proceed without waiting for this results)

Oxygen	V03AN01		Indicated in patients with hypoxia (SaO2 < 95%)
Medication	N02	IV OPIODS	
	B01	Antiplatelets	
	B01	Fibrinolytics	
	GTN	GTN	
	A04	Antiemetics	
		Anxiolytics	
Defibrillation and cardiac life support			

Table 2: Routine Investigations Management of STEMI

Type	*Description of the test*	*Codes*	*Comments*
Pathology	CKMB	4152,4153,4138	
	Troponin	4161	
	Full Blood Count-	3755 (Incl. 3739,3762,3783, 3785,3791)	
	Platelet count	3797	
	Glucose-Hypo and hyperglycaemia affect treatment outcomes	4057	
	Lipogram-Lipid profile can change within 12-24 hours	4025	
	CRP	3947	
	ESR: Markers of inflammation		
	U & E and Creatinine	4171	
	Creatinine-EGFR	4032	
	Pulse oximetry		
Radiology	Chest X-Ray: assess the patient's heart size and the presence or absence of heart failure and pulmonary oedema. This may also assist in differential diagnosis	30110,30100	

Non-invasive procedures	Single-photon emission computed tomography	This test should not be used to diagnose and will therefore not be funded as PMB	
	Echocardiogram	3620,3621,3622, 3623,3624,3625	is useful in patients with diagnostic uncertainty (ACCA)

5 Logistical considerations for Management of Patients with STEMI

a) Who should participate in care of patients with STEMI

All STEMI patients should undergo rapid evaluation for reperfusion and have reperfusion strategy implemented promptly after contact with medical system.

The goal is to facilitate rapid recognition and treatment of patients such that door to Needle time for fibrinolytic therapy is achieved within 30 minutes (door to needle) or that time for PCI can be kept under 90 -120 minutes. This goal may not be relevant for patient with diagnostic uncertainties, or co-morbidities such as respiratory failure.

Access to emergency treatment and prevention of delays is important in the management of STEMI. There is an understanding that the Cardiologist coverage in the country is insufficient, even in the private sector. There are provinces that do not have cardiologists and some small towns do not have a specialist physician.

Due to these limitations, general practitioner, other specialist other than internal physicians or cardiologist, nurses and paramedics play an important role in the management and facilitation of care for patients with acute myocardial infarct.

According to Regulation 8(6), a medical scheme may not prohibit or enter into arrangements or contracts that prohibit the initiation of an appropriate intervention by a health care provider prior to receiving authorisation from medical scheme or any other party, in respect of an emergency medical condition.

Therefore once a STEMI has been diagnosed, a first contact medical provider must initiate care which should include emergency transfer with a suitable mode of transport, to a facility and provider capable of providing treatment for acute myocardial infarct.

b) Facilities for Diagnosis and treatment of STEMI

Initial diagnosis and emergency care can take place at home, in the ambulance, or at emergency rooms or general practitioner's (GP) rooms depending on where the member first presented.

Whenever possible patients must be transported or transferred to the nearest PCI facility. If a PCI facility is a non-designated service provider (DSP) these constitute involuntary use of a DSP.

If it is anticipated that delays will be longer than 2 hours due to distance, amongst other things, then the first medical contact personnel must provide pharmacological reperfusion treatment under the remote supervision of the cardiologist or physician if necessary in line with their registered scope of practice.

According to explanatory note to Annexure A: The objective of specifying a set of Prescribed Minimum Benefits within these regulations is two-fold:

(i) To avoid incidents where individuals lose their medical scheme cover in the event of serious illness and the consequent risk of unfunded utilisation of public hospitals.

(ii) To encourage improved efficiency in the allocation of Private and Public health care resources.

In view of point (ii), if state is the schemes DSP; and both the public and private PCI are equally accessible to the member; it is considered a prescribed minimum benefit that a patient who belongs to the medical scheme access the private facility as the use of the public sector will result in inaccessible care for indigent patients. It should be noted that PCI and interventional cardiologist coverage is far lower in the public sector as compared to private sector. Therefore, channelling patients to public sector will defeat objective (ii).

c) Selection of Reperfusion Strategy

Primary PCI without fibrinolytic therapy is the preferred reperfusion strategy in patients with STEMI, provided it can be performed expeditiously by an experienced team (5) (6)(7).

d) Clinical presentation of the patient

- ***Time from Onset of symptoms:***

Time from onset of symptoms to pharmacological reperfusions is an important predictor of clinical outcomes. The beneficial effect of pharmacological reperfusion is substantially higher in patients presenting within 2 hours after symptom onset compared to those presenting later (Boersman et al), but the effect is even greater when accessed earlier. There is, however, some benefit when the treatment is offered beyond this period.

- ***Risk of bleeding***

When both types of reperfusion are available, patients with high risk of bleeding with pharmacological reperfusion should receive PCI as reperfusion strategy.

e) Availability and time required to transfer to PCI facility

The availability and location of the interventional cardiology facility is a key determinant of whether PCI can be provided or not. If a patient presents in a PCI- capable facility or can be transferred to a PCI-capable facility within 2 hours, PCI approach remains superior to pharmacological reperfusion.

A decision must be made when a patient presents to a non-PCI facility to refer for PCI or initiate pharmacological reperfusion. Fibrinolytic agents can generally be provided sooner than PCI especially in provinces and towns where there is no interventional cardiologist. Fibrinolytic agents do not require a high skilled professional; can be provided by many health care professionals (in line with scope of practice as per regulatory bodies) and even more appropriate in South Africa where the coverage for PCI facilities and interventional cardiology is low.

6 Reperfusion Strategies

6.1 Percutaneous procedures

As this component of the treatment of the DTP 907E is not only specified in general terms i.e. “medical management” or “surgery”, but also in specific terms i.e. “percutaneous procedures”, the latter component it is not subject to the provision made in the explanatory note (2) to Annexure A in the regulations.

Percutaneous coronary interventions (PCIs) as prescribed minimum benefits are therefore not restricted to availability of this intervention in the Public sector. A protocol should be developed on the basis of

the principles stated in Regulation 15D (b) and 15H namely, evidence based medicine, taking into account considerations of cost-effectiveness and affordability.

i. Indications

- PCI is the best preferred method of treatment if it can be provided within 90-120 minutes of first medical contact in patients with STEMI
- It can also be provided if the symptoms were within 3 hours and PCI can be done within an hour of diagnosis.
- When fibrinolytic ineligible patient present within 12-24 hours
- Patients with a new LBBB within 12 hours of onset of symptoms
- Within 36 hours if a patient develops shock
- If patients has no contraindication to DAPT and is ***more likely to be compliant on DAPT***.
- A rescue PCI is indicated in patients with failed fibrinolytic therapy as indicated by residual ST element elevation post fibrinolysis.

In patients with multi vessel disease, only infarct related artery should be treated during initial intervention. The only exceptions when multi vessel PCI is indicated during STEMI is when patients are in cardiogenic shock with > 90% occlusion. (6) (5)

ii. Contraindication

- Inability to take or comply with DAPT
- Asymptomatic patients more than 12 hours after onset of STEMI
- Door to balloon delay of > 2hours. In this instance fibrinolytic therapy offers relatively better outcomes.

Table 3: Percutaneous Cardiac Intervention and Procedure

Item	Description	Procedure code	Discussion and conclusions
Catheter Laboratory			
Clinicians	Cardiologist Anaesthetist (Only when unstable patient) Physicians/2nd cardiologist (maybe required to assist in case of difficult anatomy) Nurse Radiographer Technologist	0190 0191 0192 0173-0175	Anaesthetist sometimes required for PCI of unstable patients when airway management is anticipated. Assistant cardiologist is sometimes required in patients with difficult anatomy
Clinical Technologist	Preparation and operation of pre-operative, intra-operative or post operative physiological monitoring per patient, per admission	015	
	Cardiac catheterisation for the first hour.	063	
	Dilatation procedures and stents.	073	
Radiographers	Coronary angiogram per 30 minutes or part thereof provided that such part comprises 50% or more of the time	193	
	Stent procedure per 30 minutes or part thereof provided that such part comprises 50% or more of the time	197	
Ancillary Drugs	Glycoprotein IIb/IIIa inhibitor Low molecular weight heparin or unfractionated heparin Aspirin Clopidogrel or Prasugrel		Prasugrel has a fast onset of action and therefore more appropriate as a $P2Y_{12}$ receptor inhibitors during PCI

	Beta Blocker or calcium channel blocker when Beta-blockers are contraindicated. Prasugrel		
Percutaneous procedure			
PCI	Invasive cardiology: Percutaneous translumical angioplasty		
	Percutaneous transluminal angioplasty: First cardiologist: Single lesion	1276	
	Percutaneous transluminal angioplasty: Second cardiologist: Single lesion	1277	
	Percutaneous transluminal angioplasty: First cardiologist: Second lesion	1278	
	Percutaneous transluminal angioplasty: Second cardiologist: Second lesion	1279	
	Percutaneous transluminal angioplasty: First cardiologist: Third or subsequent lesions (each)	1280	
	Percutaneous transluminal angioplasty: Second cardiologist: Third or subsequent lesions (each)	1281	
	Use of balloon procedures including: First cardiologist: Atrial septostomy; Pulmonary valve valvuloplasty; Aortic valve valvuloplasty; Coarctation dilation; Mitral valve valvuloplasty	1282	
	Use of balloon procedure as in item 1282: Second cardiologist	1283	

Insertion of stents	Insertion of intravascular stent: First cardiologist	1286	The insertion of a stent(s) (item 1286 & 1267) may only be charged once per vessel regardless of the number of stents inserted in this vessel.
	Insertion of intravascular stent: Second cardiologist	1287	
Atherectomy	Atherectomy: Single lesion: First cardiologist	1284	
	Atherectomy: Single lesion: Second cardiologist	1285	
Stents	Bare metal stent		Drug eluting balloons and bioresorbable vascular scaffolds are currently not considered to be at PMB level of care due to lack of sufficient evidence on effectiveness and cost-effectiveness.
	DES		
	Drug Eluting Balloons		
	Bioresorbable vascular scaffolds		
Imaging			
IVUS	Diagnostic intravascular ultrasound (IVUS) imaging or wave wire mapping (without accompanying angioplasty). May be used only once per angiographic procedure	5117	IVUS provides direct visualization and measurement of the inside of the blood vessels and may assist the doctor in selecting the appropriate size of balloons and/or stents, to ensure that a stent, if used, is properly opened, or to evaluate the use of other angioplasty instruments
	Diagnostic intravascular ultrasound imaging or wave wire imaging (with accompanying angioplasty or accompanying intravascular ultrasound imaging or wave wire mapping in a different coronary artery [LAD (left anterior descending), Circumflex or Right coronary artery]). May be used a maximum of twice per angiographic	5118	

	procedure		
Fractional Flow Reserve (FFR)	FFR: First vessel. (add-on code)	1296	
	FFR: Each additional vessels (add-on code)	1297	

6.2 Pharmacological Reperfusion

i. Indications

In patients presenting with STEMI when PCI is inaccessible or contraindicated

ii. Absolute Contraindications

- History of intracranial bleeding
- Any significant head or face trauma in the previous 90 days
- Major trauma, surgery or gastrointestinal or genitourinary bleed in the last 6 weeks
- History of bleeding or clotting disorders
- Known structural CV lesion
- Suspected aortic dissection

iii. Relative contraindications

- CPR has been implemented for more than 10 minutes
- Pregnancy
- Active PUD
- Current use of anticoagulants: the higher the INR the higher the risk of bleeding.
- Previous exposure or allergies to certain thrombolytic

Table 4: Procedure codes for Pharmacological Reperfusion

Item	Description	Code	Comments
Professionals	Any health professional can provide pharmacological reperfusion in line with the registration status with the professional regulatory body scope of practise and local setting.		Providing pharmacological reperfusion is essential to survival and should be provided as soon a possible to reduce mortality. This treatment should be widely available as part of emergency care at primary health care (General Practice) level as well.
Fibrinolytics	Streptokinase Alteplase Tenecteplase	B01AD	GUSTO-1 GUSTO2 ASSENT 2
Anti-platelets	Clopidogrel Prasugrel	B01AC	
	Aspirin	NO2BA01	
Anticoagulant therapy	UFH Enoxaparin	B01AB	

	Fondaparinux		
	Bivalirudin		Not registered with MCC and therefore not considered PMB level of care.(MSA explanatory note 2 of definitions to annexure A)

6.3 Acute Phase Coronary By-Pass Graft

CABG may be performed as an emergency procedure in the context of an ST-segment elevation MI (STEMI) in cases where it has not been possible to perform percutaneous coronary intervention (PCI) or where PCI has failed and there is persistent pain and ischemia threatening a significant area of myocardium despite medical therapy.

Coronary artery by graft surgery will include in-hospital admission, poest-operative care which will include allied health care by physiotherapist and out-of hospital care.

At the time of publication, there was lack of industrial clarity on procedure codes regarding CABG, and the matter undergoing judicial process. Therefore the entire care associated with CABG, is not discussed, although Council will continue adjudicating cases by case.

7 Care post emergency reperfusion

All patients with STEMI undergoing reperfusion must be admitted in setting capable of monitoring the following:

a) Adverse events associated with puncture site
b) Monitoring of chest pain and ECG
c) Monitoring of adverse events associated with fibronylytic therapy
d) It may be necessary to refer unstable patients to a cardiologist.
e) In case of shock or unresponsive to pharmaceutical reperfusion, patients should be referred to a center with PCI should rescue of facilitated PCI be required.
f) Depending on the clinical circumstances and bed availability, patients can be admitted to cardiac unit, ICU, high care or general ward.
g) Radiological investigations:
    a. Echocardiography if complications are suspected
    b. Chest X-ray if cardiac failure is suspected
h) Blood tests
    i. Cardiac enzymes
    ii. U&E and creatinine
    iii. INR
    iv. Full Blood Count
    v. Baseline lipid profile in patient not previously diagnosed with hypercholestrolaemia
i) Intensive management of co-morbidities such as Diabetes, hypercholestrolaemia and hypertension

8 Post discharge follow-up

Longer-term issues post-PCI are very patient-specific and variable but broadly involves detection and treatment of recurrent ischaemia, arrhythmias and heart failure, appropriate antiplatelet therapy and secondary prevention.

Table 5: Procedure codes for investigations post-discharge

	Description	Code	Comments
ECG	General Practitioner's fee for the taking of an ECG only: Without effort: ½ (item 1232)	1228	Serial ECG recording throughout assessment in Emergency room
	General Practitioner's fee for the taking of an ECG only: Without and with effort: ½ (item 1233)	1229	Note: Items 1228 and 1229 deal only with the fees for taking of the ECG, the consultation fee must still be added
	Physician's fee for interpreting an ECG: Without effort	1230	A specialist physician is entitled to the fees specified in item 1230 and 1231 for interpretation of an ECG tracing referred for interpretation. This applies also to a paediatrician when an ECG of a child is referred to him for interpretation
	Physician's fee for interpreting an ECG: With and without effort	1231	
	Electrocardiogram: Without effort	1232	
	Electrocardiogram: With and without effort	1233	For inducible ischaemia
Exercise testing	Effort electrocardiogram with the aid of a special bicycle ergometer, monitoring apparatus and availability of associated apparatus	1252	Can be considered in patients without contradiction to exercise before discharge or early after discharge to assess inducible ischemia; to evaluate functional significance of coronary lesion; risk stratify according to likelihood of coronary events, establish ability and to exercise for life style modification
	Multi-stage treadmill test	1234, 1235	
Angiography	Right and left cardiac catheterisation without coronary angiography (with or without biopsy)	1249	Indicated in patients with ECG changes of ischaemia post STEMI In patients with positive finding during non-invasive testing In patients who are persistently unstable For risk assessment in patients who had fibrinolytic therapy
	Left heart catheterisation with coronary angiography (with or without biopsy)	1252	
	Right heart catheterisation (with or without biopsy)	1253	
	Catheterisation of coronary artery bypass grafts and/or internal mammary grafts	1254	

Echocardiography	Cardiac examination plus Doppler colour mapping	3620	It is indicated in patients with STEMI when there is a negative change in clinical status. It is reasonable to repeat the procedure in 1 to 3 months time. It is used to assess and re-evaluate LV function and to evaluate suspected complications. It can be used in patient with suspected RV infarction and inferior STEMI.
	Cardiac examination (MMode)	3621	
	Cardiac examination: 2 Dimensional	3622	
	Cardiac examination + effort	3623	
	Cardiac examinations + contrast	3624	
	Cardiac examinations + doppler	3625	
	Cardiac examination + phonocardiography	3626	
Pharmacological stress testing			

9 Secondary prevention for STEMI Patients

Secondary prevention is a prescribed minimum benefit and constitutes the following

i. Lifestyle modification (7)

All persons with risk factors for ischaemic heart disease should be encouraged to make the following lifestyle changes as appropriate:

- Smoking cessation.
- Weight reduction in overweight patients, i.e. BMI > 25 kg/m^2
- Maintain ideal weight, i.e. BMI < 25 kg/m
- Reduce alcohol intake to no more than 2 standard drinks/day
- Follow a prudent eating plan i.e. Low saturated fat, high fibre and unrefined carbohydrates, with adequate fresh fruit and vegetables.
- Moderate aerobic exercise, e.g. 30 minutes brisk walking at least 3 times a week
- Members must be encouraged to participate in wellness and prevention activities as offered by the scheme in line with scheme rules.

ii. Lipid lowering agents

The 2012 Essential drug list recommends lipid lowering agents in all Ischaemic heart disease **irrespective of cholesterol and triglyceride plasma concentration**. The intention is to reduce LDL by at least 25%.

iii. Control of Diabetes

Maintain to HbA1 C < 7%.

iv. Antiplatelets agents

Post STEMI patients must receive dual antiplatelet therapy. Aspirin must be continued indefinitely. Clopidogrel must be used for at least a month if bare metal stents were used and for 6 to 12 months if drug eluting stents were used.

v. Blood pressure control

The main aim is to maintain BP at < 140/90 or < 130/80 in patients with chronic kidney disease and diabetes mellitus.

Antihypertensive as per scheme's formulary and CDL algorithm must be used however this should include beta blockerS and angiotensin converting enzyme (ACE) inhibitors as a minimum benefit.

10 Bibliography

1. *Risk factors associated with myocardial infarct in Africa-The INTERHEART study.* **Steyn, K, Silwa, K and Hawkins, S.** 2005, Circulation, pp. 3554-61.

2. *Budern of non-communicable disease in South Africa.* **Mayosi, B, et al.** s.l. : Lancet, 2009, Vol. 374.

3. *Initial burden of disease estimates for South Africa. 2000.* **Bradshaw, D, Groenewald, P and Laubscher, R.** s.l. : S Afr Med J, 2003, Vol. 93.

4. *A hidden menace: Cardiovascular disease in South Africa and the costs of an inadequate policy response.* • **Maredza M, Hofman KJ, Tollman SM. A hidden menace: Cardiovascular disease in South Africa and the costs of an inadequate policy response. SAHeart 2011, et al.** s.l. : SAHeart, 20``, Vol. 8.

5. *ESC Guidelines for the management of acute myocardial infarction in patients presentingwith ST-segment elevation .* **The Task Force on the management of ST-segment elevation acute.** s.l. : European Heart Journal, 2012, Vol. 33. doi:10.1093.

6. *Guidelines for the management of Patients with ST-Elevation Infarction-Executive summary: A reprot of the American Cardiology/American Heart Association Task Force on Practice guidelines.* **American Heart Association.** s.l. : Circulation, 2004, Vol. 110. doi:10.116/01.CIR00001347891.68010.FA.

7. **Department of Health.** Hospital Essential Drug List. 2012.