CARE

[Cardiac Arrest and Resuscitation]

My choice of topic for my biology project came from the impact on life of the COVID-19 pandemic that was felt by everyone.
Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus., that has claimed 1.4 lakh lives in Maharashtra since 2020 alone.
The WHO formally declared the novel coronavirus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) outbreak a pandemic on 11 March 2020 with the publication of public health guidelines to guide the pandemic response. Serious illness may need hospitalisation and ventilatory support. To reduce the risk of person-to-person viral transmission during the COVID-19 pandemic, the Indian government introduced various measures including 'lockdown' on 23 March 2020 with 'social distancing' and 'self-isolation' strategies and recommended shielding of at-risk individuals.

I read and watched as doctors and healthcare workers responded to a global health crisis—trying to protect individuals, families, and communities in adverse situations with stretched resources, shortage of personal protective equipment (PPE) and other equipment and I also heard first-hand accounts from my mother, a healthcare professional, of the fear, anxiety and panic as people overflowed in hospital wards seeking urgent care.

Constraints of time, space, infrastructure, access to doctors, caused a lot of lives being lost to non-covid related lives.

A clear reduction of emergency room visits and hospitalizations for non-COVID-19 patients during the first months of the pandemic in wide and populated areas, such as Mumbai and Pune and a significant increase in non-COVID-19 out-of-hospital deaths due to neoplasms, cardiovascular and endocrine systems' diseases particularly during the lockdown weeks, was something that I became aware of.

This led me to research what a non-medical person like myself could do should a family member need cardiovascular emergency support. Doctors were fraught with logistical and ethical angst in the use of CPR, which is an aerosol producing procedure, while they saw their patients dying in isolation away from loved ones. My project is my research in medical emergencies, mainly of the cardiovascular system, and the learning and use of BLS.

Number and percentage change of all-cause mortality (overall and cause-specific), in-hospital and out-of-hospital mortality (overall and cause-specific), year 2020 compared to 2019.

	2020 (n)				Change from previous year (%)				Incidence Rate Ratio [95% CI]			
	Flu Period	Pre-lockdown	Lock-down	Post-lockdown	Flu Period	Pre-lockdown	Lock-down	Post-lockdown	Flu Period	Pre-lockdown	Lock-down	Post-lockdown
Diseases of the circulatory system	915	161	650	229	-14.2%	-4.7%	15.5%	-16.7%	0.860 [a] [0.787–0.939]	0.953 [0.768–1.182]	1.154 [a] [1.031–1.291]	0.833 [a] [0.699–0.993]
Diseases of the respiratory system	325	49	218	60	-11.2%	-29.0%	19.8%	-26.8%	0.888 [0.765–1.031]	0.710 [0.493–1.024]	1.197 [0.984–1.458]	0.732 [0.525–1.021]
Injury, poisoning and certain other consequences of external causes	120	24	77	35	-8.4%	9.1%	-2.5%	-16.7%	0.916 [0.715–1.173]	1.091 [0.612–1.945]	0.975 [0.712–1.334]	0.833 [0.532–1.305]
Out-of-hospital overall mortality	1,176	222	975	314	-9.2%	12.1%	43.2%	-12.5%	0.909 [a] [0.841–0.983]	1.121 [0.926–1.357]	1.428 [a] [1.295 a 1.574]	0.875 [0.752–1.018]

[a] $p<0.05$

[b] Causes of deaths that accounted for ≤0.5% of the total (ICD-10-CM categories D50-89, H00-95, L00-99, M00-99, O00-9A, P00-96, Q00-99, R00-99, V00-Y99, Z00-99) were included in Other.

[https://www.ncbi.nlm.nih.gov/pmc/articles]

Life threatening medical emergencies/ a brief overview

In all medical emergencies Assessment of the airway, breathing and circulation should be done immediately. CPR may be needed.

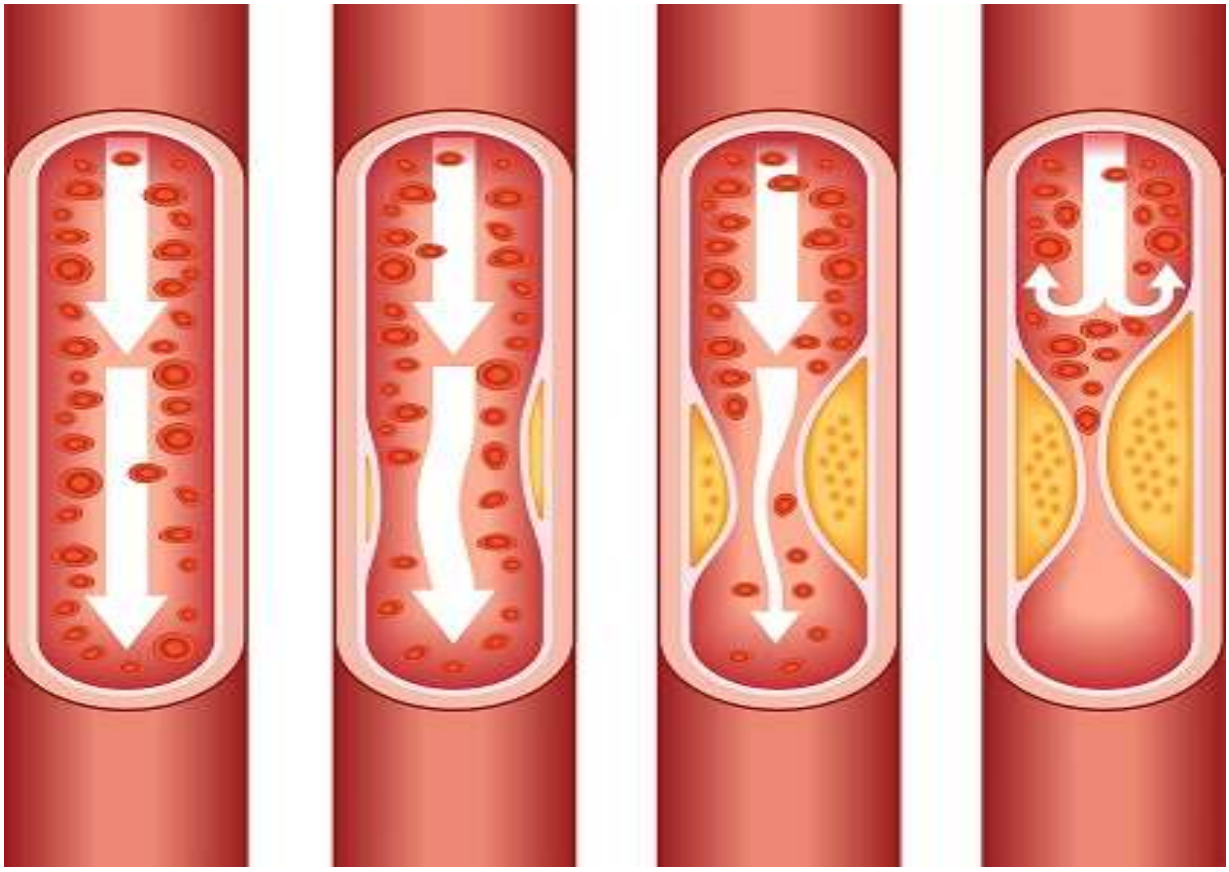
Cardiovascular diseases (CVDs) are the leading cause of death globally, taking an estimated 17.9 million lives each year. Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels. They include:

- coronary heart disease – a disease of the blood vessels supplying the heart muscle.
- cerebrovascular disease – a disease of the blood vessels supplying the brain.
- peripheral arterial disease – a disease of blood vessels supplying the arms and legs.
- rheumatic heart disease – damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria.
- congenital heart disease – birth defects that affect the normal development and functioning of the heart caused by malformations of the heart structure from birth; and
- deep vein thrombosis and pulmonary embolism – blood clots in the leg veins, which can dislodge and move to the heart and lungs. Heart attacks and strokes are usually acute events and are mainly caused by a blockage that prevents blood from flowing to the heart or brain. The most common reason for this is a build-up of fatty deposits on the inner walls of the blood vessels that supply the heart or brain. Strokes can be caused by bleeding from a blood vessel in the brain or from blood clots. More than four out of five CVD deaths are due to **heart attacks** and **strokes**, and one third of these deaths occur prematurely in people under 70 years of age. Coronary heart disease is the most common type of heart disease, killing 382,820 people in 2020.[2]About **20.1 million adults** aged 20 and older have CAD (about 7.2%).[2]In 2020, about 2 in 10 deaths from CAD happen in adults less than 65 years old.

Anaphylaxis is a serious allergic reaction that is rapid in onset and may cause death. It has been estimated to be fatal in 0.7 to 2 percent of cases. In humans, fatal anaphylaxis is difficult to study because it is rare, unpredictable, and often unwitnessed. The annual incidence of fatal anaphylaxis is not known precisely, although available estimates are less than one per million in the population. Cardiovascular manifestations of anaphylaxis include **hypotension and shock, cardiac arrhythmias, ventricular dysfunction, and cardiac arrest**

Drowning is the 3rd leading cause of unintentional injury death worldwide, accounting for 7% of all injury-related deaths. There are an estimated 236,000 annual drowning deaths worldwide. Fatal and nonfatal drowning typically begins with a period of panic, loss of the normal breathing pattern, breath-holding, air hunger, and a struggle by the victim to stay above the water. Reflex inspiratory efforts eventually occur, leading to hypoxemia by means of either aspiration or reflex laryngospasm that occurs when water contacts the lower respiratory tract. Hypoxemia in turn affects every organ system, with the major component of morbidity and mortality being related to cerebral hypoxia **Drowning may result in an acute asphyxia cardiac arrest**, which emanates from hypoxemia that precedes the development of ischemia. This scenario results from initial cessation of gas exchange followed by worsening hypoxia and eventual cardiac arrest. Rescue and immediate resuscitation by bystanders improve the outcome of drowning victim. The need for cardiopulmonary resuscitation (CPR) is determined as soon as possible without compromising the safety of the rescuer or delaying the removal of the victim from the water.

A heart attack or stroke may be the first sign of underlying disease



As plaque builds up in the arteries of a person with heart disease, the inside of the arteries begins to narrow, which lessens or blocks blood. Plaque can also rupture (break open). When it does, a blood clot can form on the plaque, blocking the flow of blood.

Sudden cardiac arrest (SCA) is an important public health challenge. Despite a dramatic decrease in the age-adjusted risk of sudden cardiac death, the cumulative number of fatal SCA cases in the United States remains large. Estimates range from <170 000 fatal SCA cases per year to >450 000; a figure in the range of 300 000 to 370 000 per year is likely the best current estimate.[1] SCA seems to account for ≈50% of all cardiovascular deaths, and it is estimated that 50% of the SCAs are the first clinical expression of previously undiagnosed heart disease. Most out-of-hospital cardiac arrests (80%) occur in private homes or other living facilities. Electric mechanisms associated with SCA are broadly classified into tachyarrhythmia [VF] and non tachyarrhythmic categories, the latter including pulseless electric activity (PEA, formerly referred to as electromechanical dissociation), asystole, extreme bradycardia, and other mechanisms, often associated with noncardiac factors.

The modern treatment of cardiac arrest is an increasingly complex medical procedure with a rapidly changing array of therapeutic approaches designed to restore life to victims of sudden death. The 2 primary goals of providing artificial circulation and defibrillation to halt ventricular fibrillation remain of paramount importance for saving lives. The evolution of artificial circulation includes efforts to optimize **manual cardiopulmonary resuscitation**, external mechanical cardiopulmonary resuscitation devices designed to augment circulation, and internal devices such as pacemakers.

The first or electric phase of cardiac arrest lasts for ≈5 minutes and is characterized by the need for rapid defibrillation as the top priority. Indeed, survival rates for out of hospital cardiac arrest can exceed 60% for patients within this early electric phase. The second or circulatory phase of cardiac arrest lasts from ≈5 to 10 minutes after initiation of VF. It appears during this circulatory phase that the best therapy is to first give a brief period of vigorous chest compressions (between 100 and 300, the exact duration is not really known), followed by defibrillation. This implies that during this phase **the immediate treatment of VF [tachyarrhythmia] is not traditional defibrillation first, but rather chest compression first. The concept is that the initial vigorous chest compressions provide blood flow to the myocardium that improve the chances of successful defibrillation and long-term survival.**

There is no single unifying definition for PEA. The common denominator is the presence of spontaneous organized cardiac electric activity, in the absence of blood flow sufficient to maintain consciousness, and the absence of rapid spontaneous return of circulation PEA is thus defined as a syndrome characterized by the absence of a palpable pulse in an unconscious patient with organized electric activity other than ventricular tachyarrhythmia on ECG.

Causes: Defining the pathobiology and management of PEA has been limited by the lack of clinically relevant laboratory models.

In autopsy studies, ≈50% of cases of PEA may be ascribed to a primary cardiac event.

One third of patients resuscitated from cardiac arrest caused by PEA undergo intervention for acute coronary occlusion and myocardial infarction, suggesting acute ischemia.

Management: immediate reperfusion is the best treatment approach to shorter periods of ischemia. To treat the complex metabolic dysfunction and high lethality of prolonged cardiac arrest, newer protocols are being developed that work well with proven therapies, such as **early CPR**, defibrillation, and intervention for coronary artery blockage. The use of cardiopulmonary bypass with the ability to produce nearly normal levels of blood flow is a logical **extension of CPR** is useful in specific emergency situations.

Conclusion: improved survival rates from Cardiac Arrest depend on **early CPR**

‘India will see highest cardiac deaths by 2030’

Every fourth death could occur due to cardiovascular disease (CVD)

CORONARY HEART DISEASE

Heart Attack [Acute Myocardial Infarction]

Acute myocardial infarctions are one of the leading causes of death in the developed world, with prevalence approaching three million people worldwide.
Researchers at the Smidt Heart Institute found during a new data analysis that deaths from heart attacks rose significantly during recent pandemic surges, including the COVID-19 Omicron surges, overall reversing the pre-pandemic heart health period.
Infections such as the flu can increase the risk for heart disease and heart attack, however a significant nearly 30% rise was seen in ages 25 to 44.
pathophysiology:
Myocardial infarction is defined as sudden ischemic death of myocardial tissue.
This is usually due to thrombotic occlusion of a coronary vessel caused by rupture of a vulnerable plaque formed on the inside of the coronary artery. [atherosclerotic plaque]
Ischemia induces profound disturbances and injury in the affected myocardium and causes rapid depression of systolic function.
This leads to cardiac arrest.

Causes

1. The main cause is **reduced coronary blood flow** resulting in oxygen supply failing to meet oxygen demand and resulting injury to heart muscle and function.

    Risk factors include:

    i. Non modifiable

        1. Age
        2. Family history

    ii. Modifiable

        1. Smoking
        2. Diabetes
        3. Hypertension
        4. Triglyceride levels
        5. Obesity
        6. Sedentary lifestyle
        7. Poor oral hygiene
        8. Presence of peripheral vascular disease

2. Trauma
3. Drug use (cocaine)
4. Coronary artery anomalies
5. Excess demands on the heart [hyperthyroidism, anaemia]

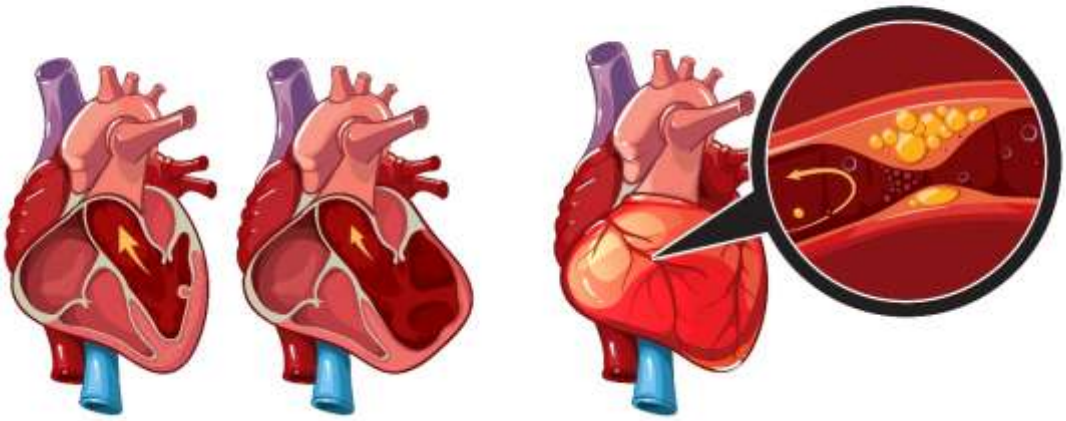
Symptoms of heart attack:

- Light headedness
- Anxiety
- Cough
- Choking sensation
- Excessive sweating
- Wheezing
- Irregular heart rate
- Fever along with other symptoms is not uncommon
- Neck veins may be distended
- Extremities may show oedema or cyanosis and will be cold

Management of AMI

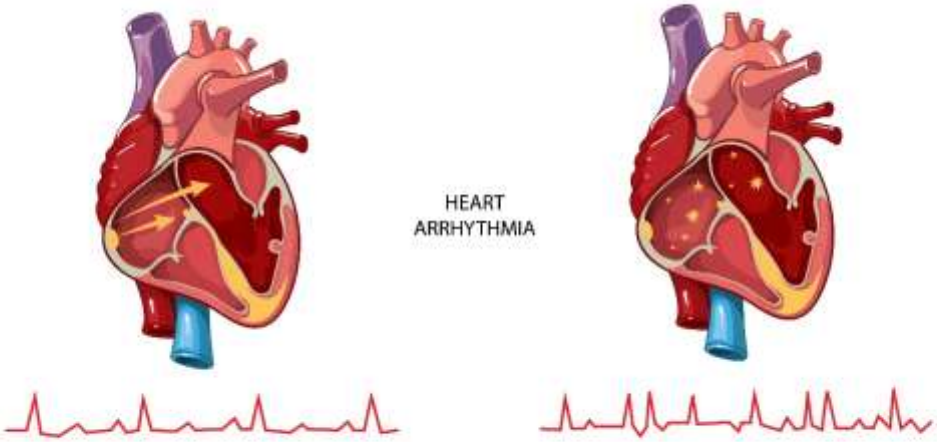
Sudden cardiac arrest (SCA) is one of the most perilous complications of acute myocardial infarction (AMI)
Providing immediate cardiopulmonary resuscitation (CPR) for a patient with SCA is crucial, prior to other life saving measures undertaken in a hospital by specialists, such as ECG, Angiogram to identify and treat coronary artery blockages and emergency medications like aspirin, nitroglycerin, blood thinners, and other specific medication.
Acute myocardial infarction continues to have high mortality out of the hospital. Data indicate that at least one-third of patients die before coming to the hospital, and another 40%-50% are dead upon arrival. Another 5%-10% of patients will die within the first 12 months after their myocardial infarction. Readmission is common in about 50% of patients within the first 12 months after the initial MI. The overall prognosis depends on the ejection fraction, age, and other associated comorbidity.
The best prognosis is in patients with early and successful reperfusion including CPR or mechanical chest compression devices. [LUCAS device]

HEART TROUBLE



ANEURYSM OF LEFT VENTRICLE

MYOCARDIAL INFARCTION



NORMAL HEART

HEART
ARRHYTHMIA

VIBRATING ARRHYTHMIA


Heart Attack Signs
Chest Pain
Vomiting
Sweating
Dizziness

CEREBROVASCULAR DISEASE

'cerebrovascular' involves – "cerebro": the large part of the brain, and "vascular": arteries and veins. The word cerebrovascular refers to blood flow in the brain. Cerebrovascular diseases include all disorders in which an area of the brain is temporarily or permanently affected by ischemia [due to clot in the blood vessel obstructing blood flow or causing a narrowing of the vessel] or bleeding and one or more of the cerebral blood vessels are involved in the pathological process.
Cerebrovascular disease includes stroke, and other injuries. **a stroke is a serious medical condition that requires emergency care**.

STROKE statistics:

Stroke remains the second-leading cause of death and the third-leading cause of death and disability combined (as expressed by disability-adjusted life-years lost - DALYs) in the world. The estimated global cost of stroke is over US$721 billion (0.66% of the global GDP). According to a 2021 study published in Neurology India, the stroke burden in India is quite high, and ischemic stroke is the most common accounting for around 80% of total stroke cases in India. The study also revealed that South Asians including Indians are disproportionately more susceptible to stroke due to the presence of cardio-metabolic risk factors. In India, the significant rise in the incidence of stroke in the last decade can be attributed to various socio-economic changes that resulted in altered lifestyle with restricted physical activity, excessive intake of processed food, and increased stress at the workplace leading to enhanced development of risk factors including diabetes, hypertension, obesity, and hyper-lipoedema. It is estimated that close to 60% of stroke cases in India lead to various disabilities, many of which are lifelong. Apart from an increase in out-of-pocket expenditure, these also mean the loss of economic potential of individuals. This has a debilitating impact on the quality of life of not only the affected individual but also of the family. Owing to the privatization of healthcare here, top-notch stroke care is only available to the affluent. Among obvious needs of better healthcare infrastructure**, interventions to teach high-school children about the primary prevention of stroke & cardiovascular diseases is thus the most vital cog in the machine**.

Symptoms:

[stroke management, like most life-threatening emergencies, benefits from the awareness of how it can present].

1. Speech and language difficulty
2. Numbness or paralysis of the face, arm, or leg
3. Visual problem
4. Walking difficulty
5. 'Mnemonic: BE-FAST' (stands for balance loss, eyesight changes, face drooping, arm weakness, speech difficulties, and time to call an ambulance)

Response and Management:

Stroke first-aid Time is of the essence. The brain can resist the absence of oxygen for around three to six minutes; however, it varies from one person to another. Immediate medical attention should be provided to prevent serious brain injury. ***If the patient is conscious:***

Position the patient with the head and shoulders elevated and supported, loosen any tight clothing, Ensure the airway is clear and not obstructed and do not give anything to eat or drink.

If the person is unconscious:

- Check for breathing. [Check if the patient's chest is rising. Listen if you can hear the person breathing]. Tilt the head back and lift the patient's chin.
- If the person is not breathing**, prepare to perform cardiopulmonary resuscitation (CPR). If you haven't received a CPR training course, consider having one for you to know what to do during emergency situations.**

TREATMENT:

Ischemic stroke is the most common type of stroke. There are two types of ischemic stroke: thrombotic and embolic. A thrombotic stroke occurs when a blood clot, called a thrombus, blocks an artery to the brain and stops blood flow. An embolic stroke occurs when a piece of plaque or thrombus travels from its original site and blocks an artery downstream. The material that has moved is called an embolus. How much of the brain is damaged or affected depends on exactly how far downstream in the artery the blockage occurs.

In most cases, the carotid or vertebral arteries [THAT ARE RESPONSIBLE FOR BLOOD SUPPLY TO THE BRAIN] do not become completely blocked and a small stream of blood trickles to the brain. The reduced blood flow to the brain starves the cells of nutrients and quickly leads to a malfunctioning of the cells. As a part of the brain stops functioning, symptoms of a stroke occur. During a stroke, there is a core area where blood is almost completely cut off and the cells die within five minutes. However, there is a much larger area known as the ischemic penumbra that surrounds the core of dead cells. The ischemic penumbra consists of cells that are impaired and cannot function but are still alive. These cells are called idling cells, and they can survive in this state for about three hours.

Ischemic stroke is treated by removing the obstruction and restoring blood flow to the brain with medication or surgery within a three-hour window from the onset of symptoms to work best.

Three Types of Stroke

Atherosclerosis Stroke | Hemorrhagic Stroke | Ischemic Stroke

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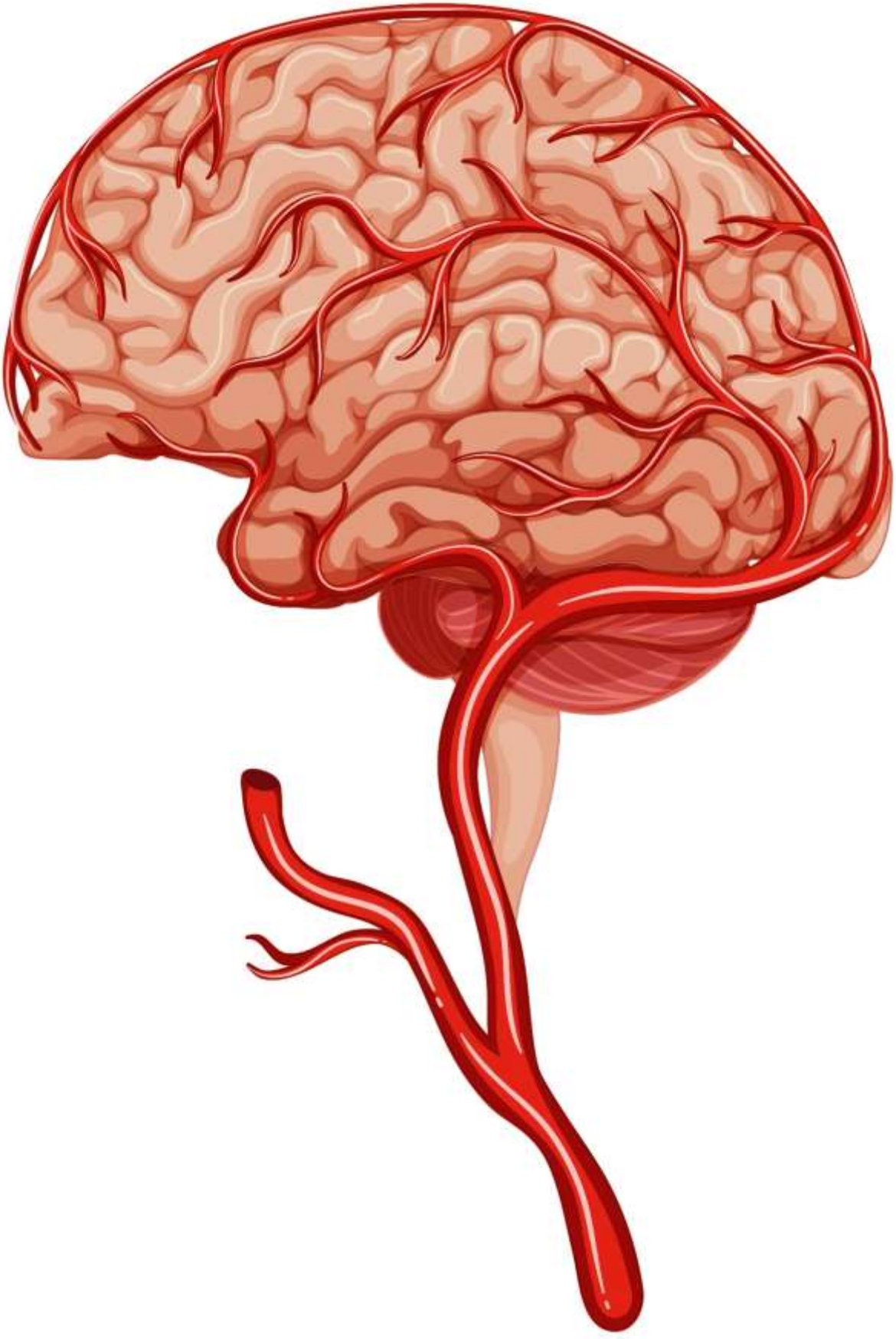


PERIPHERAL ARTERIAL DISEASE

Peripheral artery disease (also called peripheral arterial disease) is a condition in which narrowed arteries reduce blood flow to the arms or legs, causing reduced oxygen to reach musculature in these areas leading to pain and cell death. PAD is a different condition from coronary artery disease, but the two are related. People who have one are likely to have the other. Because the circulatory system is interconnected, the effects of PAD can extend beyond the affected limb. The U.S. National Institutes of Health estimates that a person with PAD has a six to **seven times higher risk of coronary artery disease, heart attack, stroke, or a transient ischemic attack (mini stroke)** than the general population. PAD is common, affecting between 8 and 12 million Americans. Despite the prevalence of PAD, it's surprisingly underdiagnosed and undertreated.

Symptoms:

1. Claudication: pain in legs that comes on with walking or exercise and goes away with rest.
2. Burning or aching pain in feet and toes while resting, especially at night while lying flat, temperature and colour changes of skin of feet and legs as well as infections.

Treatment:

1. Reducing the risk of heart attack and stroke with medications and/or making lifestyle changes to reduce your risk factors
2. Improving quality of life by easing the pain that occurs with walking with medication and/or supervised stop start method of cardiovascular exercises such as walking, running.

RHEUMATIC HEART DISEASE

Rheumatic heart disease affects 40 million people worldwide. Every year, it claims more than 300,000 lives, accounting for nearly 2% of all deaths from cardiovascular disease [the number one cause of death globally]. RHD most commonly occurs in childhood and can lead to death or life-long disability. 40 million people live with the disease, mostly children and adolescents in low- and middle-income countries, especially where poverty is widespread and access to health services is limited. Socioeconomic and environmental factors such as poor housing, undernutrition, overcrowding, and poverty are well-known contributors to the burden of rheumatic fever and rheumatic heart disease.

This is a life-threatening heart condition which results from damage to heart valves caused by one or several episodes of rheumatic fever, an autoimmune inflammatory reaction to infection with streptococcal bacteria (streptococcal pharyngitis or strep throat).This bacterium can pass easily from person to person in the same way as other upper respiratory tract infections, most common in childhood. In some cases, repeated strep infections can lead to rheumatic fever, which occurs when the immune system reacts against the tissues of the body, including inflaming and scarring the heart valves. Rheumatic heart disease is caused by damage to the heart valves and heart muscle from the inflammation and scarring caused by rheumatic fever.

Symptoms

1. Chest pain or discomfort
2. Shortness of breath
3. Swelling of the stomach, hands, or feet
4. Fatigue
5. Rapid or irregular heartbeat

Symptoms of RHD may not be noticed for many years. When they do develop, they depend on which heart valves are affected and the type and severity of the damage.

Complications:

- Heart failure. The major cause of death and disability from RHD, **Congestive heart failure (CHF)** is a chronic progressive life-threatening condition that affects the pumping power of the heart muscle. While often referred to simply as heart failure, CHF specifically refers to the stage in which fluid builds up within the heart and causes it to pump inefficiently. **This can result from a severely narrowed or leaking heart valve from RHD**, among other causes including coronary artery disease, hypertension and other risk factors associated with cardiovascular diseases, valve defects and CARDIOMYOPATHY.

- Stroke
- Arrhythmia
- Endocarditis.
- Complications in pregnancy

Treatment:

Depending on how much damage has been done to the heart valves, It may include surgery to replace or repair a badly damaged valve.

Since rheumatic fever is the cause of rheumatic heart disease, the best treatment is to prevent rheumatic fever by using antibiotics to treat strep infections. Anti-inflammatory drugs may be used to reduce inflammation and lower the risk of heart damage. Other medicines may be needed to manage heart failure.

CONGENITAL HEART DISEASE

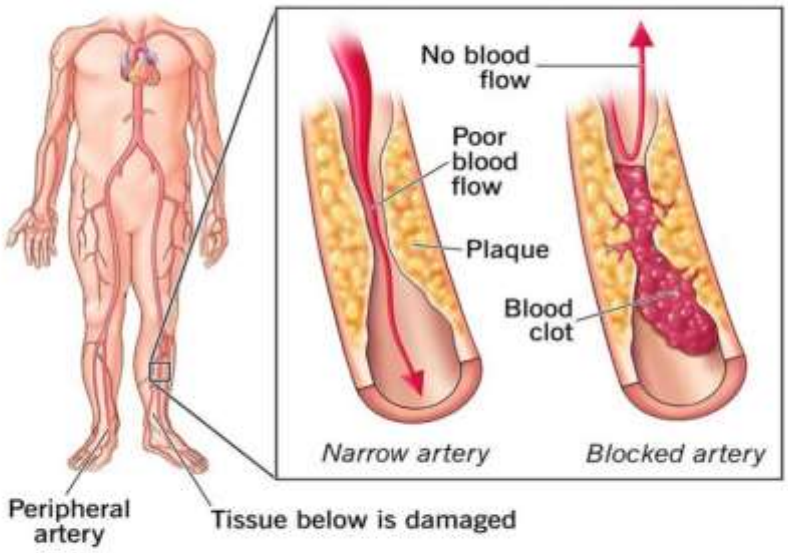
According to India´s Paediatric Cardiac Society, CHD is one per 100 live births; that is, 200,000 children are born every year with congenital heart disease and only 15,000 of them are treated. At least 30% of CHD children require surgery to survive to their first birthday, but only 2,500 operations can be conducted annually. At India's premier Institute of Medical Sciences, new-borns are on the waiting list through 2026 for heart surgery.

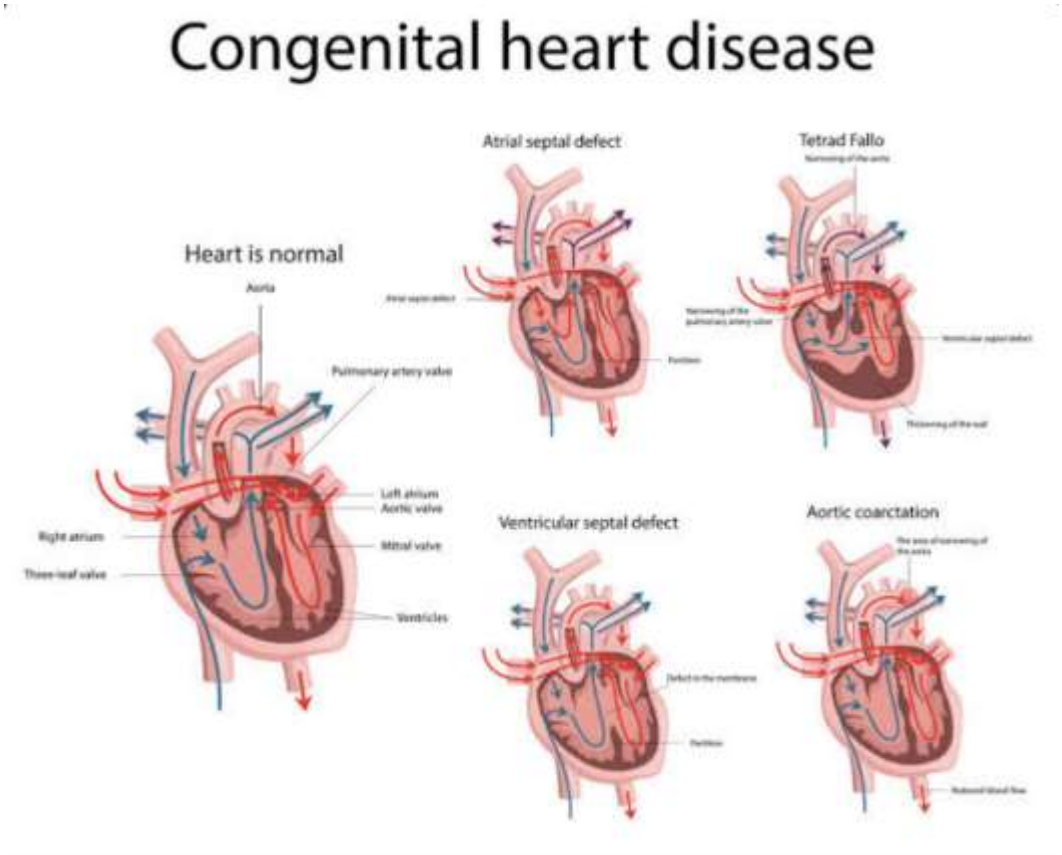
A congenital heart defect (CHD) results when the heart, or blood vessels near the heart, don't develop normally before birth. This can affect how blood flows through the heart and out to the rest of the body. While most children with congenital heart disease go on to live long and healthy lives, they face increased risk for sudden **cardiac arrest**. When that happens, **CPR is usually lifesaving and drastically increases chances of survival.** However, in infants and children with heart disease, CPR with compressions restores only 30% of blood flow to the heart and up to 40% of blood flow to the brain after sudden cardiac arrest. Use of life support, often referred to as ECPR (extracorporeal cardiopulmonary resuscitation), has been shown to improve survival when other treatment fails. Critical CHDs include atrial septal defect, ventricular septal defect, atrioventricular septal defect, coarctation of the aorta, among others. Symptoms: particularly in babies and children

1. rapid breathing and rapid heartbeat
2. swelling of the legs, tummy or around the eyes
3. extreme tiredness and fatigue
4. a blue tinge to the skin or lips

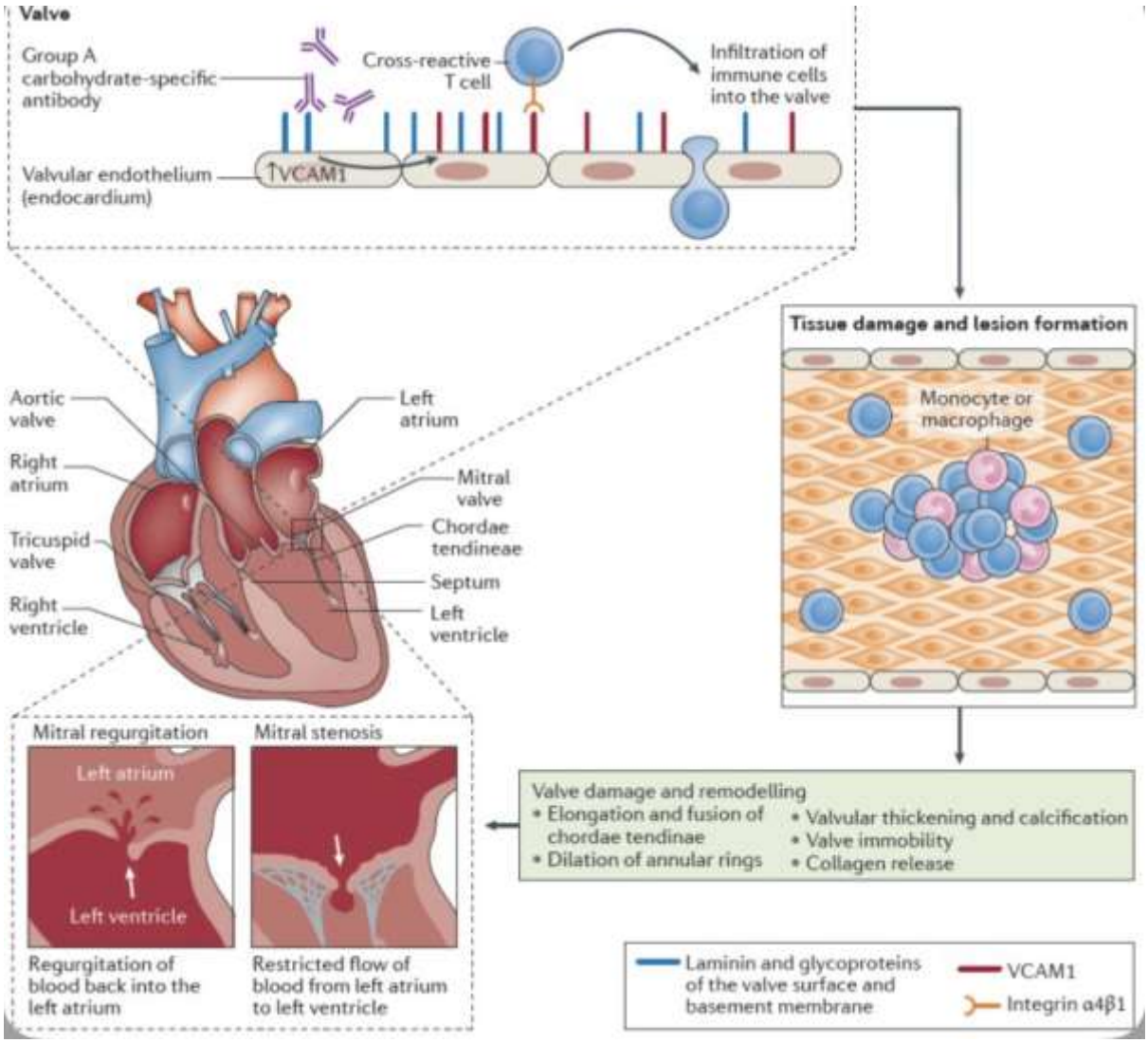
Treatment:

clinically mild defects, such as holes in the heart, may improve on their own. Surgery or interventional procedures are usually required if the defect is significant and causing problems. Modern surgical techniques can often restore most or all the heart's normal function. However, people with congenital heart disease require specialist review during childhood and adulthood to monitor any issues with heart rhythm or valves over time.


No blood flow
Poor blood flow
Plaque
Blood clot
Narrow artery
Blocked artery
Peripheral artery
Tissue below is damaged


Congenital heart disease
Heart is normal
Aorta
Pulmonary artery valve
Left atrium
Aortic valve
Right atrium
Mitral valve
Three-leaf valve
Ventricles
Atrial septal defect
Tetrad Fallo
Ventricular septal defect
Aortic coarctation

RHEUMATIC HEART DISEASE



CARDIOVASCULAR PATHOPHYSIOLOGY OF DROWNING

Drowning is the process of experiencing respiratory impairment from submersion or immersion in liquid. Non-fatal drowning is when the process is interrupted, but the patient develops some form of respiratory impairment (e.g., coughing, trouble breathing). A rescue is interruption of the drowning process without any respiratory impairment.

Drowning remains a significant worldwide public health concern, ranking as the third leading cause of unintentional injury death and accounting for 7% of all injury-related deaths. It is a major cause of disability and death, particularly in children.
Non-fatal drowning events occur much more frequently than deaths.
Drowning quickly causes **respiratory and cardiac arrest** from hypoxemia, while at least one third of survivors can sustain pulmonary, neurologic, cardiovascular, and other injuries.

Risk factors for drowning include inadequate supervision, being around bodies of water alone, inability to swim or overestimation of swimming capabilities, risk-taking behaviour, use of alcohol, hypothermia, having a seizure disorder or **cardiovascular disease**, and developmental disorder in children.

Drowning typically begins with a period of panic, loss of the normal breathing pattern, breath-holding, air hunger, and struggling to stay above the water. Reflex inspiratory efforts eventually occur, leading to aspiration of water, coughing when water contacts the lower respiratory tract, and within minutes, hypoxemia, loss of consciousness, followed by apnoea. Cardiac arrest occurs from hypoxemia and is preceded by bradycardia and pulseless electrical activity. The tissue hypoxia affects virtually all tissues and organs within the body. Fluid aspiration results in lung injury and acute respiratory distress syndrome (ARDS). Cerebral hypoxic-ischemic injury is a major factor in morbidity and mortality. Hypothermia is common and can be neuroprotective if it develops before the submersion. Cold water swimming (including diving) with attempted breath holding can precipitate fatal ventricular arrhythmias in patients with a congenital or acquired disturbances of the heart's electrical function.

BYSTANDER INTERVENTIONS AND PREHOSPITAL CARE:

Rescue and immediate resuscitation by bystanders and emergency medical personnel improves the outcome of drowning victims. The need for cardiopulmonary resuscitation (CPR) is determined as soon as possible without compromising the safety of the rescuer or delaying the removal of the victim from the water. In a patient with cardiac arrest due to drowning, bystander CPR improves outcomes compared with no CPR; conventional CPR (i.e., with expired-air resuscitation or "rescue breaths") is preferable to compression-only CPR

Ventilation is generally considered the most important initial treatment for victims in cardiac or respiratory arrest from submersion injury since the arrest is typically due to hypoxemia. Rescue breaths are particularly important as compared with the non-submersion adult cardiac arrest patient, where immediate uninterrupted chest compressions are emphasized.

Seizure activity, which increases cerebral oxygen consumption and blood flow, should be aggressively controlled with appropriate medication and protocols.

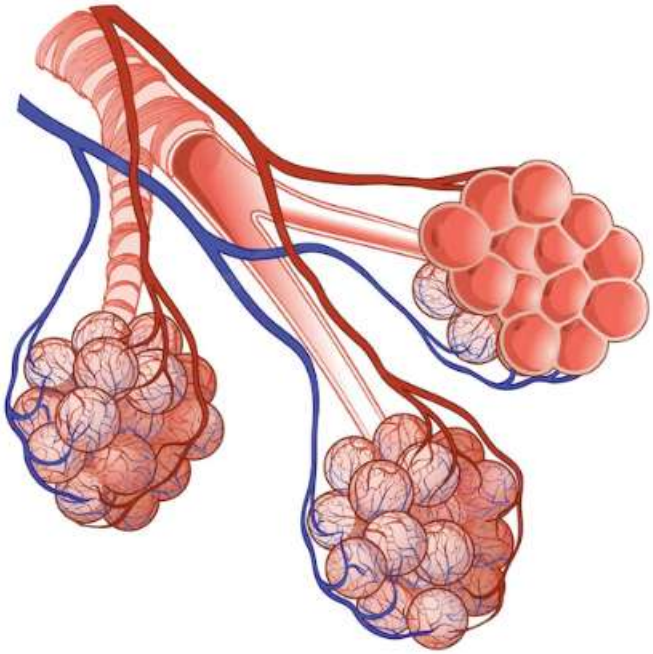
In the awake hypothermic patient, remove wet clothing and initiate passive external rewarming (e.g., application of warm blankets, plumbed garments, heating pads, radiant heat, forced warm air). Patients who remain unresponsive and hypothermic may require active internal core rewarming (e.g., warmed humidified oxygen via tracheal tube, heated irrigation of peritoneal and pleural cavities).

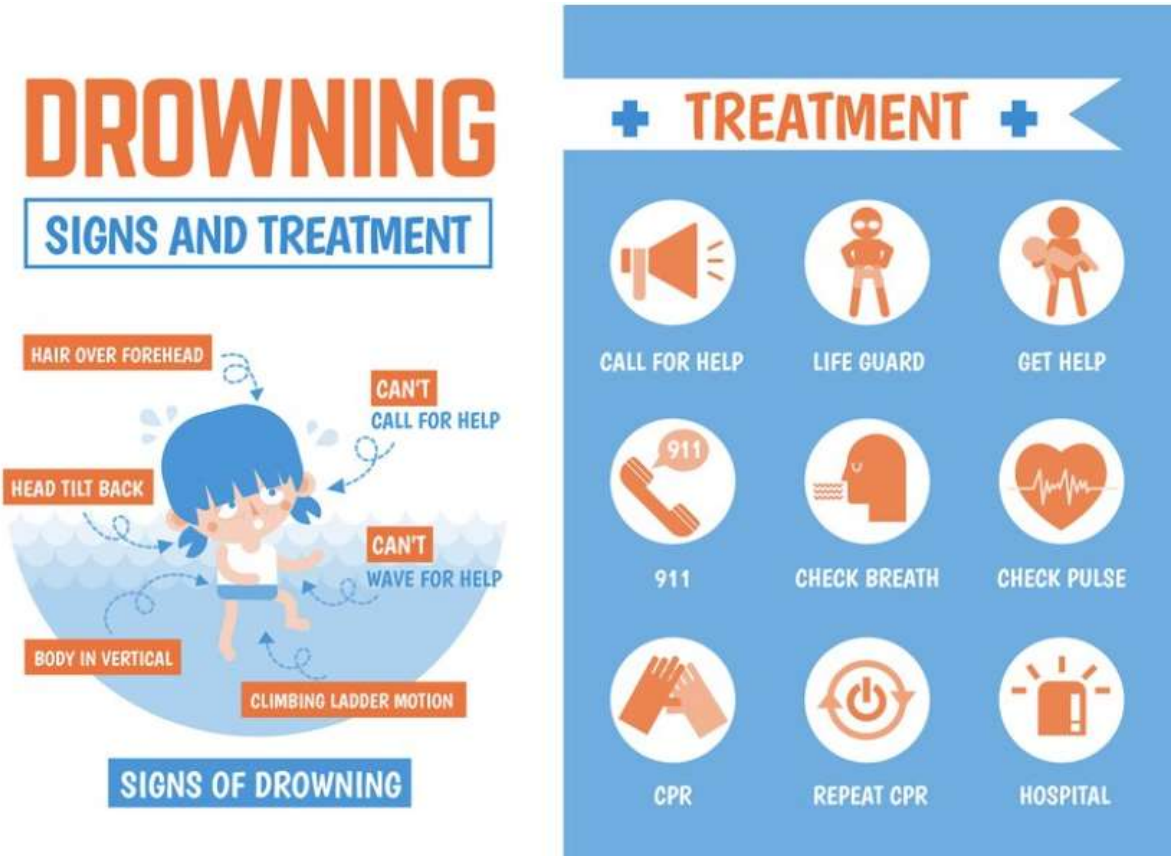
In hospital, medical and/or surgical treatment is according to the nature of injury caused by drowning.

Reported survival rates for drowning victims vary widely, but in patients who survive to hospital discharge neurologically intact, long-term survival appears to be like the general population. These are a few factors at presentation have been associated with a poor prognosis

- Duration of submersion >5 minutes (most critical factor)
- **Time to effective basic life support >10 minutes**
- Resuscitation duration >25 minutes
- Age >14 years

FLUID FILLS INTO THE ALVEOLI





Drowning Rescue

CARDIOVASCULAR PATHOPHYSIOLOGY OF ANAPHYLAXIS

Anaphylaxis is a worldwide problem, and a true medical emergency. Anaphylaxis results in a significant number of deaths each year. The major causative allergens are common to all populations. Prophylactic therapy in the form of epinephrine/adrenaline auto-injectors is only prescribed to a small proportion of the patients around the world at risk of suffering a repeat episode of anaphylaxis. Anaphylaxis, and deaths from anaphylaxis, are reported to be more frequent in adults than in children. In India, antibiotics, radiocontrast agents, and anaesthetic agents are considered major causes of anaphylaxis, and blood products, insulin and growth hormones are also relevant.

The most dangerous and life-threatening manifestation of allergic diseases is anaphylaxis, a condition in which the cardiovascular system is responsible for most of the clinical symptoms and for a potentially fatal outcome. The heart is both a source and a target of chemical mediators released during allergic reactions.

Cardiac mast cells can be activated by a variety of stimuli including allergens, complement factors, general anaesthetics, and muscle relaxants. Mediators released from immunologically activated human heart mast cells strongly influence ventricular function, cardiac rhythm, and coronary artery tone. This, combined with myocardial depression and arterial vasoconstriction called by histamine and other chemical mediators of allergic response lead to hypotension and shock, cardiac arrhythmias, ventricular dysfunction, and **cardiac arrest.**

Co-relation between heart attack and anaphylaxis:

Anaphylaxis is more severe and can be more frequently fatal in patients with coronary artery disease for at least three mechanisms: (i) mast cells are more abundant and produce more mediators in hearts with ischaemic cardiomyopathy; (ii) atherosclerotic lesions make coronary arteries more susceptible to the effects of mast cell mediators; and (iii) drugs used frequently by patients with ischaemic heart disease, may aggravate symptoms or limit efficacy of treatment of anaphylaxis. On the other hand, anaphylaxis can be an event precipitating an acute myocardial ischaemia.

Common symptoms:

Severe itchiness of the eyes or face followed by

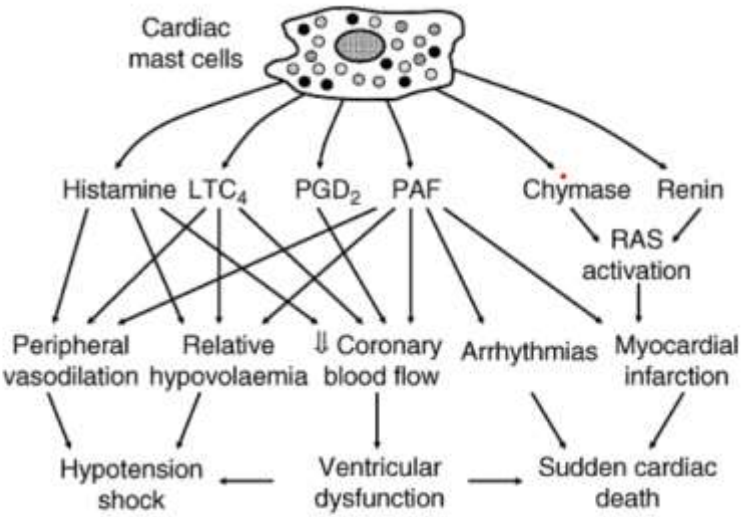
- Swelling, especially in the face, lips, tongue, eyelids, or throat
- Hives, a rash, or flushed skin
- Trouble swallowing
- Wheezing or shortness of breath
- Tightness in chest
- Stomach pain, cramps, nausea, diarrhoea, or vomiting

Without prompt treatment signs of anaphylactic shock, which include a combination of symptoms such as wheezing, passing out, and shortness of breath.

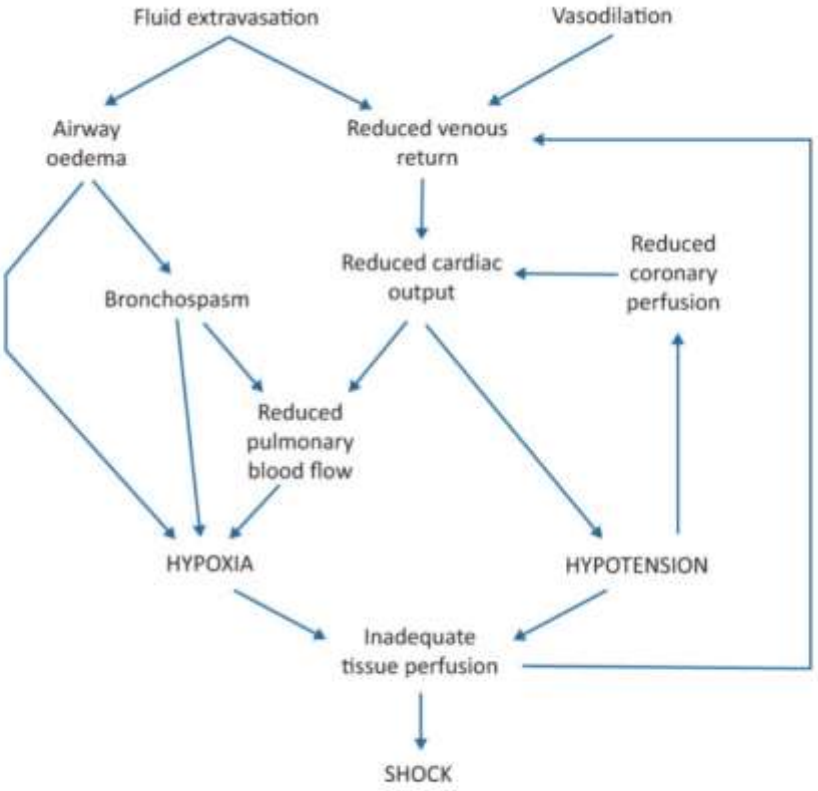
Management:

If present with someone having an allergic reaction with signs of anaphylaxis, seek emergency treatment immediately. In severe cases, untreated anaphylaxis can lead to death within half an hour. Ask if the person is carrying an epinephrine autoinjector (EpiPen] to treat an allergic attack and assist in use.

- Have the person lie face up.
- Loosen tight clothing and cover the person with a blanket. Don't give the person anything to drink.
- If there's vomiting or bleeding from the mouth, turn the person to the side to prevent choking.
- **If there are no signs of breathing, coughing or movement, begin CPR.**
- Get emergency treatment even if symptoms start to improve. Monitoring in a hospital for several hours is usually necessary.



Schematic representation of the cardiovascular effects of mediators released from cardiac mast cells.



Pathophysiological mechanisms responsible for anaphylactic shock.

CARDIOVASCULAR PATHOPHYSIOLOGY OF OPIOID RELATED EMERGENCIES

The term “opioids” includes compounds that are extracted from the poppy seed as well as semisynthetic and synthetic compounds with similar properties that can interact with opioid receptors in the brain. Opioids have analgesic and sedative effects and are commonly used for the management of pain. Opioid medicines such as methadone and buprenorphine are used for maintenance treatment of opioid dependence. After intake, opioids can cause euphoria, which is one of the main reasons why they are taken for non-medical reasons. Opioids include heroin, morphine, codeine, fentanyl, methadone, tramadol, and other similar substances.

Due to their pharmacological effects, they can cause difficulties with breathing, and opioid overdose can lead to death.

Worldwide, about 500 000 deaths are attributable to drug use. More than 70% of these deaths are related to opioids, with more than 30% of those deaths caused by overdose, however non-fatal emergencies are more common.

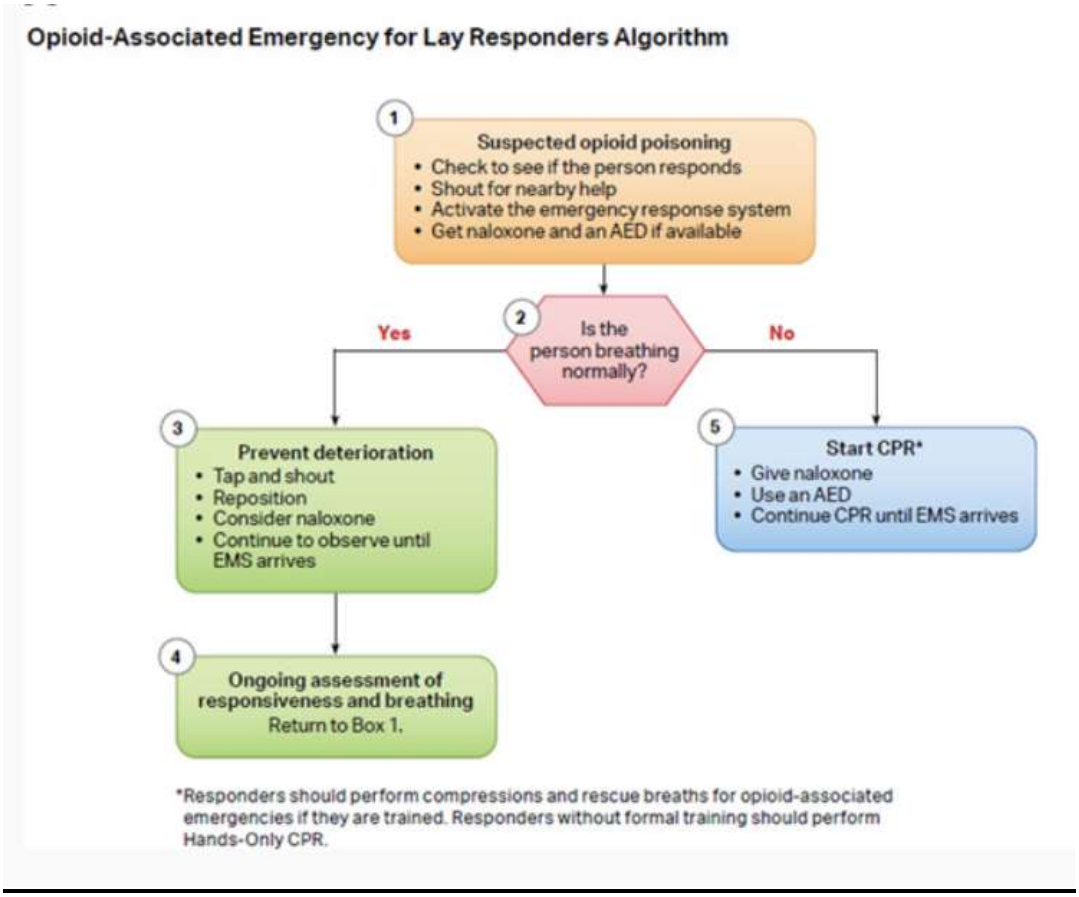
Annual US opioid-related mortality increased from 9489 to 47 600 deaths from 2001 to 2017 and is now the leading cause of death among adults 25 to 64 years of age.

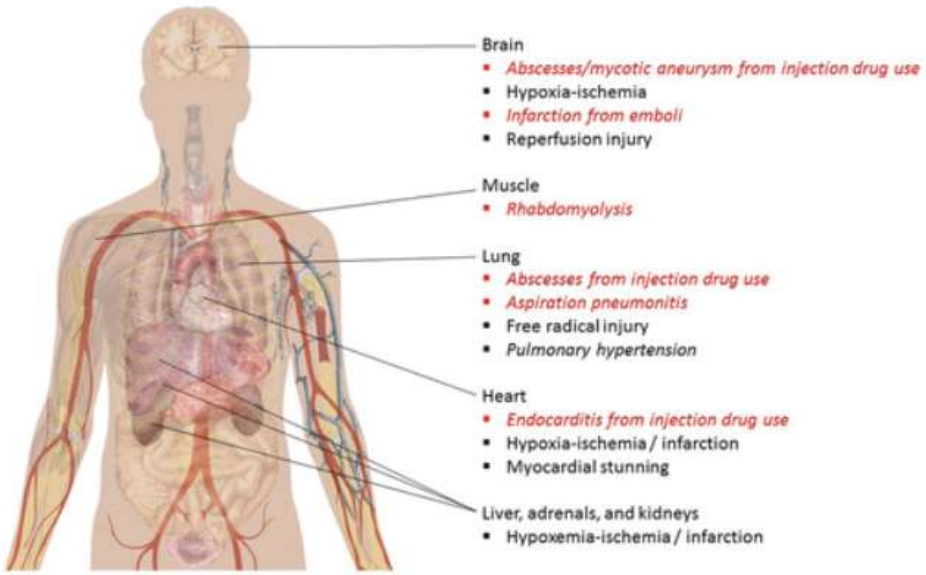
The pathophysiology of opioid related emergencies differs from that of sudden cardiac arrest. People who use opioid may also develop bacteraemia, central nervous system vasculitis and leukoencephalopathy and pulmonary oedema.
Emergency management of opioid poisoning requires recognition by the lay public or emergency dispatchers, prompt emergency response, and effective Basic Life Support in the setting of opioid-associated out-of-hospital cardiac arrest.

Risk factors for OA-OHCA [opioid-associated out-of-hospital cardiac arrest].

1. History of other substance or alcohol use disorder
2. Other medical or mental health disorders
3. High long-term dose of opioids or use of potent synthetics (e.g., Fentanyl) or antidepressants.
4. Opioid naïve person
5. Recent incarceration or inpatient hospitalization with loss of tolerance.

Opioid-associated out-of-hospital cardiac arrest differs from other forms of cardiac arrest in terms of how it abnormally changes body functions and the different ways it presents. In opioid-associated cardiac arrest, hypoxia (oxygen deficiency) happens before the heart stops and has important implications for brain injury. Without oxygen, the brain is damaged within minutes even before the heart stops.

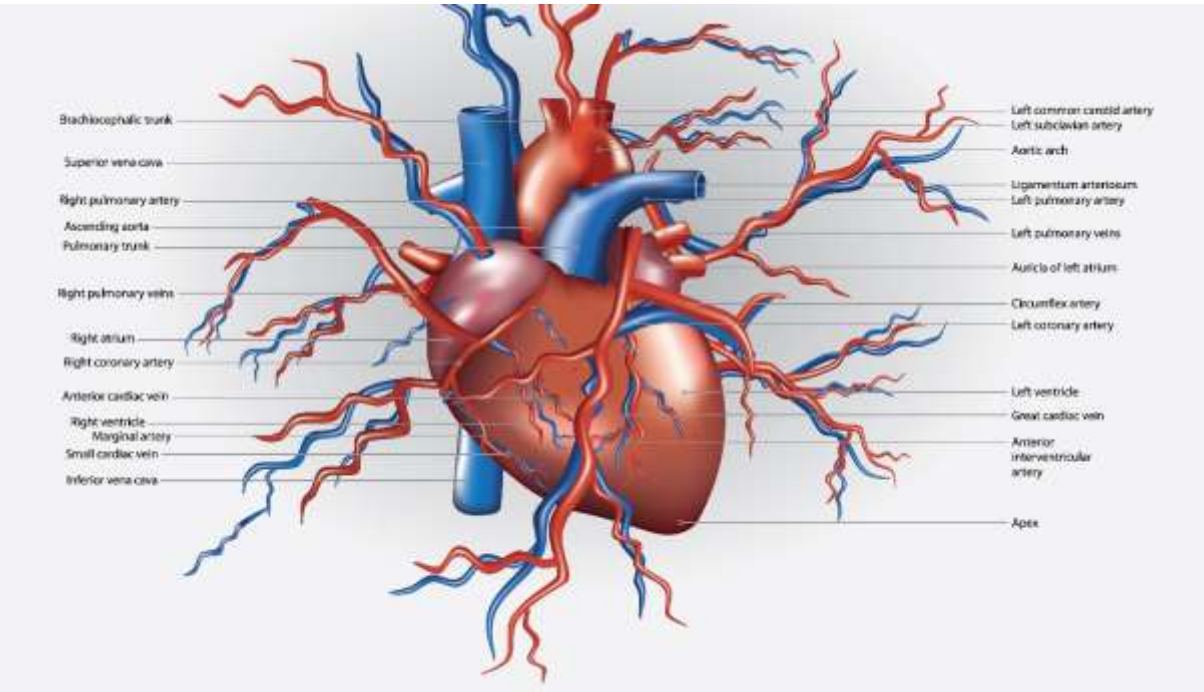




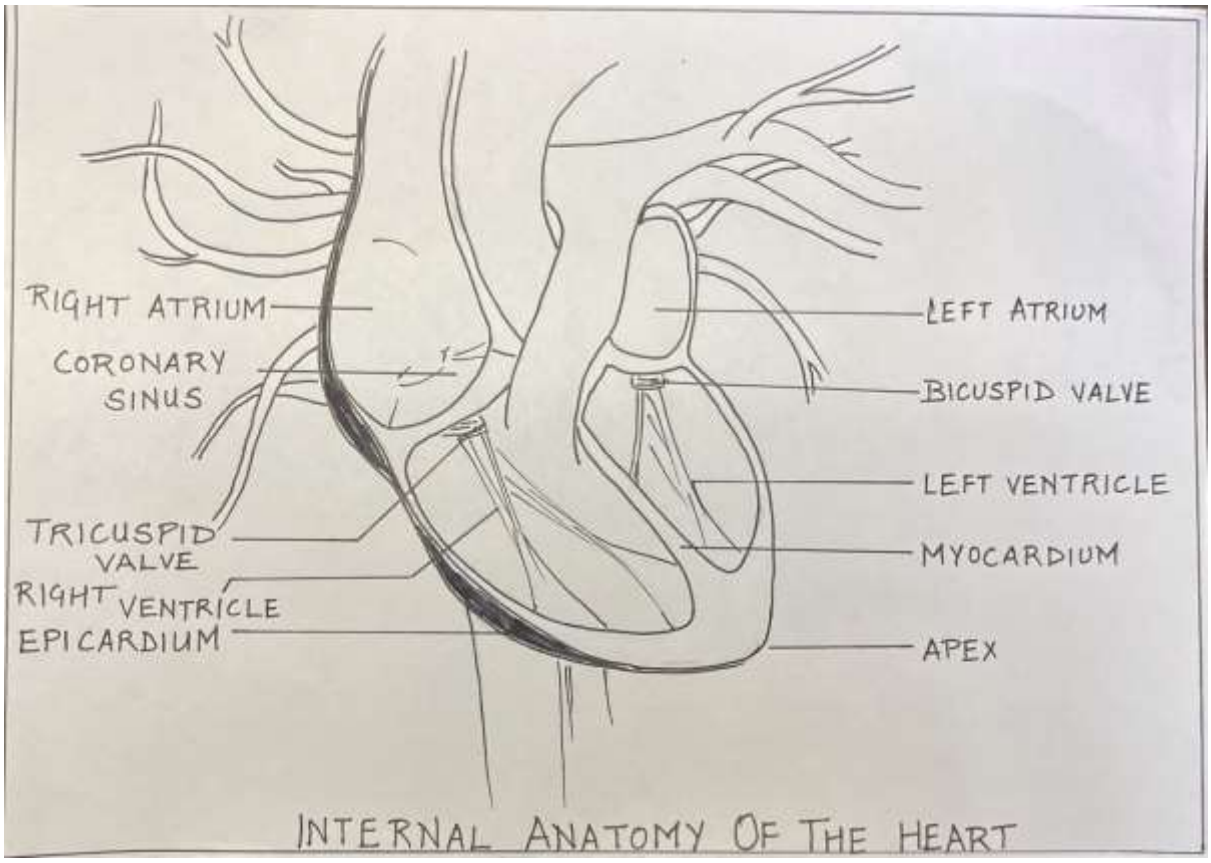
opioid associated effects on human physiology

RESUSCITATION

BLS is the foundation for saving lives after cardiac arrest.
It refers to a level of medical care which is used for patients with life-threatening illnesses or injuries until they can be given full medical care by advanced life support providers (paramedics, nurses, physicians). It can be provided by trained medical personnel, such as emergency medical technicians, and by qualified bystanders.
I feel grateful to have learned it and demonstrated it to my friends and teachers at school.



External Anatomy of the Human Heart



Chain Of Survival

Cardiac arrest can happen anywhere on the street, at home, or in a hospital emergency department (ED), inpatient bed, or intensive care unit. Elements in the system of care and order of actions in the Chain of Survival differ based on the situation. Care will depend on whether the victim has the arrest outside the hospital or inside the hospital. Care also depends on whether the victim is an adult, child, or infant.

In adults, cardiac arrest is often sudden and frequently results from a cardiac cause. In children, however, cardiac arrest is often secondary to respiratory failure or shock. Both respiratory failure and shock can be life-threatening.
Prevention of cardiac arrest is the first link in the paediatric Chains of Survival. Early identification of respiratory or circulatory problems and appropriate treatment may prevent progression to cardiac arrest. Early identification also may maximize survival.

Chain Of Survival includes the following elements:
Prevention and preparedness
Activating the emergency response system
High-quality CPR, including early defibrillation
Advanced resuscitation interventions
Post-cardiac arrest care
Recovery

Prevention and preparedness are the foundation of early recognition of cardiac arrest and rapid response. Most out-of-hospital adult cardiac arrests are unexpected and happen at home. Successful outcomes depend on early high-quality CPR and rapid defibrillation in the first few minutes after the arrest. Organized community programs that prepare the public to respond quickly to a cardiac arrest are critical to improving outcomes.
Prevention includes measures to improve the health of individuals and communities. Preparedness includes public awareness programs and training to help people recognize the signs of a heart attack and cardiac arrest and take effective action. Community CPR training and emergency response system development are important. Mobile phone apps or text messages can be used to summon members of the public who are trained in CPR. Mobile phone apps/mapping can help rescuers locate the nearest AED.
Widespread AED availability supports early defibrillation and saves lives. Public access defibrillation (PAD) programs need to be designed to reduce the time to defibrillation by placing AEDs in public places and training laypeople to use them.
Activating the emergency response system usually means shouting for nearby help and phoning the local emergency response number. The sooner a rescuer activates the emergency response system, the sooner the next level of care will arrive.
High-quality CPR with minimal interruptions and early defibrillation are the actions most closely related to good resuscitation outcomes. High-quality CPR started immediately after

cardiac arrest combined with early defibrillation can double or triple the chances of survival. These time-sensitive interventions can be provided both by members of the public and by healthcare providers. Bystanders who are not trained in CPR should at least provide chest compressions (also called Hands-Only CPR).

Advanced interventions may be performed by medically trained providers during a resuscitation attempt. Some advanced interventions are obtaining vascular access, giving medications, and placing an advanced airway. After return of spontaneous circulation (ROC), all cardiac arrest victims receive post-cardiac arrest care. Post-cardiac arrest care includes routine critical care support, such as artificial ventilation and blood pressure management. This care begins in the field and continues during transport to a medical facility. In the hospital, a multidisciplinary team performs relevant procedures in a cardiac catheterization lab (Cath lab), intensive care unit, or coronary care unit.
The patient may undergo a cardiac catheterization procedure.
Recovery from cardiac arrest continues long after hospital discharge. Depending on the outcome, the
survivor of cardiac arrest may need specific rehabilitation.

Table 1. Comparison of 5 Key Elements in the Chains of Survival

Element	In-hospital cardiac arrest	Out-of-hospital cardiac arrest
Initial support	Depends on an **in-hospital system** of appropriate **surveillance**, **monitoring**, and **prevention** with **responsive primary provider teams**	Depends on **community** and **EMS providers** for support
Resuscitation teams	Resuscitation efforts depend on • The smooth interaction of an institution's **various departments** and services (such as the patient ward, ED, cardiac cath lab, and intensive care unit) • **A multidisciplinary team of professional providers**, which includes physicians, nurses, respiratory therapists, pharmacists, counselors, and others	Resuscitation efforts depend on • **Lay rescuers** who need to recognize an unresponsive victim and quickly activate the emergency response system • **Lay rescuers** who perform CPR and use an AED (if available) until a high-performance team takes over resuscitation efforts • **EMS**, who transports the victim to a medical facility for continued care
Available resources	Depending on the facility, in-hospital **multidisciplinary teams** may have immediate access to additional personnel as well as resources of the **ED**, **cardiac cath lab**, and **intensive care unit**.	Available resources may be limited in the out-of-hospital settings: • **AED access:** AEDs may be available through a local **PAD program** or included in emergency or **first aid equipment**. • Untrained rescuers: **T-CPR** helps untrained rescuers perform high-quality CPR. • EMS high-performance teams: The **only resources may be those they brought with them.** Additional backup resources and equipment may take some time to arrive.
Resuscitation constraints	Factors that may affect both settings include **crowd control**, **family presence**, **space constraints**, **resources**, **training**, **patient transport**, and **device failures**.	
Level of complexity	Resuscitation attempts, both in and out of the hospital, are typically **complex**. They require teamwork and coordination between rescuers and care providers.	

BASIC LIFE SUPPORT [for adults by single rescuer]

BLS involves practice and performing of high-quality CPR skills, both as a single rescuer and as a part of a multi-rescuer team.
Basic framework: Anyone can be a lifesaving rescuer for a cardiac arrest victim. The CPR skills a rescuer uses depend on several variables, such as level of training, experience, and confidence (i.e., rescuer proficiency). Other variables are the type of victim (child vs adult), available equipment, and other rescuers.
Main components of CPR:
Chest compressions
Airway
Breathing

A rescuer who arrives at the side of a potential cardiac arrest victim should do the following sequentially:

1. Make sure that the scene is safe for rescuer and the victim.
2. Check for responsiveness by tapping the victim's shoulders and shouting “Are you OK?”
3. Assess for breathing and a pulse. To minimize delay in starting CPR, one should assess breathing [scan the victim’s chest for rise and fall] and pulse [at the side of the neck or at the wrist] at the same time. This should take no more than 10 seconds.
4. Next step
    a. If the victim is breathing normally and a pulse is felt monitor the victim.
    b. If the victim is not breathing normally but a pulse is felt: Provide rescue breathing at a rate of 1 breath every 6 seconds, or 10 breaths per minute. Check for a pulse about every 2 minutes. Perform high-quality CPR if you do not feel a pulse.
    c. If you suspect opioid use, follow local protocols [good Samaritan clause].
    d. If the victim is not breathing normally or is only gasping and has no pulse, begin high-quality CPR, with 30 chest compressions followed by 2 breaths. Use an AED as soon as it is available.
5. Follow the AED directions to check the rhythm.

In all scenarios, by the time a breathing-and-pulse check indicates cardiac arrest, the following should already be happening: Someone has activated the emergency response system, someone has gone to get the AED.

Technique for chest compressions on an adult

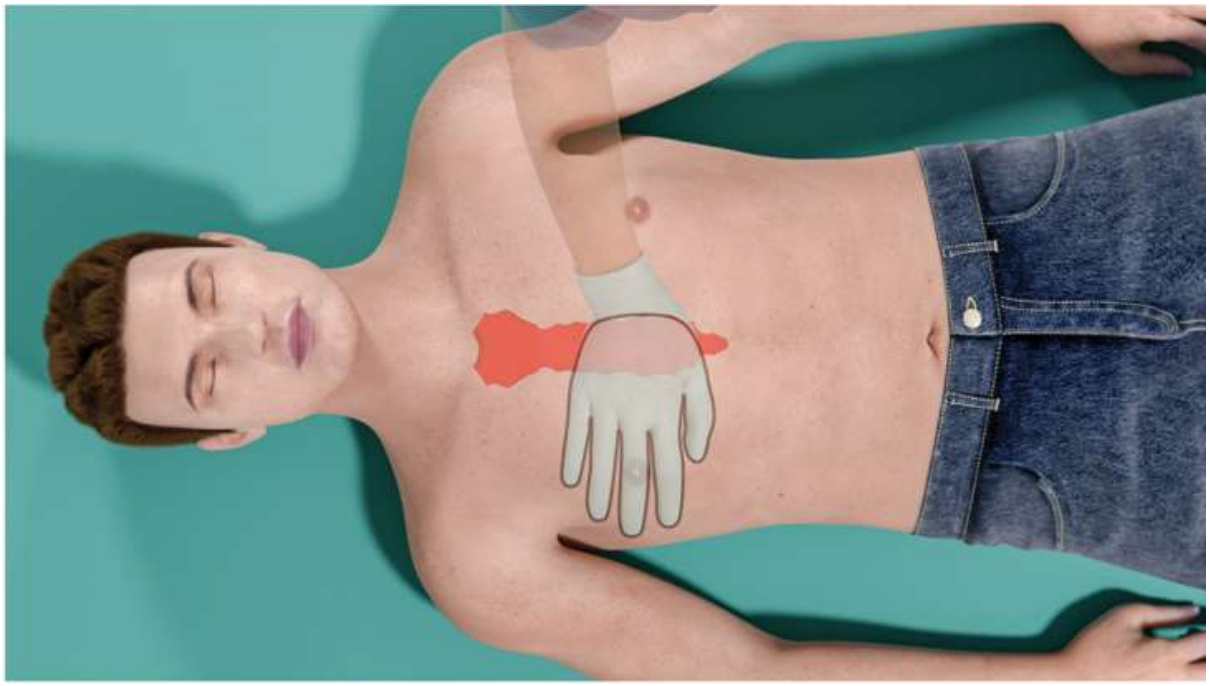
Position yourself at the victim's side.

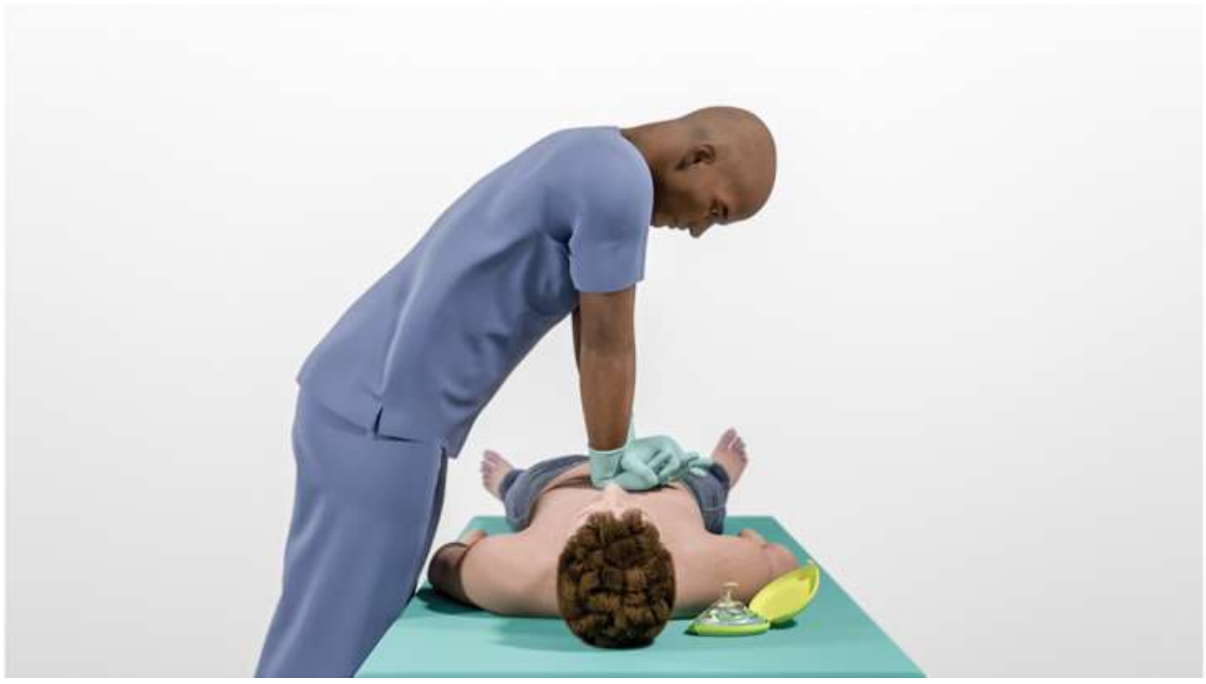
a) Make sure the victim is lying faceup on a firm, flat surface. If the victim is facedown, carefully roll the person over. If you suspect a head or neck injury, try to keep the head, neck, and torso in a line when rolling the victim to a faceup position.
b) Position your hands and body to perform chest compressions: Place the heel of one hand in the centre of the victim's chest, on the lower half of the sternum. Put the heel of your other hand on top of the first hand.
c) Straighten your arms and position your shoulders directly over your hands. Give chest compressions at a rate of 100 to 120/min. Press down at least 5 cm with each compression; this requires hard work. For each chest compression, make sure you push straight down on the victim's sternum. At the end of each compression, always allow the chest to recoil completely. Avoid leaning on the chest between compressions. Minimise interruptions of chest compressions.

Technique for rescue breaths
For breaths to be effective, the victim's airway must be open. When multiple rescuers are available, one rescuer can perform a jaw thrust/ head tilt while another rescuer provides breaths with a bag-mask device and the third rescuer will give chest compressions.
Head Tilt-Chin Lift method:
Place one hand on the victim's forehead and push with your palm to tilt the head back. Place the fingers of the other hand under the bony part of the lower jaw, near the chin. Lift the jaw to bring the chin forward. Avoid pressing deeply into the soft tissue under the chin because this might block the airway and do not close the victim's mouth completely.

When giving breaths during CPR, standard precaution is to use a barrier device, such as pocket masks. Pocket masks usually have a 1-way valve that diverts exhaled air, blood, or bodily fluids away from the rescuer. The 1-way valve allows the rescuer's breath to enter the victim's mouth and nose and diverts the victim's exhaled air away from the rescuer.
Method:
Place the pocket mask on the victim's face, establishing a seal after using the bridge of the nose as a guide for correct positioning. Perform a head tilt-chin lift to open the airway and deliver each breath over 1 second, enough to make the victim's chest rise. In case of use of a bag mask, squeeze the bag to give breaths while watching for chest rise. Deliver each breath over 1 second, with or without the use of supplemental oxygen.
When interrupting chest compressions to give 2 breaths with, be sure to resume chest compressions in less than 10 seconds

The air we breathe in contains about 21% oxygen. The air we breathe out contains about 17% oxygen.
This means that the air a rescuer breathes out still contains plenty of oxygen to provide the victim with
much-needed oxygen.





AUTOMATED EXTERNAL DEFIBRILLATOR

[for Adults and Children 8 Years of Age and Older]

An automated external defibrillator, or AED, is a lightweight, portable, computerized device that can identify an abnormal heart rhythm that needs a shock. The AED can then deliver a shock that can stop the abnormal rhythm and allow the heart's normal rhythm to return. AEDs are simple to operate. They allow laypersons and healthcare providers to attempt defibrillation safely.

Defibrillation

The AED identifies abnormal heart rhythms as shockable or nonshockable. Shockable rhythms are treated with defibrillation. Defibrillation is the medical term for interrupting or stopping an abnormal heart rhythm by using controlled electrical shocks. The shock stops the abnormal rhythm. This resets the heart’s electrical system so a normal (organized) heart rhythm can return. If effective circulation returns, the victim's heart muscle is once again able to pump blood. The victim will have a heartbeat that produces a palpable pulse (a pulse that can be felt by the rescuer). This is called return of spontaneous circulation, or ROSC. Signs of ROSC include breathing, coughing, or movement and a palpable pulse or measurable blood pressure.

Early defibrillation increases the chance of survival from cardiac arrest that is caused by an abnormal or irregular heart rhythm, or an arrhythmia. Arrhythmias occur when the electrical impulses that cause the heart to beat happen too quickly, too slowly, or erratically. Two life-threatening shockable arrhythmias that cause cardiac arrest are pulseless ventricular tachycardia (VT) and ventricular fibrillation.

pVT: When the lower chambers of the heart (ventricles) begin contracting at a very fast pace, a rapid heart rate known as ventricular tachycardia develops. In extremely severe cases, the ventricles pump so quickly and inefficiently that there is no detectable pulse (ie, the "pulseless" in pVT). Body tissues and organs, especially the heart and brain, no longer receive oxygen.

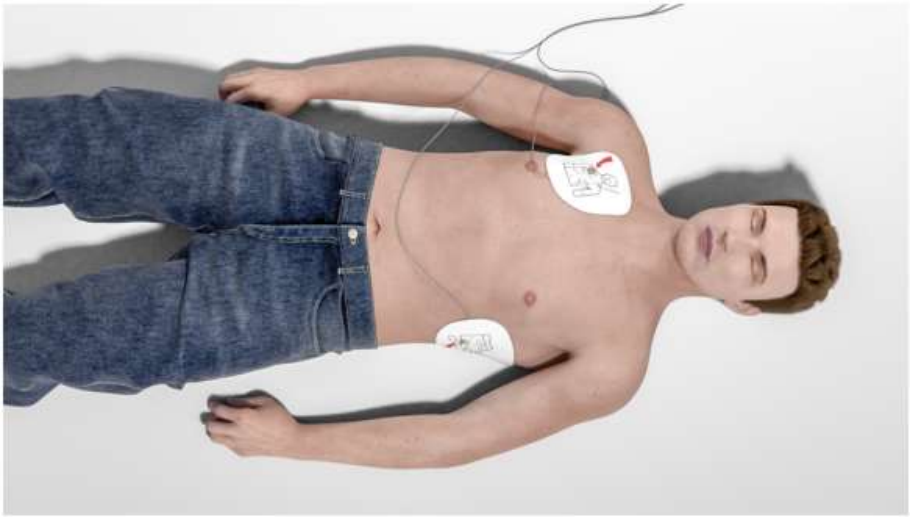
Ventricular fibrillation: In this arrest rhythm, the heart's electrical activity becomes chaotic. The heart muscles quiver in a fast, unsynchronized way so that the heart does not pump blood. Early defibrillation, high-quality CPR, and all components of the Chain of Survival are necessary to improve chances of survival from pT and ventricular fibrillation.

To provide early defibrillation, rescuers need to have an AED immediately available, and it is important to have them in places such as corporate offices, public transport areas, residential complexes and schools. AEDs should also be properly maintained according to the manufacturer's instructions.

Universal Steps to operate an AED:

1. During a resuscitation attempt, follow the AED's digital or electronic voice prompts and attach AED pads on the victim's bare chest within 30 seconds of its arrival.
2. If the AED advises a shock, it will tell you to clear the victim and then deliver a shock. Be sure no one is touching the victim, not even the rescuer in charge of giving CPR.
3. The shock will produce a sudden contraction of the victim's muscles.
4. If the AED prompts that no shock is advised or after any shock is delivered, immediately resume CPR, starting with chest compressions.
5. Victims with a high risk for sudden cardiac arrest may have implanted defibrillators or pacemakers that automatically deliver shocks directly to the heart. If you place an AED pad directly over an implanted medical device, the implanted device may interfere with the delivery of the shock.
   These devices are easy to identify because they create a hard lump beneath the skin that is most often in the left upper chest but can also be found in the right upper chest or abdomen.

   If you identify an implanted defibrillator/pacemaker:
   If possible, avoid placing the AED pad directly over the implanted device.
   Follow the normal steps for operating an AED



Demonstrating BLS to teachers and friends in school, October 2022.

Importance of BLS training

The Indian Medical Association has been working with the Indian Resuscitation Council to teach Cardiopulmonary resuscitation (CPR) skills to the people of the country.
The aim is to to reach out to a minimum of one million people with the idea that if we train one person, he may help one of our relatives to get back their life in the time of distress.
July 27 is observed as CPR Day.
Every citizen can be a Life Saver with initiatives on social media, foundation courses in schools and universities and information pamphlets as part of the Make in India program.
High school students will become the next generation of bystanders who can provide CPR and AED use, once they are educated. Those trained as students are likely to be in homes or community sites where cardiac arrests commonly occur, of special relevance in marginalised communities with less access to critical care, thus somewhat decreasing disparities of medical intervention. Giving young people the confidence to respond during medical emergencies can benefit them now and well into the future. These are skills that can be retained for a lifetime and, therefore, passed on to family members from generation to generation. As school children with training in CPR increase, the proportion of individuals in society with training and the desire to help others and gain happiness and satisfaction from these increases, which causes a general increase in resuscitation rates. It is important to start resuscitation training at school ages. All groups in the society can be accessed this way. To obtain a statistically significant increase in resuscitation results, it has been estimated that at least 15% of the population must have been trained, and this number cannot be achieved through voluntary courses (5). The development of the sense of responsibility at a young age is more permanent and makes it easier to overcome social barriers.

'Everywhere, everyone can immediately initiate CPR. All that is necessary for this is two hands' However, it is necessary to raise awareness in society and give education regarding it. CPR training in school children is compulsory in several countries; local, regional, and national initiatives have been introduced in many countries. The declaration of 'Children Save Life', which is a joint declaration made by the ERC, European Patient Safety Foundation, International Liaison Committee on Resuscitation and World Federation Of Societies of Anaesthesiologists was acknowledged by the World Health Organisation in 2015. The rate of CPR initiated by the witnesses in some Scandinavian countries, where CPR training for school children has been made obligatory for >10 years, is very high. Five years after the compulsory CPR training was added to school curriculums in Denmark, the rate of resuscitation performed by the witnesses increased almost twofold, and the rate of survival after cardiac arrest outside the hospital increased threefold in 10 years. Studies have shown how little training children need to successfully use an automatic external defibrillator (AED). Fifteen children aged 11–12 years who were not previously trained were given verbal instructions about AED. All of them used AEDs to defibrillate the model by placing the pads properly, and the duration from the beginning of the scenario to the application of shock was approximately 90s. Research shows that interest among high school students towards the subject is high.

According to a recent survey,

Only 2% of People in India know to give CPR!

The need to Be the Beat is thus, self-explanatory.

GLOSSARY

1. Aerosol- a suspension of fine solid particles or liquid droplets in air or another gas.
2. Asphyxia- a condition of deficient supply of oxygen to the body.
3. Aspiration- the action or process of drawing breath.
4. Arrythmia- an irregular heartbeat.
5. Anaphylaxis- a severe, potentially life-threatening allergic reaction.
6. Asystole- the cessation of electrical and mechanical activity of the heart/flatline.
7. Atherosclerosis- the build-up of cholesterol and other substances in and on artery walls.
8. Anaemia- a condition of lack of healthy red blood cells to carry adequate oxygen to your body's tissues.
9. AMI- a heart attack, when blood flow to the heart muscle is abruptly cut off, causing tissue damage.
10. Bradycardia- a slow heart rate.
11. Bacteraemia- the presence of bacteria in blood.
12. CPR- Cardiopulmonary resuscitation, a hands-on emergency intervention to restore breathing and a heartbeat.
13. CAD- coronary artery disease, a narrowing or blockage coronary arteries, usually due to plaque build-up.
14. CVD- a general term for conditions affecting the heart or blood vessels.
15. CHF- Heart failure/congestive heart failure, when the heart muscle doesn't pump blood well, blood backs up and fluid can build up in the lungs.
16. COVID 19- an infectious disease caused by the SARS-CoV-2 virus.
17. Cyanosis- the change of body tissue colour to a bluish-purple hue due to decreased oxygen.
18. Coronary- relating to or denoting the arteries which surround and supply the heart.
19. Defibrillation- the use of an electrical current to help the heart return to a normal rhythm in case of abnormal heart rhythm in the ventricles.
20. Embolism- a blocked artery caused by a foreign body, such as a blood clot or an air bubble.
21. Endocarditis- a life-threatening inflammation of the inner lining of the heart's chambers and valves.
22. ECG- a tool that records the electrical signal from the heart to check for heart conditions.
23. GDP- a measure of the market value of all the final goods and services produced and sold in a specific time.
24. Hypoxia- a condition in which the body or a region of the body is deprived of adequate oxygen supply at tissue level.
25. Hypoxemia- a below-normal level of oxygen in your blood, specifically in the arteries.
26. Hypothermia- a medical emergency that occurs when the body loses heat faster than it can produce it, causing a dangerously low body temperature.
27. Hypotension- low blood pressure (less than 90/60).
28. Ischaemia- a condition in which the blood flow (and thus oxygen) is restricted in a part of the body.
29. LUCAS- a device which provides mechanical chest compressions to patients in cardiac arrest.
30. Laryngospasm- a transient and reversible spasm of the vocal cords makes it difficult to speak or breathe.

31. Mast cells- white blood cells that is found in connective tissues near blood vessels.
32. Mortality- the number of deaths that occur owing to a health event.
33. Morbidity- the state of being symptomatic or unhealthy for a disease or condition.
34. Myocardium- the muscle tissue of the heart.
35. Oedema- a build-up of fluid in the body which causes the affected tissue to become swollen.
36. Pathophysiology- a study of the disordered physiological processes associated with disease or injury.
37. Prognosis- the likely course of a medical condition.
38. PPE- Personal protective equipment, worn to minimize exposure to hazards that cause serious workplace injuries and illnesses.
39. RHD- a condition in which the heart valves have been permanently damaged by rheumatic fever.
40. Reperfusion- Reestablishment of blood flow to salvage ischaemic tissues.
41. SCA- sudden cardiac arrest, the abrupt loss of heart function, breathing and consciousness.
42. Stroke- a brain attack, in which poor blood flow to the brain causes cell death.
43. Shock- a critical condition caused by sudden drop in blood flow through the body.
44. Systolic- the phase of the heartbeat when the heart muscle contracts and pumps blood from the chambers into the arteries.
45. Streptococcal- relating to infection with a bacterium known as Streptococcus pyogenes
46. TIA- a temporary period of symptoms like those of a stroke.
47. Thrombosis- the formation of a blood clot inside a blood vessel.
48. VF/Tachyarrhythmia- a type of irregular heart rhythm when the lower heart chambers contract in a very rapid and uncoordinated manner and thus the heart doesn't pump blood to the rest of the body.

BASIC LIFE SUPPORT

BLS Provider

American Heart Association.

Mariam Husain

has successfully completed the cognitive and skills evaluations in accordance with the curriculum of the American Heart Association Basic Life Support (CPR and AED) Program.

Issue Date
17 Sep 2022

Training Center Name
Charles Institute

Training Center ID
ZZ21283

Training Center City, Country
Mumbai, Maharashtra, India

Training Site Name

Renew By
Sep 2024

Instructor Name
DR. BUDHADITYA CHATTOPADHYAY

Instructor ID
22061388433

eCard Code
225608612614

QR Code

To view or verify authenticity, students and employers should scan this QR code with their mobile device or go to https://ecards.heart.org/international.

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