Postgraduate Institute of Medical Education and Research (PGIMER)

National Institute of Nursing Education, Chandigarh

HEART FAILURE EDUCATIONAL GUIDEBOOK

PREFACE

This booklet is for heart failure patients. It contains information about heart failure, its signs and symptoms, causes, early detection of complications, prevention and management of heart failure.

It also contains information regarding heart failure related cognitive impairment, its causes, effects, early signs and symptoms, prevention and management.

This booklet also provides information on cognitive exercises, physical exercises and dietary modifications to enhance cognitive abilities.

INDEX OF HEART FAILURE BOOKLET

How does the normal heart work?

The normal healthy heart is a strong, muscular pump a little larger than a fist. It pumps blood continuously through the circulatory system.

The heart has four chambers, two on the right and two on the left:

- Two upper chambers called atria (one is called an atrium)
- Two lower chambers called ventricles

Oxygen-rich blood travels from the lungs to the left atrium. The left side of the heart pumps oxygen-rich blood to all parts of the body.

The right side of the heart receives deoxygenated blood from the rest of the body.

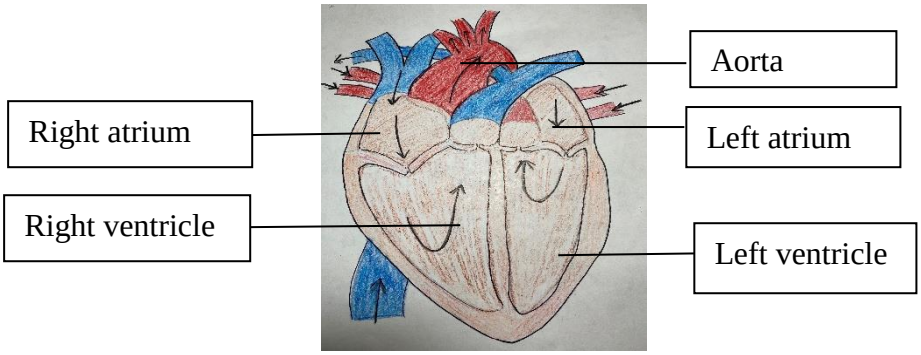


Fig 1: Human heart

Heart failure:

Heart failure (HF) is a chronic, progressive condition in which the heart muscle is unable to pump enough blood to meet the body's needs for blood and oxygen. Basically, the heart can't keep up with its workload.

Types of Heart Failure:

1. Left-sided heart failure

- **Heart failure with reduced ejection fraction (HFrEF), also called systolic failure:** The left ventricle loses its ability to contract normally. The heart can't pump with enough force to push enough blood into circulation.
- **Heart failure with preserved ejection fraction (HFpEF), also called diastolic failure:** The left ventricle loses its ability to relax normally (because the muscle has become stiff). The heart can't properly fill with blood during the resting period between each beat.

2. Right-sided heart failure

Right-sided heart failure usually occurs as a result of left-sided failure.

The right ventricle pumps blood to the lungs for oxygenation. When the right side loses pumping power, blood backs up in the body's veins. This usually causes swelling or congestion in the legs, ankles and swelling within the abdomen such as the GI tract and liver (causing ascites).

3. Congestive heart failure

Sometimes fluid collects in the lungs and interferes with breathing, causing shortness of breath, especially when a person is lying down. It causes respiratory distress.

Working capacity of heart (ejection fraction) and severity of HF

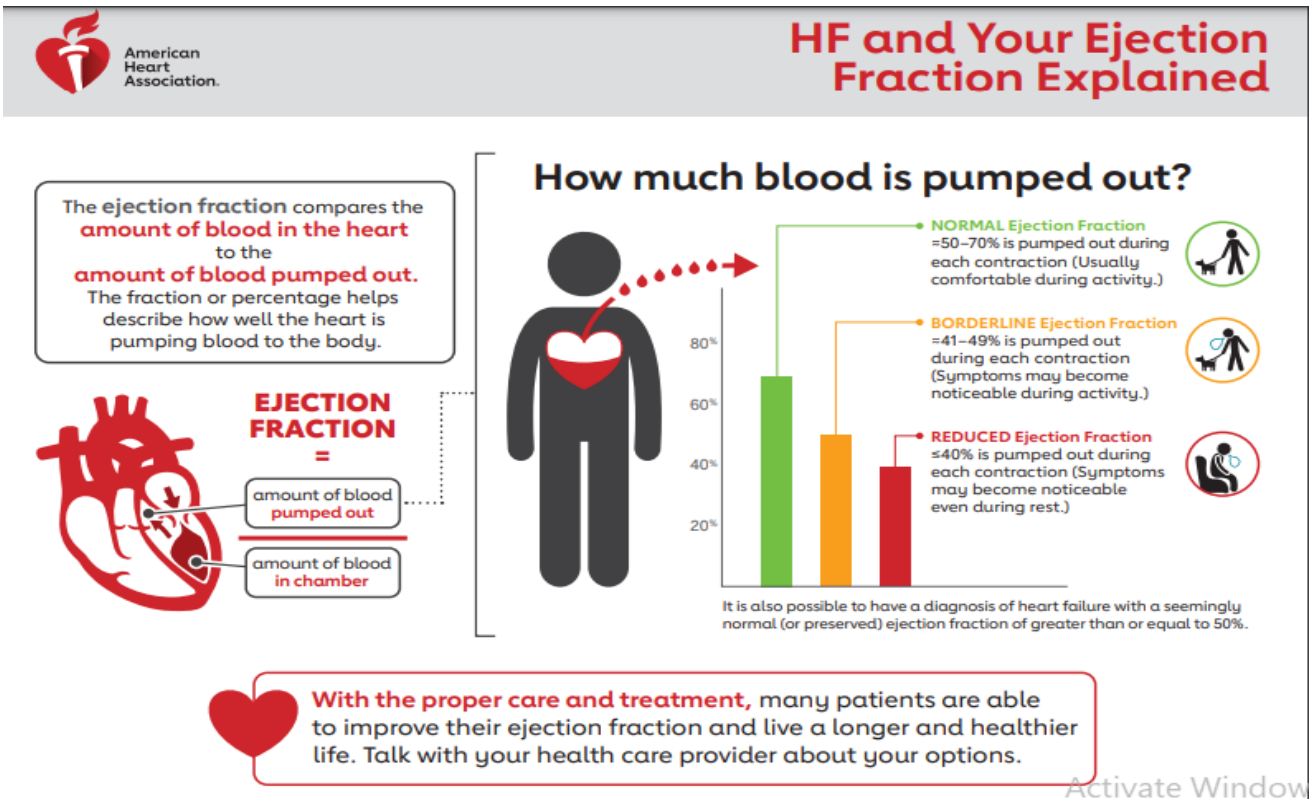


Fig 2: Working capacity of heart (ejection fraction)

S.No.	Ejection fraction(EF)	Severity of heart failure
1.	≤ 40%	**Severe HF**: Severe symptoms may become noticeable even during rest
2.	41-49%	**HF with mildly reduced EF:** Symptoms may become noticeable during activity
3.	50-70%	**HF with normal EF:** usually comfortable during activity

Table 1: Working capacity of heart (ejection fraction)

CAUSES OF HEART FAILURE

i. Coronary artery disease and heart attack
ii. Past heart attack (myocardial infarction)
iii. Chronic hypertension
iv. Valvular heart diseases
v. Heart muscle disease (cardiomyopathy, myocarditis)
vi. Heart defects present at birth (congenital heart disease)

RISK FACTORS OF HEART FAILURE

- Diabetes
- Obesity
- Severe anemia
- Abnormal heart rhythm (arrhythmia)

Signs and symptoms:

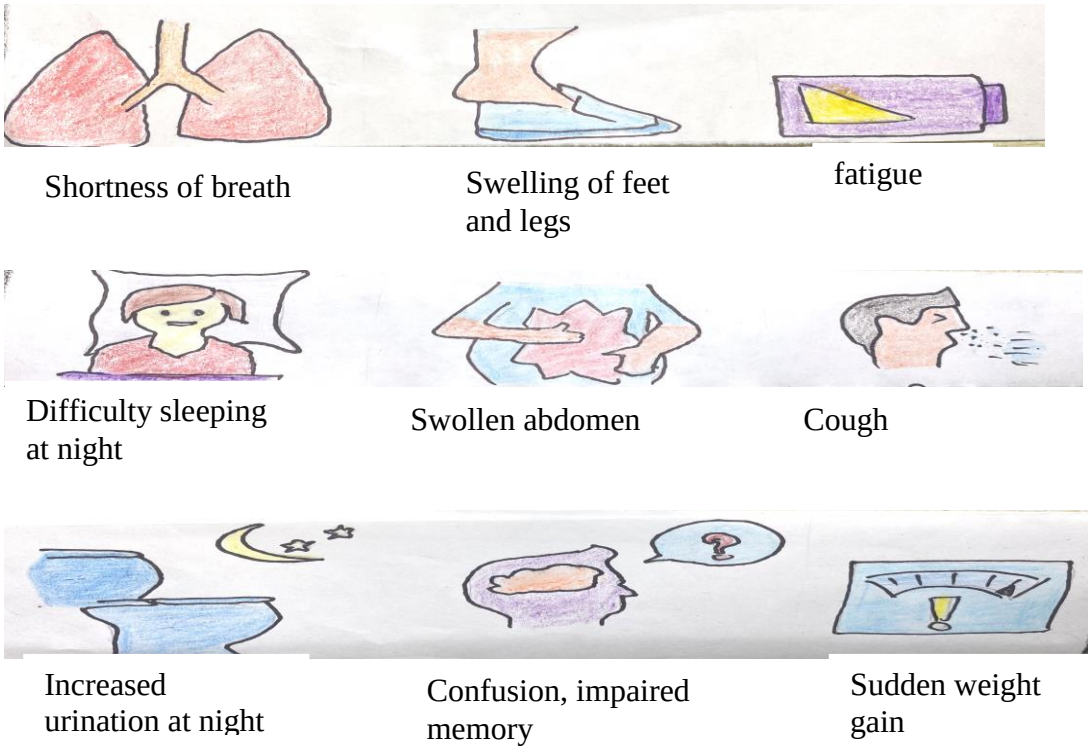


Fig 3: Signs and symptoms of heart failure

Effect of heart failure on cognitive functions

In heart failure, blood supply to brain decreases that leads to impairment in cognitive functions like-

1. Memory

Ability to register, storage and recall of information get affected.

2. Attention

It interferes with the skill to focus selectively on a stimulus.

3. Executive functions

Capacity of verbal reasoning, problem solving, planning and execution of work get reduced.

4. Language

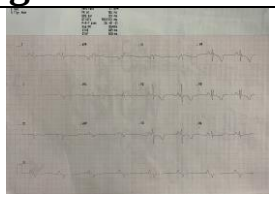
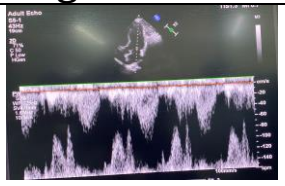
It affects verbal expression, speech production and language perception, reading and writing ability of patient.

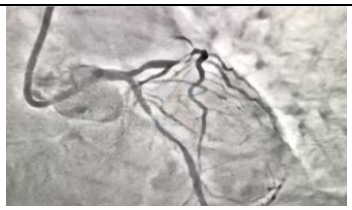
5. Visuospatial and constructional function

Ability of correct identification of objects in the surrounding environment and of their spatial relation get disturbed.

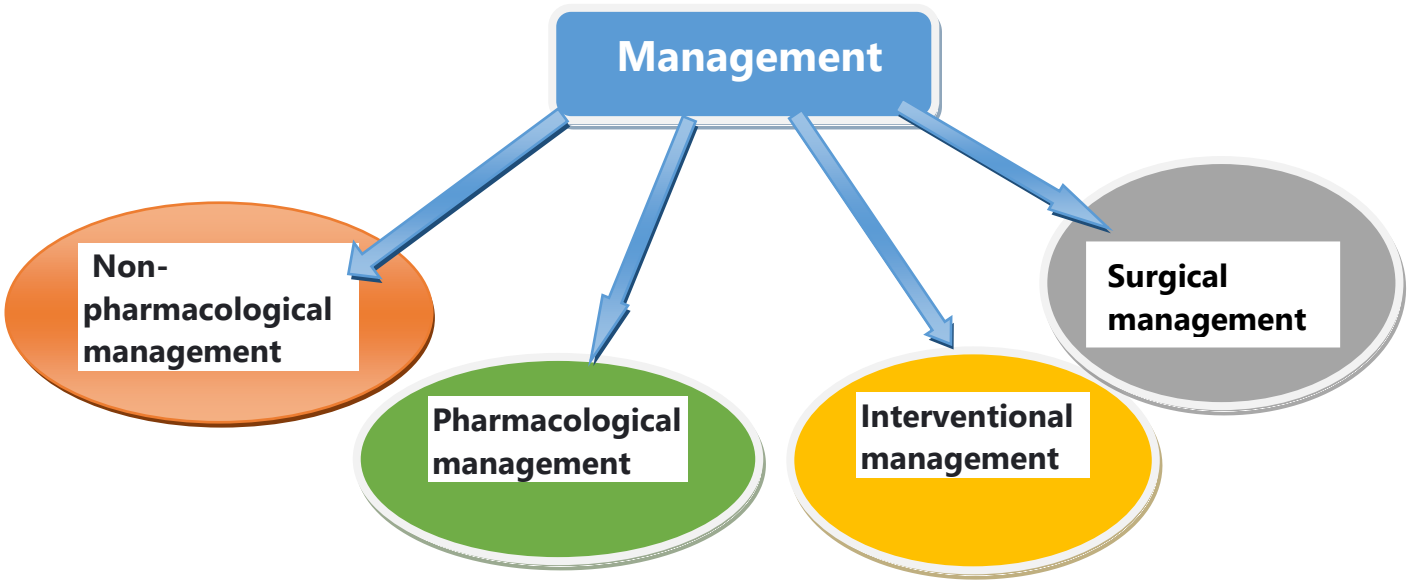
DIAGNOSTIC TESTS IN HEART FAILURE

You can be asked to undergo following tests-

Blood tests Blood tests check the levels of complete blood count, biochemistry (sodium and potassium), clotting factors, albumin, sugar, fat, cholesterol level, creatinine (which is connected with kidney function) and cardiac biomarkers, which can help diagnose heart failure and predict outcomes.	 **Fig 4: Blood test**
Chest X-rays Chest X-rays are done to see the heart size and lung congestion	 **Fig 5: Chest X-ray**
Electrocardiogram (EKG or ECG) EKG is a simple, painless test that detects and records the heart's electrical activity. It is done to diagnose heart attack and rhythm abnormalities.	 **Fig 6: ECG**
Echocardiography (echo) Echocardiography uses sound waves to create a moving picture of your heart. The test provides information about the size and shape of your heart and how well your heart chambers and valves are working.	 **Fig7: Echocardiography**

Exercise stress test During exercise stress test, you exercise to make your heart work hard and beat fast while heart tests are done. It shows how your heart responds to the stress of exercise.	 **Fig 8: Exercise stress test**
Coronary angiography and Cardiac catheterization Doctors may recommend coronary angiography if other tests or factors suggest that you may have coronary heart disease (CHD). This test uses dye and special X- ray to look inside your coronary arteries to detect any blockage.	 **Fig 9: Coronary angiography**
Magnetic resonance imaging (MRI) An MRI can show your heart's structure (muscle, valves and chambers) as well as how well blood flows through your heart and major vessels.	

HEART FAILURE MANAGEMENT:



I. NON-PHARMACOLOGICAL MANAGEMENT

A. Exercises to enhance cognitive functions

Attention

1. Beading

A set of colored beads will be given to the patient and he has to thread the beads in a specified order varied from random to easy and difficult pattern sequencing.

Week 1	सारे लाल मोती - सारे हरे मोती - सारे पीले मोती - सारे गुलाबी मोती - सारे नीले मोती
Week 2	एक लाल मोती - एक लाल मोती - एक पीला मोती - एक नीला मोती - एक नीला मोती
Week 3	एक पीला मोती - एक हरा मोती - एक नीला मोती - एक लाल मोती - एक पीला मोती
Week 4	एक पीला मोती - एक हरा मोती - एक गुलाबी मोती - एक नीला मोती - एक लाल मोती - एक पीला मोती

2. Number Cancellation

A worksheet with randomly arranged numbers will be given. The patient has to cancel one given target number.

2

9 4 2 8 5 7 8 2 9 5 8 5 2 9 7 2 2 5 4 7 9 4 5 4 8 2 9 4 8 7 4 2
9 8 4 7 9 5 2 9 7 8 5 2 8 9 4 7 8 4 5 7 2 8 4 9 7 5 2 5 4 8 7 4
5 7 9 2 5 8 4 9 7 2 5 4 8 7 2 4 5 7 9 7 5 4 4 2 9 5 4 7 2 8 9 7

8

0 8 3 3 0 9 9 8 5 0 3 3 6 9 3 8 5 9 0 5 6 8 9 5 3 8 0 6 3 3 8 5 0 3
3 0 9 6 3 8 5 0 9 5 6 8 0 8 6 3 0 8 3 9 8 0 6 9 0 3 8 9 6 5 3 9 8 6
9 8 3 5 8 0 3 0 6 9 5 5 3 5 0 9 8 5 5 6 0 3 8 9 3 5 9 3 6 5 6 8 9 8

8 & 3

5 9 0 9 8 5 3 0 8 6 9 5 6 6 9 5 6 9 8 5 0 5 3 0 9 6 9 0 9 6 3 9 5 0
3 6 5 5 0 9 8 3 0 5 8 6 5 0 6 3 5 8 9 6 9 0 9 0 3 8 0 6 0 5 9 8 9 3
9 8 8 6 5 0 9 5 8 6 3 0 9 9 3 8 5 8 5 6 5 9 9 3 8 9 3 0 9 8 9 3 0 5

3. Serial 7s:

Subtract 3 from 50, and then keep subtracting 3 from your answer up to 5 times. The subject must perform a mental calculation, therefore, (s)he may not use his/her fingers nor a pencil and paper to execute the task.

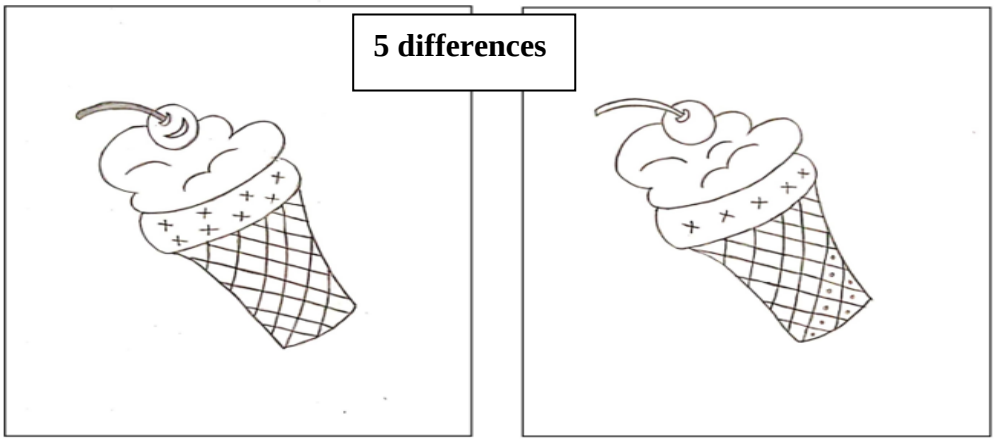
Subtract 7 from 100, and then, keep subtracting 7 from your answer up to 5 times.

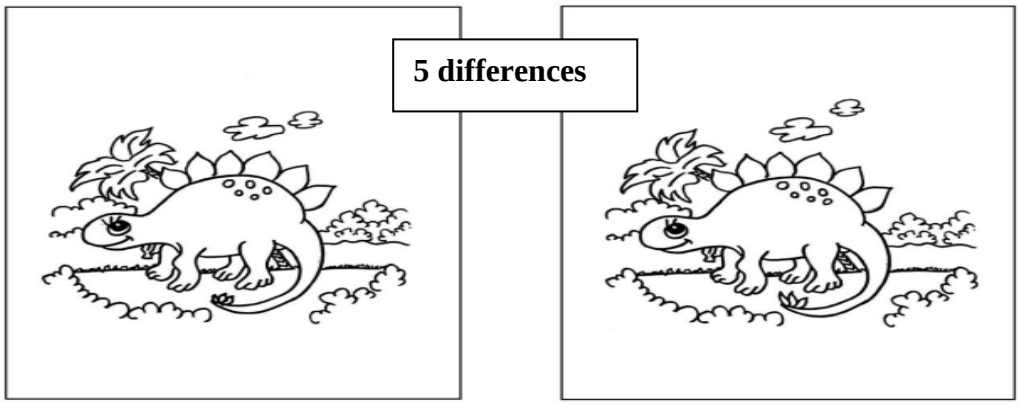
[ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65

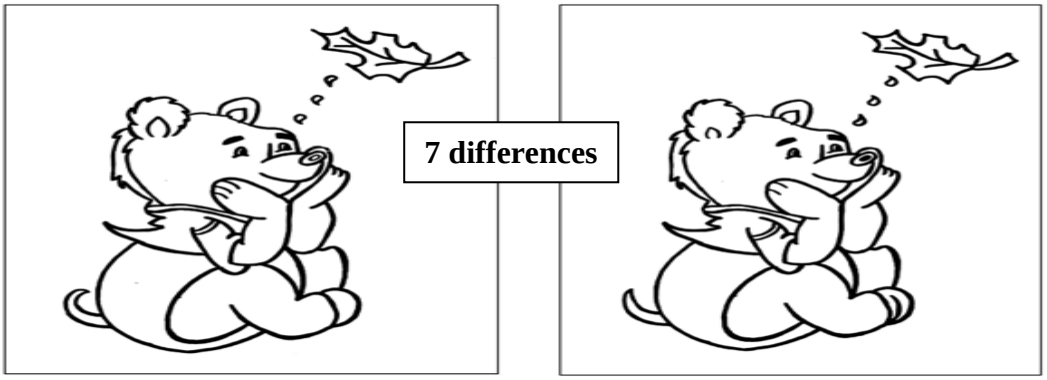
4. Spot the difference

To identify the differences between 2 similar looking pictures. The difficulty level is varied by increasing the number of differences to be identified and the complexity of changes.

5 differences
7 differences
10 differences







EXECUTIVE FUNCTIONS

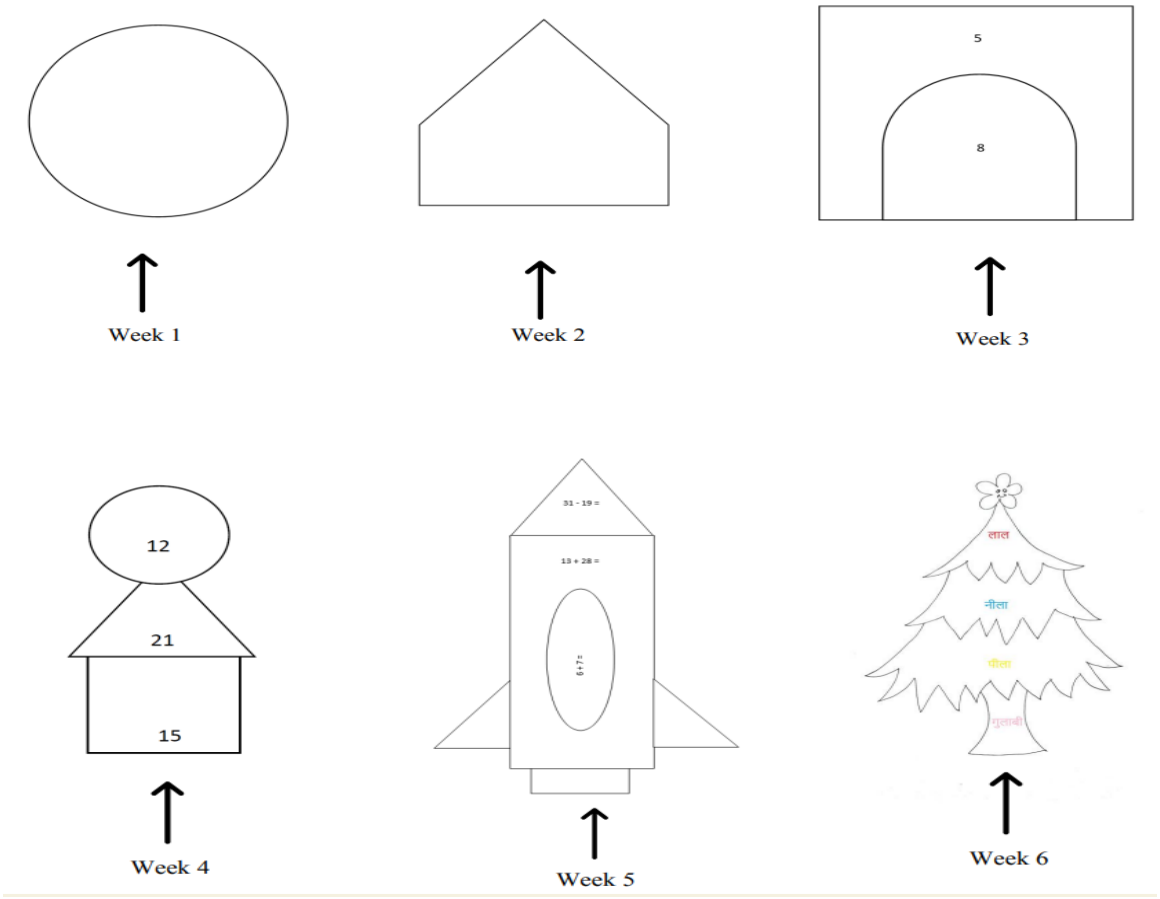
1. Letter - Number Cancellation

A worksheet with the randomly arranged number and letter combinations will be given to the patient. The task is to cancel all 7's within the sheet. However, the patient has to circle the 7 when the number comes before the symbol and cancel the 7 when the symbol comes before the number.

»1	‡3	3#	7#	⊟4	1»	3#	#3	#3	▯1	9⊟	»9	‡4	⊟7	‡3	3#
7⇔	1»	»7	3#	»8	‡8	9⊟	7⊟	1»	9⊟	3#	⇔7	3#	‡1	7#	⇔8
9⊟	‡9	1»	»9	9⊟	7#	⇔3	1»	▯3	#7	1»	7⇔	#4	9⊟	1»	3#

2. Coloring

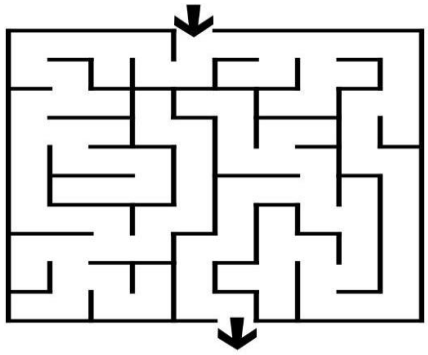
The patient has to color inside the boundary of a given shape using linear strokes (unidirectional coloring). He will be instructed to color inside the boundary and in same direction. The complexity of the task will be increased gradually by introducing objects made with two, three and multiple shapes.



3. Maze

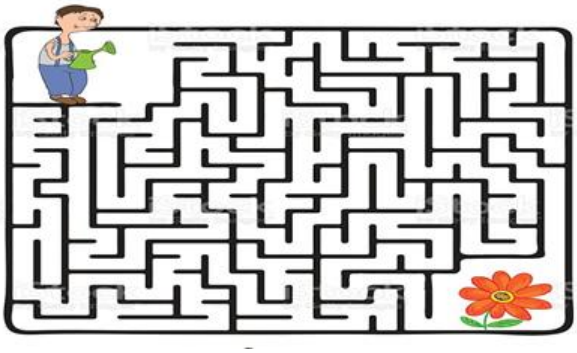
The patient has to trace the path on a given maze from point A to point B. Taking a wrong path, coming outside the boundary and reaching a blind alley will be considered errors. A different maze will be used every day.

a. Find the way out.



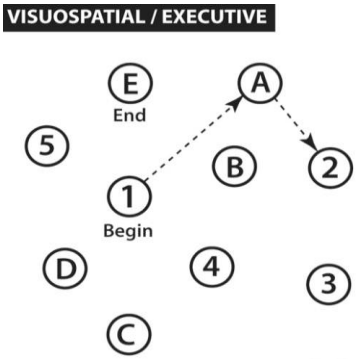
b. Help the kids to reach their home.

c. Help the women to reach the flower for watering.

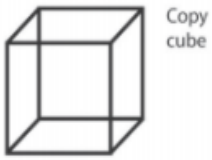


4. Trail making

Draw a line going from a number to a letter in ascending order. Begin here [point to (1)] and draw a line from 1 then to A then to 2 and so on. End here [point to (E)].



5. Visuoconstructional Skills (Copy cube):
Copy this drawing as accurately as you can.

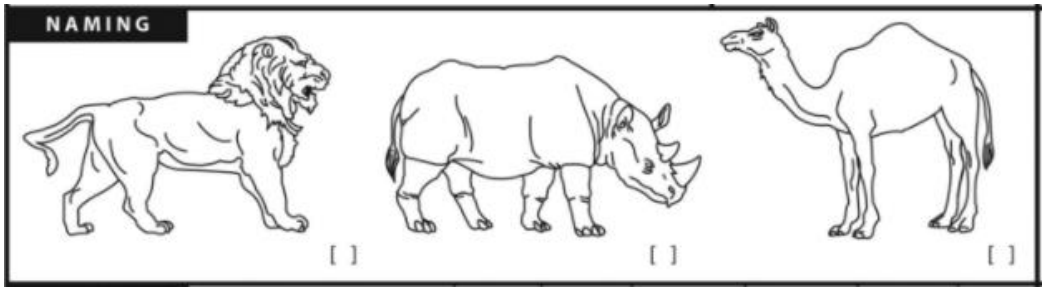


6. Draw Clock (Five past ten)
"Draw a clock. Put in all the numbers and set the time to 5 past 10."

7. Abstraction:
What is common in each pair of words:
Orange - banana
Train – bicycle
Watch- ruler

MEMORY

1. Naming
Tell the name of these animals.



2. Sentence repetition:

I am going to read you a sentence. Repeat it after me, exactly as I say it.

1. Ram got up from the chair, opened the door and went to the market.
2. Laid the patient on the table, looked at him, prescribed the medicine and asked him to come tomorrow.
3. There was no water at Mohan's house, he picked up the bucket. Went to the tap, filled water and came back.

3. Verbal fluency:

Tell as many words as you can think of that begin with the letter B. You will stop after one minute. Proper nouns, numbers, and different forms of a verb are not permitted.

4. Orientation:

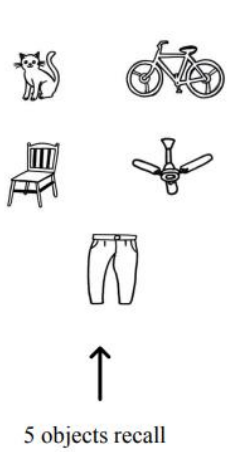
Tell me today's date.

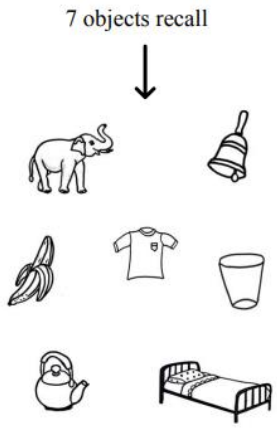
Tell me the year, month, and day of the week.

Now, tell me the name of this place, and which city it is in.

5. Visual Recall

The patient will be shown images of object one by one and is asked to name and describe its properties (color, shape, size, uses etc.). After this he will be asked to recall the images he has just seen. In case of errors a second recall will be taken using cueing method (descriptive properties). The third trial will be a recognition trial. On day 1, five images will be given and on subsequent days a mix of new and old images will be given and number will also be increased by 1 (Increasing from 5 to 10).





B. Lifestyle modification

❖ Physical exercises for heart failure patients

Tips for exercising safely while living with heart failure:

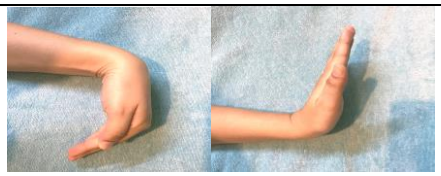
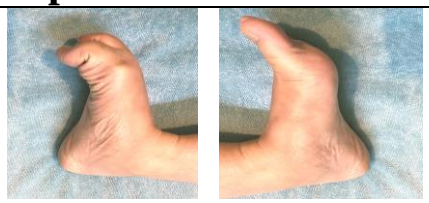
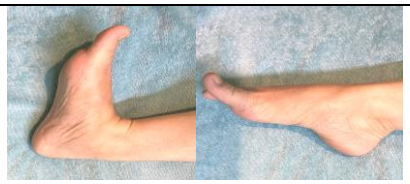
Do's	Don'ts
• Exercise before the meal. • Exercise when you have the most energy. For most people with heart failure, that is in the morning. • Perform regular exercises for 20-30 minutes per day. It can be divided into 15 minutes exercises in the morning and 15 minutes in the evening. • Exercise with a friend or family member. It's easier to stay with it when you have a partner, and it can be an enjoyable social time.	• Avoid exercises that require or encourage holding your breath, such as pushups, swimming, weight lifting. • Don't exercise if you are sick or have a fever. • Avoid exercising outdoors in extreme weather or high humidity.

Getting started on an exercise plan

1. **WARM-UP EXERCISES**

   Take a lying position on a firm surface. Perform any 2 exercises alternating. Each can be repeated 10-15 times.

Grip exercises: Take a small towel. Make a roll with it. Press and release the roll as you hold the grip and release something.	 **Fig 10: Grip exercises**

Wrist flexion and extension exercises: Keep your elbows and hands straight palms facing the ground. Perform upward and downward movements of hands by bending at the wrist joint.	 **Fig 11: Wrist flexion and extension exercises**
Pronation and supination of hands: Keep your elbows and hands straight palms facing the ground. Now alternate the position of hands in which palms face the sky and the backside of the hand faces the ground.	 **Fig 12: Pronation and supination of hands**
Flexion and extension of the toes: **Flexion:** curl the toe joints of each foot downward. **Extension:** straighten the toes of each foot.	 **Fig 13: Flexion and extension of the toes**
Ankle pumps: Keep your legs straight with your feet in the upright position. Now move your feet downward and upward at the level of ankle joints. You will feel a stretch over the calf muscles (muscle of backside of lower legs).	 **Fig 14: Ankle pumps**

2. BREATHING EXERCISES:

All breathing exercises performed in sitting position. So, Sit quietly on a firm surface.

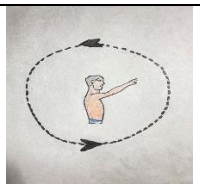
(Each can be repeated 4-5 times)

Deep inspiratory and expiratory exercises: • Take a deep and long breath from the nose. • At the peak of inspiration, relax by blowing the air through your mouth.	
Pursed-Lip Breathing • Take a deep breath through the nose with the mouth closed, allowing the chest and abdomen to expand.	

• Hold the breath for a count of 5. • Exhale slowly through pursed lips, as though whistling or blowing out a candle, making exhalation twice as long as inhalation.	
Diaphragmatic Breathing • Place one hand on the abdomen, the other on the chest. • Inhale, concentrating on pushing the abdominal hand outward while the chest hand remains still. • Exhale slowly, while the abdominal hand moves inward and the chest hand remains still.	 **Fig 15: Diaphragmatic Breathing**

3. RANGE OF MOTION EXERCISES

Take standing position for Range of motion exercises. (Each can be repeated 10-15 times)

Shoulder abduction: Move each arm laterally from a resting position at the sides to a side position above the head. Palm of the hand either towards or away from the head.	 **Fig 16: Shoulder abduction**
Shoulder adduction: Move each arm from a position at the sides across the front of the body as far as possible. The elbow may be straight or bent.	 **Fig 17: Shoulder adduction**
Circumduction: Move each arm forward, up, back and down in a full circle.	 **Fig 18: Circumduction**

Elbow-Hinge Joint **Flexion:** Bring each lower arm forward and upward so that the hand is at the shoulder. **Extension:** Bring each lower arm forward and downward, straightening the arm.	 **Fig 19: Elbow-Hinge Joint flexion and extension**

4. WALKING

- Start walking slowly on a safe surface.
- Wear comfortable footwear for walking.
- Prefer walking over grass rather than walking on hard pavement.
- Try to achieve the target of walk i.e. 15-20 minutes of normal walk.
- If you find it difficult to walk due to any reason, stop in between and relax.

5. COOL DOWN

After the exercise, sit quietly and relax. Lie down after getting relaxed.

***guidelines for sexual activity**

Many people with heart failure can still be sexually active. Choose a time when you're feeling rested and free from the day's stresses.

❖ Dietary guidelines for healthy heart

Dietary modification is an essential part of heart failure treatment. Limiting salt, fluid and saturated fat intake can improve heart failure symptoms.

1. Control your portion size

How much you eat is just as important as what you eat.

- Use a small plate or bowl to help control your portions.
- Eat more low-calorie, nutrient-rich foods, such as fruits and vegetables

2. Consume fruits and vegetables: choose a wide variety

- Fruits and vegetables should be consumed whole rather than as juice.

fruits and vegetables to choose	
• All vegetables like Brinjal, bitter gourd, beans, carrot etc. • Fruits like Guava, pears, oranges, date dried, apple, peaches, raspberries etc.  **Fig 20: Fruits and vegetables**	• If you are taking warfarin tablet, consume green leafy vegetables daily in a fixed amount like Methi, palak, bathua, cabbage etc.

2. Select whole grains

Grain products to choose	**Grain products to avoid**
• Whole-wheat flour • Whole-grain bread • Wheat bran • Cornflakes • Mixed flour (wheat, ragi, barley, grams) • Whole grains such as brown rice, barley • Porridge • Whole-grain pasta • Oatmeal	• White, refined flour • White bread • Biscuits • Cakes • Muffins • Doughnuts

4. High fiber intake

Above mentioned fruits, vegetables and whole grains are good sources of fiber that play a role in regulating blood pressure, bowel function and satiety.

5. Limit unhealthy fats

Fats to choose	Fats to avoid
• Low-fat dairy products, such as skim or low-fat (1%) milk, yogurt and cottage cheese • Vegetable oils like Mustard oil, soya oil, sunflower oil, groundnut oil, olive oil • Nuts (almonds, peanuts, walnuts) • Flaxseed • lean meat • Skinless poultry	• Full-fat milk • Cheese • Butter and cream • Ghee, dalda and other hydrogenated oils • Fast foods • Red meat (i.e. beef, pork, lamb) • processed meat (i.e. bacon, sausages, salami) • Fried meat

***Avoid the use of products that contains trans-fat like cookies, cake, pastries, chips, samosa, etc.**

6. Choose healthy sources of protein- mostly from plants

Proteins to choose
• Legumes- beans, peas and lentils • Soybeans and soya products such as soya chunks and tofu • Egg white • Fish, especially fatty, cold-water fish, such as salmon, mackerel and herring

*** Low fat content should be kept in mind while considering the protein sources.**

7. Reduce the salt (sodium) in your food

- Healthy adults have no more than about a teaspoon of salt (2,300 milligrams of sodium) per day.
- Salt intake can be reduced to ½ teaspoon (1,500 mg of sodium) based on the severity of disease symptoms.

Things to be done	Thing to avoid
• Use of herbs and spices to add flavor (pepper, cloves, dalchini, illaichi) • Make your own soups • Person's taste buds can adjust to a low salt diet over a period of 2-3 months. • Choose products with lower sodium content.	• Table salt • Canned and processed foods, such as soups, baked goods and frozen dinners. • ketchup, pickles, mayonnaise and soy sauce • Restaurant meal

8. Fluid intake

Fluid restrictions can be considered in decompensated heart failure to reduce the severity of the disease condition.
Minimize intake of beverages and foods with added sugars like sugar syrups, concentrated fruit juice etc.
Urine output need to measure for early detection of fluid overload.

DIET CHART

Low sodium and low-calorie diet Calories= 1450 Kcal Fat = 22 gms Sodium = 210 mg Protein = 58 gm
Early morning 1 cup water+ ½ nimbu Or 1 cup water+ 1 teaspoon of dry amla powder Or 1 cup lemon tea (Tea plain + nimbu)
Breakfast Skimmed milk = 1 cup (200 gm) Sugar= 1 tsp Dalia/ Muesli/ Oats= 1 cup (30 gm raw) Or mixed cereal chapati = 30 gm (wheat + chana flour) Skimmed curd= 200 gm or

Multigrain bread= 2 pieces White part of boiled egg/ paneer= 1or 2/25gm Tea 1 cup+ sugar = 1 tsp(5gm)
Mid-morning Fresh fruit = 1 piece/ Lassi= 1 glass or Sprouted moong daal/ black Chane/ Poha= 1 cup (25 gm daal+ 150 gm vegetables)
Lunch Salad= 150 gm Chapatti= 2 (30 gm each) or rice= quarter plate (60 gm) Vegetable curry = 150 gm Skimmed curd= 1 cup (200 gm) Cooking oil= 1 tsp.
Evening tea Tea- 1 cup sugar= 1 tsp roasted Chana/ high fiber biscuits= 30 gm/ 2
Dinner Vegetable soup= 1 cup, Chapati = 2 or Rice = 60 gm, Vegetable curry= 1 katori Daal=1 katori 30 gm Paneer= 50 gm or chicken/ fish= 100gm (once in week) Cooking oil = 15 grams/ per day or 500 ml per month Desi ghee= ¼ tsp per day

❖ Stress management

➢ Meditation

- Take 10 to 15 minutes a day to sit quietly and perform meditation.
- When you get angry, count to 10 before responding to help reduce your stress.

Fig21: Meditation

➢ Getting adequate rest/sleep

- Take 7-8 hours' sleep per day.
- To improve your sleep at night, use pillows to prop up your head.
- Avoid naps and big meals right before bedtime.

Seeking support

- Seek help from family members, friends or health professionals.
- Join a support group for people with heart failure and other heart conditions.

❖ Others

- Avoid alcohol
- **Quit smoking**

  Each puff of nicotine from tobacco smoke temporarily increases heart rate and blood pressure, even as less oxygen-rich blood circulates through the body. Smoking also leads to clumping or stickiness in the blood vessels feeding the heart.

C. Self-check plan

➢ **Symptoms to track for early interventions**

- **Shortness of breath** and any worsening in your ability to do your regular activities.
- **Palpitations:** You may feel like your heart is racing or throbbing.
- **Sudden weight gain:** when you notice a weight gain of more than 0.9 -1.3 kg in a 24-hour period or more than 2.2 kg in a week, consult your doctor.
- **Edema** from fluids collecting in your body – most often in the ankles, lower legs and feet – and especially if you notice any increase in swelling.
- **Blood pressure** < 90/60 mm of Hg or BP > 140/90 mm of Hg on 2 reading taken at an interval of 6 hours.
- **Confusion or impaired thinking**: Changes in the makeup of your blood, such as the amount of sodium (too much) or oxygen (too little), can result in confusion or changes to your mental state.
- You may have some memory loss or worsening symptoms of depression or sadness, which may be related to changes in your body's ability to compensate for the heart failure.

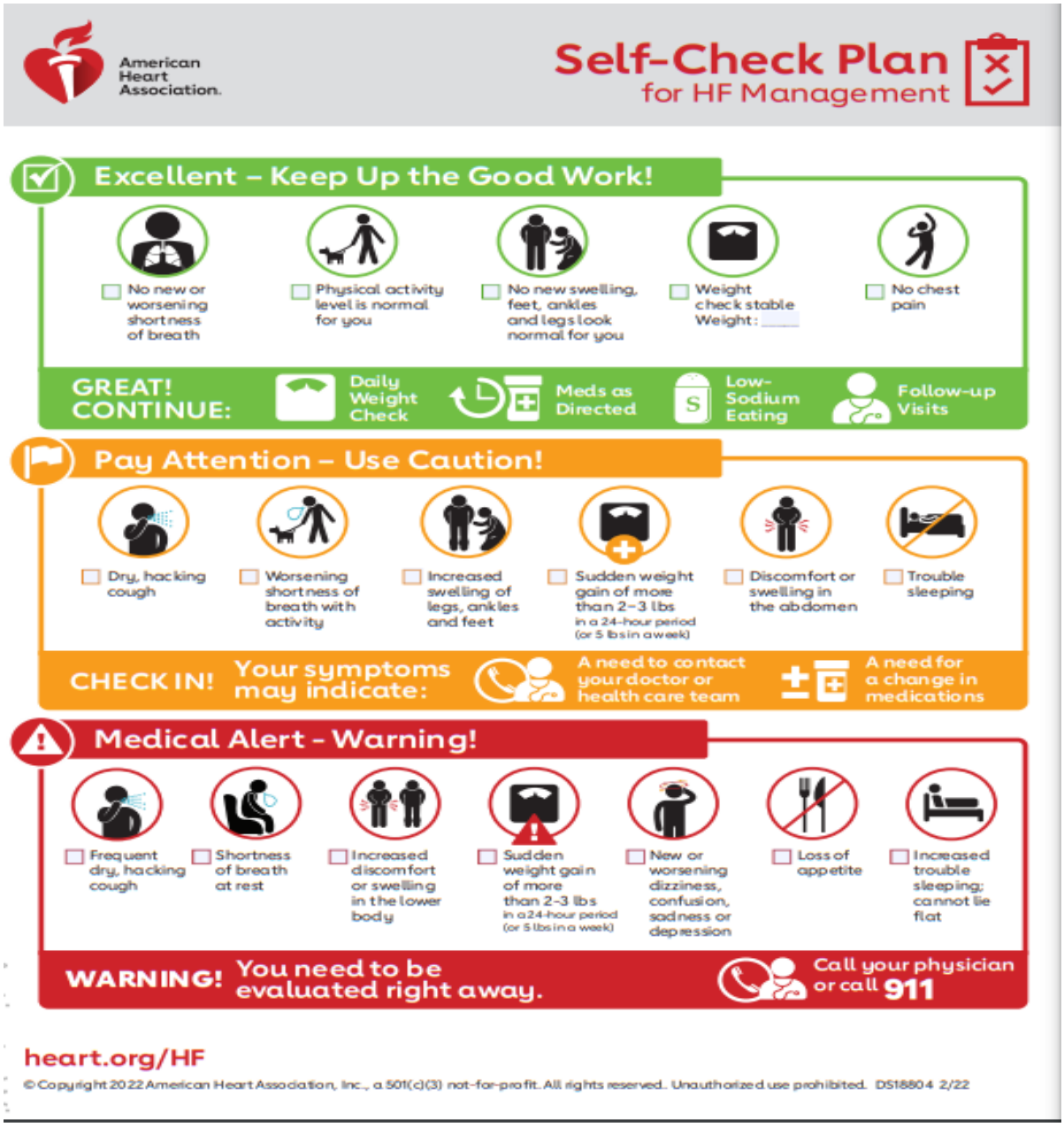


Fig 22: Self-check plan

- Self-check plan will be recorded in diary for health professional reference.

Daily Diary for recording the symptoms/ activities

You have to note symptoms/ activities every day and write them date wise except for weight monitoring. Weight should be monitored once a week only (in the morning time, after urinating and before breakfast). If you find yourself unable to monitor and write these things in the diary, take help of family members who can do it for you.

Symptoms/ Parameters/ Activities	Day	Salt restriction	Liquid intake	24 hr Urine output	Weight	Dyspnea on Rest/exertion	Cough Yes/No	Pedal edema Yes/No	Duration of brisk walk Yes/No
WEEK 1	1								
	2								
	3								
	4								
	5								
	6								
	7								
WEEK 2	8								
	9								
	10								
	11								
	12								
	13								
	14								
WEEK 3	15								
	16								
	17								
	18								
	19								
	20								
	21								
WEEK 4	22								
	23								
	24								
	25								
	26								
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	28								
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	31								

II. PHARMACOLOGICAL MANAGEMENT

Various medications used in heart failure to maintain adequate heart function. It includes-

- blood thinners (Anticoagulants)
- heart rate controlling drugs
- Cholesterol-lowering drugs (statins)
- Diuretics
- Blood pressure lowering agents
- Sugar control drugs and insulin in case of diabetes.

Medications adherence is very essential to improve heart function, reduce hospitalization risk and increase survival.

Medication compliance chart

In this chart you have to write number of tablets taken daily along with time. Also mention the reason if you forgot to take tablet.

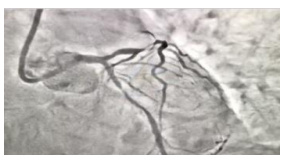
S.No.	Date	Time	No. of tablets taken	Reason for not taking tablet

III. INTERVENTIONAL MANAGEMENT

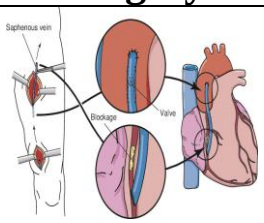
Devices and procedures to treat heart failure

S.No.	Device	Heart condition
1.	Implantable cardioverter defibrillator (ICD)  **Fig 23: ICD**	serious arrhythmias (irregular heartbeats)
2.	Cardiac Resynchronization Therapy (CRT)	abnormal conduction of the heart's electrical system
3.	Left ventricular assist device (LVAD)  **Fig 24: Left ventricular assist device**	end-stage heart failure patients when heart transplantation isn't an option.

HF correction done according to underlying pathology

S.No.	Condition	Procedure
1	Acute coronary syndrome	Percutaneous coronary intervention (PCI, also referred to as angioplasty)  **Fig 25: Coronary angioplasty**

SURGICAL PROCEDURES FOR HEART FAILURE

S.No.	Disease condition	Surgery
1.	Triple vessel disease	 **Fig 26: Coronary artery bypass**
2.	Valvular heart diseases	 **Fig 27: Valve replacement**

Heart transplantation

In end-stage heart failure patients when no other treatment modality is effective, heart transplant is last resort of choice.
Surgeons replace the damaged heart with a healthy one from a donor who has been declared brain dead.
But due to scarcity of donors, the number of patients who receive heart transplants is still relatively low.

https://www.onlymyhealth.com/all-you-need-to-know-about-a-heart-transplant

Fig 28: Heart transplant

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