



## Complications, Conditions & Treatment of Substance Abuse & Cardiovascular Disease

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## Introduction

### Substance Abuse and Cardiovascular Disease

Substance abuse is defined as the excessive and/or compulsive intake of a compound that can cause changes in the neurological or biochemical state of an individual. This may be associated with physiological and/or psychological dependence on the compound in question. This intake is categorized as abuse when it leads to significant impairments in the ability to function in occupational and/or societal terms. Substance abuse may lead to deteriorations in existing health complaints, or to the need for treatment for complaints that may have arisen due to substance abuse<sup>1</sup>. This abuse may be strongly associated with some conditions such as infective disease<sup>2</sup>.

The ingestion of harmful substances, particularly drugs and alcohol, may be associated with deterioration in the health of the heart and/or blood vessels<sup>3</sup>. This is known as cardiovascular disease, and may have considerable impacts on overall health and longevity. This guide will discuss the potential roles substance abuse may play in the risk of cardiovascular disease, and the potentially harmful effects of dangerous ingestible (or incorporable into the body by other means, such as intravenously) substances on pre-existing disorders of the vascular system.

### Cardiovascular disease

Cardiovascular disease is the dysfunction or damage to the tissues of the heart or blood vessels (e.g. cardiac muscle, arterial walls) that results in reductions of their inherent capacity to carry out their normal functions. These functions include the regular and consistent 'pumping' of blood throughout the body, which is done to supply all parts of the body (including the brain) with nutrients and oxygen. The vascular system (or the network of blood vessels in the human body) is also concerned with exchanging oxygenated blood with de-oxygenated blood from veins to arteries and back again. Without this ability, the body's tissues would quickly become starved of oxygen. Blood vessels may also transport waste products to the kidneys and harmful materials (including metabolized and unused drug molecules) to the liver, which contributes to their removal from the body.

Cardiovascular disease may reduce the extent and efficiency of these functions and interferes with the basic capabilities (i.e. the muscular actions involved in blood flow and the beating of the heart) of the system in question. This form of disease may result in brain abnormalities and damage due to interruptions in the supply of oxygen to this organ. It may also lead to tissue starvation, as mentioned above, which may manifest in severe adverse effects including necrosis (tissue death). Some types of cardiovascular disease may also result in physical blockages within blood vessels, which may result in the effects mentioned above, or even the need for surgeries such as cardiac procedures or even amputations. Cardiovascular disease and the subtypes (or conditions) of this are associated with increases in

mortality (the risk of death) and reductions in the quality of life for the millions currently affected. These conditions are also associated with many risk factors that, for many conditions, include substance abuse.

## Conditions and complications related to cardiovascular disease

### Myocardial Infarction

Myocardial infarction (MI), more commonly known as heart attack, is the impairment of blood flow to some part of the heart, which may result in extensive damage to cardiac muscle and other tissues due to oxygen starvation<sup>4</sup>. Myocardial infarctions may manifest as pain in the chest area and in stark decreases in heart function that lasts for several minutes. This may culminate as tightness and extreme discomfort in the chest, loss of consciousness or even death in severe cases. Many cases of myocardial infarction are 'built up' over time, due to the effects of other conditions such as atherosclerosis or coronary artery disease. Eventually, this results in enough cumulative cardiac damage—and symptoms noticeable enough—to become apparent as a heart attack.

### Arrhythmias

Cardiac arrhythmias are irregularities in heartbeat, or the rate at which blood is pumped around the body by the heart. A common form of these is atrial fibrillation (also known as A-fib), related to disorders of an atrium (one of the

main 'chambers' of the heart)<sup>5</sup> and the resultant malfunction of atrial electrical signaling. Ventricular fibrillation (or V-fib), in which the other type of chamber (a ventricle) is dysfunctional, is rarer, but can be a more serious condition. V-fib tends to be more closely associated with myocardial infarction<sup>5</sup>. Arrhythmias may be asymptomatic, or perceived as palpitations in the chest, or manifest in other ways. Many forms of arrhythmia are not life threatening, but some may precipitate events that lead to a cardiac arrest. This is a rapid decline in the contraction of heart muscles, resulting in cessations of blood circulation. This is an event distinct from a heart attack, but may also be a consequence of one.

### Brain hemorrhages

These are disruptions of blood vessels in the skull, resulting in bleeding into some spaces around the brain and within the brain. This may manifest as acute intense headaches, and leave the patient with neurological disorders or, even, pulmonary edema (termed neurogenic pulmonary edema, or PNE). Bleeding within the brain may lead to another form of stroke known as a cerebrovascular accident (CVA). Depending on the size and location of interrupted cerebral blood flow, CVAs may result in reductions in functional, cognitive or sensory capacities. Many forms of brain hemorrhage are associated with increases in blood pressure<sup>6</sup> – both acutely and from long-standing hypertension.

### Cardiomyopathy

Cardiomyopathy describes damaged or irregular myocardium, or heart muscle.

Cardiomyopathy may contribute to the conditions discussed above. There are many types of cardiomyopathy, including dilated and hypertrophic cardiomyopathy<sup>7</sup>. This disorder may also be associated with many risk factors, including genetics<sup>7</sup>.

## **Atherosclerosis**

Atherosclerosis involves the formation of plaques and resulting vessel hardening (sclerosis) along the interior walls of the arteries. Atheromatous plaque is mostly composed of cholesterol and blood proteins. These proteins, including low-density lipoprotein, facilitate the introduction of cholesterol into arteries, but do not remove it. This condition may be related to the consumption of 'unhealthy' foods such as foods rich in certain sugars or fats. Some cases of atherosclerosis are also related to genetic disorders such as familial hypercholesteremia. Atherosclerosis may progress to a point at which an artery is nearly totally blocked by cholesterol plaques. This results in considerable interruptions of blood flow through these vessels. Atherosclerosis is associated with adverse effects such as increased risks of heart failure, peripheral artery disease and stroke.

## **Coronary artery disease**

Coronary artery disease is the narrowing (or stenosis) of major arteries feeding the heart with blood. This is often (but not always) related to atherosclerosis<sup>8</sup>. Coronary artery disease is another common cause of heart attack and congestive heart failure. This is a condition in which the capability of the

heart to pump blood is often significantly reduced. Coronary artery disease may be known by other names, including ischemic heart disease and coronary heart disease. As with some other cardiovascular conditions, the development of coronary artery disease may have a genetic component for some patients<sup>8</sup>.

## **Hypertension**

Hypertension, or high blood pressure, is a condition in which the heart must work harder than usual to keep blood circulation at acceptable levels. Many cases of hypertension are linked to age-related increases in blood pressure<sup>9</sup>. Estimates suggest that approximately 33% of all adults over 20 years of age are affected by hypertension<sup>6</sup>. Hypertension may be a risk factor in the development of atherosclerosis, and thus coronary artery disease<sup>9</sup>. Additionally, long-standing uncontrolled hypertension can lead to the secondary development of cardiomyopathy, arrhythmia and valvular disease, and puts one at higher risk for cerebrovascular accident.

## **Ischemia**

This is a collective term describing the negative effects of oxygen starvation on tissues. Any vascularized tissue or organ system—from the gastrointestinal tract to the nervous system—can be impacted by an ischemic event. Ischemia is particularly relevant to the heart and vascular system, and is a hallmark of myocardial infarction, as above. Ischemia may also occur in the brain as a result of interrupted blood supply. Acute (or sudden-onset) cerebral ischemia is

the second most common cause of death<sup>10</sup>. Estimates suggest that it is responsible for approximately 130,000 deaths per year in the United States, and is the cardiovascular condition most strongly associated with death<sup>10</sup>. Cerebral ischemia is also known as ischemic stroke or cerebral hypoxia. Another condition closely related to cerebral ischemia is cerebral infarction. Ischemia may be a result of obstructive vascular conditions such as coronary artery disease<sup>10</sup>. This condition is also associated with hypertension<sup>6</sup>. A history of ischemia may be associated with reduced chances of surviving a heart attack<sup>10</sup>.

### **Peripheral artery disease**

This is a condition similar to coronary artery disease, in which an artery located away from the heart (usually in an extremity) is obstructed. This may, again, lead to ischemia and death in the tissues affected and is also associated with atherosclerosis<sup>11</sup>. Peripheral artery disease may also result in pain and discomfort (claudication) in the areas affected, and may be detected by the development of blueness (or cyanosis) in the extremities<sup>11</sup>.

### **Thrombosis**

This is another obstructive cardiovascular condition, in which abnormal levels of coagulation (or blood clotting) results in the formation of large clots within blood vessels. Clotting is the natural response of the body to blood loss, and occurs in tissues to prevent this. However, the disproportional or abnormal expression of blood proteins

involved in clotting may result in thromboses. A common form of this disorder is deep-vein thrombosis (DVT), in which a large clot forms in or migrates to a vein in an extremity. This may result in cyanosis and tissue damage, and may need to be addressed through the external sonication of the clot to break it up, or surgery to remove it and the section of an affected vein in which it is located. Thrombosis may be related to atrial fibrillation, hypertension or genetic factors.

### **Thromboembolism**

This is the blockage of an artery or vein by a thrombus (large clot). If this occurs in an artery, it may result in tissue ischemia and damage.

Thromboembolism in some arteries may lead to a cerebral infarction or other form of ischemic brain damage.

Thromboembolism in a vein may lead to peripheral tissue damage, as above, or pulmonary embolism (also known as PE, in which the blood flow to a portion of the lung is blocked).

### **Cardiovascular Risk**

Some individuals appear to be at higher risk of cardiovascular disease than others. This may be dictated by many factors, including many types of genetic variation<sup>12</sup>. The abuse of substances such as alcohol and drugs may also be a strong contributing factor in many cases of cardiovascular disorder. The use of these compounds may result in the further deterioration of an existing illness, or even the onset of disease. The role of substance abuse in the conditions as above will be discussed here in detail.

## Alcohol abuse and cardiovascular disease

Excessive alcohol intake may be associated with the increased risk of hemorrhages in the blood vessels of the brain<sup>3</sup>. Alcohol abuse may also lead to cardiomyopathy<sup>3,13</sup>. It is also associated with the increased risk of high blood pressure<sup>13</sup>. Alcohol abuse is a risk factor in the development of hypertension, and this may have a component of genetic susceptibility<sup>14</sup>. In other words, the development of hypertension may be affected by variations in the gene for aldehyde dehydrogenase, a major enzyme involved in alcohol metabolism<sup>14</sup>. A study including 73 patients with heart failure found that 17.8% of these had a history of alcohol or substance abuse<sup>15</sup>. Heavy alcohol consumption is also associated with other cardiovascular conditions and events, including<sup>11</sup>:

- Arrhythmias
- Brain hemorrhages
- Peripheral artery disease
- Death associated with acute cardiovascular events

Pre-existing cardiovascular disease (alone or in combination with other disorders) may increase the risk of alcohol abuse itself. A study on patients with heart failure and conditions such as obsessive-compulsive disorder, found that these individuals were at a significantly greater risk of alcohol abuse than similar patients without these personality disorders<sup>16</sup>.

On the other hand, low to moderate alcohol consumption may be associated with the reduced risk of some disorders, including stroke<sup>3</sup>. Some researchers claim that alcohol consumption is associated with positive effects on cardiovascular health, by promoting the 'anti-atherosclerosis' blood proteins – HDL, or high-density lipoproteins<sup>11</sup>. This could further emphasize the importance of using alcohol responsibly.

## Drug use and cardiovascular disease

### The effects of smoking on cardiovascular disease

Tobacco smoking, while still legally and (somewhat) socially acceptable, is linked to a high prevalence of illness and reduced life quality. This may be related to cardiovascular disorder in many cases. Habitual and/or high-volume smoking is regarded as a risk factor for peripheral artery disease<sup>17</sup>. Smoking is also associated with the increased risk of ischemia and brain hemorrhages<sup>6</sup>. The nicotine in cigarettes (and in nicotine-replacement products used in smoking cessation) may also be associated with increased cardiovascular risks<sup>18</sup>.

### The effects of illicit drugs on cardiovascular disease

Illicit drug use may be associated with the increased risk of cardiovascular disease. A study on the need for hospitalization in approximately 4800 drug users found that 223 of these were admitted to hospital due to cardiovascular disease<sup>1</sup>. This was the

fourth most common reason, exceeded only by psychoses, schizophrenia and depression respectively<sup>1</sup>. Hepatitis C (a viral infection that may be contracted from contaminated needles) is another common consequence of the abuse of some drugs<sup>19</sup>. This infectious disease has major repercussions on the hepatic system (liver), but may be also associated with some types of cardiomyopathy<sup>2</sup>. An analysis of blood samples from 1355 patients indicated that anti-hepatitis C virus antibodies were more likely to be present in those with a history of myocarditis and heart failure<sup>20</sup>.

## **Common illicit drugs associated with adverse effects on cardiovascular disease**

Illicit (or 'illegal') drugs are banned from commercial sale and trade in many countries. This is due to the side-effect profile, addiction potential, often-high tolerance (or increases in dose needed to elicit the same effect in an individual over time) profiles and potential for dependence that are disproportional to those acceptable to several regulatory and drug-approval authorities worldwide. These properties may increase the risk of abuse of these drugs over time.

Illicit drugs, also often referred to as 'drugs of abuse', may provide subjectively positive effects initially, but become the basis for habit formation, addiction, physiological or psychological dependence and unpleasant withdrawal over time. Their use may also lead to emotional and behavioral abnormalities, to the extent of the onset of personality

change or psychoses. The chronicity of these changes may be related to the length, or extent of abuse.

In some cases, (e.g. that of heroin) these drugs may have been available as therapeutic commercial products in the past. However, a combination of socially unacceptable abuse, safety concerns and other socioeconomic factors have driven them into disrepute and prohibition from widespread use. These drugs are associated with the increased risk of many conditions and adverse events – including a myriad of cardiovascular disorders. The use of some drugs may also be related to deteriorations and increased mortality in those with pre-existing cardiovascular disease. For example, one in five adults aged 18 to 44 who had experienced a stroke in 2005 had abused illicit drugs<sup>21</sup>.

The more prominent drugs associated with cardiovascular disease are the stimulants and opioid drugs. These may increase the risk of vascular and/or heart disorders by disrupting the balance of certain neurotransmitters, called catecholamines, in the body and brain. This may lead to dose dependent changes in blood pressure, abnormalities in the normal rhythms of the heart or blood vessels, increased blood clotting and increased arterial plaque formation<sup>3</sup>. This may result in abrupt, albeit often temporary, deteriorations in patients with conditions related to these effects<sup>3</sup>. However, this may increase the risk of serious events such as heart attacks, especially with long standing abuse.

## **Amphetamines**

This is a class of drugs that contain some derivatives associated with the treatment of conditions such as attention-deficit/hyperactive disorder (e.g. the compounds of dextroamphetamine and methylphenidate in Adderall and Ritalin), and the increasingly popular street drug of abuse, methamphetamine. The abuse of this stimulant is related to many cardiovascular disorders and adverse events. These may include<sup>3</sup>:

- Cardiomyopathy
- Cerebral infarction
- Cardiac arrhythmia
- Myocardial infarction

## Cocaine

The common illegal stimulant cocaine is linked to the greatest incidence of cardiovascular disorders and adverse events. These include the same conditions and effects as for amphetamines<sup>3</sup>. Cocaine intake is associated with a stark rise in heart rate, blood pressure and the need for oxygen in heart muscle<sup>22</sup>. In contrast, blood flow is usually seen to be depressed<sup>22</sup>. In addition to its effects on neurotransmitters, cocaine appears to cause damage and death in cardiac muscle by upsetting the balance of calcium at a cellular level<sup>23</sup>. This increases the risks of hypertension, stroke, aneurysm and damage to cardiac tissue<sup>22</sup>. This in turn may affect the probability of a heart attack and heart rate irregularities<sup>22</sup>. Up to 25% of non-fatal heart attacks in adults aged 18 to 45 are associated with regular cocaine use<sup>24</sup>. Even a single session of cocaine use can lead to a painful condition

known as variant angina or Prinzmetal's angina, which results from coronary arterial vasospasm and the subsequent diminished blood flow to the heart tissue.

Cocaine use on its own is dangerous, but combining it with other forms of substance abuse can intensify cardiovascular risks. For example, the metabolism of cocaine in the presence of ethanol (e.g. from combining cocaine and alcohol use) can result in formation of an extremely cardiotoxic metabolite, known as cocaethylene.

The abuse of cocaine is also linked to the increased risk of infections of heart muscle and other cardiac tissues<sup>22</sup>. This leads to conditions such as endocarditis, which in turn may result in the increased risk of hospital re-admission for conditions such as stroke, arrhythmia, heart attack and heart failure<sup>25</sup>. Approximately half a million people attend emergency departments with complications related to cocaine use, many of which are concerned with chest pain and discomfort indicating cardiovascular events, every year<sup>26</sup>.

## Opioids

Opioids are in a class of drugs that mimic the body's natural endorphins, which bind to 'pain' receptors to inhibit their signaling to the brain. Therefore, opioids, when ingested or injected, may effectively and rapidly reduce pain awareness. Some of the earliest drugs, including heroin, are opioids. The opioid morphine is regarded as a 'gold standard' in pain management research. These drugs also have neurological effects beside analgesia, which may include euphoria, lethargy, respiratory

problems and withdrawal symptoms. These drugs have exquisitely pronounced potential for addiction and abuse. Opioid abuse—especially with an intravenous route of administration—is associated with the increased risk of infectious disease, including hepatitis C<sup>19</sup>. Some researchers assert that this is also influenced by other factors, including stability of abode (e.g. homelessness) and taking these drugs in unhygienic conditions<sup>19</sup>.

Opioid use over time may also aggravate the risk of cardiovascular disease by elevating the biochemical hallmarks of disorders related to these conditions. These include increases in the concentrations of low-density lipoproteins and free triglycerides (the metabolites of dietary fats) in the body, which is associated with increased risks of atherosclerosis, stroke and heart attacks<sup>27</sup>. A study comparing 117 patients requiring a coronary artery bypass who also abused opioids with 208 similar patients who did not abuse this substance found that low-density lipoprotein and average triglyceride levels were significantly higher in substance-abusing patients<sup>28</sup>.

## Performance-Enhancing Drugs

Steroids are a class of drugs that mimic many hormones and other physiological regulatory molecules in the body. As such, they have the potential to disrupt the balance of one or more of these when taken as medications or as performance-enhancing drugs. This may result in many biochemical abnormalities, which may manifest as symptoms of disease or hormonal imbalance. These include changes in

blood pressure and other cardiovascular anomalies. Many athletic authorities and governing bodies ban the use of these drugs, particularly those associated with increases in muscle mass (i.e. anabolic steroids)<sup>29</sup>. Anabolic steroids are linked to the increased risk of many cardiovascular disorders, including<sup>29</sup>:

- Atrial fibrillation
- Stroke
- Heart failure
- Cardiomyopathy
- Thromboembolism

Anabolic steroids include testosterone and its derivatives<sup>29</sup>. Other non-steroidal drugs associated with similar effects on muscular structure include clenbuterol. This substance is also associated with deteriorations of heart muscle tissue<sup>29</sup>.

## The abuse of other substances and cardiovascular disease

Energy drinks are commercially produced beverages typically containing a high concentration of caffeine and, in some cases, refined sugars. They may also contain less-studied compounds linked to improvements in alertness and energy levels, such as taurine or guarana. Concerns about the potential harms of energy drink abuse have arisen in the last few years<sup>30</sup>. This may involve the regular consumption of these beverages in volumes greater than those recommended by the manufacturer and/or health authorities<sup>30</sup>. Another dimension of energy drink abuse may be in their combination with illicit drugs or alcohol<sup>30</sup>. We're in the midst of an age of energy drink cocktails and mixers – with potentially negative physiologic consequences.

These forms of substance abuse are linked to increased risk of neurological or cardiovascular disorders<sup>30</sup>. A recent review of the literature on the subjects of energy drinks, their abuse and associated conditions found that, while low to moderate consumption in adults was not associated with harm, the heavy or abuse-related intake of these products was associated with the increased risk of many conditions, including psychiatric illnesses<sup>30</sup>. This was particularly relevant to those with pre-existing cardiovascular disease<sup>30</sup>.

### **Effects of multiple or concurrently abused substances**

Another concern in the management of cardiovascular disease is the combination of drugs, which increases the risks of some adverse effects due to drug-drug interactions. This may include the combination of alcohol with illicit drugs, or with prescription drugs. These legal substances may include medications indicated for cardiovascular disorders, which often interact to negative effect with alcohol<sup>31</sup>. A review of data from the American National Health and Nutrition Examination Survey found that the rate of alcohol/prescription drug combination was 41.5%<sup>31</sup>. This rate, when adjusted for age (65 years or more) was 77.8%. In many cases, the medications in question were for cardiovascular conditions<sup>31</sup>. Another major study on aging found that 72% of its approximately 3800 participants used medications that interact with alcohol, most often drugs for cardiovascular or neurological conditions<sup>32</sup>. Approximately one in five of these people combined heavy alcohol intake with anti-clotting agents and other drugs for cardiovascular disease<sup>32</sup>.

Older people (who may be at a higher risk of cardiovascular disease) often have an increased probability of drug/alcohol interaction due to age-related decreases in the ability to absorb and metabolize these compounds. The effects resulting from cardiovascular drug interactions may include<sup>32</sup>:

- Increased blood alcohol levels
- Liver damage
- Gastrointestinal damage and bleeding
- Increased risks of the adverse effects of cardiovascular drugs
- Reduced efficacy of the drugs in question

Marijuana or cannabis is another (mostly) illicit drug that may play a role in the risk of cardiovascular disease. This substance may be linked to increased risks in middle-aged adults, but this association has still not been confirmed<sup>33</sup>. There is also some evidence that cannabis use increases the risk of cardiovascular disease in younger people with or without other risk factors<sup>34</sup>. This may be due to the fact that many people who use cannabis also have a history of tobacco-smoking<sup>33</sup>. For a long time, cannabis was not associated with abuse. However, recent evidence concerning impairments in cognitive, attentional and executive functions (particularly those involved in operating motor vehicles), addiction, and the increased risk of psychiatric disorders with prolonged or high-volume use of this substance, may change that perception<sup>35,36</sup>.

Other drugs that have been found to be associated with hospitalization for cardiac damage include

methylphenidate (marketed under the trade name Ritalin), an attention-deficit disorder medication in a similar class to amphetamines<sup>37</sup>.

## Reducing harm for those with cardiovascular disorders

The need for advice and education for cardiovascular disease patients (or those at an increased risk of these disorders) on the effects of drug abuse on the heart and blood vessels is clear. This information may be supplied by medical professionals. Screening for substance abuse in those with cardiovascular disease may also be helpful, as may patient education in the course of screening programs for this form of disease itself.

Some evidence on the role of psychiatric illnesses on the risk of substance abuse may indicate the need for improved mental health screening and services in those with cardiovascular disorders. A study of mental health in heart failure patients found that the prevalence of substance or alcohol abuse was associated with major depressive disorder<sup>15</sup>. Another study using data from over 1000 patients with cardiovascular disease found that a history of trauma was associated with substance abuse in this population<sup>38</sup>. This may indicate that the improved availability of counseling to people with mental health disorders and an increased risk of cardiovascular disease may reduce substance abuse, and its further deleterious effects on heart

health, in this population. Patients reporting to treatment centers for substance abuse may take the opportunity to tell doctors about their psychological issues<sup>19</sup>.

Cardiovascular disorders are diagnosed using a number of techniques and types of equipment. These may include<sup>37</sup>:

- Electrocardiography (ECG or EKG)
- Echocardiography
- Magnetic resonance imaging
- Angiography (an invasive radiologic procedure that involves visualizing the interior of the heart or coronary arteries)

The use of one or more of these may be ordered by a health professional if a patient presents with cardiovascular symptoms that may be linked with substance abuse<sup>37</sup>. However, ECGs are often found to be inconclusive in cases of cocaine-related symptoms, possibly due to the changes in blood flow and heart rate associated with the drug<sup>23</sup>. There are some standard treatments for symptoms found to be related to drug or alcohol abuse, such as nitroglycerin and calcium-channel blockers for cocaine-induced pain or discomfort<sup>23</sup>.

Patients diagnosed with cardiovascular disorders may also be advised on the potential dangers of alcohol and tobacco abuse. These individuals may be encouraged to reduce or discontinue their intake of these substances, such as cigarettes. Smoking cessation may be achieved through pharmacological

replacement therapies. These may include<sup>18</sup>:

- Nicotine
- Bupropion
- Varenicline

A review of 67 clinical trials of these treatments found no association between bupropion or varenicline and cardiovascular risk, and a negative association between varenicline and serious events<sup>18</sup>. However, there was an association between the risk of more minor events (but not major events) and replacement nicotine therapy<sup>18</sup>.

Cardiovascular disorders are treated with a range of pharmacological therapies and other interventions, which may include exercise. Drugs for conditions such as atherosclerosis and hypertension include:

- Low-dose aspirin
- Beta-adrenergic receptor antagonists ('beta-blockers')
- Ezetimibe
- Fibrates
- Statins

These drugs may be effective in reducing blood pressure or cholesterol levels. However, they may be associated with adverse effects and risks. These may be magnified by alcohol abuse, as described above.

## Seeking professional treatment for substance abuse

The majority of cardiovascular disease diagnoses tend to be made in older adults (of approximately 65 years or

more). However, these disorders are being seen in increasing number of younger adults. Substance abuse, including the abuse of illicit drugs, is most often seen in adolescents and young adults, and may thus increase the risk of cardiovascular disease in this population. As discussed above, illegal drug use is also associated with increased risks of conditions such as arrhythmia<sup>4</sup>.

Substance abuse is one of the leading modifiable factors affecting the risk of death. It is also associated with increased uptake of healthcare resources, particularly emergency medicine facilities. It is currently regarded as a major healthcare and social issue.

Substance abuse may pose risks to other organs and parts of the body, including the gastrointestinal system, brain and kidneys. As seen above, these risks are influenced by alcohol abuse in combination with prescription drug intake. This may affect mortality and life quality of the patients affected.

Some drugs of abuse are associated with unpleasant withdrawal symptoms. For example, withdrawal from opioids such as morphine is associated with intense sweating, nausea and vomiting, pain, diarrhea and psychological complications. Alcohol withdrawal may involve delirium tremens, extreme agitation and seizures<sup>39</sup>. The experience of these may discourage individuals from discontinuing their abusive behavior, thus exposing themselves to further potential cardiovascular risk.

Substance abuse is often difficult to diagnose, and may be complicated by other health issues such as

cardiovascular disease. As illustrated, the combination of both can lead to serious complications and death. Seeking treatment for substance abuse may contribute to the long-term cessation or control of these problems<sup>19</sup>. This may also afford the opportunity to address and manage other health problems that may be associated with this, including cardiovascular disease. Depending on the state (or country) concerned, substance abuse may be provided in outpatient clinics, private facilities, rehabilitation clinics or

community healthcare clinics. The management of both cardiovascular disorder and substance abuse is often best served by assistance from qualified healthcare professionals who may specialize in either. A consultation may be the first step on the road to recovery from substance abuse. Seeking medical advice for suspected conditions and/or worrying symptoms such as chest pain resulting from substance abuse is also recommended.

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