

# Cardiovascular Algorithms: Myocardial Infarction Management

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## Diagnosis of myocardial Infarction (MI);

1. Usually there is typical constricting, dull rest pain over the precordium of 20 min or longer duration. It may be choking, vice like or boring in quality.
2. The pain may radiate to arms, throat and be accompanied by breath lessness, sweating, nausea, vomiting and collapse.

## CATEGORY I.

(Uncomplicated myocardial infarction).

1. E.C.G may be diagnostic of myocardial infarction or may show early Hyperacute changes or may be normal and shows no arrhythmia.
2. Blood pressure may be normal, mildly increased or mildly decreased, pulse rate may be physiologic or usually there is tachycardia, but bradycardia may occur and color is ashen gray with cold sweating.
3. No congestive cardiac failure is present.

## MANAGEMENT CATEGORY I.

1. Admit in semi intensive unit or CCU if available, monitor BP, pulse rate, resp, liver size and chest crepitations at 15-30 min interval.
2. Bed rest in supine position with slight head prop if preferred.
3. Insert a large venous canula and maintain IV line with D5%W solution.

## [Sedation:—

- A. Morphia 4.0 mg IV at 10 min interval till pain is relieved or 10 mg dose (Maximum) has been given.
- B. Or pethidine 25 mg + 12.5 mg phenergan IV can be given, repeated in 15 min untill 100 mg pethidine is given.

Watch for respiratory depression.

- C. Isordil 5 mg S/L for recurrent chest pain and morphia may be repeated if pain not relieved.]
4. Humidified 100% oxygen by mask or nasal catheter at 2-4 litres/ min flow. Venturi mask should be set at 35-30% oxygen flow (if Chronic obstructive lung disease exists be careful with high concentration of O<sub>2</sub>).
  5. Draw blood for CP, ESR, SGOT, CPK, LDH, urea and blood sugar and then daily for 3 days.
  6. Keep IV open with D5W for 3 days or until in CCU.
  7. Soft diet (liquids only on day of admission).
  8. On 3rd day give propranolol 20 mg t. d. s orally. Slowly increase the dose until resting heart rate falls between 55-65/min or 120 mg/day dose is reached. Propranolol is contra indicated in: (a) Cardiac failure (b) or severe Bradycardia less than 45/min. This recommendation is optional.
  9. Bed rest. 3rd day uses toilet facilities. 5th days moves about in the room. 7th day short walks. Discharge on 10th day.

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10. Ambulation at home: same level as at point of discharge for 1st week. 2-4 week increase walks before meals 5 min increment each week. Medical check at 4 weeks then light job duties gradually to normal. Sexual activity resume between 4-8 weeks post infarction 1-2 flights may be climbed after 4 weeks.
11. Diet: Semisolid diet; normal diet after 5 days. Low cholesterol and calories.
12. Discharge: 10th day.
13. Advise on discharge.
  - a. Medication.
  - b. Activities.
  - c. Job resumption.
14. Follow up:
 

After 4 weeks; then 3 monthly.

#### CATEGORY II

Category II on Admission (M.I with mild LVF).

Clinical:-

1. Chest pain accompanied by sweating and cold extremities.
2. BP, reduced less than 90mm Hg, or Low normal or even slightly elevated.
3. Tachypnea, restlessness, apathy and lethargy.
4. Crepitations in the lungs half way up the back.
5. No arrhythmias.

#### MANAGEMENT CATEGORY II

Myocardial infarction with acute left ventricular failure of mild degree.

- A. Keep in ICU and relieve pain with morphia or Pethidine as in category I.
- B. Isordial, 1 - 2 tab (5 - 10 mg) S/L 2 hourly if needed, watch the BP.
- C. Lasix 40 - 80 mg IV, stat.

- D. Humidified 100% oxygen by mask or nasal catheter.
- E. Maintain 5DW IV, If no improvement in respiratory rate or chest crepitations. Repeat Lasix 80 mg in one hour. Most patients will settle with above regimen. If no improvement but no serious ventricular arrhythmia is present consider digitalization. Give 0.25 mg IV, stat over 10 min period repeat 0.125 mg IV, one hourly till 1.0 mg is given in 12 hours. Maintenance dose is 0.125 mg daily.
- F. If improvement is slow do arterial blood gases and correct electrolyte and acid base balance and Hypoxemia i.e.  $P_{aO_2}$  less than 80 mm Hg with higher concentration of oxygen.

#### CATEGORY III

Category III on admission severe left ventricular failure but no shock.

Recognition:- History of typical chest pain accompanied by:

- A. Respiratory distress.
- B. Dry cough or blood stained sputum. (Acute pulmonary edema).
- C. Low or high blood pressure.
- D. Lungs full of crepitations bilaterally (pulmonary edema).
- C. Low or high blood pressure.
- D. Lungs full of crepitations, bilaterally (pulmonary edema).
- E. Sinus tachycardia e.e more than 100 beats/minute.
- F. JVP may be elevated, S 3 Gallop, and Cardiomegaly may be noted.

If facilities exist insert Swan Ganz catheter in the pulmonary artery and measure pulmonary artery wedge pressure (PAW) or PA diastolic pressure. (Thermodilution catheter may be substituted so that CO and PAW pressure can both be obtained).

## MANAGEMENT CATEGORY III

1. Relief of pain as in cat I & II and establish a D5W IV lines.
2. Humidified oxygen by nasal mask.
3. Rotating limb tourniquet each 15 min in 3 of 4 limbs at one time.
4. Lasix 80 - 100 mg IV stat, repeat in 1 - 2 hours depending upon urine out put response.
5. If BP more than 90 mm Hg give S/L isosorbide dinitrate 2 tab stat and q 1 - 2 hourly. Be sure that BP remains more than 90 mm Hg.
6. Digitalize: Digoxin 0.25 mg IV stat over 10 min period repeat 0.125 mg 1 - 2 hourly till 1.0 mg total in 12 hours is given.
7. Reevaluate every 15 min, repeat Lasix, S/L isodril and Morphia for recurrent pain. If facilities exist insert Swan Ganz catheter in the pulmonary artery and monitor PAW pressure or PA diastolic (if similar to PA wedge) and cardiac out. Insert an arterial cannula in the radial artery and monitor systemic pressure. Monitor CVP through venous line if PAW is not available treat with Inotropic drugs according to the following table:—

Hemodynamics	Treatment
If CO more than 2.2L/M <sup>2</sup> PAW less than 18 mm Hg	No support.
CO less 2.2L/M <sup>2</sup> PAW less than 10 mm Hg	Volume expansion, dopamine.
CO more than 2.2L/M <sup>2</sup> PAW more than 18 mm Hg BP > 90 mm Hg.	Nitroprusside + Diuretics or Nitroglycerine I/V.
CO less than 2.2L/M <sup>2</sup> PAW more than 18 mm Hg BP less than 90 mm Hg	Dopamine 5 - 10 Ug/Kg/min Diuretics 40 - 80 mg (Lasix).
Or if CO less than 2.2L/M <sup>2</sup> PAW more than 18 mm Hg BP 90 mm Hg or more	Dopamine or Dobutrex 5 - 10 Ug/Kg/min Add Nitroglycerine when BP improves.

## REMEMBER :--

Normal CVP = 4 - 8 mm Hg

Normal PAW = 4 - 12 mm Hg

8. Do arterial blood gases;

Treat acidosis with Na Hco<sub>3</sub> ; If PH less than 7.3 or Hco<sub>3</sub> less than 18 mEq/L, Give 1 mEq/Kg stat and repeat each 20 min till PH more than 7.3. If no improvement in LVF consider Balloon counter pulsation if available. Treat Hypoxamia i.e Pao<sub>2</sub> less than 80 mm Hg with high O<sub>2</sub>. Consider mechanical ventilation If:

- A, Clinically confused and disorientated.
- B, Pao<sub>2</sub> less than 55 mm Hg inspite of O<sub>2</sub>.
- C. Paco<sub>2</sub> more than 56 mm Hg.
- D. Persistent lung rales and clinical cyanosis.

If with Acute pulmonary edema there is cardiogenic shock proceed with shock protocol.

Maintenance treatment after IV vasodilator therapy (after 24 - 72 hours).

Oral vasodilators should be tried. Oral Isorbide dinitrate 10 - 40 mg q 2 - 4 hourly.

This is particularly useful if the PAW or LAP pressure continues to be more than 18 mm Hg.

## NOTE .-

Amrinone is not yet recommended for use in Acute infarction.

Doses : Of IV vasodilators.

1. Nitroglycerine: 10 - 20 Ug/min increase by 5 - 10 Ug/min at q 5 - 10 minutes interval till hemodynamic improvement i.e drop in PAW pressure or clinical relief of chest pain and respiratory distress.

2. Nitroprusside: (Not to be used without monitoring of PA wedge and arterial pressure). 10 - 15 Ug/min increase at q 2 - 5 min interval till PAW pressure falls to less than 15 mm/Hg, keep the systolic pressure at or above 90 mm/Hg one may have to use extra volume administration.
3. Dobutrex or Dobutamine, 5 - 10 Ug/Kg/min. Calculate rate of infusion of drugs according to the equation.

$$\text{Ml/Hour} = \frac{\text{Wt in Kg} \times \text{Dose in Ug/Kg/ min} \times 60}{\text{Ug/ML (Conc of drug in the infusion)}}$$

#### CATEGORY IV.

Myocardial Infarction with shock.

- Cause
1. Hypovolemic
  2. Cardiogenic

#### 1. Hypovolemia recognition:

1. BP less than 80 mm Hg, pulse is feeble or thready.
2. Apprehensive, cold clammy extremities.
3. Tachypnea with clear lungs; no crepitations.
4. No JVP elevation (or rarely elevated in RV infarction but with clear lungs).
5. Invasive Pressure Monitoring if available:
  - a. PAW pressure less than 5 - 10 mm Hg.
  - b. CVP less than 5 - 10 mm Hg.
  - c. Systemic pressure less than 80 Hg.

#### 2. Cardiogenic shock; recognition:

1. BP less than 80 mm Hg; pulse feeble.
2. Cool and clammy skin with or without peripheral cyanosis.
3. Apprehensive or disorientated.

4. Tachypnea with lungs full of crepitations.
5. Urine output less than 20 ml/hour. Pressure Monitoring if available:
  - a. PAW pressure more than 18 mm Hg (15 - 18 mm Hg border line).
  - b. CVP more than 15 - 18 mm Hg.
  - c. Systemic pressure less than 80 mm Hg.

In summary patients in shock may be categorized as follow:—

- A. Clear lungs with PAW pressure less than 10 mm Hg. (Hypovolemia).
- B. Few basal lung crepitations with PAW pressure between 10 - 18 mm Hg (border line patient for cardiogenic shock).
- C. Lungs full of crepitations with PAW more than 20 mm Hg. Confirmatory of cardiogenic shock i.e pump failure.

#### Hypovolemic shock; Management:—

If lungs are clear or PAW pressure is less than 10 mm Hg Hypovolemia is most likely so keep flat in bed and give fluids as follows:—

If no monitoring facilities are available i.e. PAW and systemic pressures are not known. Then proceed as follows:—

Give normal saline IV fluids 200 cc In 10 min watch improvement of BP and lungs for appearance of crepitations. If Improved or no change and lungs are still clear give 20 ml saline per min till BP is normal and shock is improved. Stop if rales appear in the lungs or JVP is increased, continue maintenance rate of 1000 ml (½ saline) / 24 hours ( 40 ml/hour). If crepitations appear in the chest after original fluid challenge stop fluids and proceed as for cardiogenic shock.

If monitoring is available and PAW pressure 10 - 18 mm Hg. Give 200 ml NS in 10 min check BP urine flow, and peripheral circulation if no change and CVP or PAW pressure increases less than 2 mm Hg give 200 ml NS in 10 min if BP improved and Urine flow increased and no rales in the lungs continue at 500 ml/hour till

shock disappears or crepitations appear in the lungs. PAW pressure should remain less than 18 mm Hg during fluid challenge.

If by previously laid clinical criteria or by monitoring. PAW pressure is more than 20 mm Hg then proceed to treat as cardiogenic shock.

#### Cardiogenic shock; Recognition :-

1. BP less than 80 mm Hg, feeble theready pluse.
2. Cold clammy mottled or cyanotic periphe-ral extremities.
3. Apprehensive and disoriented.
4. Tachypnea, lungs, full of crepitations.

#### Management :-

1. Keep in CCU, keep slight head elevation of bed; if BP too low keep flat.
2. Monitor cardiac Rhythm, insert catheter in the bladder and maintain an intake out put chart.
3. If facilities exist insert Swan Ganz catheter. And arterial line.
4. Give Oxygen, and relieve pain as for other categories.
5. X - Ray, ECG and Routine blood tests.

If no PAW pressure monitoring is available. Treat as follows:-

1. Keep head elevation 30 - 40°.
2. 100% oxygen by mask or nasal catheter.
3. Relief of pain with morphia or pethidine as for other categories.
4. IV Dobutamine or dopamine 3 - 10 ug/ Kg/min.

#### Calculate rate of infusion:-

$$\text{MI/Hour} = \frac{\text{Wt in Kg} \times \text{dose in ug/ Kg/min} \times 60}{\text{ug/ml of Conc. in infusion}}$$

Add 200 mg dopamine to 500 ml DW 5% 400 ug/ml and in a 60 Kg person give 45 ml/hour as follows to administer 5 ug/Kg/min dopamine.

$$\text{MI/Hour} = \frac{5 \text{ ug/Kg/min} \times 60 \text{ Kg} \times 60}{400 \text{ ug/ml}}$$

$$= 45 \text{ ml/Hour at } 5 \text{ ug/Kg dose of Dobutrex.}$$

5. Give 40 - 80 mg Lasix stat.
6. Take arterial blood for blood gases i.e PH,  $\text{Paco}_2$  and correct acidosis, if PH less than 7.3 or  $\text{Hco}_3$  less tha 14 mEq/Kg, with 1m Eq/Kg of  $\text{NaHCO}_3$  as stat dose repeat in 20 min till PH is more than 7.3
7. If no arrhythmia is present give digoxin IV as for category III.
8. Insert urinary catheter and maintain intake out put.

Evaluation, every 10 min - 15 min interval.

1. BP
2. Peripheral circulation.
3. Lungs for crepitations.
4. Urinary out put.

If no change in clinical condition, repeat lasix 80 - 100 mg;; increase dose of dopamine up to 20 ug/Kg min.

Check blood gases and correct acidosis (PH less than 7.3 or  $\text{Hco}_3$  less than 12 mEq/L) with Na  $\text{Hco}_3$ . Evaluate need for mechanical ventilation if clinically tired and disoriented or  $\text{Paco}_2$  more than 55 mm Hg  $\text{Pao}_2$  less than 60 mm Hg.

Cardiac out put and monitoring of PAW pressure if available then treat according to the table.

A. Co more than 2.2L/min/M <sup>2</sup> PAW pressure less than 16 - 18 mm Hg.	No treatment
B. Co less than 2.2L/M <sup>2</sup> PAW pressure less than 10 mm Hg.	Give volume + dopamine 2 - 5 ug/Kg/min or dobutamine 3 - 10 ug/Kg increased. to 20 - 50 ug/Kg min dobutamine.
C. Co more than 2.2L/min/M <sup>2</sup> PAW pressure more than 18 mm Hg.	Nitro prusside + frusamide as Nitroglycerine.
D. Co less than 2.2L min/M <sup>2</sup> PAW pressure more than 18 mm Hg BP less than 90 mm Hg.	Dopamine 2 - 5 mg/Kg min diuretics, digitalise.
E. Co less than 2.2L/M <sup>2</sup> PAW pressure more than 18 mm Hg BP more than 90 mm Hg.	Nitroprusside or Nitroglycerine. Digoxin + diuretics

Note:— If cardiac out put is not available use PAW and BP pressure as a guide to the therapy.

If c. o. remain low and signs of shock are present consider balloon counter pulsation if available.

Note:—

A. Dobutrex or Dopamine can be combined with Nitroprusside or Nitroglycerine. Once BP is stabilised with Dopamine.

B. If Hypotension is unresponsive to the above Norepinephrine (levophed) 2 - 8 ug/min should be tried or Isuprel added in 0.1 - 0.5 ug/ Kg/min dose.

Management of low cardiac out put (Hypotensive state) with Invasive Monitoring.

Hypotension; BP less than 80 mm Hg.

Cold peripheral extremities, feeble thready pulse.

Check and correct the following:—

1. HR less than 60/min try IV atropine before artial pacing. And correct electrolyte imbalance or Hypoxemia and acidosis.
2. Preload-Hypovolemia PAW 7-15 mm Hg, BP normal or reduced.
3. Monitor, CVP, PAW and systemic pressure.

Mean PAW mm Hg	SP mean mm Hg	Cardiac out put L/M <sup>2</sup>			
		2.0	2.0-2.25	2.25-3.0	3.0
< 7	N	VE	VE	NT	NT if urine O.K.
7 - 14	N	VE	VE	NT or D	NT or D
> 15 - 19	Decreased	VE	D	NT, or D	NT, or D
> 15 - 19	Increased or normal	Diuretic, D or NP	Diuretic, D	D	NT, or Diuretic, or oral dilators.
> 20	Increased	Diuretic, D + NP	Diuretics, D + NP	Diuretics NP	NT, or Diuretic or NP
> 20	Decreased	D Diuretics	D Diuretics	D or oral dilator	NP or oral dilators

PAW	=	Mean Pulmonary artery wedge pressure.
SP	=	Systemic blood pressure.
CI	=	Cardiac Index
VE	=	Volume Expansion.
I	=	Isuprel.
D	=	Dobutamine, or dopamine.
NP	=	Nitroprusside.
NT	=	No treatment.

## Note :-

If cause of shock is not myocardial infarction Isuprel can be used where dobutrex or Dopamine are suggested.

### ARRHYTHMIA WITH MYOCARDIAL INFARCTION

#### 1. Tachyarrhythmia:-

##### SUPRA VENTRICULAR TACHYCARDIA;

If blood pressure is normal and not affected by MI. Use Isoptin (verapamil) 5.0 mg IV over 2 - 3 min period, repeat after 10 min. If no response give digoxin IV 0.125 mg stat then 0.125 mg every 30 - 60 min till 1 mg. Over drive atrial pacing if available. (Note verapamil interferes with the excretion of Digoxin and may cause Hypotension or A-V block). If BP is low or unrecordable do cardioversion with 1 - 2 joules/Kg energy does.

#### 2. Atrial extra systoles :-

If more than 6 beats per min or bigeminous or trigeminous Rhythm, treat the primary cause.

#### 3. Paroxysmal atrial fibrillation :-

- Digitalise as for Myocardial Infarction and failure.
- Counter shock if BP is reduced.

#### 4. Paroxysmal atrial flutter :-

- Digoxin if stable BP.
- Counter shock if BP is reduced to less than 90 mm Hg with evidence of low output state.

#### 5. Paroxysmal atrial tachycardia :-

Uncommon; use verapamil or digitalise.

#### 6. A. V Junctional beats :-

Junctional tachycardia; give verapamil or digoxin.

#### 7. Ventricular Tachyarrhythmias :-

Ventricular extrasystoles.

##### A. Isolated - no treatment.

- Greater than 5 beats per min or in groups or multifocal or R on T phenomenon, Give Lidocain 50 mg IV State repeat in 5 min. If adequate response use. IV maintenance for 48-72 hours at 2-4 mg/min; add 100 MI of 2% plain lidocain in 900 MI D5W give one MI (2mg)/min or 60 ml hour; double the dose for larger patients. If no response give procaineamide IV, 100 mg IV at each 5 min till 1 G at a rate of 25-50 mg/min then maintenance 4-6 mg/min infusion. Check BP at each 5 min before each dose. Oral dose is 50 mg/Kg/day or 250 - 500 mg QID. If no response, give propranolol 0.5-2.0 mg IV in 5 to 10 min every 2-3 hours. Or if digoxin toxicity is suspected give; Phenytoin sodium 50 mg slowly I/V each 15 min till 200 mg; give 1000 mg in 24 hours then use oral maintenance dose of 100 mg q hourly if response is noted.

#### Ventricular Tachycardia

- No significant change in BP; try Lidocine 75 mg repeat in 5 min then IV maintenance.
- If BP drops do immediate chest thump, and electrical cardioversion if available give 60-120 joules anergy dose; given IV lidocaine; maintenance quinidine or procaine amide for 3 weeks to 3 months.
- Ventricular fibrillation D/C counter shock with 400 W/S.

Late ventricular premature contractions at 2-3 weeks post M I try :-

Propranolol oral 40-80 mg daily, 10-20 mg QID.

or

Procaine amide oral 250-500 mg QID.

or

Phenyton sodium oral 100 mg tds (if evidence of digoxin toxicity).

Bradycardia in acute myocardial infarction ;

1. Sinus bradycardia: No effect on BP, needs no treatment. If BP is reduced or HR is less than 50 per minute and there is clinical deterioration too, leg raise at 45° with patient in supine position. Give Atropine 1.0 mg IV q 4-8 hours upto 48 hours. Insert a temporary pacemaker.
2. Wandering pacemaker :- No treatment is needed.
3. S.A block : If pause greater than 2 beats and clinical deterioration do temporary pacing.
4. Slow junctional rhythm : No treatment is required.
5. Complete AV block : Start Isuperl 2 mg/1000 MI infusion at 60-80 ml/hour and Insert a temporary pacemaker.
6. Wenkebach : 1st degree block; no treatment is required.
7. Mobitz type II : Keep pacemaker in readiness.
8. Bifasicular or trifasicular block : Insert temporary pacemaker.

Note :-

Newer antiarrhythmic drugs are becoming available, appropriate drug substitutions should be considered in unresponsive arrhythmias.

Prevention of thromboembolic episodes following M.I

High risk patients :-

1. Persistent chest pain.
2. Presence of shock.
3. Occurrence of LV failure.
4. Tachyarrhythmias.

Pericarditis is a contra indication to anti-coagulants. Give low dose Heparin (3,000 to 5,000 units S/C 8 hourly continue till amlulation). When pain free do leg excercises and deep breathing excercises

Sequelae of Acute Myocardial Infarction

Most patients recover from acute myocardial infarction without any sequelae but some may suffer from temporary or permanent disability.

Temporary Sequelae. Cardiac:-

1. Arrhythmia, cardiac failure and chest pains, at rest or on effort, are very common post infarction: Usually subside during hospitalization but may need treatment for longer period.
2. Mitral regurgitation due to ischaemic papillary muscle dysfunction: If papillary muscle had not infarcted improvement usually follows:

Non Cardiac:-

1. Weakness and debility: This persists for varying periods of time even after full ambulation and is sometimes psychological.
2. Transient Ischaemic episodes of central nervous system: These result usually from mural LV thrombus; And need anticoagulation treatment.

3. Deterioration of preexisting conditions such as renal failure, which improves with improvement in cardiac output.
4. Atelectasis and orthostatic pneumonia.
5. Deep vein thrombosis and pulmonary embolism.

#### Permanent Sequelae. Cardiac:--

1. Considerable recovery occurs in most patients and they return to pre infarction level of exercise tolerance. However, there remains a sizeable group of patients who have enough cardiac muscle damage and residual left ventricular dysfunction so as to be disabled or functionally limited for the rest of their life. It is therefore important to establish the safe limits of effort tolerance for each person after the patient is stable and fully ambulated, by objective means such as stress testing.
2. Arrhythmias: Premature ventricular and atrial extrasystoles are very common during post infarction period and if infrequent need no treatment. Repetitive ventricular arrhythmias complex PVC's or runs of ventricular Tachycardia require long term suppression with antiarrhythmic drugs. Ideally arrhythmias should be looked for on 24 hour holter monitoring. The effectiveness of suppression with treatment should be documented by holter monitoring and the drug dose should be regulated by blood levels.
3. Cardiac failure and ventricular aneurysm: The continuation of commonly present left ventricular failure after the recovery phase is due to loss of considerable L.V

muscle mass or development of left ventricular aneurysm. A 2-D Echocardiogram and if necessary cardiac catheterization should be done to confirm these possibilities.

4. Chest pains and angina: Continuing chest pains after infarction may be pericardial in origin or due to residual ischaemic muscle. These two types of pains have to be diagnosed and treated accordingly. If persistent angina is present, stress testing and possible coronary angiography may be needed.
5. Acquired ventricular septal defect due to septal rupture. It produces severe hemodynamic disturbances and will need surgical closure, preferably when the patient has been stabilized after six weeks of the onset of myocardial infarction.
6. Mitral regurgitation due to infarction of papillary muscle: If severe or due to rupture of chordae tendinae of papillary muscle, may require surgical repair. When the patient is hemodynamically unstable and in left ventricular failure, he should be managed medically and surgery is undertaken when six weeks or more have lapsed following acute infarction.

#### Non Cardiac:--

1. Neurologic: Hemiplegia with resultant permanent disability may occur from embolism from left ventricular mural thrombus.
2. Psychological trauma: A certain amount of permanent psychological trauma and confidence crisis occurs in most patients with myocardial infarction and may occasionally require psychotherapy.