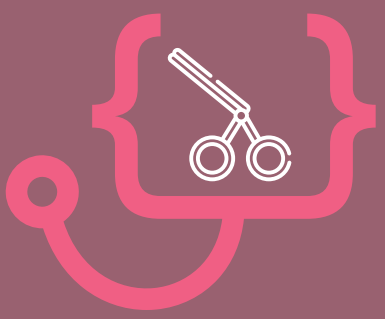
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2019 Edition, Vol. I

STANDARD TREATMENT WORKFLOWS

of India

PARTNERS

national health authority

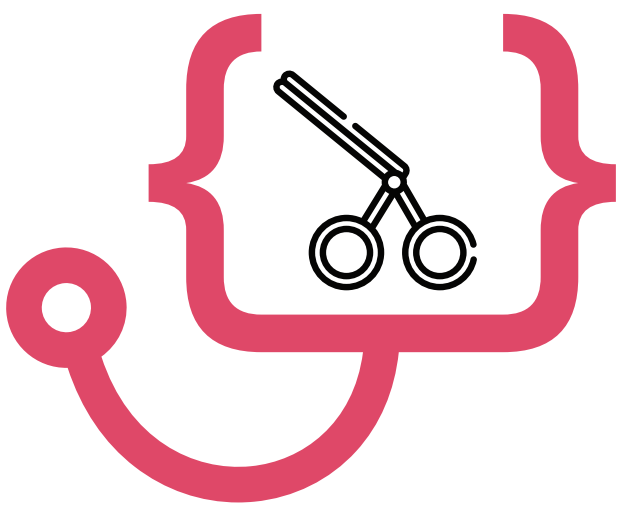
World Health Organization

Suggested Citation: Standard Treatment Workflows of India, 2019 Edition, Vol. 1, New Delhi, Indian Council of Medical Research, Department of Health Research, Ministry of Health and Family Welfare, Government of India

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STANDARD TREATMENT WORKFLOWS of India

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These STWs have been prepared by national experts of India with feasibility considerations for various levels of healthcare system in the country. These broad guidelines are advisory, and are based on expert opinions and available scientific evidence. There may be variations in the management of an individual patient based on his/her specific condition, as decided by the treating physician. There will be no indemnity for direct or indirect consequences. Kindly visit our web portal (**stw.icmr.org.in**) for more information.
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- **INTRODUCTION**
- **SPECIALITIES COVERED IN THIS EDITION**

- **CARDIOLOGY**
  - ATRIAL FIBRILIATION
  - BRADYARRTHYMIAS
  - HEART FAILURE
  - STABLE ANGINA
  - STEMI
  - UNSTABLE ANGINA/ NSTEMI
  - HYPERTENSION

INTRODUCTION

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Ministry of Health and Family Welfare, Government of India

GOAL

To empower the primary, secondary and tertiary care physicians/surgeons towards achieving the overall goal of Universal Health Coverage with disease management protocols and pre-defined referral mechanisms by decoding complex guidelines

OBJECTIVES

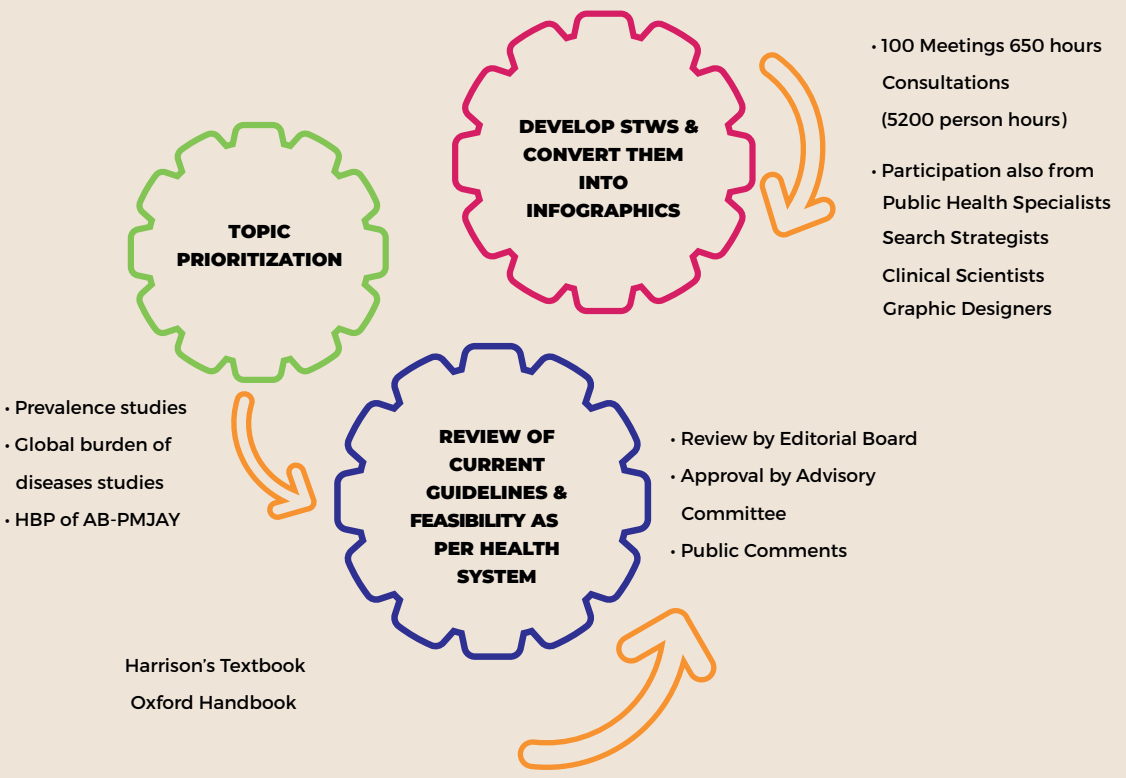
Primary Objective:
To formulate clinical decision making protocols for common and serious medical/ surgical conditions for both OPD and IPD management at primary, secondary and tertiary levels of healthcare system for equitable access and delivery of health services which are locally contextual

Secondary Objective:
To facilitate PMJAY arm of Ayushman Bharat with secondary and tertiary level management of all surgical and medical conditions covered under the scheme.

METHODOLOGY



PROCESS OVERVIEW



CARDIOLOGY

December/ 2025

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Standard Treatment Workflow (STW)

ATRIAL FIBRILLATION

ICD-11-BC81.31

WHEN TO SUSPECT ?

SYMPTOMS
- Rapid rate palpitations with or without
  - General fatigue or weakness or exhaustion
  - Dizziness, near syncope or syncope
  - Shortness of breath
  - Chest pain
- More marked on exertion

SIGNS
- Irregularly irregular pulse
- Variable heart sound

LOOK FOR RISK FACTORS
- Prior valvular heart disease or CHF or MI
- Prior TIA or stroke or embolic episode
- Hypertension, DM, COPD,CKD, Obesity

LOOK FOR PRECIPITATING FACTORS
- Post (cardiac) surgery
- Alcoholism or binge drinking
- Myo-pericarditis or ACS
- Pneumonitis or pulmonary embolism
- Sepsis, hyperthyroidism

MANAGEMENT PRINCIPLES
- Categorize AF
- Look for immediate intervention indicators
- Assess stroke risk & need for anti-coagulation
- Assess bleeding risk
- Need for rate control
- Consideration for rhythm control

CATEGORIZE AF
- Paroxysmal AF: Episodes of AF for less than 7 days
- Persistent AF: AF lasing from 7 days to 1 year
- Long standing perssistent AF: AF lasting for > 1 year
- Permanent AF: AF with heart rate control as only option

LOOK FOR IMMEDIATE INTERVENTION INDICATORS
- Systolic BP 90 mmHg, HR > 150 or <50/min
- Ongoing Angina
- CHF or TIA or stroke
- Major bleed on Oral Anti-coagulants

STROKE RISK SCORE

CHA_2DS_2-VAS_c	SCORE
- Congestive heart failure/LV dysfunction	1
- Hypertension	1
- Aged ≥ 75 years	2
- Diabetes mellitus	1
- Stroke/ TIA/ TE	2
- Vascular disease [prior MI, PAD or aortic plaque]	1
- Aged 65-74 years	1
Maximum Score	9

OAC if score >1

BLEEDING RISK SCORE

HAS-BLED	SCORE
- Hypertension i.e. uncontrolled BP	1
- Abnormal renal/ liver function	1 or 2
- Stroke	1
- Bleeding tendency or predisposition	1
- Labile INR	1
- Age (e.g. >65)	1
- Drugs (e.g. concomitant aspirin or NSAIDSs or alcohol	1
	9

Bleeding Risk High in score >3

CHOICE OF ANTI-COAGULATION
- Direct oral anticoagulants (DOAC)
  - Aim for INR 2-3
  - Assess risk of bleeding
  - Take measures to reduce/ modify risk of bleeding
  - VKA only if severe M.S or metallic valve

MEASURES TO REDUCE HIGH BLEEDING RISK
- Control SBP to less than 140 mmHg
- Avoid dietary indiscretions
- Avoid concomitant aspirin, anti platelets, NSAIDs
- Avoid alcohol
- Correct anemia

HEART RATE CONTROL

In all patients except hemodynamic instability	Beta blocker or calcium blocker or combination	BB ± digoxin in HF	Rate aim to be less than 110/ min

CONVERSION TO NSR

Hemodynamic instability	Uncontrolled symptoms despite HR control	Unacceptable rate control drug side effects	Patients' preference

MANAGEMENT

AT PHC/CHC
- Detailed clinical evaluation
- Basic investigations
- Careful ECG evaluation
- Start OAC
- Start Metoprolol/Diltiazem/Verapamil if HR >110/min & no evidence of CHF
- Refer if indicators for early intervention

AT DISTRICT HOSPITAL
- Admit if indicators of early interventions
- Immediate cardioversion after heparinization,if hemodynamic instability
- Manage precipitating factors if any
- Assess stroke, bleeding risk & coagulation parameters
- Detailed echocardiogram
- Start OAC (Oral Anticoagulant)
- Control HR by single drug or combination of BB & Ca Blocker

Refer HR uncontrolled or CHF or angina

AT TERTIARY CENTRE
- Re-assess clinical status, need and adequacy of OAC
- Start NOAC (Non-Vitamin K antagonist Oral Anticoagulants)
- Optimise management of underlying cardiac disease
- Stress life style and AF risk factor modification
- Assess need for rhythm control and discuss pros & cons
- Consider RFA in select patient

INVESTIGATIONS

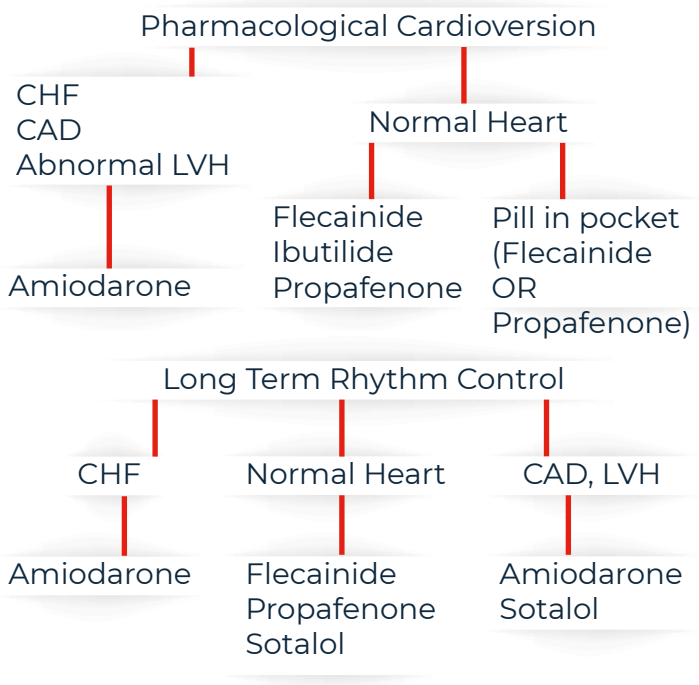
BASIC INVESTIGATIONS
- Hemograms
- Blood sugar, Creatinine
- Electrolytes
- 12 lead ECG

DESIRABLE INVESTIGATIONS
- Plain X-ray chest
- Thyroid evaluation
- Liver function test
- Troponins
- Prothrombin time, INR (Coagulation profile)
- Echocardiography

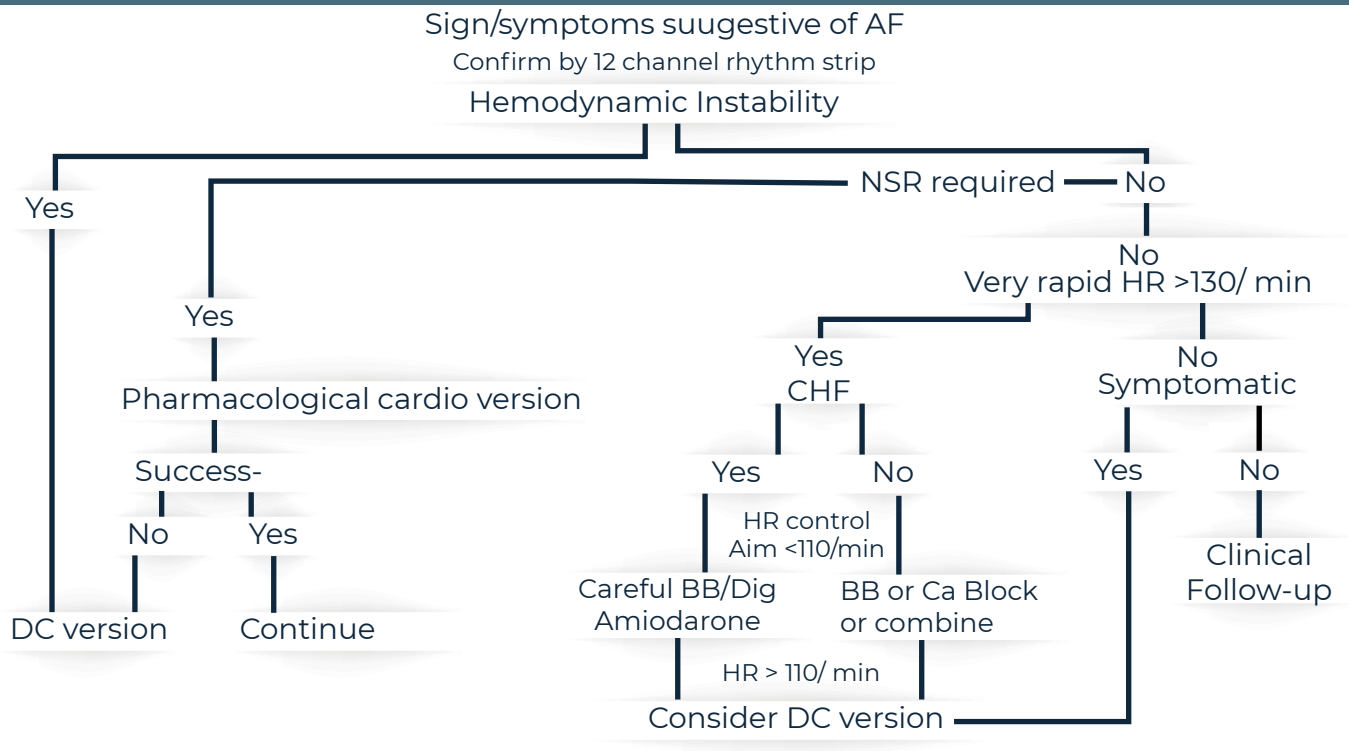
OPTIONAL INVESTIGATIONS
- Prolonged ECG monitoring
- Trans-esophagial echocardiography
- Exercise Stress Test
- CT scan
- MRI
- EP study
- Coronary angiography

WHAT TO LOOK FOR IN ECG ?
- Ventricular rate
- Chamber enlargement
- Pre-excitation
- Prior MI
- Bundle branch block
- QT interval

RHYTHM CONTROL



MANAGEMENT ALGORITHM





Anti-coagulants in all Except
- Limited period with reversible etiology
- Score <2

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2. VanGelder et al. 2024 ESC guidelines for the management of AF developed in collaboration with EACTS. European Heart J.2024:45,3314-3414

RESTORING RHYTHM, RESTORING FREEDOM

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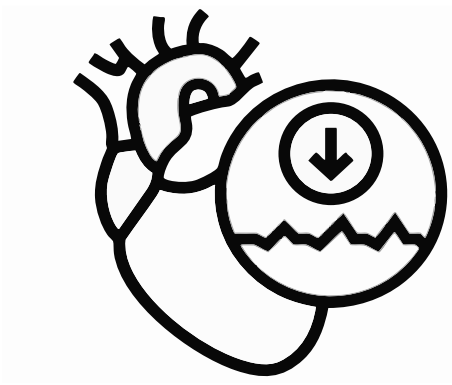
Standard Treatment Workflow (STW)

BRADYARRTHYMIAS IN SYMPTOMATIC PATIENTS

ICD-11-MC81.1

WHEN TO SUSPECT

Patient with any of the following symptoms, AND a pulse rate < 50bpm: (persis-tent)



- Syncope/ presyncope/ dizziness
- Lethargy/ fatigue
- Breathlessness/ chest pain on exertion

BASIC EVALUATION

HISTORY

- Syncope/presyncope: frequency, associated fall/ injury/incontinence
- Exertional angina or known coronary artery diseas
- Look for reversible cause like drugs (Beta-blockers, Calcium Channel Blockers or digoxin)
- Known hypothyroidism or kidney disease
- .. Sleep aponea
- Patient with an implanted pacemaker or other device

EXAMINATION

- Drowsiness/ impaired consciousness
- Pulse, BP

TESTS TO BE DONE

Patient presenting to PHC/CHC:

- 12-lead ECG
- Blood urea, serum creatinine
- Electrolytes
- Blood sugar
- TSH

EVALUATION AND TREATMENT OF UNSTABLE PATIENTS

1. TREATMENT OF ASSOCIATED CONDITIONS
   - **Suspected drug (BB or CCB) overdose:**
     - Withhold the drug
   - **Hyperkalemia(serum K+>6meq/l orwith ECG chages of hyperkalemia)**
     1. Stop exogenous potassium, K sparing diuretics, NSAID, RAAS inhibitors
     2. 10 ml of 10% calcium gluconate over 10 mins
     3. IV insulin with glucose
     4. IV sodabicarb
     5. Salbutamol inhalation/ loop diuretics/ potassium binders
2. TEMPORARY PACEMAKER INSERTION
   (iv dopamine or isopranaline may be given till the time TPI can be placed)

EVALUATION AND MANAGEMENT OF STABLE PATIENTS

Findings on 12-lead ECG

- Atrioventricular block
- Sinus node dysfunction
- Bundle branch blocks, tri-fascicular blocks
- AF with CHB

INDICATIONS FOR URGENT TREATMENT/REFERRAL

- Hypotension (SBP <90 mmHg), impaired consciousness or ongoing chest pain
- Recurrent or ongoing syncope/presyncope
- Associated headache with or without neurologic deficit (suspect intracranial event)
- Patient with a pre-existing device
- If ECG available, evidence of any of the following
  - Complete heart block
  - Sinus node disease with pauses >3 s long
  - Bradycardia (HR < 50 bpm)

GENERAL APPROACH TO PATIENTS WITH SYMPTOMATIC BRADYCARDIA

1. Rule out **associated conditions**
   Drug toxicity (BB, CCB, clonidine, Lithium)
   Renal dysfunction, hyperkalemia
   Sleep apnea
2. Transthoracic echocardiography

INDICATIONS FOR PERMANENT PACING

AV CONDUCTION DISEASE

- Complete heart block, advanced AV block, or Mobitz Type II block
- Associated neuromuscular disease

SINUS NODE DYSFUNCTION

- Symptomatic patients with sinus pauses > 3s long with symptom correlation or heart rate <40/min during awake hours

OTHER CONDUCTION DISORDERS WITH 1:1 AV CONDUCTION

- Unexplained syncope in a patient with BBB or documented transient high grade AV block with no reversible cause identified
- Others (alternating BBB, infiltrative/ neuromuscular disease)

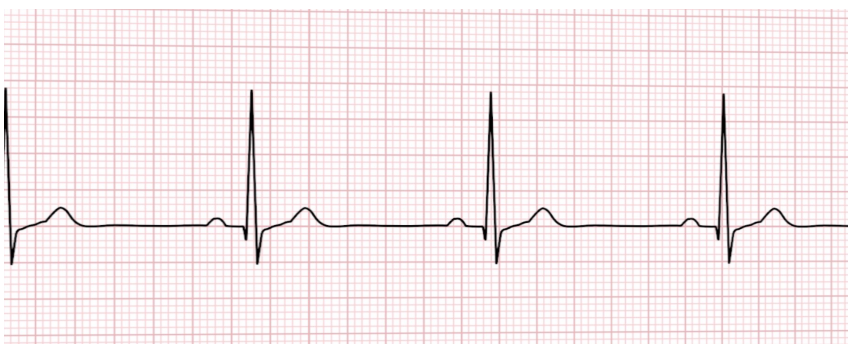
RECOMMENDED PACING MODES

1. **SND with intact AV conduction**
   - Atrial-based single or dual chamber pacing
   - VVI pacing is reasonable if symptoms are infrequent
2. **AV Conduction disease**
   - VVI/Dual chamber pacing in patients with LVEF >50%
   - CRT/LBBA pacing system pacing in patients with LVEF <40%

ADDITIONAL TESTING

1. **Advanced imaging** (cMRI) may be needed if infiltrative disease is suspected
2. **Ambulatory ECG** may be needed
   - In patients with first or second degree AV block for symptom correlation
   - In patients with suspected sinus node disease for detection of pauses and symptom correlation
   - In symptomatic patients with LBBB or bifascicular block
3. **Implantable Loop Recorder and EPS** (consult published society guidelines)

ECG: SINUS BRADYCARDIA



ECG: THIRD DEGREE HEART BLOCK



ABBREVIATIONS

BB: Beta Blocker
CCB: Calcium Channel Blockers
CMRI: Cardiac Magnetic Resonance Imaging
CRT: Cardiac Resynchronization Therapy
ECG: Electrocardiogram
LVEF: Left Ventricular Ejection Fraction
VVI: Velocity Vector Imaging
LBBA: Left Bundle Branch Area

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2. Glikson M et al. 2021 ESC guidelines on cardiac pacing and cardiac resynchronization therapy. European Heart J (2021)00,1-94

BRADYARRHYTHMIA MANAGEMENT: RESTORING LIFE'S NATURAL RHYTHM

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Standard Treatment Workflow (STW)

HEART FAILURE: A BREATHLESS PATIENT

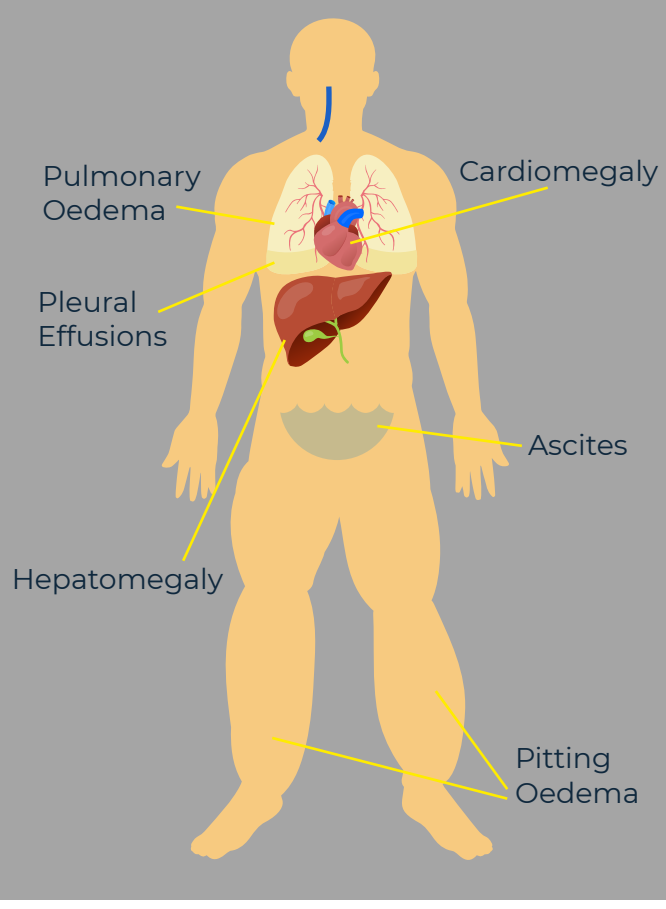
ICD-11-BD10-BD1Z

SYMPTOMS

1. Dyspnea/ orthopnea/PND
2. Pink frothy sputum
3. Pitting oedema
4. Recent weight gain
5. Easy fatiguability
6. H/o CHF/ MI

SIGNS

1. Tachypnoea
2. Tachycardia or irregular pulse
3. Raised JVP
4. Basal crepitations
5. Cardiomegaly
6. Presence of murmurs
7. Systemic desaturation



ADDITIONAL INFORMATION

- Prior history of respiratory illness like asthma or COPD
- Known patient of anemia, CHF similar illness in past with response to therapy
- Prior history of RHD, CAD, pregnancy, cancer chemotherapy
- Risk factors: HT, DM, smoking, hyperlipidemia or premature CAD in first degree relatives

COMMON ETIOLOGY AND INDICATORS

1. Ischemic cardiomyopathy: past MI
2. Diabetic/hypertensive heart disease (cardiomyopathy)
3. RHD: existing valvular disease
4. Post-viral: acute onset breathlessness within last 3 months
5. Peri-partum cardiomyopathy-onset in last trimester or after delivery
6. Idiopathic cardiomyopathy
7. Post-cancer chemotherapy

MANAGEMENT AT PHC

- Rule out respiratory cause: Breathlessness with fever, cough and expectoration or known patient of asthma or COPD
- Likely CHF: Decongest with furosemide

REFER IF FOLLOWING:

- BP < 90 mmHg or > 200 mmHg
- Heart rate < 50/min or > 120/min
- Respiratory rate > 30/min or cyanosis
- Oliguria
- Altered sensorium

→ **REFER TO COMMUNITY HEALTH CENTRE**

MANAGEMENT AT CHC

- Admit and stabilize
- Send for routine investigations
- ECG: Rule out acute ST-Elevation MI, tachyarrhythmia
- X-ray chest: Rule out respiratory etiology
- Decongest with intravenous furosemide
- O2 therapy if systemic saturation < 90%
- Start ARNI and spironolactone orally
- Consider β blockers after decongestion
- SGLT2 inhibitors

REFER IF FOLLOWING

- Low oxygen saturation
- Low BP and high/low heart rate
- Abnormal electrolytes and renal parameters

→ **REFER TO A DISTRICT HOSPITAL**

MANAGEMENT AT DISTRICT HOSPITAL

- Admit and re-assess
- Optimise therapy with furosemide/ARNI/ spironolactone/ O2 and stabilize
- Consider non-invasive ventilation if marked respiratory distress and O2 saturation < 90%
- Echocardiography: confirm diagnosis of HFrEF: LV ejection fraction < 35%
- Search for etiological diagnosis
- Consider β blockers after decongestion
- Refer back to CHC/ PHC after stabilization

REFER TO TERTIARY CARE IF

- CHF uncontrolled,
- Unstable hemodynamics
- Suspected ongoing ischemia
- Abnormal electrolytes
- Abnormal renal functions
- Structural heart disease
- Unclear etiology

MANAGEMENT AT TERTIARY HOSPITAL

1. Re-assess and confirm diagnosis of HF
2. Categorize acute (< 3 months) vs chronic (> 3 months) and HFrEF (EF 35%) vs HFpEF (EF 35-50%)
3. Optimize therapy with furosemide, ARNI, β blockers (HFrEF, HFMrEF, HFpEF) spironolactone and O2
4. Consider ivabradine, vericiguat and lanoxin
5. Pneumococcal and influenza vaccines
6. Investigate for etiology and manage
7. Consider non-pharmacological invasive therapy
   a. ICD: In selected patients (Ref Arrhythmia STW)
   b. BiV: Consider in NYHA class II/ III Symptomatic patient, EF <35%, QRS >150msec in sinus rhythm with LBBB morphology and optimal medical therapy of >3 months
8. Etiology based Interventions
   a. Valvular intervention
   b. PCI/CABG
   c. Tachyarrhythmia management

CONSIDER AT ALL LEVELS

Smoking Cessation | Salt restriction | Physical activity | Weight Reduction | Moderation of alcohol | Control of DM/ HTN/ Lipids | Secondary CVD prevention with aspirin and statins

INVESTIGATIONS:

BASIC INVESTIGATIONS

- Hemogram, ESR
- Blood sugar
- Urine examination
- Urea/ Creatinine
- Sodium/ Potassium
- ECG
- Chest X-ray PA view

WHAT TO LOOK FOR IN X RAY

- Cardiomegaly
- Pulmonary venous congestion
- Pneumonia or other lung pathology

WHAT TO LOOK FOR IN AN ECG?

- Pathological Q wave
- Conduction abnormalities, especially LBBB
- Chamber enlargement
- Atrial fibrillation

Note: If ST elevation present, manage as STEMI

DESIRABLE INVESTIGATIONS

- 2D Echocardiography
- BNP/NT pro-BNP
- Troponin
- Lipid profile
- Thyroid function test
- Iron profile

OPTIONAL INVESTIGATION

- Prolonged ECG monitoring
- Coronary angiography
- Radionuclide imaging
- CT scan
- MRI
- PET
- Myocardial biopsy
- Electrophysiological study

COMMON DRUGS AND DOSAGE FOR CHF

FUROSEMIDE

- Dose 20-80 mg daily PO
- Intravenous 10-80 mg SOS in acute stage
- Change to oral when symptoms subside
- Monitor serum electrolytes, creatinine and uric acid on therapy

SPIRONOLACTONE

- Dose 25-50 mg once daily PO
- Keep watch on serum potassium and creatinine every 2-4 weekly

- **CARVEDILOL** Dose 3.125 to 25 mg twice daily PO
- **METOPROLOL** 12.5-50mg twice daily PO
- **BISOPROLOL** 1.25-10mg once a day PO

PRECAUTIONS

- Start after decongestion with low dose with BP > 100 mmHg and HR >60/min
- Uptitrate dose 1-2 weekly till maximum tolerable dose
- Keep watch on BP, heart rate and recipitation of CHF symptoms
- Increase diuretics and reduce carvedilol to manage reappearance of CHF

ARNI

- Dose 50 to 200 mg twice daily PO
- Start with low dose with BP >100 mmHg, normal electrolyte and creatinine less than 2.5 mg/dl
- Uptitrate dose 1-2 weekly till maximum tolerable dose
- Keep watch on BP and electrolytes before every increment and on follow-up

ABBREVIATIONS

ICD: Implantable Cardioverter defibrillator
BiV: Bi-Ventricular Pacing
PND: Paroxysmal Nocturnal Dyspnea
HFMREF: Heart Failure with Mid-Range Ejection Fraction
PCI: Percutaneous Coronary Intervention
CABG: Coronary Artery Bypass Graft
CVD: Cardiovascular Diseases
RHD: Rheumatic Heart Disease
CAD: Coronary Artery Disease
HFrEF: Heart Failure with reduced Ejection Fraction
HFpEF: Heart Failure with preserved Ejection Fraction
STEMI: ST elevation Myocardial Infarction
LV: Left Ventricle
COPD: Chronic Obstructive Pulmonary Disease

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2. *Heart failure guidelines 2025 by Heart Failure Association of India. Heart Failure Journal of India ¦ Volume 3 ¦ Supplement 1 ¦ January 2025."*

MONITOR, MANAGE, AND MAINTAIN HEART HEALTH

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Standard Treatment Workflow (STW)

STABLE ANGINA

ICD-11-BA40.1

PATIENT PRESENTING WITH CHEST PAIN



CONSIDER ANGINA IF

- Diffuse retrosternal pain, heaviness or constriction, radiating to arms or neck or back
- Associated with sweating
- Easily reproduced with post-meal exertion
- Consider atypical presentation: Exertional fatigue or breathlessness or profuse sweating or epigastric discomfort

Likelihood more if known patient of CAD

ANGINA UNLIKELY IF

- Variable location or characteristic
- Long lasting (hours to days) or short lasting (less than a minute)
- Restricted to areas above jaw or below epigastrium
- Localized to a point
- Pricking or piercing or stabbing type of pain
- Precipitated by movement of neck or arms or respiration

CATEGORIZE ANGINA

ACUTE CORONARY SYNDROME

- Angina at rest or lasting more than 20 minutes
- Recent worsening of stable angina (crescendo) to CCS class III
- New onset effort angina of less than 1 month in CCS class II/ III
- Post infarction angina

For management: refer to STEMI/ NSTEMI STW

STABLE ANGINA

Any effort related pain fitting in previous category, relieved by rest or NTG in 1-2 min

STABLE ANGINA: GENERAL MANAGEMENT

1. Manage factors potentaiting angina
   - Anemia, Thyrotoxicosis, Pregnancy, febrille illness
   - Hypertension, Ventricular hypertrophy, CHF
   - Tachy or brady-arrhythmia
   - Drugs : bronchodilators, steroids
2. Risk factor control
3. Other atherosclerotic CV disease : PVD, stroke
4. Secondary prevention : Statins, BB, ACE-I

INVESTIGATIONS

ESSENTIAL INVESTIGATIONS

1. Hemogram
2. Urea, Creatinine, Electrolytes
3. Sugar
4. Lipids
5. ECG

OTHER INVESTIGATIONS

1. Echocardiography
2. Exercise Treadmill Test
3. Thyroid Function Test
4. Iron profile
5. Uric acid
6. HbA1C

OPTIONAL INVESTIGATIONS

1. Stress radionuclide/ echocardiographic imaging
2. CT scan including multi-slice coronary angiography
3. Coronary Angiography
4. Coronary Fractional Flow Reserve
5. Intra-vascular Ultrasound/ OCT

MANAGEMENT

MANAGEMENT AT PHC/CHC LEVEL

1. Control angina: Metoprolol with/without DHP Ca channel blockers
   Add nitrates if symptoms not controlled
2. ECG for Q waves, ST - T changes, BBB or chamber enlargement
3. Aspirin & high intensity statins
4. Refer to higher centre electively

MANAGEMENT AT DISTRICT HOSPITAL LEVEL

1. Optimise anti-anginal treatment
2. Echocardiography for LV function or structural heart disease
3. Risk stratify by exercise treadmill test in low, intermediate or high risk (DUKE risk score) for cardio-vascular events , if patient is ambulatory and ECG is interpretable
4. Refer to tertiary centres if:
   - Angina uncontrolled on optimal medical therapy
   - Echo reveals abnormality
   - Non-ambulatory patient or un-interpretable ECG
   - High risk on exercise stress test for possible re-vascularization

MANAGEMENT AT TERTIARY LEVEL

1. Reassess and optimise drug therapy: If uncontrolled choose from trimetazidine, nicorandil and ranolazine
2. Risk stratify with CT coronary angiogram or stress imaging or exercise treadmill test

RISK CATEGORIZATION

Identify high risk patients on non-invasive evaluation

1. Uncontrolled angina
2. Poor LV function
3. Left main/proxi multivessel disease on CT coronary angioplasty
4. Large defect on stress imaging

RISK CATEGORY MANAGEMENT

Low/ Intermediate Risk Group

1. Optimal anti-anginal therapy
2. Follow up 3-6 monthly at primary/ secondary care centre
3. Refer to tertiary centre when change in symptomatic status

High Risk Group

1. Discuss pros and cons of possible revascularization and dual anti-platelet therapy
2. Angiography, if any of following
   - Angina not controlled on optimal medical therapy
   - High risk on non-invasive testing
   - Cardiac arrest survivor or documented VT

DRUGS & DOSAGE

Anti-platelets
- Aspirin 75 mg OD
- Clopidogrel 75 mg OD (if intolerant to aspirin)
- Ticagralor 90 mg BD

Lipid lowering agents
- Atorvastatin: 40-80 mg OD
- Rosuvastatin: 20-40 mg OD
- Non-statin lipid modifying agents

Ace-inhibitor
- Ramipril: 2.5-10 mg OD
- Enalapril: 2.5-10 mg BD

Anti-ischemic:
1. Metoprolol:
   - Short acting: 25-100 mg BD
   - Long acting: 25 -100 mg OD
2. Nitrates:
   - Isosorbide mono-nitare: 20 to 60 mg in 2 devided dose
   - Nitroglycerine sustained release: 2.6 to 6.5 mg BD
3. Calcium channel blockers:
   - Amlodipine 5-10mg OD
   - Verapamil 40-80 mg TDS
   - Diltiazem 30 to 90 mg TDS
4. Nicorandil: 5-10 mg BD
5. Ranolazine: 500 -1000 mg BD
6. Trimetazidine: 20 mg mg TDS

REVASCULARIZATION

1. Revascularize if anatomy is suitable
2. Prefer CABG over PCI in DM with multivessel disease or left main disease
3. Complete re-vascularization is preferable
4. Use invasive functional and imaging modalities (FFR, IVUS, OCT) when indicated
5. Stress on continuing dual anti-platelets at least for six months after PCI

ABBREVIATIONS

CHF: Congestive Heart Failure
FFR: Fractional Flow Reserve
IVUS: Intravascular Ultrasound
OCT: Optical Coherence Tomography
PVD: Peripheral Vascular Disease

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LISTEN TO YOUR HEART: PREDICTABLE PAIN NEEDS PREDICTABLE CARE

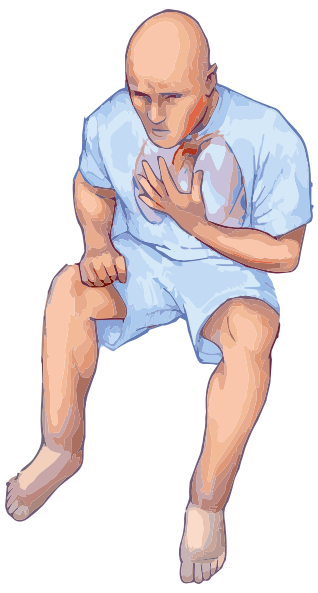
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Standard Treatment Workflow (STW)
UNSTABLE ANGINA/NSTEMI
ICD-11-BA40.0



CONSIDER ANGINA IF
- Diffuse retrosternal pain, heaviness or constriction. Radiation to arms or neck or back
- Associated with sweating
- Easily reproduced with post-meal exertion
- Consider atypical presentation: Exertional fatigue or breathlessness or profuse sweating or epigastric discomfort

More likelihood if known patient of CAD/ multiple risk factors

ACUTE CORONARY SYNDROME:
1.Angina at rest or lasting more than 20 minutes
2.Recent worsening of stable angina (crescendo) to CCS class III
3.New onset effort angina of less than 1 month in CCS class II/ III
4.Post infarction angina

ECG:
- If ST Elevation: Follow ST Elevation MI (STEMI) STW
- If no ST Elavation: UA/NSTEMI

RED FLAG SIGNS
- Pain lasting for more than 20 minutes
- Recurrent or ongoing pain or rest pain
- Associated breathlessness, profuse sweating or syncope
- Hemodynamic instability

Refer as emergency to nearest Primary PCI/Thrombolysis capable centre

Rest pain beyond 24hrs or without above features may be referred early for further evaluation

LOOK FOR OTHER CAUSES OF PROLONGED CHEST PAIN
- Dissection of aorta (unequal/ absent peripheral pulses)
- Respiratory Evaluation: Pleuritis/ pneumonitis/ embolism/ pneumothorax
- Pericardial rub
- Neuralgia or herpes

ANGINA UNLIKELY IF:

Variable location or characteristic	Long lasting (hours to days) or short lasting (less than a minute)	Restricted to areas above jaw or below epigatrium	Localized to a point	Pricking or piercing or stabbing type of pain	Precipitated by movement of neck or arms or respiration

MANAGEMENT

PHC/CHC LEVEL
1, ECG, Troponin.
2. Start
-Aspirin, Clopidogrel in loading dose
-Heparin/ LMWH
-High dose statin
-Metoprolol
3. Risk stratify GRACE score or TIMI score
- Refer High/ Intermediate risk to PCI capable centre
- Refer Low risk for further evaluation to DH
4. Refer to PCI capable centre if:
- Acute LVF
- Hypotension
- Systolic murmur
- Arrythmia

DISTRICT HOSPITAL
1.Admit in ICU equipped with ECG monitoring and defibrillator
2.Troponin & bio-chemistry if not done
3.Serial ECG & echocardiography
4.Continue Aspirin, Clopidogrel, Heparin & Metoprolol
5.Add nitrates if needed
6.Management for different risk categories:
-Very high,High or Intermediate risk or LVEF <40%: Refer for revascularization
-Low risk patients: Conservative management
Life style modification
Risk factor control
Secondary prevention

TERTIARY CENTRE
1. Admit, reassess clinically and monitor in ICCU
2. Continue aspirin and heparin
3. Load with clopidogrel or prasugrel or ticagralor if not already done
4. Optimal medical therapy to continue (BB, high dose atorvastatin, ACE-inhibitors, intra-venous nitrates if ongoing pain, severe MR or LVF)
5. Detailed echocardiography
6. Low risk patients may undergo non-invasive risk stratification with exercise stress test, CT coronary angiography or stress imaging
7. Very high risk, high risk and intermediate risk patients may be subjected to coronary revascularization

Revascularization:
1. Discuss pros & cons of re-vascularization and prolonged dual anti-platelet therapy
2. Revascularize if anatomy is suitable
3. Prefer CABG over PCI in DM with multivessel disease or left main disease

Revascularization strategy:
1. Very High risk: Urgent re-vacsularization (within few hours) after loading preferably with Ticagrelor or prasugrel if PCI is planned
2. High risk patients: Early revascularization (within 24 hours)
3. Intermeditae risk patients: Revascularization (within 72 hours)
4. Continue Dual anti-platelets in patients undergoing PCI for atleast 12 months in DES and for 3 months in BMS

1. GRACE SCORE:

Killip Class	Points	SBP1 mm Hg	Points	Heart rate Beats/ min	Points	Age. y	Points	Creatinine Level, mg/ dL	Points	**Other risk factors**	Points
I	0	<80	58	≤50	0	≤30	0	0-0.39	1	• Cardiac arrest at admission	39
II	20	80-99	53	50-69	3	30-39	8	0.40-0.79	4	• ST-Segment Deviation	28
III	39	100-119	43	70-89	9	40-49	25	0.80-1.19	7	• Elevated Cardiac Enzyme Levels	14
IV	59	120-139	34	90-109	15	50-59	41	1.20-1.59	10		
		140-159	24	110-149	24	60-69	58	1.60-1.99	13		
		160-199	10	150-199	38	70-79	75	2.00-3.99	21		
		≥200	0	≥200	46	80-89	91	>4.0	28		
						≥90	100			Sum Total= GRACE score of patient	

2. TIMI SCORE:
One point for each of following
1. Age >65 yrs
2. More than 3 risk factors
3. Known CAD (>50% lesion)
4. Recurrence of angina in 24 hrs
5. Aspirin use within 7 days
6. ST deviation >0.5 mV
7. Raised cardiac markerss
Sum total = TIMI score of patient

UNSTABLE ANGINA OR NSTEMI DIAGNOSIS

- Very high risk: Clinical instability → Immediate invasive <2 h
- High risk: GRACE > 140, TIMI ≥4 → Early invasive 2-24 h
- Intermediate risk: GRACE 109-140, TIMI2-3 → Delayed invasive 25-72 h
- Low risk: GRACE <109, TIMI ≤1 → Medical/ non-invasive strategy

If at non-PCI-capable hospital
Very high risk: Immediate transfer to PCI-capable hospital
High risk: same-day transfer
Intermediate risk: transfer for PCI withing 72 h
Low risk: transfer if pursuing invasive treatment

Clinical instability. rise in cTn, or ECG changes

Invasive evaluation + Non-invasive ischaemic testing

INVESTIGATIONS

ESSENTIAL INVESTIGATIONS
1. Hemogram
2. Creatinine
3. Sugar, HbA1C
4. Fasting lipids
6. ECG
7. Troponin T/ Troponin I
8. Plain X-ray chest
9. Echocardiography

OPTIONAL INVESTIGATIONS
1. Coronary Angiography
2. CT scan including coronary angiography
3. Stress Radionuclide/ echocardiographic imaging
4. MRI
5. Coronary Fractional Flow Reserve
5. Intra-vascular Ultrasound

UA/NSTEMI: RISK CATEGORIZATION:
Based on clinical features, GRACE score & TIMI score
A).Very high risk:
-Acute LVF
-Hypotension
-Uncontrolled Ventricular arrhythmia
-Severe MR
B. High Risk:
-GRACE score > 140 or TIMI score >4
C. Intermediate Risk:
-GRACE score 109-140 or TIMI score 2-3
D. Low Risk:
-Grace score <108 or TIMI score 0-1

UA/NSTEMI: RISK CATEGORY MANAGEMENT:
A)Low risk:
1.Conservative management: Aspirin, clopidogrel, BB and statin
2. CT coronary angiography/TMT within a week to risk stratify
3.Refer low risk for re-vascularization if
-Recurrent pain
-Hemodynamic deterioration
-New ECG change

B. Intermediate/ Very High/ High risk:
Re-vascularization

DRUGS & DOSAGE

Anti-platelets
1. Aspirin: Loading dose 325 mg followed by 75 mg OD
2. Clopidogrel: Loading dose 300 mg followed 75 mg OD
3. Prasugrel: Loading dose 60 mg followed by 10 mg OD
4. Ticagralor: Loading dose 180 mg followed by 90 mg BD

Anti thrombotics:
1. Enoxaparin: 1 mg/Kg SC 12 hrly
2. Unfractionated heparin: Bolus of 60 U/Kg (maximum 5000 U) followed by 12 U/Kg hourly infusion to maintain APTT at 50-70 sec

Ace-inhibitor
Ramipril 2.5 -10 mg OD
Enalapril 2.5-10 mg BD

Anti-ischemic:
1. Metoprolol:
Short acting 25-100 mg BD
Long acting 25 -100 mg OD
2. Nitrates:
Isosorbide mono-nitare 20 to 60 mg in 2 devided dose
Nitroglycerine sustained release 2.6 to 6.5 mg BD
Nitroglycerine IV 5-25 mcg/min infusion

Statins:
High dose Atorvastatin 80 mg OD or Rosuvastatin 20-40 mg OD

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1. Byrne RA et al. 2023ESC guidelines for the management of acute coronary syndrome. European Heart J (2024) 44, 3720-3826
2. Rao SV et al. 2025 ACC/AHA/ACEP/NAEMSP/SCAI guidelines for the management of acute coronary syndrome. J Am Coll Cardiol(2025) 85, 2135-2237

ASSESS SWIFTLY, TREAT PRECISELY

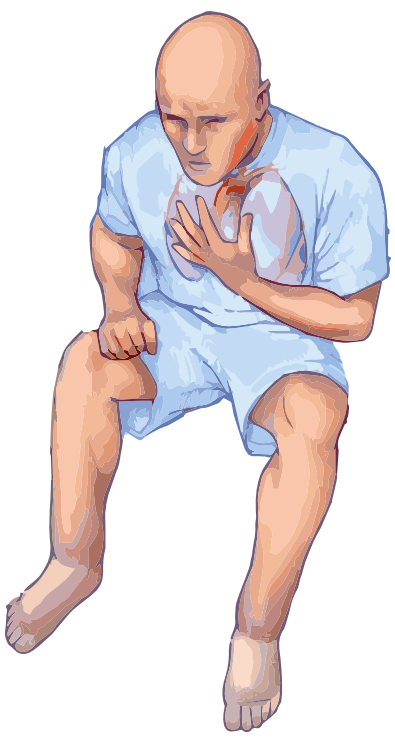
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Standard Treatment Workflow (STW)
ST ELEVATION MYOCARDIAL INFARCTION (STEMI)
ICD-11-BA41.0



CONSIDER ANGINA IF
- Diffuse retrosternal pain, heaviness or constriction
- Radiation to arms or neck or back
- Associated with sweating
- Easily reproduced with post-meal exertion
- Consider atypical presentation: Exertional fatigue or breathlessness or profuse sweating or epigastric discomfort/ syncope

More likelihood if known patient of CAD/ multiple risk factors

ACUTE CORONARY SYNDROME:

1. Angina at rest or lasting more than 20 minutes
2. Recent worsening of stable angina (crescendo) to CCS class III
3. New onset effort angina of less than 1 month in CCS class II/ III
4. Post infarction angina

ECG: If ST Elevation: Follow ST Elevation MI (STEMI) protocol
If no ST Elavation: UA/NSTEMI

ANGINA UNLIKELY IF:

Variable location or characteristic	Long lasting (hours to days) or short lasting (less than a minute)	Restricted to areas above jaw or below epigatrium	Localized to a point	Pricking or piercing or stabbing type of pain	Precipitated by movement of neck or arms or respiration

LOOK FOR OTHER CAUSES OF CHEST PAIN (ONGOING OR WITHIN 12 HRS)

- Unequal or absent peripheral pulses — Dissection of Aorta
- Respiratory evaluation — Pleuritis/ Pneumonitis/ embolism/ pneumothorax
- Pericardial rub
- Neuralgia or herpes

PATIENT WITH STEMI WITHIN 12 HOURS

ECG REVEALS ST ELEVATION MI

Refer to primary angioplasty/ thrombolysis capable hospital

GENERAL MEASURES
1. Admit in ICU equipped with continuous ECG monitoring & defibrillation
2. Routine bio-chemistry and serial cardiac enzymes (troponin)
3. Pain relief by opioid
4. O2 if saturation less than 90%
5. Aspirin 325 mg, Clopidogrel 300 mg and Atorvastatin 80 mg/Rosuvastatin 20-40mg
6. Echocardiography, particularly for mechanical complication

PCI CAPABLE HOSPITAL
1. Proceed for PCI
2. Radial route preferred
3. Preferably within 90 minutes

DURING PROCEDURE
1. Use unfractionated heparin
2. No routine thrombosuction
3. Tackle culprit artery only unless shock
4. DES to be preferred

POST PROCEDURE
1. Continue dual antiplatelets for at least 1 year

PCI INCAPABLE CENTRE

A. Tranfer to PCI capable hospital if PCI can be performed within 120 min

B. If Transfer to PCI incapable hospital not feasible

THROMBOLYSE
1. Within 12 hours of symptom onset, if no contra-indication
2. Preferably with fibrin specific agent Tenecteplase/ TPA/ Reteplase or Streptokinase, if fibrin-specific are unavailable
3. Therapy to be started within 10 min preferably

POST THROMBOLYSIS
1. ECG to be done at 60-90 min after starting thrombolysis to assess whether thrombolysis is successful (>50% ST settlement with pain relief) or not
2. If successful, transfer patient for PCI within 3-24 hours
3. If thrombolysis failed, transfer patient immediately for PCI capable hospital
4. Enoxaparin (preferred over unfractionated heparin) to be continued till PCI OR discharge

PATIENT WITH STEMI IN 12-24 HOURS

Transfer to PCI capable hospital immediately	If ongoing pain, thrombolysis and transfer immediately

PATIENT WITH STEMI AFTER 24 HOURS

Angiography with a view to PCI only if any of following/ Contra indications of angiography:

- Recurrent anginal pain not controlled by medical therapy
- Cardiogenic shock
- Acute LVF
- Mecahnical complication
- Dynamic ST-T changes
- Life threatening ventricular arrhythmias

ABSOLUTE CONTRA-INDICATIONS TO THROMBOLYIC THERAPY:

Previous intra-cerebral hemorrhage or stroke of unknown etiology	Ischemic stroke in last 6 months	CNS neoplasm or AV malformation	Recent (within 1 month) major trauma/ surgey/ head injury	Recent (within 1 month) major GI bleed	Known bleeding tendency (except menstrual bleed)	Aortic dissection	Severe uncontrolled hypertension

DRUGS & DOSAGE

Anti-platelets
1. Aspirin: Loading dose 325 mg followed by 75 mg OD
2. Clopidogrel: Loading dose 300 mg followed 75 mg OD
3. Prasugrel: Loading dose 60 mg followed by 10 mg OD
4. Ticagralor: Loading dose 180 mg followed by 90 mg BD

Anti-ischemic:
Metoprolol:
Short acting: 25-100 mg BD
Long acting: 25 -100 mg OD
Nitrates:
Isosorbide mono-nitare 20 to 60 mg in 2 divided dose
Nitroglycerine sustained release 2.6 to 6.5 mg BD
Nitroglycerine IV 5-25 mcg/ min infusion

Lipid lowering agents:
High dose Atorvastatin 80 mg OD
Rosuvastatin 20-40mg OD
Non-statin lipid modifying agents

Ace-inhibitor
Ramipril 2.5 -10 mg OD
Enalapril 2.5 -10mg BD

Oxygen:
If oxygen saturation below 90%

Morphine:
Titrated in a dose of 2-4 mg IV every 15 minutes

Beta-blocker:
Oral beta-blocker if LVEF is less than 40%

Anti thrombotics:
1. Unfractionated heparin: Bolus of 60 U/Kg (maximum 5000 U) followed by 12 U/Kg hourly infusion to maintain APTT at 50-70 sec
2. Enoxaparin: 1 mg/Kg SC 12 hrly

Thrombolyic Therapy:

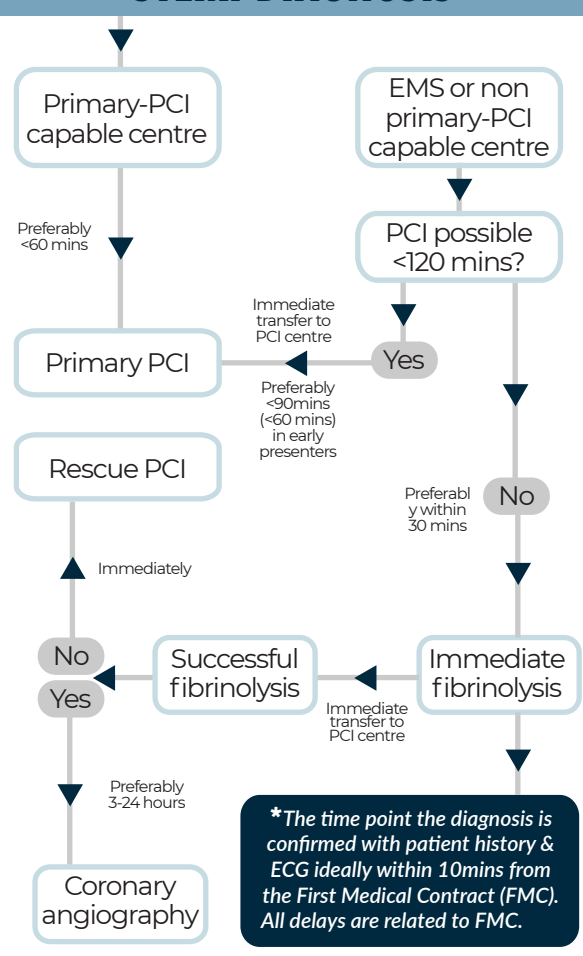
Tenecteplase
35 mg IV bolus if 60-70 Kg
40 mg IV bolus if 70-80 Kg
45 mg IV bolus if more than 80 Kg

Reteplase
10 mg IV bolus, repeat after 30 min

Alteplase
15 mg IV bolus followed by 0.75 mg/Kg over 30 min upto 50 Kg weight, then 0.5 mg/Kg over 60 min up to 35 mg

Streptokinase
1.5 million units IV over 60 min

STEMI DIAGNOSIS*



REFERENCES

1. 1. Byrne RA et al. 2023ESC guidelines for the management of acute coronary syndrome. European Heart J (2024) 44, 3720-3826
2. 2. Rao SV et al. 2025 ACC/AHA/ACEP/NAEMSP/SCAI guidelines for the management of acute coronary syndrome. J Am Coll Cardiol(2025) 85, 2135-2237

MISSION: LIFELINE

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Standard Treatment Workflow (STW)

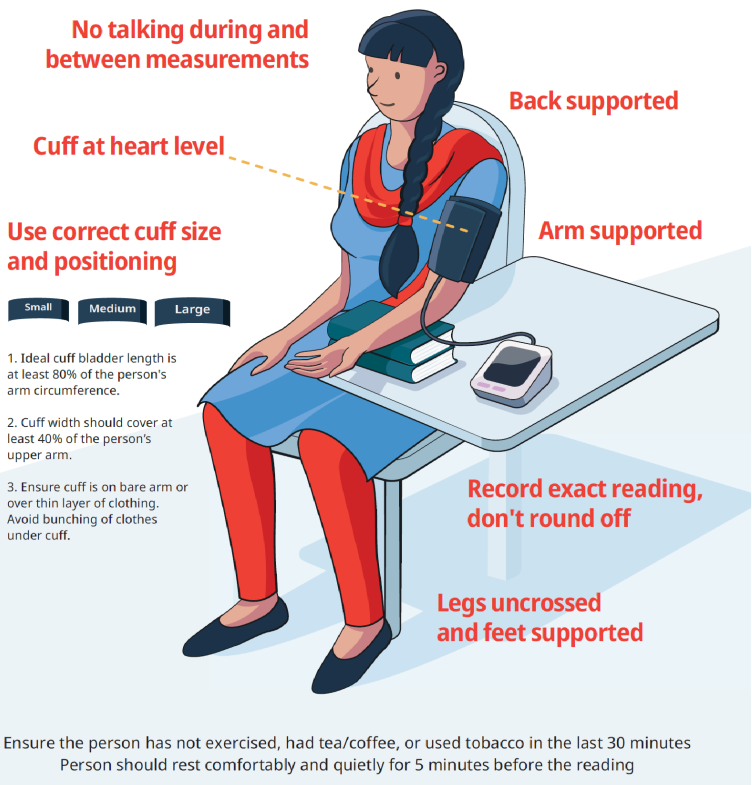
HYPERTENSION IN ADULTS

ICD-11 BA00

Hypertension is a SILENT KILLER
as the majority of patients with high BP are asymptomatic!
Only way to know if BP is high is to measure it accurately!

BP Measurement Checklist

Measure blood pressure of all adults ≥ 30 years



Ensure the person has not exercised, had tea/coffee, or used tobacco in the last 30 minutes
Person should rest comfortably and quietly for 5 minutes before the reading

RISK FACTORS

- High salt intake
- Sedentary behavior
- Tobacco and alcohol consumption
- Obesity

CLASSIFICATION	BLOOD PRESSURE LEVELS	ACTION
Normal	Systolic <120 AND Diastolic<80	Reassure and encourage healthy lifestyle
Elevated BP	Systolic 120-139 AND/ OR Diastolic 80-89	Lifestyle modification
Hypertension Grade 1	Systolic 140-159 AND/ OR Diastolic 90-99	Pharmacological management+ Lifestyle modification
Hypertension Grade 2	Systolic 160-179 AND/ OR Diastolic 100-109	
Hypertension Grade 3	Systolic ≥ 180 AND/ OR Diastolic ≥ 110	

DIAGNOSIS OF HYPERTENSION

- Systolic BP ≥140 AND/OR Diastolic BP ≥ 90 mmHg on two different clinic visits
- Population screening BP reading may count as the first reading
- Use the higher category if only Systolic or Diastolic BP is high, manage based on the higher value
- If Systolic BP is ≥160 AND/OR Diastolic BP ≥100 measurement of one clinic visit is sufficient for diagnosing hypertension

BLOOD PRESSURE CONTROL TARGETS

- All adults: SBP <140 and DBP <90 mmHg
- Diabetes mellitus, CKD, or established CVD: SBP <130 and DBP <80 mmHg (optimal target if tolerated)
- Age ≥80 years: SBP <150 and DBP <90 mmHg
- Assess orthostatic BP at every visit of adults ≥ 65 years

MANAGEMENT OF HYPERTENSION

PHARMACOTHERAPY

DRUG CLASS	DRUG	DOSES	CONTRAINDICATIONS	SIDE EFFECTS
CCB	Amlodipine	2.5–10 mg OD	Heart failure	Pedal edema, constipation
ACE inhibitors	Enalapril	5–40 mg OD or BD	Pregnancy, Women planning pregnancy, prior angioedema to ACEi, Hyperkalemia, Bilateral renal artery stenosis	Dry cough, angioedema, hyperkalemia rise in serum creatinine
	Ramipril	2.5–10 mg OD or BD		
ARB	Losartan	50–100 mg OD		Hypotension, acute renal failure, hyperkalemia
	Olmesartan	20–40 mg OD		
	Telmisartan	40–80 mg OD		
Diuretics	Chlorthalidone	12.5–25 mg OD	Pregnancy, Gout	Glucose intolerance, metabolic syndrome, hyponatremia, hypercalcemia, hypokalemia
	Hydrochlorothiazide	12.5 mg OD		
Beta-blockers	Carvedilol	12.5–50 mg OD or BD	Asthma, severe bradycardia, A-V block (grade 2 or 3), uncontrolled heart failure	Depression, fatigue, reduced exercise tolerance, hyperglycemia, sexual dysfunction
	Labetalol	100–400 mg BD		
	Metoprolol	50–100 mg OD or BD		
	Nebivolol	5 mg OD		
Aldosterone antagonist	Spironolactone	25 mg OD	Hyperkalemia	Mastalgia, gynecomastia, sexual dysfunction, gout

PHARMACOLOGICAL STRATEGY

- Combination therapy (two drugs from two different classes) could be the default initial pharmacological treatment for most adults with hypertension
- Single-pill combinations (SPCs/fixed-dose combinations, FDCs) are preferred over multiple pills to improve adherence
- Monotherapy remains appropriate only for (a) low-risk Grade 1 HTN, (b) elderly ≥ 80 years, or (c) frail patients
- A CCB or Thiazide/Thiazide-like diuretic should be used with a Renin-Angiotensin-Aldosterone System (RAAS) blocker (either an ACEi or an ARB)
- Three-drug combination, often a RAAS blocker, CCB, or a Thiazide/Thiazide-like diuretic, if blood pressure is not controlled with the initial two-drug combination
- β-blockers are appropriate in cases of angina, postmyocardial infarction, heart failure (HFrEF or HFpEF with ischemia)
- DO NOT combine two RAAS blockers as it increases the risk of adverse effects, including acute kidney injury (AKI)

SUGGESTED TREATMENT PROTOCOLS

PROTOCOL NO 1 ATTACC

1. **If BP is high:*** Prescribe Amlodipine 5mg
2. **After 4 weeks measure BP again. If still high:** Add Telmisartan 40mg
3. **After 4 weeks measure BP again. If still high:** Increase Telmisartan to 80mg
4. **After 4 weeks measure BP again. If still high:** Increase Amlodipine to 10mg
5. **After 4 weeks measure BP again. If still high:** Add Chlorthalidone 12.5mg
6. **After 4 weeks measure BP again. If still high:**

PROTOCOL NO 2 AATTCC

1. **If BP is high:*** Prescribe Amlodipine 5mg
2. **After 4 weeks measure BP again. If still high:** Increase to Amlodipine 10mg
3. **After 4 weeks measure BP again. If still high:** Add Telmisartan 40mg
4. **After 4 weeks measure BP again. If still high:** Increase to Telmisartan 80mg
5. **After 4 weeks measure BP again. If still high:** Add Chlorthalidone 12.5mg
6. **After 4 weeks measure BP again. If still high:**

Consider adding drugs of other classes, preferably MRA (eg.Spironolactone)

*High BP ≥140 /90 mmHg
At every visit: Check if the patient has been taking medications regularly and correctly

LIFESTYLE MODIFICATION

- Advise all patients against tobacco and alcohol use
- Limit salt intake to <5g/day
- Use healthy oils, eat more fruits/vegetables, prefer fish/omega-3 foods such as nuts and seeds
- Physical Activity: 30 minutes daily
- Weight Management: Keep BMI <23 kg/m^2 and waist circumference: <90 cm (men) and <80 cm (women)

MONITORING OF HYPERTENSION

- BP to be measured at every clinical visit
- Evaluate for diabetes (fasting plasma glucose or HbA_{1c}) and manage accordingly
- Annual evaluations - Serum creatinine, Urine (albumin, sugar, creatinine), Lipid profile, Fundoscopy
- Additional investigations (if required)- ECG, ECHO

HYPERTENSION URGENCY

- Systolic BP ≥180 AND/OR Diastolic ≥ 120 mmHg
  AND
- No signs of acute target-organ damage

Management

- Start oral antihypertensive drugs
- Do NOT use IV medicines
- Reduce BP gradually over 24–48 hours
- Refer/admit if symptoms or organ damage suspected
- Follow-up within 1 week

RED FLAGS SIGNS

Systolic BP ≥180 AND/OR Diastolic BP ≥120

with

Symptoms of target organ damage

- Visual disturbance, dizziness, confusion, headache
- Chest pain
- Breathlessness (worse lying down/leg swelling)
- Sudden weakness, speech/ swallowing difficulty, vision problem

Management

- Stabilise ABC and refer to emergency care at higher center

ABBREVIATIONS

ACEi: Angiotensin-converting enzyme inhibitor
ARB: Angiotensin receptor blocker
BP: Blood pressure
CCB: Calcium channel blocker
FDC: Fixed-dose combination
HFrEF: Heart failure with reduced ejection fraction
HFpEF: Heart Failure with Preserved Ejection
OD: Once Daily
MRA: Mineralocorticoid Receptor Antagonist
RAAS: Renin Angiotensin-Aldosterone System

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ALL ADULTS ≥ 18 YEARS SHOULD GET BLOOD PRESSURE MEASURED AT EVERY CLINIC VISIT

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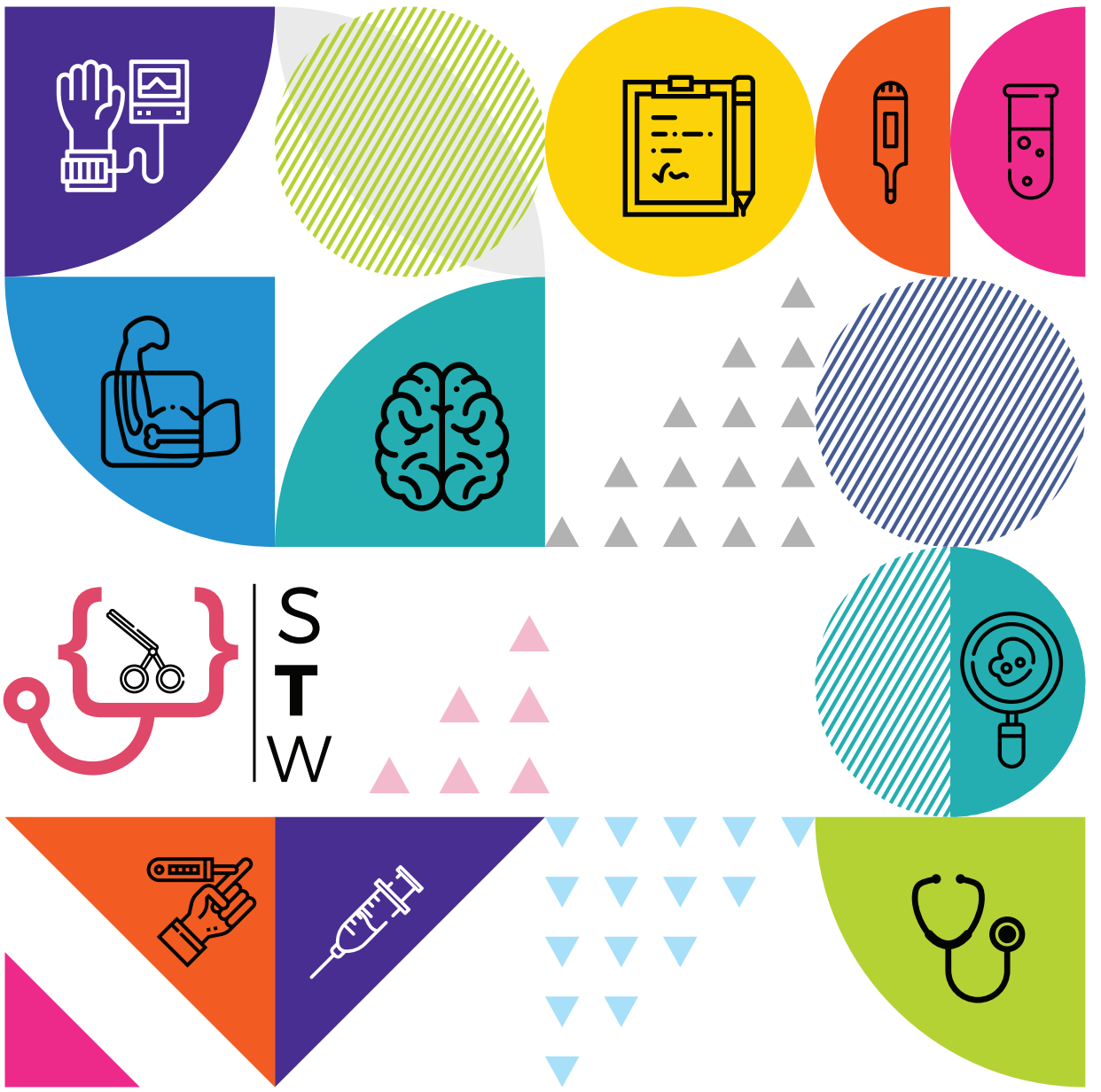
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