CONTINUING EDUCATION
for Occupational Therapists

THE ROLE OF OCCUPATIONAL THERAPY IN CARDIAC REHABILITATION

PDH Academy Course #OT-1709 | 3 CE HOURS

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Course Abstract

This course provides an overview of Occupational Therapy's role in cardiac rehabilitation, with attention to diagnoses, terminology and procedures, and process. It concludes with case studies.

Target audience: Occupational Therapists, Occupational Therapy Assistants (no prerequisites).

NOTE: *Links provided within the course material are for informational purposes only. No endorsement of processes or products is intended or implied.*

Learning Objectives

At the end of this course, learners will be able to:

- ❑ Differentiate between primary cardiac diagnoses
- ❑ Identify terminology and procedures pertaining to cardiac rehabilitation
- ❑ Recognize roles of occupational therapy in cardiac rehabilitation
- ❑ Recall elements of three cardiac rehabilitation-focused case studies

Timed Topic Outline

I. Primary Cardiac Diagnoses (60 minutes)
Hypertension (HTN), Coronary Artery Disease (CAD), Atrial Fibrillation (AFib), Heart Failure / Congestive Heart Failure (CHF), Myocardial Infarction (MI)

II. Common Cardiac Terminology and Procedures (15 minutes)

III. Role of Occupational Therapy in Cardiac Rehabilitation (45 minutes)
Overview, Settings, Process, Common Questions

IV. Case Studies (45 minutes)

V. Conclusion, Additional Resources, References, and Exam (15 minutes)

Delivery & Instructional Method

Distance Learning – Independent. Correspondence/internet text-based self-study, including a provider-graded multiple choice final exam. *To earn continuing education credit for this course, you must achieve a passing score of 80% on the final exam.*

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Course Author Bio & Disclosure

Midge (Annamaria) Hobbs, OTR/L, originally from the UK, graduated with an MA in Occupational Therapy from Tufts University, Boston MA in 2005. She spent the following ten years working in long-term acute care gaining experience as a clinician, educator, and manager. In 2010, Midge was selected for the inaugural cohort of AOTA's Emerging Leaders Development Program (ELDP). Since then she has continued to amplify AOTA's leadership initiatives by serving the Emerging Leaders Development Committee (ELDC) as Chairperson and as a member of AOTA's Volunteer Leadership Development Committee (VLDC). She is currently the Editor of AOTA's A Mindful Path to Leadership, a new online self-paced leadership development course, and she co-authored Module 3: Mentoring and Leadership with current AOTA president, Amy Lamb.

Midge is currently employed as a consultant for internship development in the adolescent residential psychiatric programs at Sheppard Pratt Hospital in Baltimore MD, an adjunct professor at the MGH Institute of Health Professions in Boston, and a clinician at local rehab and assisted living facilities. Midge is also enrolled at Thomas Jefferson University for her post-professional OTD with a specialty in teaching in the digital age. In her limited spare time she watches English soccer and eats a lot of popcorn.

DISCLOSURES: Financial – Midge (Annamaria) Hobbs received a stipend as the author of this course. Nonfinancial – No relevant nonfinancial relationship exists.

INTRODUCTION

Cardiovascular disease, known popularly as heart disease, is an umbrella term that includes conditions affecting the blood vessels such as coronary artery disease; heart rhythm issues such as arrhythmias; and congenital defects. While hospitalizations and deaths associated with heart disease have declined in the U.S.A. over the last decade – due to an increase in evidence-based practice and medications, as well as initiatives to promote heart-healthy lifestyles – it remains the number one cause of death for both men and women in the U.S.A., killing more than 600,000 individuals annually and spanning most racial/ethnic groups.[1] Approximately 27.6 million American adults have been diagnosed with some form of heart disease, with coronary artery disease (CAD) the most prevalent. Although many forms of heart disease are preventable or treatable with healthy lifestyle choices, it is estimated that approximately 49% of all Americans have at least three risk factors for heart disease, which include high blood pressure, high LDL cholesterol, smoking, diabetes, chronic stress, and obesity. Additional lifestyle choices that increase risk include poor diet, physical inactivity, and excessive alcohol consumption. The financial burden of heart disease, including both health-related expenses and lost revenue, is estimated to be more than $200 billion per year.[2]

Symptoms associated with heart disease vary across conditions and may also vary between genders. Common symptoms associated with coronary artery disease (CAD) include fatigue and shortness of breath, while changes in heart rate, including the sensation of fluttering in the chest or a racing heartbeat, may be indicative of an arrhythmia. In cases of congestive heart failure, individuals may also experience lower extremity edema or a persistent cough. Some adults may even remain asymptomatic until experiencing an acute cardiac

event, such as an episode of angina, a heart attack, or a stroke.[3] Whether heart disease presents as an acute health crisis or a chronic condition, symptoms can often limit function leading to loss of independence and a decline in confidence.[4] Multidisciplinary health care is designed to alleviate and/or manage symptoms, increase strength and endurance in order to optimize function, and maximize quality of life. Occupational Therapy (OT) – with its distinct focus on evaluating individual needs and developing meaningful, client-centered interventions to maximize individual functional capacity through education, the improvement of strength and activity tolerance, and psychosocial support – plays a key role within the interdisciplinary team. While many occupational therapists may not work primarily in cardiopulmonary rehabilitation, many therapists working in physical medicine settings will encounter adults with limitations associated with heart disease, and it is important to understand OT's role and be prepared to provide appropriate services.[5]

PRIMARY CARDIAC DIAGNOSES

Hypertension (HTN)

Description:

Hypertension, or high blood pressure, is a common condition determined by a resting systolic blood pressure of 140 mm Hg or more, and/or a diastolic pressure of 90 mm Hg or more, on repeated examination. Approximately 95% of hypertension develops without a known etiology (essential or primary hypertension) and 5% of cases are attributed to a comorbid condition such as chronic kidney disease (secondary hypertension). Without appropriate medical management, the persistent high force of blood pumping through the blood vessels places significant stress on the heart, increasing the risk of serious health problems.[6]

Pathophysiology:

Approximately 75 million or one in three American adults have high blood pressure yet only about half are aware they even have the condition and in many cases the disease is not adequately controlled.[7] Hypertension significantly increases the risk of heart disease and stroke, which are two of the leading causes of death in the United States. It is the most common chronic disease managed by primary care physicians: annual medical expenses associated with hypertension are estimated to be around $47.5 billion each year. The condition is either the primary or contributing cause of almost 1000 deaths each day in the U.S.A. According to the Centers for Disease Control (CDC), hypertension affects men and women in equal numbers; however, the condition is more prevalent in men if under the age of 45, and is more likely to affect women than men when over the age of 65. High blood pressure affects all races and ethnicities, although it occurs more often and at an earlier age in African Americans.[8]

Blood pressure typically increases with age due to a stiffening of the arteries or the development of small vessel blockages, but genetics and environmental factors, such as stress, sodium intake, and obesity, are also major considerations in the development of primary hypertension. Additionally, excessive alcohol consumption, over-use of non-steroidal anti-inflammatory drugs (NSAIDS), corticosteroids, cocaine, and oral contraceptives may also contribute to the development of hypertension.[7]

No specific pathologic changes occur in the early stages of hypertension; however, a severe or chronic disease profile will damage arteriole tissue over time with further narrowing of vessels, thereby increasing the risk of developing coronary artery disease (CAD), myocardial infarction (MI), heart failure, stroke, or renal failure.[6]

Clinical picture:

Hypertension is commonly called the "silent killer" because it is typically asymptomatic and individuals are commonly unaware of the disease until a medical professional conducts a **blood pressure measurement** during a physical examination. In order to determine a diagnosis, a doctor may require multiple readings over the course of several days in order to assess whether high blood pressure persists over time. High blood pressure is classified by its degree of severity, which also guides the treatment plan, but it is equally important to consider the individual's family history and any additional risk factors that may require attention. [6]

Classification	Systolic BP (mmHg)	Diastolic BP (mmHg)
Normal	<120	And <80
Pre-hypertension	120-139	Or 80-89
Stage 1 hypertension	140-159	Or 90-99
Stage 2 hypertension	≥160	Or ≥100

Classification of Blood Pressure[9]

The primary goal in treating hypertension is to decrease blood pressure to levels below those used in determining a diagnosis. Prior to introducing blood pressure medication, individuals who have been classified as pre-hypertensive are typically encouraged to make lifestyle changes to minimize the risk of disease progression. With appropriate healthcare guidance and support, a number of nonpharmacological interventions have been shown to help decrease blood pressure. Interventions include

participation in a tailored weight loss program, a reduction in sodium intake, a regular exercise regimen, limiting alcohol consumption, and smoking cessation.[10]

While each individual case is unique, medication treatment is typically initiated immediately for those individuals who have been diagnosed with at least stage 1 hypertension, in cases where lifestyle changes have been shown to be ineffective, or when the healthcare provider sees a need to expedite control of blood pressure. Age, ethnicity, lifestyle factors, and comorbidities are all considered in the drug treatment plan.[10] Medication regimens may include **diuretics** to eliminate excess sodium and water in order to reduce blood volume, beta blockers such as atenolol to minimize cardiac workload and dilate vessels to optimize blood flow, angiotensin-converting enzyme (ACE) inhibitors like Lisinopril to relax and open vessels, and calcium channel blockers such as diltiazem to relax vessels and decrease heart rate. Additional medications that may be considered include alpha blockers to minimize nerve impulses that narrow blood vessels, vasodilators that directly impact artery walls and decrease tightening and narrowing of vessels, and aldosterone antagonists that reduce salt and fluid retention.[11]

A comprehensive treatment plan may also include a stress management program to minimize triggers and help develop effective coping strategies, including relaxation techniques. Regardless of whether hypertension is treated with medication or lifestyle changes or a combination, healthcare providers should inform clients that treatment is invariably a life-long commitment and any changes to the treatment protocol should be first discussed with a physician.[10]

Coronary Artery Disease (CAD)

Description:

Coronary artery disease (CAD) is one of the most common cardiac-related disorders that affects millions of individuals worldwide. It is an **ischemic** disease, most commonly attributed to **atherosclerosis**, a buildup of fatty, fibrous **plaque** in the coronary arteries that can progressively narrow the vessels over time and occlude blood supply to the heart muscle, increasing the risk of significant health related issues.[12]

Pathophysiology:

In the United States, approximately 370,000 deaths are attributed to CAD annually.[13] The majority of individuals who die as a result of the disease are over 65 years of age, and it typically affects more men than women, although women typically develop heart disease later than men and the death rate among women continues to rise each year. The risk of heart disease generally increases with age but a decline in the hormone estrogen may play a role in increasing the risk for post menopausal women. Research suggests that estrogen helps to maintain the flexibility of blood vessels thereby improving blood flow and as hormone level decline the risk of cardiovascular disease increases.[14] While genetic predisposition or a family history of heart disease may increase the likelihood of developing CAD, there are also a number of additional risk factors that can be modified or controlled with appropriate medical care. For example, controlling high blood pressure is key, as an increase in cardiac output associated with hypertension can place significant stress on the heart muscle. Other significant factors that require appropriate medical attention are managing cholesterol levels, managing diabetes mellitus, monitoring weight, staying physically active, and stopping smoking. More recent research also implicates chronic inflammation associated with prolonged stress as a significant contributor to the development of atherogenesis and the early development of plaque.[15] Approximately 68% of individuals over the age of 65 who have been diagnosed with diabetes die as a result of some form of heart disease. The correlation between high blood cholesterol – in particular an increase in low-density lipoprotein (LDL) cholesterol – and CAD is significant, with the risk escalating even further with the addition of other risk factors such as tobacco use and obesity. Other factors that contribute to the development of CAD include excessive alcohol consumption, which can raise blood pressure and contribute to high cholesterol and weight gain. Individual exposure to stress and the ability to manage stress may also be a contributing factor to CAD: not only does it increase the workload and strain on the heart muscle but it may also lead to unhealthy behaviors such as poor dietary choices or an increase in smoking or alcohol consumption.[7]

CAD is a complex chronic inflammatory disease notable for a narrowing of the coronary arteries that supply oxygen to the heart by atherosclerotic plaque. As blood flow is restricted over time, CAD can lead to a weakening of the heart muscle increasing the risk for major health concerns, including **angina**, myocardial infarction, heart failure and **arrhythmias**. Restricted blood flow or a blockage may also trigger a heart attack and if blood supply is not restored promptly, cardiac tissue will begin to die which may result in death.[16] Research suggests that 70% of sudden deaths associated with CAD can be attributed to plaque rupture or plaque erosion.[17]

Clinical picture:

CAD is commonly diagnosed through a detailed medical history, physical exam, and diagnostic tests that may include an **echocardiogram** to assess the heart's effectiveness, a **stress test** to determine the heart's response to increased activity demand, and/or **cardiac catheterization** or **angiogram** to determine potential blockages.[18] Individuals may not experience

any symptoms during the early stages of the disease, which is commonly treated by controlling risk factors, such as managing high blood pressure, cholesterol levels, and diabetes, as well as other preventative actions designed to address diet and weight, activity, stress, and smoking cessation.

Angina is a complication of CAD that may develop as the arteries continue to narrow over time and blood supply is reduced. This causes the heart muscle to constrict with increased activity demand, such as exercise, eating, or stress, causing chest discomfort or pain. It may also be experienced as pressure, aching, or a squeezing sensation in the left shoulder, the arms, neck, back, or jaw. Other symptoms associated with angina include shortness of breath, nausea or vomiting, a rapid or irregular heartbeat, diaphoresis, or a feeling of fullness or heartburn similar to indigestion.[19] Typically, women's angina symptoms are less easily identified as cardiac related and consequently women are often less likely to seek medical help for the onset of a heart attack. While women can also experience chest pain or pressure that extends to the arm or jaw during an episode of angina, many often report additional symptoms prior to having a heart attack, including significant fatigue, sleep disturbance and anxiety.[20]

Angina is commonly classified as either stable or unstable. The stable kind occurs more predictably during periods of exertion or stress with episodes lasting approximately 2-15 minutes and resolving with rest or medication. Unstable angina typically occurs when more than 70% of the arteries are occluded, and symptoms can occur at rest without any notable cardiac demand. Treatment for angina includes nitrates, such as **nitroglycerin** tablets, or beta-adrenergic blockers that dilate vessels. Symptoms of angina are very similar to those of a heart attack and immediate medical attention is imperative if symptoms persist and last longer than 15 minutes or there is no response to prescribed medication.[21]

With significantly narrowed or blocked vessels a more invasive treatment may be indicated to alleviate angina and minimize the risk of myocardial infarction (MI). This includes **coronary artery bypass graft (CABG)** surgery to circumvent blocked vessels by using another vessel harvested from the body, most commonly the **saphenous vein** in the leg.[22] Alternately, **percutaneous coronary intervention (PCI)**, also known as coronary angioplasty, with or without **stent** placement may be indicated to open the artery. The procedure involves a deflated balloon being passed through a catheter that has been inserted into the narrow artery. Once in place, the balloon is inflated to open the vessel and a stent is commonly left in place to maintain the changes.[23]

Atrial Fibrillation (AFib)

Description:

A cardiac arrhythmia is a disturbance in the normal rhythm of the heart that can be benign or immediately life-threatening. Changes in the heart's electrical impulse sequence can cause the heart to beat too fast, too slowly, or irregularly, which may impact the heart's ability to pump effectively. Atrial fibrillation (AFib) is the most common sustained arrhythmia condition, notable for cardiac irregularity and sometimes referred to as rapid heartbeat.[24 25]

Pathophysiology:

AFib affects an estimated 2.7-6.1 million individuals in the United States and occurs when the **atria** and **ventricles** beat out of sync. It may develop as a result of another disorder such as high blood pressure, CAD, heart failure, or heart valve issues. It may also occur as a result of pneumonia (PNA), a thyroid problem, or sleep apnea. Each year more than 750,000 hospitalizations are attributed to the condition with healthcare related costs estimated to be about $6 billion. Of note, the condition can increase an individual's risk for developing an ischemic stroke by 15-20% and each year approximately 130,000 deaths in the U.S. are associated with AFib as either the primary cause or a contributing factor. Risk factors for developing AFib include advancing age, high blood pressure, obesity, diabetes, ischemic heart disease, and heavy alcohol consumption.[26]

A normal heartbeat begins with an electrical signal from the sinus node, a single point within the right atrium of the heart. During AFib, electrical signals fire rapidly from multiple sites in both atria thereby overwhelming the ventricles, which are unable to fill and pump in a normal rhythm. As a result, an individual will experience a rapid and irregular heartbeat. With ongoing cardiac inefficiency, the risk of a blood clot developing increases as blood pools in the upper chambers. In turn, this leads to greater risk of stroke.[23 27]

Clinical picture:

For many, AFib does not cause obvious symptoms but may include an uneven pulse, a racing or pounding heart, a sensation that the heart is fluttering, chest pain, feeling short of breath, dizziness and/or fatigue. Signs and symptoms of an acute medical event include severe chest pain, feeling weak or faint, as well as the typical signs associated with stroke.[25]

In addition to a full physical evaluation, a diagnosis of AFib is confirmed via **electrocardiogram (ECG)**, which detects and records the heart's electrical activity and rhythm. Doctors may also suggest a portable ECG device, such as a Holter Monitor, to record an individual's heart rhythm over a set period of time, or an Event Monitor that may be used for longer

periods of time but is only triggered by abnormal heart rhythm. If an ECG is consistent with AFib, additional tests such as an ultrasound may be used to also determine if valve damage or heart failure are also present.[23] [25]

If AFib is the result of a treatable medical condition such as PNA, the arrhythmia may resolve as the infection resolves. However, typical treatment of AFib varies according to symptoms. Antiarrhythmic medication may include those designed to slow the heart rate or control rhythm. Additionally, **anticoagulants** are often prescribed to also minimize the risk of stroke. Treatment options also include **catheter ablation** to destroy the cardiac cells producing the errant electrical signals, or **cardioversion** whereby the heart is shocked into rhythm under controlled circumstances. While the cardioversion procedure is considered effective in reestablishing normal **sinus rhythm** it does not necessarily prevent a future recurrence. For others, a **pacemaker** may be indicated to correct the heart's rhythm.[25]

Despite the increased risk for stroke, individuals with a diagnosis of AFib can continue to lead healthy, active lives with careful medical management and lifestyle modifications. Managing triggers, such as excessive caffeine and alcohol intake, poor sleep, and increased stress, is considered an essential component of long term care.[28]

Heart Failure / Congestive Heart Failure (CHF)

Description:

Heart failure, or congestive heart failure (CHF), is a complex diagnosis that results from impaired structure and/or function of the ventricles. It is a chronic progressive condition that affects the heart's ability to pump blood to the body and provide organs and tissues with necessary oxygen and nutrients. Heart failure often affects both sides of the heart; however, one side may be more affected than the other. While both left or right sided dysfunction share similar clinical traits, left ventricular dysfunction typically presents with increased fatigue, shortness of breath, and pulmonary edema, while right sided dysfunction is notable for peripheral edema. The decrease in cardiac efficiency and output impacts the body's ability to circulate blood, hence the term "congestive" heart failure. Left or right sided heart failure may be the result of either systolic dysfunction, whereby the heart is unable to contract efficiently, or diastolic dysfunction when cardiac muscle is unable to relax.[29]

Pathophysiology:

Approximately 5.7 million American adults have a diagnosis of CHF, with an additional 500,000 new cases each year. Globally, about 23 million are affected by CHF with about half dying from the disease within 5 years of diagnosis. Each year in the United States, one million hospitalizations are attributed to CHF with costs estimated in the region of $30.7 billion, which includes medical care and treatment costs, medications, and missed work. [27] [30]

Any disorder that directly impacts the heart may contribute to the development of heart failure. The most common etiology for systolic dysfunction is coronary artery disease, typically caused by a combination of factors; as vessels narrow over time limiting the flow of oxygenated blood to the heart, cardiac muscle weakens impacting its ability to contract. Chronic HTN is the most common disorder that leads to diastolic dysfunction; s the heart pumps more forcibly at a higher pressure the cardiac walls thicken leading to ventricle hypertrophy, which makes oxygenating the heart muscle even more difficult and may lead to ischemic damage. Additionally, an acute ischemic event such as a myocardial infarction (MI) may destroy tissue contributing to cardiac inefficiency. Unhealthy lifestyle factors may also increase the risk for developing heart failure. These include smoking, having a diet high in fat and/or sodium, alcohol or drug abuse, limited physical activity and/or obesity.[27]

Under stress, the body responds by releasing epinephrine and norepinephrine, two hormones designed to increase cardiac output. However, with a sustained response to the stress of chronic conditions such as CAD or HTN, the heart ultimately becomes weaker with a notable impact on **stroke volume** and a further decrease in cardiac output. The body responds by triggering compensatory mechanisms that include an inflammatory response as well as structural changes to the wall of the heart muscle. As the heart works harder its walls thicken and enlarge in order to contract more forcefully. While this measure may increase stroke volume in the short term, the tissue ultimately stiffens with effort thereby decreasing its effectiveness over time. Additionally, decreased renal perfusion causes a release of the renin-angiotensin-aldosterone-vasopressin system (antidiuretic hormone ADH), which promotes sodium and water retention ultimately leading to volume overload. Initially, retaining salt and water instead of excreting it into urine helps to increase heart function and regulate blood pressure and organ perfusion, but chronic activation is detrimental to cardiac efficiency. Over time the effort weakens the cardiac muscle worsening the heart failure.[27]

Clinical picture:

Heart failure may begin with an acute onset or progress slowly and become a chronic condition, although in many cases individuals are initially asymptomatic. Heart failure symptoms are classified in stages from mild to severe.

Class	Description
I	No limitations with normal activity. For example, no undue fatigue or dyspnea with exertion.
II	Mild limitations with ordinary physical activity. For example, dyspnea when ambulating long-distances, climbing two flights of stairs.
III	Moderate limitations with increased activity demand. For example, fatigue and dyspnea while ambulating short distances, climbing one flight of stairs.
IV	Severe limitations. For example, dyspnea occurs at rest or with minimal exertion.

New York Heart Association (NYHA) Heart Failure Symptom Classification[31]

Even when both types of heart failure are present, one side will likely dominate. In the majority of cases, left-sided heart failure will lead to right-sided dysfunction.[32] Although right and left-sided heart failure produce different symptoms, the most common symptom associated with the disease is shortness of breath.

Initially, in left-sided heart failure, shortness of breath may only be evident with increased activity demand. However, as the disease progresses and with increasing fluid accumulation in the lungs, **dyspnea** may also occur at rest or with minimal exertion. Additionally, individuals may also experience **orthopnea** as gravity causes the increase in fluid to move to the lungs, which is exacerbated in supine. Breathing is often improved by sitting up. In addition to shortness of breath, individuals may also experience wheezing and **bronchospasms**, as well as an increase in fatigue and muscle weakness.[30]

Right-sided heart failure is characterized by peripheral edema that includes the lower extremities, the liver, and abdomen. With significant fluid accumulation in the abdomen or liver, individuals may experience a decline in appetite and/or nausea. When food is not being absorbed efficiently, **cardiac cachexia** is common. [30]

Depression, decreased alertness, and a decline in cognition are also characteristics of CHF. Cognitive deficits are particularly indicated in the elderly with research showing that heart failure has an impact on memory and recall, attention, and the capacity for new learning. The effects on function may include an inability to manage the disease appropriately, problem-solve daily routines or challenges, and adequately perform self-care tasks. A decline in cognition alongside a decline in function may lead to decreased confidence and depression.[33]

In severe cases individuals may also experience a rapid or irregular heart rate or **Cheyne-Stokes respiration**. Any sudden changes in dyspnea or heart rate with chest pain should be considered a medical emergency requiring immediate help. Individuals are also at greater risk of developing emboli, which in turn increases the risk for stroke. [34]

Diagnosis is typically determined through a complete medical history with a thorough assessment of symptoms and physical examination. Additional procedures are used to support the diagnosis, which typically includes an electrocardiogram (ECG) to determine heart rhythm irregularities, whether there are structural changes in the ventricles or to assess valve function. An ECG may also help to determine if the heart failure is the result of systolic or diastolic dysfunction by assessing the thickness and stiffness of the heart wall and the **ejection fraction** (EF). A normal ventricle ejects approximately 60% of its blood. An EF below this percentage confirms systolic heart failure. A normal EF suggests diastolic dysfunction. Additional procedures used to confirm diagnosis include blood tests, chest X-rays to assess fluid build up in the lungs, a stress test to determine the cardiovascular system's response to exertion, a cardiac computerized tomography (CT) scan, magnetic resonance imaging (MRI), or a coronary angiogram to assess arterial health.[30]

While CHF is considered a chronic condition, it can be managed long-term with appropriate medical care and lifestyle changes. However, CHF may worsen rapidly requiring immediate emergency care and hospitalization. While a good number of individuals manage the disease for many years and life expectancy can improve with treatment, much depends upon the severity of the condition and which treatments options are applicable. Approximately 70% of individuals with mild heart failure die within 10 years of being diagnosed, while those who are classified as severe cases often die within 2 years. In older adults, treatment options may be limited and quality of life takes priority versus attempting to implement heroic measures. In such cases, hospice is the main consideration whereby the individual is offered symptom relief and compassionate care to ensure comfort and dignity at end of life.[27]

Treatment options vary but typically include a combination of measures. Medications and lifestyle changes are often the cornerstone of treatment plans while oxygen and/or surgical interventions may also be indicated. For example, if the known etiology is valve dysfunction or vessel blockage, surgery may be appropriate. A heart transplant may also be an option for eligible candidates with worsening symptoms but no other comorbidities. [27 30]

There are a number of medications used to treat heart failure. These include angiotensin-converting enzyme (ACE) inhibitors, a type of vasodilator, which are often the core of treatment and work to reduce the levels of the hormones angiotensin II and aldosterone in the blood. In doing so, ACE inhibitors dilate vessels, help the kidneys eliminate excess water, and lower blood pressure thereby decreasing cardiac

workload. Common alternatives to ACE inhibitors are angiotensin II receptor blockers that have similar benefits. Beta blockers are also frequently used with ACE inhibitors to treat heart failure. In cases of diastolic heart failure, beta blockers reduce heart rate and relax thickened cardiac muscle that has stiffened. Consequently, the heart can fill more readily and work more efficiently.[30]

Diuretics are also commonly use to manage fluid retention, particularly when dietary sodium restriction is inadequate. Most often, diuretics are taken orally as part of a long-term regimen; however, they are also used intravenously in acute situations. Aldosterone antagonists directly obstruct the effects of aldosterone and are potassium-sparing diuretics.[30]

In acute heart failure, such as the development of pulmonary edema, individuals commonly require supplemental oxygen alongside diuretics to decrease edema and morphine to manage the significant anxiety associated with respiratory distress. By slowing respiration rate and dilating blood vessels, the morphine can decrease cardiac effort and improve breathing. [27, 30]

Lifestyle changes are also important considerations in heart failure management and can help minimize symptoms and slow the progression of the disease. Doctors may recommend smoking cessation, daily weight monitoring including checking for edema, dietary changes with sodium and high fat restrictions, limiting alcohol and fluid consumption, reducing stress, and increasing physical activity as tolerated. [27]

Despite managing chronic disease symptoms, heart failure can cause sudden death even without a period of worsening symptoms. Healthcare providers are encouraged to discuss end of life issues and advance directives with individuals who have been diagnosed with CHF and include family members and significant others in the dialogue. [27]

Myocardial Infarction (MI)

Description:

Commonly referred to as a heart attack, acute myocardial infarction (MI) is the irreversible damage to heart muscle as a result of coronary artery obstruction or prolonged lack of oxygen to cardiac tissue. If blood flow is not restored quickly, cardiac muscle begins to die and the **infarction** may be fatal.[35 36]

Pathophysiology:

In the United States, someone has a heart attack every 43 seconds with approximately 735,000 events occurring annually. One in five infarctions is asymptomatic and around 50% of individuals experiencing an MI die within an hour after onset before they reach the hospital.[37] Men are more likely to experience an MI than premenopausal women, although the number of women who are at risk for heart attack increases post menopause. Myocardial infarction affects all ethnicities and about half of all Americans have at least one of the three risk factors that may contribute to heart disease and increase the possibility of an MI. These include hypertension, high cholesterol, and smoking. In addition, several lifestyle factors and medical conditions may also increase risk of triggering a MI, including diabetes, obesity, poor diet, physical inactivity, and excessive alcohol consumption.[38]

Infarction is tissue death that occurs in response to one or more **coronary occlusions**. It may occur as a result of an atherosclerotic rupture that leads to thrombus formation that in turn plugs the artery and obstructs blood flow to the heart. In many cases, the vessels may already be narrower if there is underlying atherosclerosis, a build-up of fatty, fibrous plaque in the coronary arteries. Less common is an MI stemming from a coronary artery spasm that inhibits blood flow, which may be triggered by amphetamine or cocaine use.[39]

An acute MI typically affects the left ventricle but ischemia may also impact the right ventricle or the atria. Anterior infarcts are more commonly associated with a poor prognosis than inferoposterior events. Prolonged ischemia to the **myocardium** can cause irreversible tissue damage or death. In terms of function, an MI may cause reduced contractility with unstable cardiac wall movement, altered left ventricular compliance, reduced stroke volume, decreased ejection fraction, and elevated left ventricular end-diastolic pressure.[34]

Classification of an acute MI is designed to assist rapid decision-making and is based on the presence of serum markers in the blood, symptoms of ischemia, and imaging results. The three classifications include unstable angina and two types of MI: Non-ST-segment elevation MI (NSTEMI) and ST-segment elevation MI (STEMI), which are determined by the presence or absence of ST-segment elevation or Q waves on an Electrocardiogram (ECG). In cases of NSTEMI, there may be ST-segment depression and/or T-wave inversion, and blood tests will show cardiac markers, troponin I or troponin T and CK-MB, to be elevated. In cases of STEMI, ECG changes will show ST-segment elevation as well as elevated cardiac markers.[34]

Acute MI may be classified further according to etiology and context.[34]

Type	Etiology/context
I	MI caused by ischemia due to primary coronary event such as atherosclerotic rupture or coronary dissection
II	MI caused by ischemia due to coronary artery spasm decreasing O2 supply or increased O2 demand due to hypertension
III	MI related to sudden cardiac death
IVa	MI linked with percutaneous coronary intervention
IVb	MI linked with stent **thrombosis**
V	MI associated with coronary artery bypass graft (CABG)

The severity of an infraction depends upon several key factors: the extent of the arterial occlusion, the duration of the blockage, and whether there is collateral circulation. Typically, the more proximal the blockage, the more likely there will be extensive myocardium tissue necrosis.[33]

Clinical picture:

While some individuals are asymptomatic during a heart attack, there are several characteristic warning signs associated with an infarction, although these often differ between men and women. Most commonly, symptoms include significant chest pain that is often described as pressure, aching, fullness, or a squeezing sensation that may radiate into the jaw, shoulders, left arm, and/or upper back. Symptoms may also include dyspnea, diaphoresis, epigastric discomfort with nausea or vomiting, **syncope** or near syncope episodes, and impaired cognition. Skin is often pale and peripheral cyanosis may be visible.[33 34] In women, a heart attack is often precluded by extreme weakness akin to flu-like symptoms with a sense of restlessness or apprehension, and they may not experience any notable chest pain. The milder, less characteristic heart attack symptoms may be why so many women fail to seek or do not receive appropriate emergency medical attention.[40]

Evaluation begins with serial electrocardiography (ECG) and should be carried out immediately upon presentation of chest pain. These measurements will show the electrical activity of the heart, the location of damaged cardiac muscle, and help determine whether an individual is having a heart attack or not. An ECG will also help doctors differentiate between unstable angina, NSTEMI, or STEMI in order to provide appropriate medical care. A blood test is also a key diagnostic tool, measuring the presence of cardiac markers or cardiac enzymes in the blood indicating myocardial cell injury. Heart muscle proteins, troponin I and troponin T, and an enzyme called CK-MB are normally only found in heart muscle unless tissue is damaged or dead, upon which they are released into the bloodstream. Levels of these cardiac markers are high within 6 hours of infarction and remain elevated for several days after an event. Additionally, a coronary angiography (diagnostic imaging) may be considered after an acute MI if there is evidence of ongoing ischemia, the individual remains hemodynamically unstable, or there is recurrent ventricular **tachyarrhythmias**.[34]

Delay in medical attention caused by failure to recognize MI symptoms may significantly limit options for care, and reduce the potential for successful intervention. Trained pre-hospital personnel are often the key to improving survival rates. [33 41] Pre-hospital intervention, including collecting early diagnostic data, may significantly increase diagnosis confirmation and reduce mortality rates associated with heart attack. Early interventions include administering potent antiplatelet medication, like aspirin, immediately upon recognition of MI symptoms, providing supplemental oxygen if O2 sats are below 90%, and if available, administering nitroglycerin for active chest pain. Paramedics may also initiate intravenous (IV) access, provide appropriate analgesics, and initiate **telemetry** or ECG, if available.[42]

Treatment focuses primarily on restoring coronary blood flow and recovering functional myocardium. Once diagnosis is confirmed, intervention is determined by the clinical picture and prognosis. Medication is most often the mainstay of therapy. Typical drugs include thrombolytic agents to revascularize tissue, antiplatelet drugs to prevent new clots forming or existing clots from growing larger, and beta blockers to relax cardiac muscle, decrease blood pressure and myocardial demand, and minimize heart muscle damage. Additional medications include ACE inhibitors to lower blood pressure and minimize the stress on the heart, antiarrhythmics to manage ventricular arrhythmias, and pain medication such as morphine to ease discomfort. Surgical interventions include percutaneous coronary intervention (PCI), also known as angioplasty, and stenting, a reperfusion procedure that uses a catheter to place a stent to open an occluded vessel. PCI is the preferred reperfusion intervention for individuals with STEMI provided it can be performed within 90 minutes of admission to the hospital. For others, coronary artery bypass grafting (CABG) may be indicated when arterial disease is severe and an individual cannot undergo PCI, or in cases where thrombolytic drugs are contraindicated due to a recent surgery or stroke. [39 40]

Even if blood flow is successfully restored, individuals who have experienced MI may remain in the hospital until considered medically stable. Additional treatment focuses on minimizing complications, restoring normal function, and the exploration of lifestyle modifications to reduce risk factors. Once discharged from the hospital, treatment may include cardioprotective

medications, cardiac rehabilitation, and ongoing dietary/lifestyle education.[40] Unless complications are present, progressive mobility and activity participation is encouraged while hospitalized to minimize physical deconditioning and depression.[37]

Upon discharge, several key lifestyle modifications have been shown to strongly decrease risk for recurrent MI and minimize the progression of cardiac disease, including adoption of a low fat and low sodium diet, smoking cessation, and increased physical activity. Regular exercise based on an individual's age and cardiac picture, as well as the resumption of normal daily routines, will be guided by healthcare providers.[37]

Individuals who survive an acute heart attack are at greater risk of additional infarcts, as well developing other cardiac conditions, such as heart failure, arrhythmias, angina, or stroke. However, prognosis may vary according to age and clinical picture, including the presence of absence of risk factors. Many individuals continue to live full active lives with appropriate lifestyle changes and medical management.[43]

COMMON CARDIAC TERMINOLOGY AND PROCEDURES

Angina pectoris: Acute chest pain due to inadequate oxygen to the heart muscle. Angina is symptomatic of heart disease and may preclude a heart attack. It is often characterized by a feeling of localized pain, pressure, or tightness behind the sternum.[44]

Angiogram: An imaging technique used to diagnose heart conditions. It is the primary procedure used to evaluate arterial blockages and is typically conducted under sedation. The procedure is conducted using X-rays and contrast dye to identify blockages and determine the most appropriate treatment. The most common interventions provided during an angiogram are stent placement and balloon angioplasty.[45]

Anticoagulant: A blood clot is the body's way of sealing and containing bleeding wounds. While typically useful, the clotting process can also block vessels and restrict blood flow thereby increasing the risk of myocardial infarction or stroke. An anticoagulant is a medication that is used to prevent blood clots by inhibiting the process of clot formation. They are also referred to as "blood-thinners" although this is somewhat of a misnomer. They are commonly recommended by physicians in conditions such as heart disease, arrhythmias, congenital heart defects, vascular issues, or after surgery. Common side effects associated with anticoagulants include increased risk of bruising, nosebleeds, bleeding gums, heavy periods for women, and changes in temperature or pain in the extremities.[46]

Arrhythmia: An abnormal heart rhythm that is considered too fast, too slow, or irregular, and that most commonly occurs as a result of a heart disorder, such as coronary artery disease (CAD) or heart failure. The heart is normally regulated by the autonomic nervous system via an electrical sequence and is designed to maintain efficiency and reliability over a lifetime. Some individuals are asymptomatic while others experience **palpitations**, although these vary considerably between people. If an arrhythmia is limiting the heart's ability to contract and pump blood, some individuals may experience decreased activity tolerance, dyspnea, hypotension and dizziness with an increased risk for syncope, or death. Diagnosis is conducted via an electrocardiogram (ECG). Treatment includes antiarrhythmic medication, lifestyle changes, or surgically implanting a pacemaker.[47]

Atherosclerosis: Arteriosclerosis is slow progressive disease that is typified by a thickening and hardening of the arteries. Atherosclerosis is a form of arteriosclerosis that specifically refers to an increase in lipids, cholesterol, or other substances that restrict arterial blood flow.[48] When mild it is usually asymptomatic but as arteries deteriorate over time and decrease in elasticity, the condition may gradually limit blood flow to the heart muscle increasing the risk of complications such as arrhythmias, angina, peripheral artery disease, or stroke.[49] Arteriosclerosis / atherosclerosis is most commonly caused by hypertension, high cholesterol, tobacco use, diabetes, obesity, or inflammation associated with conditions such as arthritis or lupus. Additional risk factors include aging, diabetes, a family history, poor diet, and a sedentary lifestyle. Diagnosis is via a complete physical and may include blood tests, a doppler ultrasound, electrocardiogram (ECG), and/or a stress test. Treatment includes medication, surgical interventions, and lifestyle changes.[50]

Atria: One of two upper heart chambers separated by the septum. The right atrium receives deoxygenated blood returning to the heart from the superior and inferior venae cavae. The left atrium receives blood returning from the pulmonary veins.

Bibasal consolidation: A radiological term that refers to dense material, such as fluid accumulation, in the alveolar within the base of both lungs. It is commonly associated with pneumonia and congestive heart failure.[51]

Blood pressure measurement: A diagnostic measure used to determine the strength of the blood pushing against blood vessels. Typically measured via the radial artery by means of a gauge called sphygmomanometer, which comprises of an inflatable cuff, a measuring unit, a bulb mechanism for inflation, and a stethoscope, or a digital version that uses electronic calculations versus manual inflation and reading. The procedure measures two numbers. The higher number, or systolic blood pressure, indicates the pressure in

the heart when it beats, while the lower number, or diastolic reading, denotes the pressure in the heart at rest in between beats.[52]

Bradycardia: Abnormally slow heart rate. In adults, it is typically under 60 beats per minute. Symptoms may include fatigue, dizziness or light headedness, confusion, or syncope.[53]

Bronchospasm: An involuntary contraction of the walls of the bronchi and bronchioles resulting in a narrowing of the airway. It is most commonly the result of an infection, allergen, or irritation or injury to the mucosa. It is a key characteristic of asthma and is often associated with a cough or wheezing.[54]

Cardiac arrest: The abrupt loss of heart function caused by a malfunction in the electrical system often resulting from underlying abnormal or irregular heart rhythms. More than 350,000 out of hospital cardiac arrests occur each year in the United States. In many cases, underlying heart disease is undiagnosed and deaths can be unexpected and instant.[55]

Cardiac cachexia: Often described as "body wasting," cardiac cachexia is a common complication of chronic disease such as congestive heart failure. Weight loss is unintentional and typically associated with decreased appetite, nausea, poor absorption, and an increased respiration rate that causes the body to burn additional calories. Individuals often experience a generalized loss of muscle mass that leads to significant weakness and fatigue and impacts activity tolerance and daily function.[56]

Cardiac catheterization: A 30-minute procedure used to diagnose and treat cardiovascular conditions by means of inserting a catheter into an artery or vein in the groin, neck, or arm, which is then threaded through the blood vessels to the heart. Contrast material and imaging help to identify narrow arteries or blockages, and if indicated, a non-surgical intervention such as an angioplasty may also be performed during the diagnostic procedure.[57]

Cardioversion: A common procedure to restore normal heart rhythm. In non-emergency situations, chemical or pharmacological cardioversion may be used via an IV. During electrical cardioversion shocks are provided via electrodes to try and regulate the heartbeat. [58]

Catheter ablation: A low risk procedure commonly used to treat cardiac arrhythmias, in particular supraventricular tachycardia (SVT), when medication has been unsuccessful. The procedure takes approximately 2-4 hours and is conducted in a cath lab. Catheter ablation selectively destroys the abnormal tissue responsible for the rhythm problem without damaging the rest of the heart.[59]

Cheyne-Stokes respiration (CSR): Defined as a periodic breathing pattern whereby episodes of apnea alternate with hyperventilation. It is a common characteristic of congestive heart failure, particularly during sleep. The pattern typically occurs every 45 seconds to 3 minutes, and is considered a poor prognostic sign.[60]

Coronary angioplasty: See percutaneous coronary intervention (PCI)

Coronary artery bypass graft (CABG): An established cardiothoracic surgical procedure used to improve blood flow to the heart by diverting blood around narrowed or restricted arteries. It is typically used in cases of severe heart disease, such as CAD, where a build of plaque has narrowed arteries and is restricting blood flow to the heart. During the procedure a heathy artery or vein is harvested from the body and used as a graft to bypass any blockages in the coronary arteries. Surgery can be performed for multiple vessel disease and typically requires a stay in the hospital with close post-operative care. Mortality rate is low and many individuals continue to live full, active lives although physical, psychological, and social variables must be considered and addressed. [61] [62]

Coronary occlusion: Refers to a complete obstruction within a coronary artery interrupting the blood flow to the heart and often resulting in a heart attack.[63]

Defibrillation: Delivery of a controlled electric shock via an automated external defibrillator (AED) in order to restore normal cardiac rhythm during life-threatening ventricular fibrillation. Early defibrillation is vital to increasing an individual's survival rate after sudden **cardiac arrest**.[57]

Diuretics: Medication used to increase urine output and excrete excess water and sodium from the body thereby decreasing the amount of fluid and pressure in the blood vessels. They are commonly used to treat high blood pressure and edema in heart failure. There are three types of diuretics, each addressing different needs with different side effects and precautions, although they are considered generally safe.[64]

Dyspnea: Shortness of breath or difficulty breathing, commonly an indicator of airway, lung, or heart dysfunction. The most common respiratory diseases associated with dyspnea include asthma, pneumonia, and chronic obstructive pulmonary disease (COPD). Red flags of particular concern include dyspnea at rest, chest pain, wheezing, palpitations, and crackles (suggestive of left sided heart failure or interstitial lung disease). An appropriate history and physical is required to determine severity, cause, and treatment.[65]

Echocardiogram (echo): A non-invasive test that uses sound waves to produce images of the heart and determine the cause of heart disease. It is often used to assess overall cardiac performance as well as more specific concerns such as unexplained chest pain, arrhythmias, or heart valve function.[66]

Ejection fraction (EF): A measurement of the percentage of blood leaving the ventricles during each contraction, often used to diagnose and track heart failure. A normal EF reading is typically between 50-70%. An EF under 40% may be evidence of heart failure. It is most commonly measured via an echocardiogram.[67]

Electrocardiogram (ECG or EKG): A painless diagnostic test used to measure the heart's electrical activity via electrodes attached to specified areas of your body. It is commonly performed to assess unexplained chest pain, check the condition of the heart in the context of disease such as hypertension, high cholesterol, smoking, diabetes, and to diagnose heart disease. Normal test results include a heart rate of 60-100 beats per minute with a consistent, even rhythm.[68]

Hypercholesterolemia: More commonly referred to as high cholesterol, hypercholesterolemia is an excess of low-density lipoprotein (LDL) cholesterol in the blood, which is linked to atherosclerosis and coronary artery disease. Most individuals with high cholesterol are asymptomatic, although over time the condition may lead to significant narrowing of arteries that may trigger chest pain associated with angina. The most common medical interventions are lifestyle changes, including diet and exercise, and medications such as statins, which are used to reduce the risk of heart attack or stroke.[69]

Implantable Cardioverter Defibrilator (ICD): A small battery powered device implanted under the skin in the chest or abdomen to monitor heart rhythm, that will also deliver a shock to restore normal rhythm if it detects an individual going into sudden cardiac arrest. The generator is the size of a pocket watch with fine wires connecting it to the heart. If the ICD determines that an individual is experiencing **bradycardia** it will work as a pacemaker and send signals to the heart. If the heart beat detected is too rapid or irregular, the ICD will give **defibrillation** shocks to stop the abnormal rhythm. It is typically recommended if someone has had a heart attack, survived a sudden cardiac arrest, has ventricular arrhythmia, has congenital heart disease, or any other condition that increases the risk for cardiac arrest.[70]

Infarct: An area of tissue that has been damaged or has died as a result of inadequate blood supply to the affected area. It may be the result of an arterial blockage, rupture, or trauma. [54]

Ischemia: Restriction of blood supply to tissue, particularly the heart, preventing it from receiving adequate oxygen.[54]

METs (metabolic equivalents): A simple, practical measure used to determine the amount of energy expressed during physical activities. It can be measured on a continuum from static to dynamic. For example, one MET is roughly the equivalent of sitting quietly while ten METs is typical of playing a game of basketball. Despite its simplicity, it is considered a convenient means of describing functional capacity or activity tolerance for defined tasks so that an individual may continue to participate in his or her daily routine within prescribed intensity parameters. [71]

Myocardium: The middle and thickest layer of contractile cardiac muscle.[53]

Nitroglycerin (nitro): A prescription medication commonly used to treat angina as a result of coronary artery disease. It works by relaxing blood vessels and increasing blood flow to the heart while reducing cardiac workload.[72]

Orthopnea: Shortness of breath that occurs while an individual is lying down but is relieved by assuming an upright position. It is often caused by pulmonary congestion as blood volume is redistributed from the lower extremities to the lungs while in a recumbent position, and is commonly associated with the early stages of heart failure.[73]

Pacemaker: A small device implanted in the chest or abdomen to control abnormal heart rhythms. It uses electrical pulses to prompt the heart to beat at a normal rate if it detects irregularities.[74]

Palpitations: The sensation of having a rapid, fluttering, or pounding heart, commonly associated with stress, medication, or exercise. While typically harmless, palpitations can also be associated with arrhythmias that may require medical attention.[75]

Percutaneous coronary intervention (PCI): A non-surgical reperfusion procedure, also known as coronary angioplasty, that uses a catheter to open an occluded vessel or place a stent in order to improve blood flow to the heart. PCI may be used to open coronary arteries if there is narrowing of vessels or a blockage, and is also the preferred reperfusion intervention for individuals who have experienced a heart attack. It is most commonly used with a ST-segment elevation myocardial infarction (STEMI) provided it can be performed within 90 minutes of admission to the hospital.[76]

Plaque: A fatty deposit made up of cholesterol, fat, calcium, and other cellular waste substances in the blood that may slowly build up and line the arterial walls thereby restricting blood flow. If plaque breaks off and blocks the artery risk of heart attack or stroke increases.[77]

Pleural effusions: An increase in fluid accumulation in the space between the pleura, the thin membrane that lines the surface of the lungs. A pleural effusion may be indicative of a number of conditions, including congestive heart failure. Symptoms may include shortness of breath, chest pain, and/or a cough. A pleural effusion is typically detected via imaging, such as a chest X-ray.[78]

Rales: An abnormal respiratory sound, sometimes also referred to as a crackle, heard during inhalation. It is synonymous with a number of conditions, including heart failure and pulmonary edema.[53]

Saphenous vein: A large subcutaneous and superficial vein in the leg, commonly harvested as a venous graft in coronary bypass surgery.[53]

Sinus rhythm: Normal heart rhythm established by the sinus node, the heart's natural pacemaker, found in the right atrium.[79]

Stent: A small wire mesh tube that is fed through a catheter via a surgical procedure (angioplasty) in order to open a blocked coronary artery and increase blood flow.[80]

Stress test: An assessment of cardiovascular fitness in a controlled clinical setting. The procedure typically involves walking on a treadmill or riding a stationary bike while heart rate, blood pressure, and respiration rate are monitored. It is commonly used to diagnose heart diseases such as coronary artery disease and arrhythmias. It may also be used to monitor cardiac treatment for effectiveness, particularly following surgery such as valve replacement or the introduction of medication.[81]

Stroke volume (SV): The amount of blood pumped from the left ventricle with each beat.[73]

Syncope: A temporary loss of consciousness, often called fainting, as a result of insufficient blood supply to the brain. It is a characteristic of low blood pressure and can also be symptomatic of stress, dehydration, pain, exhaustion, and sudden changes in body position. The risk of cardiovascular syncope increases with age and may be a symptom of coronary artery disease, myocardial infarction, cardiomyopathy, arrhythmias, or angina. Additional symptoms associated with cardiovascular syncope include dyspnea, palpitations, and/or chest pressure or pain.[82]

Tachyarrhythmia: A disturbance in the heart's normal rhythm resulting in a heart rate over 100 beats per minute.[53]

Telemetry: A means of electronically measuring cardiac rhythms and heart rate via electrodes placed on the patient's chest. Blood pressure, respiration rate, and oxygen may also be monitored if necessary using a cuff and probe placed on a finger. The data is sent to a central area where it is displayed on monitors and read by staff. It is particularly indicated for patients who require a higher level of care, including those with arrhythmias or have undergone an ICD or pacemaker procedure.[83]

Thrombosis: The development or presence of a blood clot in a vessel that has the potential to restrict or block blood flow to the affected part of the body. It is commonly defined by the type of vessel affected, arterial or venous) and the location.[54]

Ventricle: One of two lower heart chambers that receives blood from the atriums, the upper chambers, and pumps blood to the body. The right ventricle supplies the lungs via the pulmonary artery, while the left supplies the rest of the body via the aorta.[73]

ROLE OF OCCUPATIONAL THERAPY IN CARDIAC REHABILITATION

Overview of Occupational Therapy Philosophy

Occupational Therapy practice, education, research, and advocacy is founded on the premise that individuals, communities, and populations of all age groups have the right to engage in meaningful occupations throughout the lifespan. It is understood that participation in occupation can be a conduit to change and a means to foster health and well-being. "Health enables people to pursue the tasks of everyday living that provide them with life meaning that is necessary for their well-being."[84]

Occupation is defined as any purposeful and meaningful activity that enables participation in society and supports the ability to live life to its fullest. Occupational Therapists (OT) and Occupational Therapy Assistants (OTA) consider both intrinsic and extrinsic factors in determining interventions, including psychosocial, cultural, physical, and environmental issues, and use occupation as a means to promote health and wellness.[85]

OT/OTAs are trained in the areas of prevention, life-style modification, and physical and psychosocial rehabilitation.[86] Therapists work from the understanding that many factors influence participation and performance, and that clients have values, life experience, and skills that are invaluable in developing meaningful short and long-term goals. OT/OTAs understand that including the client and caregivers in the decision-making process care is empowering and that client-centered practice fosters greater collaboration and participation in the therapeutic process.[87]

Additionally, interprofessional collaborative practice is integral to providing safe, quality, accessible, and client-centered care. Successful interprofessional practice includes four competencies: understanding one's role and those of other professions to assess and address the needs of clients and populations served; maintaining a climate of mutual respect based on shared values and ethical principles; providing responsible and timely communication with clients, caregivers, communities, and other healthcare providers; and applying relationship-building values to maintain healthy team roles in order to plan and deliver effective client-centered health care.[88]

Occupational Therapy plays a distinct role in interprofessional practice and in the provision of

client-centered care while addressing cardiac disease across the continuum of care from acute care to inpatient rehab to home care.

Typical Settings Associated with Occupational Therapy and Cardiac Rehabilitation

Acute Care Hospitals:

Individuals are typically admitted to acute care hospitals with significant or life-threatening health concerns requiring immediate medical diagnosis and/or intervention, as well as 24-hour physician and nursing care. An intensive care unit (ICU) is indicated for those individuals who require advanced medical care, which may include support after a myocardial infarction (MI) or survival of sudden cardiac arrest. Life-saving surgical interventions include percutaneous coronary intervention (PCI) or angioplasty and coronary artery bypass grafting (CABG), as well as providing supportive measures for arrhythmias and congestive heart failure (CHF) exacerbations.

OT/OTAs are increasingly assuming a more active role in acute care settings with an emphasis on early mobilization, monitoring of vitals with activity, client and caregiver education, restoring function, and performing evaluations to assist with the coordination of care and to determine appropriate discharge recommendations. OT/OTAs work within an interprofessional team that may include members from medicine, nursing, respiratory therapy, case management, physical therapy, speech and language pathology, social work, and spiritual care.

Long-term Acute Care (LTAC):

In some cases, individuals require ongoing medical care while beginning rehabilitation. In these instances, individuals may have experienced a prolonged and/or complex hospital course or may remain significantly impaired requiring 24-hour care. In these cases, a long-term acute care facility may be indicated as a bridge between acute care and rehabilitation or home.

As successful critical care intervention increases and mortality rates decline, the number of individuals surviving but experiencing long-lasting complications is on the rise. These include chronically impaired cardiopulmonary function, neuromuscular weakness, and cognitive impairments, as well as anxiety and depression. It is important for all members of the interprofessional team to understand these additional complications while addressing the more common impairments associated with cardiac disorders.[89]

Common cardiac conditions encountered in long-term acute care include complications from CABG surgery, including non-healing incision, and end stage congestive heart failure (CHF) including failure to thrive. Occupational therapy provides evaluations and develops client-centered short- and long-term goals that may address ADL and IADL re-training, as well as education that includes safety, energy-conservation strategies, and cognitive impairments. Therapists are also involved in caregiver training and discharge planning. OT/OTAs work within an interprofessional team that may include members from medicine, nursing, respiratory and/or pulmonary therapy, case management, physical therapy, speech and language pathology, social work, and spiritual care.

Inpatient Rehab and Skilled Nursing Facilities (SNF):

Given the number of admissions to acute care facilities that are associated with chronic cardiac conditions, such as CAD and arrhythmia, as well as health crises that are acute in nature, such as CHF exacerbations and myocardial infarctions, individuals are often referred to inpatient rehabilitation facilities. The primary focus of OT in short-term rehab is to promote strength, endurance, and mobility within the context of ADL and IADL re-training, and provide client/caregiver education, including energy conservation strategies, in order to manage conditions at home and in the community upon discharge.

OT/OTAs work within an interprofessional team that may include members from medicine, nursing, case management, physical therapy, speech-language pathology, social work, and spiritual care.

Home Care, Including Independent and Assisted Living Facilities (ILF and ALF):

Upon discharge from either acute care, inpatient rehab, or long-term acute care settings, clients may benefit from continued OT services to maximize functional independence within the context of their own homes. Therapists often continue to provide ADL and IADL re-training, as well as safety and energy-conservation education while supporting caregivers during this transitional period.

The most common cardiac conditions addressed in home care or independent/assisted living facilities are related to CHF exacerbations and post surgical interventions, such as CABG. However, OT/OTAs may also assist clients who have experienced a prolonged hospitalization with failure to thrive, or more significant cardiac events, such as myocardial infarction.

Occupational therapy works within an interprofessional team that may include members from medicine, nursing, physical therapy, speech-language pathology, as well as independent/assisted living staff.

Outpatient Cardiac Rehab:

OTs have a distinct role in outpatient cardiac rehab programs with clinicians working within an interdisciplinary team to address the needs of clients with chronic cardiac conditions or with those recovering from acute events such as CABG surgery or myocardial infarction. OT/OTAs typically assess an

individual's ability to perform meaningful ADLs and IADLs in a satisfactory manner, develop individualized treatment plans, and collaborate with the client and caregivers to establish goals and provide education to manage conditions at home and in the community.

OT Process – From Evaluation to Discharge

OT Evaluations and Screening Tools that May be used in Cardiac Rehabilitation

Evaluation Process:

An OT evaluation is indicated when there are concerns regarding an individual's functional ability to perform the activities that are meaningful and necessary to live life to its fullest. In order to understand an individual's performance strengths and limitations, an OT will use his/her clinical reasoning skills to perform an evaluation that may include a synthesis of formal standardized assessment tools, medical data, informal observation and interview techniques, as well as interprofessional communication. In addition to performance skills impacting motor, cognitive processing, and/or social interaction, client factors and performance patterns, such as values and beliefs and roles and routines, as well as environmental and contextual factors are also considered in OT's holistic approach to care.

By synthesizing all pertinent data, the OT is able to develop an occupational profile that will guide the plan of care. This includes collaborating with the client and/or caregiver to determine his or her priorities regarding outcomes in order to develop objective and measurable goals that are meaningful and client-centered. Once the goals have been established, interventions may be determined to execute the plan of care.[90]

ADLs:

Functional Independence Measure (FIM®): A system of measuring dysfunction appropriate for varied settings including sub-acute and rehabilitation facilities, long-term care hospitals, and skilled nursing facilities. It determines the degree of assistance required for an individual to perform his or her ADLs and is typically completed upon admission and discharge. The tool assesses 18 areas of ADLs, including 13 motor and 5 cognitive items. Performance areas are rated on a 7-point scale ranging from total assistance to independence. Every facility has its own processes in place for administering the FIM®; however, OTs will most commonly address the performance areas of eating, grooming, bathing, upper body dressing, lower body dressing, toileting, toilet transfer, shower transfer, problem-solving and memory.[91]

FIM® levels*:*

7 = Independence (timely, safely)

6 = Modified independence (device, increased time)

5 = Supervision (cuing, prompting)

4 = Minimal assistance (performs 75% or more of task)

3 = Moderate assistance (performs approximately 50-74% of task)

2 = Maximal assistance (performs approximately 25-49% of task)

1 = Total assistance (performs less than 25% of task)

0 = Activity does not occur (only used upon admission)[91]

Barthel Index (BI): A 10 item ordinal scale used to measure ADL performance that is most commonly used in inpatient rehabilitation, skilled nursing facilities, and home care. Each of the 10 items describes performance in feeding, bathing, grooming, dressing, bowel control, bladder control, toileting, chair transfer, ambulation, and stair climbing. Each performance item has a designated score. A higher total score is associated with the increased likelihood of an individual successfully and safely living at home independently.[92]

BI sample performance items and rating scale:

Grooming

0 = needs help with personal care

5 = independent face/hair/teeth/shaving (implements provided)

Dressing

0 = dependent

5 = needs help but can do about half unaided

10 = independent (including buttons, zips, laces, etc.)

Transfers (bed to/from chair)

0 = unable, no sitting balance

5 = major help (one of two people, physical)

10 = minor help (verbal or physical)

15 = independent [92]

ADLs/IADLs:

Canadian Occupational Performance Measure (COPM): An evidence-based, client-centered outcome tool designed to reflect an individual's satisfaction with ADL and/or IADL performance. It is primarily administered by OTs and can be used across the lifespan with all clients,

regardless of diagnosis or setting. The COPM enables individuals to self-assess performance, prioritize areas to address, and collaborate with their therapist to identify goals. Administration is conducted via a semi-structured interview format and is recommended at the beginning of services and periodically thereafter to monitor progress towards outcomes. The tool has five key steps: The client is asked to identify performance areas that are challenging, rate the importance of each identified area using a 10-point scale, and then select up to 5 of the most important problems to address through therapy. The client is then asked to self-assess their own level of performance and satisfaction with each of the identified problem areas. The therapist then calculates an average score, typically between 1-10. A low score indicates poor performance and lower satisfaction with a higher score indicative of good performance and a higher level of satisfaction.[93]

Satisfaction with Performance Scaled Questionnaire (SPSQ): An instrument developed to measure an individual's performance satisfaction with their independent living skills. The tool is a self-report questionnaire and consists of two subscales. Subscale I identifies 24 items associated with home management, such as using a stove, handling a milk carton, and cleaning the tub or shower stall. Subscale II contains 22 items related to social and community activities, including paying bills and participating in vocational, educational, and leisure tasks. Each item is scored on a 5-point scale using the percentage of time over the past six months to report performance satisfaction.[94]

Stress Management:

Stress Management Questionnaire (SMQ): A valid and reliable tool designed to help individuals determine their personal stressors before exploring appropriate coping strategies to minimize the symptoms associated with stress. The questionnaire is a self-scoring tool that takes approximately 20 minutes to complete and consists of 87 psychometrically designed questions that uses a 5 point Likert scale.[95]

Resilience Scale for Adults (RSA): A 25-item, self-report, 7-point Likert scale tool used to assess resilience in adults, including their ability to adjust successfully after a major life event. The Likert scale is based on five characteristics of resiliency that include the ability to accept self/life, personal competence, self-reliance, meaning, equanimity, perseverance, and existential aloneness.[96]

Interest Checklist: A simple measure used to glean information on a client's strength of interest and engagement in 68 varied activities in order to help them select meaningful activities as a leisure pursuit or manage stress. [97]

Exercise/Activity Intensity:

Borg Rating of Perceived Exertion Scale (RPE): A self-assessment tool used by individuals to measure their perceived intensity of an exercise or activity. Individuals are asked to estimate the degree of exertion required during an activity using a 0-10 scale where 0 equals no perceived exertion and 10 indicates maximal exertion.[98]

Cognition:

The Mini Mental State Examination (MMSE): A 30-point questionnaire designed to measure cognitive impairment, most commonly used as a screen for dementia but can be used to estimate cognitive impairment associated with illness or injury. The tool typically takes approximately 5-10 minutes to administer and assesses cognitive areas such as attention, recall, language, repetition, orientation, calculation, and ability to follow directions. One point is given to each correct response with a score equaling or greater than 24 points out of 30 indicating normal cognition. A score of 19-23 indicates mild cognitive impairment, a score of 10-18 suggests moderate impairment, with a score equal or below 9 points indicative of severe cognitive deficits.[99]

MMSE sample questions:

- What is the year? Season? Date? Day? Month? (Maximum score = 5)
- The examiner names three unrelated objects clearly and slowly, then asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until the patient learns all of them, if possible. (Maximum score = 3)
- "I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65…) Alternative: "Spell WORLD backwards." (D-L-R-O-W). (Maximum score = 5)
- "Repeat the the phrase: "No ifs, ands, or buts." (Maximum score = 1)
- "Make up and write a sentence about anything." (This sentence must contain a noun and a verb.) (Maximum score = 1)[99]

Short Portable Mental Status Questionnaire test (SPMSQ): A short 10-item standardized assessment tool designed to detect intellectual impairment, particularly in the elderly. Incorrect responses are tallied to provide an indication of cognitive impairment. For example, 0-2 errors indicate normal mental functioning, 3-4 errors indicate mild cognitive impairment, 5-7 errors suggest moderate impairment, and 8 or more errors are associated with severe deficits.[100]

SPMSQ sample questions:

- What is the date, month, and year?
- What is the name of this place?
- How old are you?
- What year were you born?

- Who is the current president?
- Who was the president before that?[100]

OT Interventions and Education that May be used in Cardiac Rehabilitation

Intervention process:

Cardiac rehabilitation typically involves an interdisciplinary approach and refers to a structured program of therapeutic exercise, functional participation, and client education to manage recovery and optimize function. Following a cardiac event, there are typically four phases of recovery. Phase I is the acute phase where an individual may receive care in an ICU or step down cardiac unit following a significant cardiac event such as a myocardial infarction or open heart surgery. Phases II and III typically occur in a sub-acute setting, rehab facility, or outpatient unit where an individual can receive more intensive therapy and education. Phase IV focuses on empowering individuals to apply their knowledge and assume responsibility for maintaining optimal health and functional independence.

Once the initial evaluation process is complete, and objective, measurable goals have been determined, OTs develop an individualized treatment plan tailored to meet individual needs that also incorporates anticipated outcomes and methods. Discharge and long-term needs are also considered, along with recommendations to other professionals if needed. The plan of care typically includes meaningful occupation-based interventions such as skill training and education, but may also include preparatory methods to facilitate performance. The client's response to therapy is monitored throughout the process and modified as needed.[84] [85]

Early mobilization: A process of passive, active, and progressive movement during critical illness to counter the effects of sedation and immobility that may lead to neurocognitive deficits and physical debilitation. It may be performed by any member of the interdisciplinary team, including OTs. Early mobilization typically occurs in acute care settings, particularly in the ICU with critically ill patients, but may also be relevant in long-term acute care or sub-acute settings when the client has experienced a prolonged or complex hospital course after critical illness and remains significantly debilitated. Evidence indicates that limited mobility is a significant contributor to long-term health issues including muscle weakness, delirium and cognitive impairments, and joint shortening. Research suggests that safe and appropriate early mobility can significantly improve functional outcomes.[101]

Activities of daily living (ADL) re-training: Clients experiencing cardiac events or chronic conditions commonly find their ability to perform basic ADLs compromised by fatigue, dyspnea and decreased activity tolerance. OT/OTAs provide interventions to address tasks that are typically performed on a daily basis and are considered essential to an individual's ability to live life to its fullest. ADLs include bathing/showering, grooming, dressing/undressing, toileting including hygiene, eating, sexual activity, and the ability to perform functional mobility.[86] In caring for clients with cardiac-related disorders, energy conservation techniques are commonly embedded into ADL re-training. For example, the OT/OTA may provide recommendations to modify tasks, such as adjusting body mechanics to minimize fatigue and work of breathing, or may suggest altering the environment to reduce extraneous effort and decrease activity demand. Therapists will also educate the client or caregiver regarding the use of adaptive equipment (AE) to maximize functional independence, such a long-handled shoe or sock aide, or the use of durable medical equipment (DME), such as a tub seat for seated showers. The ability to complete ADL tasks safely is also a consideration and appropriate education is provided to both client and caregiver.

Instrumental activities of daily living (IADL) re-training: IADLs include activities that support daily life and enable an individual to successfully live life to its fullest and interact with his/her environment and community. Examples of IADLs include home management, shopping, meal preparation, driving and community mobility, pet care, financial management, medication management, care of others, leisure tasks, employment, education, rest/sleep, and social participation.[86] The OT/OTA may provide recommendations to modify tasks or alter the environment to reduce extraneous effort and decrease activity demand. Energy conservation techniques are commonly embedded into IADL re-training. Examples of recommendations include making larger meals to freeze, letting dishes air dry, grouping task items together to minimize unnecessary searches, sliding rather than carrying items, shopping with someone who can carry grocery bags, or using grocery home delivery services.

Activity tolerance and energy conservation techniques: Fatigue, shortness of breath, and limited endurance are common factors that may limit performance and participation. OT/OTAs address strategies to modify tasks, and make recommendations regarding the use of assisted devices (AD) and/or adaptive equipment (AE) to reduce effort associated with the performance of daily routines in order to minimize fatigue, shortness of breath, and work of breathing. Energy conservation education emphasizes prioritizing, planning, and organizing tasks. This may include simple strategies such as eliminating unnecessary steps, sitting versus standing if possible, setting up task equipment in advance to minimize extraneous effort, and using lightweight tools or utensils. Additionally, clients are encouraged to self-assess symptoms, pace themselves

through activities, and take rest breaks prior to experiencing fatigue.

Cardiac/sternal precautions: Sternal precautions are typically recommended after open heart surgery, such as a coronary artery bypass graft (CABG), where a median sternotomy is performed. During this procedure, the sternum is cut in two before being repaired after the intervention has been completed. While there are some inconsistencies between facilities with regard to post-operative restrictions, the most common sternal precautions include the following, recommended for 6-8 weeks following surgery or until cleared by the health care team:[102]

- No lifting anything over 5lbs
- No excessive twisting or turning of the body
- No pushing or pulling (this includes using upper extremities to push/pull up in bed. Log-rolling technique is recommended)
- Avoid simultaneous bilateral upper extremity shoulder flexion or abduction above 90 degrees. Okay to perform unilateral active range of motion (ROM) as tolerated to perform functional tasks
- Minimize upper extremity weight-bearing when using adaptive equipment like canes and walkers
- Encourage chest splinting using a pillow when coughing
- No driving until cleared by surgeon [103]

Permanent pacemakers and **implantable cardiac defibrillators (ICD)** are surgically implanted to maintain a normal heart rate and prevent life-threatening arrhythmias, and require 4-6 weeks of post surgical precautions to ensure incision healing. Recommendations include:[104]

- No exercise to the involved shoulder, although it may be used functionally as tolerated but limited to flexion and abduction to 90 degrees / shoulder level
- Minimize upper extremity weight-bearing when using adaptive equipment like canes and walkers. Crutches are not recommended
- No lifting anything over 5lbs with affected extremity
- No driving until cleared by surgeon [105]

While it is the responsibility of every member of the interdisciplinary team to ensure precautions are adhered to, the restrictions are particularly relevant in OT where ADLs and IADLs are addressed and use of the upper extremities and full body movement are integral to task performance.

Edema/weight management: Edema is a common complication of congestive heart failure (CHF) and occurs as a result of sodium and water reabsorption by the kidneys and expansion of the extracellular fluid. Edema in the lower extremities, or peripheral edema, is more noticeable, but edema can also impact the abdominal cavity, known as ascites. It is important for individuals to know their dry weight, which is their baseline weight without edema, and to perform daily weight checks to monitor fluid retention, which may be reflected by an increase in weight as well as fatigue and shortness of breath.[105] It is the responsibility of all members of the interdisciplinary team to monitor edema and provide client education regarding disease management. Empowering individuals to manage their own chronic conditions can reduce hospital readmissions. OTs are able to identify barriers to weight/edema management and recommend strategies to increase responsibility and maximize independence. Additionally, the prevalence of lower extremity edema and the risk of developing a deep vein thrombosis (DVT) increases among those in rehabilitation following cardiac surgery such as coronary artery bypass graft (CABG).[106] OTs are able to measure and educate clients on appropriate compression garments as well as provide strategies to don stockings using compensatory strategies and/or adaptive equipment.

Stress management / relaxation strategies: Stress, anxiety, and depression are common by-products of cardiac disorders and life-threatening events, such as myocardial infarction or coronary artery bypass surgery. Providing education to help individuals manage their symptoms in the context of daily routines is an important step in lessening anxiety and promoting participation in the treatment program. Interventions include strategies to help clients prioritize activities and create a balanced lifestyle, increase awareness of body and mind interaction to manage stressors and perform daily activities with more confidence, and provide education on a variety of relaxation methods. These include guided imagery, progressive muscle relaxation, and diaphragmatic breathing.[107] [108]

Therapeutic exercise programs / upper extremity function: Prolonged hospitalization and chronic cardiac conditions frequently impact muscle strength, and in turn, may limit participation and/or performance in functional activities. For example, individuals who have experienced critical illness may present with significant muscle weakness. Providing education for body mechanics, stretching, and an appropriate exercise program can be invaluable to the process of improving aerobic capacity, reducing O2 requirements if applicable, minimizing pain, and increasing performance in functional tasks.[109]

OT Considerations for Safe Discharge Planning

While each discipline involved in an individual's care will contribute specific information according to their professional expertise, discharge planning is typically an interdisciplinary effort ensure safe transitions. OT provides a distinct perspective on the client's functional status, including the individual's ability to safely perform ADLs, IADLs, and mobility, with recommendations for the continuum of care including the potential need for equipment, home modifications, or further services.[83]

Safety / home O2 management: OT/OTAs address home safety training that may include recommendations for environmental modifications, such as grab bar installation, the removal of scatter rugs, and the improvement of lighting. Education also focuses on fall prevention training and emergency responses, safe O2 tank use and O2 cord management training if applicable, as well as caregiver education to support a safe transition.

Health / wellness at home and in the community: Education includes medication management training, exploration of healthy leisure pursuits for the home and/or the community to promote lifestyle balance, information regarding community resources, such as fitness groups, diet, nutritional, and weight loss education, and smoking cessation, as well as caregiver education to support a safe transition. Community resources and support may also be indicated in cases of depression, commonly associated with a decline in cardiac health or when significant lifestyle changes are necessary, or post-operatively, such as coronary artery bypass graft (CABG).[110]

Common Client / Caregiver Questions

Q. Are there any restrictions to lifting weights after heart surgery?

A. Typically, no lifting over 5lbs is recommended for approximately 2 months. A gallon of milk weighs 8lbs.

Q. Will I be depressed after heart surgery?

A. Cardiac surgery, such as a coronary artery bypass graft (CABG), is considered major surgery and requires a period of recovery where participation in regular, meaningful activities is limited. It is common to experience varying degrees of frustration, anxiety, and depression and it's important to discuss supportive measures with the healthcare team.

Q. When can I drive my car again after heart surgery?

A. This will depend on the surgeon's recommendations, but is typically 3-4 weeks after surgery.

Q. When can I go back to work after heart surgery?

A. It depends on the type of work. Some individuals may be able to return to a desk job approximately 2-3 weeks after a MI or 4 weeks after a CABG without any post-operative complications. For others who have a more physically demanding job, it may take 8-12 weeks. It is essential to discuss returning to work with the medical team.

Q. When can I travel again after heart surgery?

A. Airline travel is often permitted within 1-2 months after discharge from the hospital. It is important to consider the activity demand required to travel and discuss plans with a physician. For example, it is important to be aware of the impact associated with stressful business trips, long distance walking, and stair climbing.

Q. Can I travel with CHF?

A. Generally, individuals whose symptoms are poorly controlled should avoid locations with high altitude as they are more likely to experience an increase in shortness of breath and fatigue. The stress and activity demand of travel should also be considered, as well as the need for prolonged sitting during long haul flights to minimize the development of blood clots. It is important to discuss all travel plans with a physician.

Q. What are the red flags I should look out for with CHF?

A. The three key symptoms to look out for include fluid build-up/edema, arrhythmias, and increased shortness of breath.

Q. I have cardiac problems, is it really necessary for me to quit smoking?

A. Smoking has been strongly associated with heart disease and death. It significantly increases blood pressure, damages blood vessels and restricts blood flow to the heart, as well as increasing the risk of blood clots.

CASE STUDY #1

Hypertension (HTN) / Myocardial infarction (MI) (Acute care setting)

History of presenting information (HPI):

Mr. S. is a 70-year old active male with a past medical history significant for hypertension (HTN), coronary artery disease (CAD) and **hypercholesterolemia** with a remote history of tobacco use who presented to the Emergency Room following 35 minutes of chest pain that was not relieved by nitroglycerin. Upon admission, Mr. S. appeared restless and diaphoretic and reported ongoing chest pressure with a rapid, irregular heart rate. His blood pressure was 170/94 with a pulse of 112 at rest, a respiration rate of 24, and an oxygen saturation of 97%. An ECG and blood draws to measure cardiac markers in the bloodstream

indicated that Mr. S. had experienced a ST-segment elevation myocardial infarction (STEMI) and he was also experiencing tachyarrythmias. He underwent a percutaneous coronary intervention (PCI) to open the occluded vessels with stent placement, and an implantable cardioverter defibrillator (ICD) procedure to manage his arrhythmia and minimize the risk of further cardiac events. There were no post-operative complications and after 2 days in intensive care, Mr. S. was transferred to a cardiac step down unit.

Reason for OT Referral:

Mr. S. tolerated both the PCI and ICD procedures well. While still being monitored, he is considered medically stable to begin phase one of his cardiac rehabilitation, including education from the interprofessional team. He is being referred to occupational therapy services to assess his current functional status, develop a plan of care, and help him return to his baseline independent level of function. Mr. S. informs his team that his goals are to return home to his wife who requires care and to return to work.

OT Initial Assessment:

The initial evaluation is conducted in Mr. S.'s room on the step down unit. His pulse and cardiac rhythms are being monitored via telemetry and he is receiving 2L oxygen via a nasal cannula. He appears relaxed and is resting in a bedside chair wearing a hospital gown and pants. When asked, he reports mild fatigue and 3/10 pain at his incision site but is agreeable to participate in the OT evaluation. His prior level of function, current status, and personal goals for therapy are assessed via an informal interview, observation, and the Functional Independence Measure (FIM) to determine a baseline for ADLs.

Mr. S. was diagnosed with HTN 20 years ago and CAD approximately 5 years ago. He has attempted to manage both conditions by actively participating in lifestyle changes that included modifying his diet, stopping smoking, and incorporating an exercise regimen into his daily routine. He reports feeling disappointed that he still had a heart attack and is now motivated to participate in cardiac education to decrease the risk of future events. He lives with his wife in a 2 level home with the laundry in the basement. He has two steps to enter the house with bilateral rails. His bedroom and bathroom is on the second floor, and he typically uses a tub/shower combo for standing level showers. Mr. S. reports that his wife has COPD and in the past year underwent a hip replacement, so grab rails were installed and a tub seat is available. Otherwise, he has no other equipment. Prior to this hospitalization he was independent with all ADLs, he ambulated without an assistive device (AD), and was still driving. He works for H&R Block approximately 32 hours a week but often works more than that. He shares grocery shopping, meal prep, and the laundry with his wife, and they have a housekeeper 1 x pw. Mr. S. likes to go to the gym at least 3 x pw and play tennis during the summer. He has a golden retriever dog and is responsible for walking her.

During the evaluation, Mr. S. participated in ADL tasks to assess his response to increased activity demand, his functional status, and to begin his cardiac rehab education. He was encouraged to participate in physical activity as tolerated to maintain strength and endurance as well as increase his functional independence in preparation for a safe discharge home. He was educated about pacemaker precautions and how to apply the restrictions, particularly while bathing and dressing. He was able to complete all ADLs with close supervision (CLS) while being monitored for vitals, safety, precautions, and fatigue. He tolerated 4 minutes standing sink-side to perform grooming tasks but benefitted from sitting for approximately 75% of the time while performing a sponge-bathing routine. He required a 10 minute seated rest break before dressing into a hospital robe, pants, and socks. He was able to ambulate to/from the bathroom and perform toileting tasks with CLS and without an assisted device (AD) but benefitted from verbal cues for pacing and O2 cord management. The Mini Mental State Examination (MMSE) was used to assess cognition and provide a baseline for learning potential. Mr. S. was alert and oriented x 3, able to follow multi-step directions, and both short- and long-term memory was intact. Throughout the evaluation process, Mr. S. demonstrated good problem-solving and capacity for new learning.

OT Problem List:

- Limited activity tolerance impacting mobility and participation in ADLs/IADLs
- Limited knowledge of energy-conservation education, and effective pacing strategies
- Limited knowledge of pacemaker precautions with ADLs and IADLs
- Limited knowledge of recommended lifestyle modifications required to minimize further cardiac events
- Limited knowledge of community-based resources

OT Plan of Care (POC):

Anticipated length of stay: 4-7 days

Duration and frequency of OT sessions: 3-4 x 20-40 minute visits.

OT Goals: Anticipated timeframe to meet goals - 3-5 days (STGs = LTGs)

- Patient will independently (I) recall pacemaker precautions
- Patient will Independently (I) complete shower routine sitting/standing as tolerated with good

application of energy conservation strategies and pacemaker precautions

- Patient will Independently (I) complete dressing routine sitting/standing as tolerated with good application of energy conservation strategies and pacemaker precautions
- Patient will independently (I) complete safe tub transfer with appropriate use of durable medical equipment as needed and application of pacemaker precautions
- Patient will independently (I) complete all steps of toileting routine with good application of energy conservation strategies and pacemaker precautions
- Patient will tolerate 20 minutes continuous standing while independently (I) performing grooming routine
- Patient will participate in disease management and lifestyle modification education

Interprofessional Communication:

Physical Therapy (PT): Discussed Mr. S.'s OT plan of care including functional goals and education in order to develop a coordinated, collaborative effort with PT to build strength, activity tolerance, and functional mobility. Participated in daily communication to provide updates, reinforce consistent educational material, and coordinate efforts to minimize schedule conflicts.

Nursing: Discussed Mr. S.'s ADL goals and provided rationale for application of energy conservation skills to improve his functional status and perform his bathing, dressing, and toileting tasks at an independent level by discharge. Participated in daily communication to determine current clinical status.

Cardiologist: Discussed evaluation results and discharge goals, including lifestyle changes. Provided ongoing updates throughout Mr. S.'s stay regarding his functional status and vitals, as well as his progress towards discharge goals.

Care Coordinator: Ongoing communication throughout Mr. S.'s hospitalization regarding his OT plan of care, goals, and recommendations for a safe discharge home and cardiac rehab.

Interventions:

Mr. S.'s plan of care focused on increasing activity tolerance and cardiac education via ADLs and mobility in order to maximize his functional independence and minimize the potential for future cardiac events. Education included disease management, energy conservation skills, and application of pacemaker precautions.

Mr. S. was educated regarding the importance of early mobilization after surgery but encouraged to pace himself throughout the day and prioritize activities. In order to perform his tasks more efficiently and with less fatigue while continuing to build endurance he was instructed in energy conservation strategies. He was also educated regarding appropriate body mechanics to complete his ADL tasks while maintaining his pacemaker precautions. Once he had mastered his daily ADL routine more efficiently, safely, and independently, he was educated in the application of energy conservation strategies and pacemaker precautions via his typical IADLs. Mr. S. was introduced to **metabolic equivalents (METs)**, a measure used to describe activity tolerance for defined tasks so that he could continue to participate in his meaningful daily tasks while maintaining intensity parameters set by his cardiology team.

Disease management education included identifying risk factors, stress management strategies, dietary modifications, and good sleep hygiene. The benefits of cardiac rehab were explained to Mr. S. who was encouraged to participate in a program after discharge. The value of ongoing education, psychological support, as well as a tailored and monitored physical exercise regimen was stressed and Mr. S. seemed motivated to participate.

Discharge:

Mr. S. was discharged home after 5 days having been deemed medically stable by his cardiology team and having met all of his discharge goals for therapy. While still experiencing limited endurance, he returned home at an independent level for mobility, ADLs, and simple IADLs. He agreed to cardiac rehab upon discharge to continue his education and build activity tolerance in a supportive environment. His long-term goals included participation in higher level IADLs and ultimately return to work.

CASE STUDY #2

Coronary artery disease (CAD) / Coronary artery bypass graft (CABG) - Short-term Rehab Setting

History of presenting information (HPI):

Mr. P. is a 58-year old male with a past medical history significant for hypertension (HTN), coronary artery disease (CAD), hypercholesterolemia, obesity, R total knee replacement, with a 40-year tobacco history (1 pack per day) who developed chest pain due to angina while at work. He was treated on site with nitroglycerin and oxygen before being transported by EMTs to the local emergency room. Upon admission his blood pressure was 162/102 with a heart rate of 96 at rest, a respiration rate of 22, and an O2 saturation of 92%. He underwent an ECG and cardiac catheterization to identify arterial blockages, and subsequently underwent surgery for a coronary artery

bypass graft (CABG) x 4. The great long saphenous vein (GSV) was harvested for grafting during the procedure. Mr. P. initially tolerated the surgery well but then experienced an episode of afib, as well as lower extremity edema and significant pain that impacted his early mobilization and recovery. Once medically stable, Mr. P.'s interdisciplinary team determined that he would benefit from additional medical management and rehab at a skilled nursing facility prior to discharge home.

Reason for OT Referral:

In addition to decreased strength, endurance, and reduced functional mobility, Mr. P. has ongoing discomfort at both sternal and graft sites and he is functioning significantly below his baseline. He is in the process of a divorce and lives alone, and must be independent with all ADLs and many IADLs before returning home. He is being referred to OT for evaluation in order to assess his current status, develop a plan of care, and provide appropriate interventions and education to support a safe discharge home. His long-term plan is to return to work.

OT Initial Assessment:

The evaluation to ascertain Mr. P.'s background and current functional status is conducted in his room via informal interview, observation, and the Functional Independence Measure (FIM). Mr. P. is an overweight male wearing a hospital gown and socks and is greeted sitting in a bedside chair with his lower extremities elevated. He is reading through some paperwork but appears comfortable. He reports fatigue and 4/10 pain at his graft site but agrees to participate as tolerated. His sternum is covered with a protective dressing while his lower extremity incision is open to the air with staples visible.

Mr. P. states that he is in the process of "a messy and expensive divorce" which has added to his stress lately. He has two adult children who live and work out of state. He is determined to return home at an independent level rather than ask for help from his ex-wife or family. He works approximately 60 hours a week in the retail industry, which he reports is also highly stressful. He lives in a second floor single level condo with one flight of stairs to enter and bilateral rails. His bathroom has a tub/shower combo but he has no equipment or grab rails installed. Prior to surgery, he was independent (I) with all mobility without an assistive device, and all ADLs and IADLs, including laundry, housekeeping tasks, grocery shopping, and meal prep. However, Mr. P. admits to eating a lot of take-out food lately because of his workload and divorce. He also reports that he is generally very sedentary even though he knows he should be making healthier decisions due to his heart condition. He has not taken a vacation in 6 years and cites watching sports on TV as his only leisure interest.

During the initial OT evaluation, Mr. P. appeared fatigued with any moderate increase in activity demand although his vitals were stable and he only reported a mild increase in pain at his graft site with movement. He was able to perform bed mobility and a sit-stand transfers to a rolling walker (RW) with supervision and benefitted from several verbal cues not to push with his upper extremities when sitting up in bed or when using the RW in order to protect his sternum. He ambulated 15 feet to the bathroom and performed a toilet transfer with supervision but reported the sternal precautions limited his ability to perform hygiene thoroughness. He completed oral hygiene and a sponge-bathing routine while sitting sink-side but was able to stand as tolerated for 1-2 minutes when necessary. He subsequently dressed using his personal clothes. He benefitted from moderate assistance (Mod A) for both bathing and dressing tasks due to the sternal precautions impacting his ability to reach his lower extremities, or bend and twist his torso. He reported significant fatigue with the increased workload of an ADL and deferred shaving at this time. Using the Borg Rating of Perceived Exertion Scale (RPE), he described the ADL as very hard. A basic cognitive screen using the Mini Mental State Examination (MMSE) indicated that Mr. P. was alert and oriented x 3, able to follow multi-step directions, and both short- and long-term memory were intact. At the end of the evaluation, Mr. P. expressed his concerns regarding returning to work and how he would manage the lifestyle changes being recommended by his cardiologist.

OT Problem List:

- Limited activity tolerance impacting mobility and participation in ADLs/IADLs
- Limited knowledge of available adaptive equipment (AE) to assist with ADLs
- Limited knowledge of energy-conservation education, and effective pacing strategies
- Inconsistent application of sternal precautions with ADLs/IADLs and mobility
- Limited knowledge of lifestyle modifications consistent with cardiologist's heart healthy recommendations, including smoking cessation
- Increased signs of stress associated with life events and decline in function with limited knowledge of stress management strategies
- Limited knowledge of community-based resources

OT Plan of Care (POC):

Anticipated length of stay: 10-14 days

Duration and frequency of OT sessions: Approximately 60 minutes per day, 5-6 x per week.

OT Goals: Anticipated timeframe to meet goals – approximately 2 weeks

- Patient will independently (I) complete all steps of toileting routine with appropriate body mechanics and application of sternal precautions
- Patient will complete shower routine with modified independence (Mod I) sitting/standing as tolerated with appropriate use of adaptive equipment (AE) and application of sternal precautions
- Patient will complete dressing routine sitting/standing as tolerated with Mod I, appropriate use of AE, and application of sternal precautions
- Patient will independently (I) complete safe tub transfer with appropriate use of durable medical equipment as needed
- Patient will tolerate 15 minutes continuous standing while independently (I) performing full grooming routine, including shaving tasks
- Patient will independently (I) complete simple meal prep or laundry task with appropriate energy conservation strategies and application of sternal precautions
- Patient will purchase adaptive equipment to maximize functional independence with ADLs upon discharge home
- Patient will independently (I) don compression garments to minimize LE edema using appropriate compensatory strategies and AE as needed
- Patient will explore stress management strategies, including healthy leisure pursuits, and plan to implement them into daily routine
- Patient will participate in disease management and lifestyle modification education
- Patient will explore community resources regarding smoking cessation

Interprofessional Communication:

Physical Therapy (PT): Discussed Mr. P.'s OT plan of care and goals in order to develop a coordinated, collaborative effort with PT to build strength, activity tolerance, and functional mobility. Participated in daily communication to provide updates, reinforce consistent educational material, and coordinate efforts to minimize schedule conflicts.

Nursing: Discussed Mr. P.s ADL goals and provided rationale for allowing him to practice energy conservation skills and use of adaptive equipment during all tasks so that he could improve his functional status and perform his bathing, dressing, and toileting tasks at an independent level by discharge. Reinforced importance of cuing Mr. P. to apply appropriate sternal precautions throughout ADLs.

Social Work: With Mr. P.'s permission, a referral was made to Social Work services. Discussed the need for smoking cessation material and community resources.

MD: Discussed evaluation results and discharge goals, including Mr. P's concerns regarding stress management and lifestyle changes. Provided ongoing updates throughout Mr. P.'s stay regarding his functional status and vitals, as well as his progress towards long-term goals.

Spiritual Care: With permission from Mr. P. a referral was made to Spiritual Care services with particular concern regarding his divorce and possible grief around his family breakdown.

Case Manager: Ongoing communication throughout Mr. P.'s stay regarding his OT plan of care, goals, and recommendations for a safe discharge home with continued OT services.

Interventions:

Mr. P.'s treatment plan consisted of increasing his functional mobility and activity tolerance through both ADLs and IADLs in order to maximize his functional independence. It was of primary importance to include education for disease/stress management, energy conservation skills, and adaptive equipment use via all tasks so that he could better manage his condition and prepare for a safe discharge home.

Mr. P. was encouraged to pace himself throughout the day but gradually increase his tolerance for more demanding tasks in order to manage all necessary ADLs and IADLs upon discharge. He was instructed in energy conservation strategies to perform his tasks more efficiently and with less fatigue while continuing to build endurance. Discussion about the benefits of adaptive equipment (AE) was embedded into his ADL routine and he was encouraged to trial recommendations for a reacher, a long-handled shoe-horn, a sock aide, and a long-handled sponge. After practicing, Mr. P. decided to purchase all recommended items as they enabled him to reach his lower extremities when bathing and dressing without breaking his sternal precautions. He was also educated regarding appropriate body mechanics to complete his hygiene tasks after toileting. Once he had mastered his daily ADL routine more efficiently and independently, he more confidently participated in meaningful IADL activities. Energy conservation, work simplification strategies, and application of sternal precautions were included in beverage and meal prep activities, as well as light housekeeping allowing Mr. P. to perform tasks more efficiently and confidently.

Addressing disease management education to help implement lifestyle changes was an important step

in empowering Mr. P. to take responsibility for his health and minimizing the risk of future cardiac events. Mr. P. committed to smoking cessation and agreed to review the literature provided as well as follow up with community resources if required. He also agreed to explore stress management strategies and healthier leisure options. He completed both the Stress Management Questionnaire (SMQ) and Interest Checklist to better understand his high risk stressors and potential areas of interest. Mr. P. identified the warning signs associated with burnout and anger, and was educated about the physical effects of high level and prolonged stress, including the implications for cardiac health. He identified several healthier leisure tasks to explore in the future, including hiking, visiting museums, and sketching. Mr. P. also expressed an interest in exploring relaxation strategies and was introduced to progressive muscle relaxation and guided imagery as additional means of managing stress.

Discharge:

Mr. P. met all his long-term goals by the anticipated date and was discharged home at an independent level for mobility, at a Mod I level of function for all his ADLs and simple IADLs. He agreed to OT services upon discharge to ensure a safe transition home, apply his new strategies in his own environment, and continue to build activity tolerance via higher level IADLs so that he could perform these meaningful tasks to a satisfactory level and ultimately return to work. As a short-term measure and while he was still unable to drive, he also agreed to a home delivery service for his groceries and a home health aide to assist with the heavier household tasks.

CASE STUDY #3

Congestive heart failure (CHF) - Home Care Setting

History of presenting information (HPI):

Mrs. L. is an 81-year-old female with a past medical history significant for hypertension (HTN), diabetes mellitus, osteoporosis, chronic obstructive pulmonary disease (COPD), and pneumonia (PNA) who lives alone in an assisted living facility (ALF). She also has a 50-year history of tobacco use but quit approximately 13 years ago. Three weeks ago, the ALF staff noticed Mrs. L. was experiencing increased fatigue and shortness of breath with a persistent cough, and she was transferred to the hospital for assessment. Upon admission, she had difficulty breathing with a respiration rate of 26 and significant dyspnea in supine or with exertion. Her BP was 178/112, she had a pulse of 110 and an O2 saturation of 86% on room air. Mrs. L. had **rales** on auscultation, an elevated white blood count (WBC), and a chest X-ray revealed right middle and lower lobe **pleural effusions** consistent with PNA and **bibasal consolidation** consistent with CHF. Due to her advanced age and weakened condition, Mrs. R. was admitted and treated with antibiotics and supplemental oxygen. Once stable she was transferred to a short-term facility for continued medical management and rehab efforts where she received OT services 5 x per week for 10 days until ready for discharge home. It was recommended that she use O2 at home as needed.

Reason for OT Referral:

Mrs. L made steady progress in rehab and was considered both medically stable and functionally able to return home to the assisted living facility (ALF). While not at her prior level of function, Mrs. L.'s family is willing to pay for short term additional AL staff services to assist her with showering and housekeeping tasks while she continues to get therapy. The primary goal of occupational therapy services is to help Mrs. L. return to her baseline independent level of function by addressing strength, endurance, safety, education, and compensatory strategies.

OT Initial Assessment:

The initial evaluation to determine Mrs. L.'s functional status, her potential barriers, and goals for therapy is conducted in her apartment via informal interview, observation, mobility assessment, the Barthel Index (BI) to assess ADL ability, the Short Portable Mental Status Questionnaire (SPMSQ) to assess cognition, and the Missouri Alliance for Home Care test (MAHC-10) to assess fall risk. Mrs. L's studio apartment includes a living room with kitchenette area, and a separate bathroom with a walk-in shower stall and flip-down seat. Both the shower and standard toilet have grab rails in place. She is greeted fully dressed sitting in her recliner reading the newspaper. She appears comfortable and is not using O2, although both a concentrator and portable tank are present. She is pleasant and cooperative throughout the evaluation and highly motivated to participate in therapy in order to continue living as independently as possible.

Mrs. L. informs her therapist that she has recently lost her husband of 60 years. He had multiple co-morbidities, including dementia and lung cancer, and she had been his primary caregiver in recent years. However, a year ago the couple was transferred to the memory care unit in the facility so that her husband could get additional care as his health and cognition deteriorated. Mrs. L. was hospitalized for CHF exacerbation at the time of her husband's passing and she reports still feeling sad that she was unable to be with him at the end. Upon discharge from rehab, Mrs. L. was transferred back to an assisted living apartment within the facility and feels that she is still acclimating to her new environment.

Prior to her recent hospitalization, Mrs. L. was able to ambulate independently without an assistive device in her apartment and within the ALF, although she

used a rollator in the community due to decreased activity tolerance and mild dyspnea with increased activity demand. She was independent with all her ADLs, performing standing level showers, and she was able to complete routine homemaking tasks like making the bed and doing the laundry, although she also utilized the ALF housekeeping services for heavier household chores. She was able to make snacks and beverages, but ambulated to the dining room for all meals. She has always been very sociable and enjoys visiting with other residents and participating in many of the community leisure groups. She loves politics and reading the newspapers. Her daughter lives locally, visits regularly, and is able to provide transportation as needed.

During the initial evaluation, Mrs. L. was able to independently ambulate approximately 20 feet to the bathroom using her rollator. She completed her toileting routine independently with mild dyspnea during hygiene and clothes management tasks. She performed a shower transfer and completed a full bathing routine mostly sitting but standing as tolerated with supervision. She used a hand held shower and long-handled sponge to reach her lower extremities. She dressed with moderate assistance (Mod A), needing help to reach her feet to don both socks, as well as feed her feet through her left pant leg. She was able to stand to hike her pants and donned both shoes with Velcro straps unassisted. She reported moderate fatigue and shortness of breath with the sustained increase in activity demand as well as bending to perform lower body dressing. She also presented with 2+ edema in both lower extremities. Using the Barthel Index in addition to observation, it was apparent that Mrs. L.'s main deficits with regard to her ADLs was performing lower body dressing (LBD) tasks, with both endurance and edema as limiting factors. The results of the MAHC test suggested that Mrs. L. is at risk for falling although she has no prior history of falls. Throughout the evaluation, she was capable of sustained attention with an ability to follow multi-step directions. On the SPMSQ test, Mrs. L. scored two errors indicating normal mental functioning with capacity for new learning. She reported feeling frustrated with her decreased activity tolerance and shortness of breath. She did not use oxygen at any time during the evaluation and maintained O2 saturations between 90-93%. Mrs. L. reported that while the oxygen makes her feel better if she gets winded, she is fearful of using it without someone present as the cord makes her feel anxious and she worries about falling. She reports feeling particularly short of breath when she ambulates approximately 300 feet to the dining room area or activity room.

OT Problem List:

- Limited activity tolerance impacting participation in ADLs/IADLs and community mobility
- Limited knowledge of energy-conservation education, effective pacing strategies, and ventilation techniques impacting performance in ADLs and participation in IADLs
- Limited knowledge of available adaptive equipment to assist with ADLs
- Limited knowledge of O2 use, including O2 cord management and fall prevention techniques
- Limited knowledge of edema management

OT Plan of Care (POC):

Anticipated length of OT services: 6 weeks

Duration and frequency of OT sessions: Approximately 30-40 minutes, 2 x per week.

OT short-term goals: Anticipated timeframe – 3 weeks

- Patient will independently complete safe shower stall transfer with appropriate use of durable medical equipment (DME)
- Patient will complete shower routine with Supervision (S) sitting/standing as tolerated with appropriate use of adaptive equipment (AE) and verbal cues for energy conservation strategies including ventilation techniques as needed
- Patient will complete dressing routine sitting/standing as tolerated with Supervision (S) and verbal cues for appropriate energy conservation strategies, ventilation techniques, and use of AE as needed
- Patient will participate in edema management education in order to monitor signs and symptoms of CHF exacerbation that may require immediate medical attention
- Patient will participate in O2 cord management and fall prevention education in order to maximize safety

OT long-term goals: Anticipated timeframe – 6 weeks

- Patient will independently (I) complete shower routine sitting/standing as tolerated with appropriate use of adaptive equipment (AE) and energy conservation strategies including ventilation techniques as needed
- Patient will independently (I) complete dressing routine sitting/standing as tolerated with appropriate application of energy conservation strategies, ventilation techniques, and use of AE as needed
- Patient will independently (I) complete a simple beverage/snack prep with appropriate energy conservation strategies including ventilation techniques as needed

Patient will participate in disease management education, including edema management, and be able to verbalize strategies to monitor signs and symptoms of CHF exacerbation requiring immediate medical attention

- Patient will independently (I) demonstrate appropriate O2 cord management and fall prevention techniques in order to maximize safety

Interprofessional Communication:

Primary Care Physician (PCP): Discussed evaluation results and rationale with request for continued OT services 2 x pw for 6 weeks. PCP agreed with plan of care and provided verbal order.

Physical Therapy (PT): Discussed Mrs. L.'s OT plan of care and goals in order to develop a coordinated, collaborative effort with PT to build strength, activity tolerance, and maximize functional mobility and safety. Participated in frequent communication to provide updates, reinforce consistent educational material, and coordinate efforts to minimize schedule conflicts.

Nursing: Discussed Mrs. L.'s evaluation results including deficits, goals, and rationale for OT services. Discussed potential risk for falls and depression due to the client grieving her husband's death, loss of caregiver role, and social isolation. Participated in frequent communication to provide updates, reinforce consistent educational materials, and monitor for signs and symptoms of depression or caregiver burden.

Independent Living Facility Staff: Discussed evaluation results including Mrs. L.'s goals to return to baseline level of function for ADLs. Discussed OT plan of care and recommendations to maximize functional independence with use of adaptive equipment and energy conservation strategies.

Independent Living Facility Resident Programs Coordinator: Discussed evaluation results and deficits impacting participation in social/community activities, including options to incorporate energy conservation strategies and encourage participation.

Interventions:

Mrs. L.'s treatment plan consisted of increasing her activity tolerance and functional mobility through both ADLs and IADLs in order to maximize her functional independence and minimize the potential for depression associated with grief and loss of her caregiver role. Given Mrs. L.'s goal to return to her baseline level of function and her capacity for new learning, disease management education including daily weight/edema checks, energy conservation skills, and adaptive equipment use were considered of primary importance in her plan of care.

Given Mrs. L.'s recent bereavement, hospitalization, and apartment change, The Resilience Scale for Adults (RSA) was completed early in her plan of care in order to assess her strengths and ability to adapt after adversity. It was clear that Mrs. L. thrived in social contexts and her level of conscientiousness suggested she had a preference for routine and planning.

Mrs. L. was issued a daily planner and encouraged to prioritize her activities according to importance and level of fatigue. She was educated about the need to decrease extraneous tasks if necessary while still building up her activity tolerance. She was encouraged to include ADLs and social participation through community leisure activities in her daily schedule in order to plan for tasks, include adequate rest breaks, and create a balance of necessary and meaningful occupations. She was also encouraged to pace herself through all tasks and sit when possible.

Mrs. L. was instructed on using energy conservation strategies to perform tasks more efficiently and with less fatigue. She was highly motivated to use adaptive equipment to improve her dressing routine and she was encouraged to trial a reacher, a long-handled shoehorn, and a sock aide. Mrs. L. practiced with each item and was excited to notice less shortness of breath when minimizing the need to bend frequently to reach her feet. She decided to purchase all recommended items. Once Mrs. L. had mastered her daily ADL routine more efficiently and independently she was more confidently able to participate in meaningful IADL activities, including retrieving drinks or snacks from the apartment's kitchenette, selecting clothes from the closet or dresser, and straightening the bed. She was also able to slowly increase her time participating in social activities within the ALF community. Energy conservation and work simplification strategies were included allowing Mrs. L. to perform IADL tasks more efficiently and confidently without significant fatigue or shortness of breath.

Providing Mrs. L. with education to self-monitor signs and symptoms of a CHF exacerbation was important in minimizing the risk of future hospitalizations. Mrs. L. was provided with an easy to follow visual self-check plan from the American Heart Association[168] to help her monitor typical signs and symptoms and know when to seek medical assistance or call 911. She was also provided with several blank weight-monitoring logs and was encouraged to check and record her daily weights. She understood that sudden weight gain of several pounds over a 24-hour period would require at least a check in with her Primary Care Physician. Additionally, she was encouraged to perform daily checks for increased lower extremity edema and monitor for abdominal discomfort. She was also encouraged to be aware of worsening shortness of breath, the development of a dry cough, or if her quality of sleep deteriorated and she was no longer able to tolerate lying flat in bed. Mrs. L. was also educated regarding use of oxygen if needed, including safe O2 cord management, and fall prevention strategies.

Mrs. L. was encouraged to participate in regular functional activities and ambulate as tolerated. She verbalized her understanding of the importance of physical activity in maintaining general endurance that would also enable her to continue participating in meaningful social activities within the ALF and local community.

Discharge:

For the first two weeks, Mrs. L. used her rollator to go down to the dining room for meals or community events, and took occasional seated rest breaks. As her strength and endurance improved she was able to safely ambulate independently with her rollator with fewer rest breaks.

She met all her long-term goals by the anticipated date and was discharged from OT services at an Independent level for shower stall transfers, bathing, dressing, and simple IADLs within the apartment. She continued to receive ALF housekeeping services for heavier chores. Mrs. L. demonstrated appropriate skills to apply energy-conservation strategies when necessary and manage her daily weight log. She slowly increased her tolerance for social activities within the ALF and local community, participating in trips to the local library and an antiques fair with her daughter.

Resources

American Heart Association: *CHF patient guide and symptom check list*

https://www.heart.org/HEARTORG/Conditions/HeartFailure/Heart-Failure_UCM_002019_SubHomePage.jsp

American Heart Association: *Heart eating patient guide*

http://www.heart.org/HEARTORG/HealthyLiving/HealthyEating/Healthy-Eating_UCM_001188_SubHomePage.jsp

PBS, WGBH Boston: *The hidden epidemic: heart disease in America – 10 things you never knew about heart disease*

https://www-tc.pbs.org/wgbh/takeonestep/heart/pdf/10Things.pdf

CHF weight monitoring log chart (free PDF download)

https://www.freeprintablemedicalforms.com/preview/Congestive_Heart_Failure_Log

American Heart Association: *Activity log* (free download)

http://www.heart.org/idc/groups/heart-public/@wcm/@hcm/documents/downloadable/ucm_445503.pdf

American Heart Association: *Blood pressure log* (free download)

http://www.heart.org/idc/groups/heart-public/@wcm/@hcm/documents/downloadable/ucm_305157.pdf

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The Role of Occupational Therapy in Cardiac Rehabilitation

(3 CE Hours)

FINAL EXAM

1. **Hypertension is either the primary or contributing cause of almost _____ in the U.S.A.**
   a. 1000 deaths each day
   b. 1000 deaths each month
   c. 2500 deaths each day
   d. 2500 deaths each month

2. **Which of the following statements regarding angina is NOT correct?**
   a. Angina is a complication of coronary artery disease (CAD) that may develop as the arteries continue to narrow over time and blood supply is reduced
   b. Angina is commonly classified as either stable or unstable
   c. Treatment for angina includes nitrates, such as nitroglycerin tablets, or beta-adrenergic blockers that dilate vessels
   d. Typically, women's angina symptoms are more easily identified as cardiac related

3. **A normal heartbeat begins with an electrical signal from the sinus node, a single point within the _____ of the heart.**
   a. Left atrium
   b. Left ventricle
   c. Right atrium
   d. Right ventricle

4. **Heart failure symptoms are classified in stages from mild to severe. "Moderate limitations with increased activity demand. For example, fatigue and dyspnea while ambulating short distances, climbing one flight of stairs," are characteristic of _____.**
   a. Class I
   b. Class II
   c. Class III
   d. Class IV

5. **Around _____ of individuals experiencing a myocardial infarction (MI)MI die within an hour after onset before they reach the hospital.**
   a. 35%
   b. 50%
   c. 65%
   d. 80%

6. **During _____, electrical signals fire rapidly from multiple sites in both atria thereby overwhelming the ventricles, which are unable to fill and pump in a normal rhythm. As a result, an individual will experience a rapid and irregular heartbeat.**
   a. Atrial Fibrillation (AFib)
   b. Coronary Artery Disease (CAD)
   c. Heart Failure / Congestive Heart Failure (CHF)
   d. Hypertension (HTN)

7. **Approximately 95% of _____ develops without a known etiology, and 5% of cases are attributed to a comorbid condition such as chronic kidney disease.**
   a. Atrial Fibrillation (AFib)
   b. Coronary Artery Disease (CAD)
   c. Heart Failure / Congestive Heart Failure (CHF)
   d. Hypertension (HTN)

8. **Commonly referred to as a heart attack, acute _____ is the irreversible damage to heart muscle as a result of coronary artery obstruction or prolonged lack of oxygen to cardiac tissue.**
   a. Atrial Fibrillation (AFib)
   b. Coronary Artery Disease (CAD)
   c. Hypertension (HTN)
   d. Myocardial Infarction (MI)

9. **_____ is most commonly attributed to atherosclerosis, a buildup of fatty, fibrous plaque in the coronary arteries that can progressively narrow the vessels over time and occlude blood supply to the heart muscle, increasing the risk of significant health related issues.**
   a. Atrial Fibrillation (AFib)
   b. Coronary Artery Disease (CAD)
   c. Hypertension (HTN)
   d. Myocardial Infarction (MI)

10. **_____ is a complex diagnosis that results from impaired structure and/or function of the ventricles. It is a chronic progressive condition that affects the heart's ability to pump blood to the body and provide organs and tissues with necessary oxygen and nutrients.**

a. Coronary Artery Disease (CAD)
b. Heart Failure / Congestive Heart Failure (CHF)
c. Hypertension (HTN)
d. Myocardial Infarction (MI)

11 _____: An imaging technique used to diagnose heart conditions. It is the primary procedure used to evaluate arterial blockages and is typically conducted under sedation.
a. Angiogram
b. Bibasal consolidation
c. Cardioversion
d. Defibrillation

12. _____: A non-surgical reperfusion procedure, also known as coronary angioplasty, that uses a catheter to open an occluded vessel or place a stent in order to improve blood flow to the heart.
a. Coronary artery bypass graft (CABG)
b. Implantable Cardioverter Defibrilator (ICD)
c. Percutaneous coronary intervention (PCI)
d. Telemetry

13 _____: a form of arteriosclerosis that specifically refers to an increase in lipids, cholesterol, or other substances that restrict arterial blood flow
a. Atherosclerosis
b. Cardiac cachexia
c. Hypercholesterolemia
d. Ischemia

14. _____: A disturbance in the heart's normal rhythm resulting in a heart rate over 100 beats per minute.
a. Bradycardia
b. Cardiac cachexia
c. Orthopnea
d. Tachyarrhythmia

15. _____: An instrument developed to measure an individual's performance satisfaction with their independent living skills. The tool is a self-report questionnaire and consists of two subscales. Subscale I identifies 24 items associated with home management; subscale II contains 22 items related to social and community activities.
a. Barthel Index (BI)
b. Interest Checklist
c. Satisfaction with Performance Scaled Questionnaire (SPSQ)
d. The Mini Mental State Examination (MMSE)

16. _____: A 25-item, self-report, 7-point Likert scale tool used to assess resilience in adults, including their ability to adjust successfully after a major life event.
a. Canadian Occupational Performance Measure (COPM)
b. Functional Independence Measure (FIM®)
c. Resilience Scale for Adults (RSA)
d. Short Portable Mental Status Questionnaire test (SPMSQ)

17. _____: A process of passive, active, and progressive movement during critical illness to counter the effects of sedation and immobility that may lead to neurocognitive deficits and physical debilitation. It may be performed by any member of the interdisciplinary team, including OTs.
a. Cardiac/sternal precautions
b. Early mobilization
c. Instrumental activities of daily living (IADL) re-training
d. Stress management / relaxation strategies

18. Considering Case Study #1: As part of OT intervention, Mr. S. was introduced to _____ so that he could continue to participate in his meaningful daily tasks while maintaining intensity parameters set by his cardiology team.
a. Ejection fractions (EFs)
b. Holter and Event Monitors
c. Implantable Cardioverter Defibrilators (ICDs)
d. Metabolic equivalents (METs)

19. Considering Case Study #2: _____ was an important step in empowering Mr. P. to take responsibility for his health and minimizing the risk of future cardiac events.
a. Addressing disease management education to help implement lifestyle changes
b. Asking for help from his ex-wife and family
c. Working approximately 60 hours a week in the retail industry
d. None of the above

20. Considering Case Study #3: To help her perform tasks more efficiently and with less fatigue, Mrs. L. was _____.
a. Advised to seek out community volunteers
b. Instructed on using energy conservation strategies
c. Presented with healthier leisure options
d. Taught to identify the warning signs associated with burnout and anger