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Please note that links in this page may take you directly to the British Heart Foundation website, where you can find person-centred information on heart conditions and related terms.

### Definition

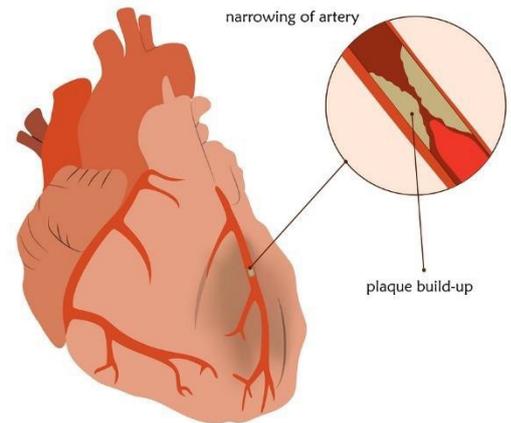
Coronary heart disease (CHD – also referred to as coronary artery disease or ischaemic heart disease) is a type of cardiovascular disease (CVD) where oxygenated blood is unable to perfuse the myocardium (muscle tissue of the heart) due to narrowing of the coronary arteries.

Most commonly, this narrowing of the coronary arteries is a result of atherosclerosis.

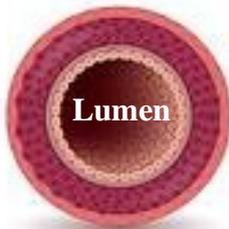
Atherosclerosis is a condition where plaques form within the lining of the arteries. These plaques are formed of white blood cells, lipids (cholesterol and fatty acids), calcium and fibrous connective tissue. This is collectively known as atheroma. Atheromatous plaques cause the lumen of the arteries to narrow and blood flow to become restricted.

Sometimes atheromatous plaques in the coronary arteries can rupture, causing a blood clot to form (coronary thrombus). If this happens, the blood flow in that artery may be partially or completely blocked.

### Coronary artery disease



### Healthy artery



### Plaque formation



### Plaque rupture



There are three main presentations of CHD: angina, myocardial infarction and heart failure. This factsheet will cover angina and myocardial infarction. Heart failure is covered in a separate factsheet.

### A note about chest pain

Chest pain refers to pain in the thorax. It can be classified by cause (cardiac or non-cardiac). Cardiac causes of chest pain include:

- Acute coronary syndrome (unstable angina and myocardial infarction)
- Stable angina
- Other cardiac causes, such as dissecting thoracic aneurysm, pericarditis, cardiac tamponade, myocarditis, acute congestive cardiac failure, or arrhythmias<sup>1</sup>

[Chest pain \(of cardiac origin\)](#) is caused by an insufficient blood supply to the myocardium. [Pain](#) may be experienced in the neck, shoulders, jaw or arms.<sup>1</sup>

### Angina

[Angina](#) is commonly a symptom of CHD, however, it can less commonly be result of a [heart valve disease](#) (for example, aortic stenosis – narrowing of the aortic valve opening), [hypertrophic cardiomyopathy](#), atrial fibrillation, anaemia or hypertensive heart disease (raised pressure inside the heart).<sup>2</sup>

The British Heart Foundation (BHF) also describes **microvascular angina** and **coronary artery spasm**.

The National Institute of Health and Care Excellence (NICE) Clinical knowledge summary (CKS) Health topics: A to Z: **Angina** states the following:

*‘Stable angina usually occurs predictably with physical exertion or emotional stress, lasts for no more than ten minutes (usually less) and is relieved within minutes of rest, as well as sublingual nitrates.*

*Unstable angina is new onset angina or abrupt deterioration in previously stable angina, often occurring at rest. Unstable angina usually requires immediate admission or referral to hospital.’<sup>2</sup>*

### Acute coronary syndrome (ACS) – unstable angina and myocardial infarction

#### Myocardial infarction

Myocardial infarction (MI) is often referred to as a [heart attack](#). It is defined as the death (necrosis) of an area of myocardium due to an inadequate supply of oxygenated blood.

#### Pathophysiological subtypes of MI

**Type 1 MI** occurs secondary to more or less complete mechanical obstruction of coronary flow following an acute plaque event, which is by an atheromatous plaque rupturing and forming a thrombus. The size of the thrombus and extent to which it affects blood flow affects whether it leads to no necrosis, a relatively small amount of necrosis, or a more extensive area of necrosis.<sup>3</sup>

However, coronary thrombosis does not always cause an MI. **Type 2 MI** is defined as the result of a functional imbalance between myocardial oxygen supply and demand in the absence of an atherothrombotic process, leading to myocardial necrosis. Type 2 MI is a strongly age-related condition.<sup>3</sup>

NICE CKS [MI – secondary prevention](#) describes the sub-divisions of ACS as follows:

- **ST-elevation ACS (STE-ACS)**. This is typically caused by a complete blockage of an artery. ST relates to the changes observed on an electrocardiogram (ECG); in this case, there is persistent elevation of the ST wave. Most people with this type of ASC develop an **ST-elevation MI (STEMI)**.<sup>4</sup>
- **Non-ST-elevation ACS (NSTEMI-ACS)**. This typically reflects a partial or intermittent blockage of an artery. Here the ECG does not show persistent ST-segment elevation, although there may be other ECG changes or no changes.<sup>4</sup>
- NSTEMI-ACS is further divided into:
  - **non-ST-elevation MI (NSTEMI)**: there is a rise in the [blood troponin](#) level
  - **unstable angina**: blood troponin level does not rise.<sup>4</sup>

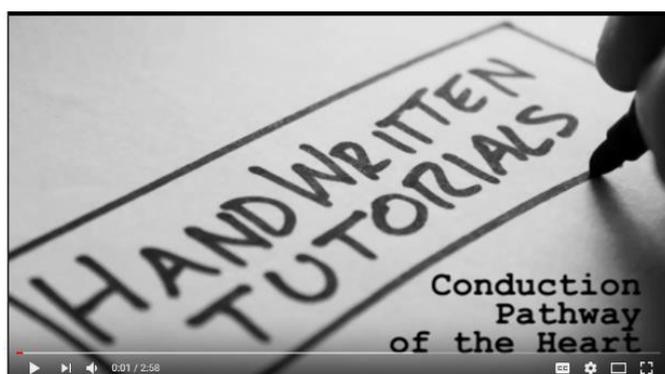
# Factsheet

## Coronary heart disease

Access the 2015 BMJ infographic [Assessment of acute chest pain of suspected cardiac origin](#) for a visual summary.<sup>5</sup>

ECGs show the electrical activity of the heart. To understand what this means, it is important to understand the conduction pathways of the heart. If you would like to learn more about this, then watch the following video by Handwritten Tutorials:

[Handwritten Tutorials – Conduction pathway of the heart](#)



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### Prevalence and incidence

The BHF publishes [data and statistics](#) on mortality, morbidity, treatment and costs associated with cardiovascular disease. They state that 'CHD is one of the UK's leading causes of death' and 'it is also the leading cause of death worldwide'.

Access the [BHF England Factsheet \(February 2023\)](#); this states that in 2021 there were 136,616 deaths due to CVD, of which 38,481 were in those under 75 years of age. There are around 6.4 million people living with CVD in England - an ageing and growing population and improved survival rates from heart and circulatory events could see these numbers rise further. Heart and circulatory diseases cause a quarter (25 percent) of all deaths in England; that's nearly 140,000 deaths each year – an average of 375 people each day or one death every four minutes.<sup>6</sup>

Visit the [Patient Info](#) website and refer to the Professional articles: Cardiovascular disease: [Epidemiology of Coronary Heart Disease](#) for an overview.

To develop your understanding of the wider role of public health access the current [PHE Fingertips Cardiovascular disease profiles data](#): an overview of data on cardiovascular and cardiovascular-related conditions of heart disease, stroke, diabetes and kidney disease. The profiles are for commissioners and health professionals when assessing the impact of cardiovascular disease on their local population and making decisions about services. They include data on mortality, hospital admissions, procedures and disease management.<sup>7</sup>

The profiles are created and maintained by the National Cardiovascular Intelligence Network (NCVIN).<sup>7</sup>

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### Signs and symptoms

#### Stable angina

NICE CKS: [Angina](#) outlines the following as symptoms of angina:

- *'feels tight, dull or heavy – it may spread to your left arm, neck, jaw or back*
- *is triggered by physical exertion or stress*
- *stops within a few minutes of resting'.<sup>2</sup>*

#### Acute Coronary Syndrome (unstable angina and myocardial infarction)

NHS UK Conditions: [Heart attack](#) outlines the following as symptoms of a heart attack, which differ considerably from the symptoms listed for angina:

- *'chest pain – a sensation of pressure, tightness or squeezing in the centre of your chest*
- *pain in other parts of the body – it can feel as if the pain is travelling from your chest to your arms (usually the left arm is affected, but it can affect both arms), jaw, neck, back and abdomen*
- *feeling lightheaded or dizzy*
- *sweating*
- *shortness of breath*
- *feeling sick (nausea) or being sick (vomiting)*
- *an overwhelming sense of anxiety (similar to having a panic attack)*
- *coughing or wheezing'.*

NICE CKS *Chest pain*<sup>1</sup> states to suspect ACS if:

- *'Pain in the chest or other areas (for example the arms, back, or jaw) lasts longer than 15 minutes.*
- *Chest pain is:*
  - *associated with nausea and vomiting, sweating or breathlessness, or a combination of these.*
  - *associated with [haemodynamic instability](#) for example the person has a systolic blood pressure less than 90 mmHg).*
  - *of a new-onset or is the result of an abrupt deterioration of stable angina; with pain occurring frequently with little or no exertion, and often lasting longer than 15 minutes.*
- *Do not use the person's response to glyceryl trinitrate to confirm or exclude a diagnosis of acute coronary syndrome.'*

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#### Causes/risk factors

[NICE CKS CVD risk assessment and management](#)<sup>8</sup> states that risk factors for CHD due to atheromatous plaques correlate with many of the risk factors for the overall development of CVD. They can be classified as modifiable or non-modifiable.

### Modifiable risk factors

- Low blood level of high-density lipoprotein cholesterol (HDL-C)
- High blood level of non-HDL-C
- Hypertension
- Diabetes
- Smoking
- Being overweight/obese
- Inactivity
- Unhealthy diet
- Excessive alcohol consumption
- Excessive stress<sup>8</sup>

### Non-modifiable risk factors

- Increasing age
- Being male
- South Asian ethnic background and those with an African Caribbean background are at greater risk of hypertension
- Family history of heart disease (family history of hypertension or hypercholesterolaemia increases the risk of developing these risk factors.<sup>8</sup>)

### A note about cardiovascular risk assessment and management of modifiable risk factors

For more information about modifiable risk factors, access the BHF website: [Healthy hearts – Risk factors for coronary heart disease](#).

[NHS Health Check](#) is a scheme that, 'aims to promote and improve the early identification and management of individual behavioural and physiological risk factors for vascular disease and the other associated conditions.'

For more information about NHS Health Checks, access [CPPE's Health Checks](#) gateway page.

Access the [NICE Clinical guideline \[CG181\]: Cardiovascular disease: risk assessment and reduction, including lipid modification. May 2023](#), to understand the updated recommendations on risk assessment tools for primary prevention of CVD, cardioprotective diets, and statin treatment for primary and secondary prevention of CVD.

Note: NICE [CG181]<sup>9</sup> covers the assessment and care of adults who are at risk of or who have cardiovascular disease (CVD), such as heart disease and stroke. It aims to help healthcare professionals identify people who are at risk of cardiovascular problems including people with type 1 or type 2 diabetes, or chronic kidney disease. It describes the lifestyle changes people can make and how statins can be used to reduce their risk.<sup>9</sup>

See also, the [NICE BNF Treatment summaries: Cardiovascular disease risk assessment and prevention](#).

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### Pathophysiology (mechanism of disease)

In their 2020 Education in Heart article, [Inflammation and atherosclerosis: what is on the horizon?](#)<sup>10</sup> Ruparelia and Choudhury explain that 'atherosclerosis is a chronic inflammatory process with the immune system central to its pathogenesis'.<sup>10</sup> Current understanding of how atherosclerosis is initiated, and progresses is explained in detail. The authors explain that 'specific targeting of the biological processes involved can attenuate plaque formation and, in some instances, even induce regression of disease'.<sup>10</sup> The limitations of currently available biomarkers and possible future therapeutics for atherosclerosis are described.

Watch the following video (2:38 minutes), which summarises the development of atherosclerosis.

#### [Craig Daly - Development of atherosclerosis](#)



The following video (17:37 minutes) describes an overview of the pathogenesis, risk factors and complications of atherosclerosis.

#### [Dr Matt & Dr Mike: Atherosclerosis - Pathogenesis, risk factors and complications](#)



Dr Matt & Dr Mike's Medical Education©

### Stable angina

Atheromatous plaques affect the flow of blood through the coronary arteries; they also disrupt the endothelium and affect its ability to fully dilate in response to increased oxygen demand. When the demand for oxygenated blood is higher than the supply (without leading to necrosis). For example, during exercise – this can cause the pain experienced during stable angina.<sup>11</sup>

### Acute Coronary Syndrome – ACS

If the atheromatous plaque changes acutely, this can trigger ACS. Changes can include endothelial dysfunction, platelet aggregation and spasm leading to plaque erosion, rupture, haemorrhage and thrombosis.<sup>12</sup>

- An ST-elevation myocardial infarction (STEMI) is associated with major blockages to coronary arteries and a relatively large amount of damage.<sup>13</sup>
- A Non-ST-elevation myocardial infarction (NSTEMI) is associated with less myocardial damage than STEMI, which may be due to there being a partial blockage or a smaller vessel being affected.<sup>14</sup>
- Unstable angina is associated with a partial blocking of an artery.<sup>15</sup>

When blood flow to the myocardium is reduced or blocked for around 30 to 60 minutes, this can lead to cardiomyocyte (heart muscle cell) damage. This damage leads them to release a protein called [troponin](#).

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### Prognosis and complications

NICE CKS offers excellent summaries of the prognosis for [angina](#), and the prognosis and complications associated with an MI, [MI – secondary prevention – Complications and prognosis](#).

A serious complication of CHD is cardiac arrest. For more information about cardiac arrest, visit the BHF's [Cardiac arrest](#) page.

Post MI, a process called cardiac (or ventricular) remodelling may occur. This can result in left ventricular (LV) dysfunction and heart failure. For more information about remodelling and its prevention, access the following article:

- The European Society of Cardiology's 2022 [State of the Art Review Left ventricular remodelling post-myocardial infarction: pathophysiology, imaging and novel therapies](#)<sup>16</sup>

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### Diagnosis/detection

#### Stable angina

Stable angina is diagnosed through clinical assessment, recognition of relevant risk factors and potentially an ECG. Those who have experienced chest pain, but do not require a hospital admission, should be referred to a specialist chest pain service to confirm or exclude angina. At this point, a diagnostic test such as a computerised tomography (CT) coronary angiogram, non-invasive functional testing or a percutaneous [coronary angiogram](#) may be performed.<sup>17</sup>

NICE clinical guidance [Recent-onset of chest pain of suspected cardiac origin: assessment and diagnosis \[CG95\]](#)<sup>18</sup> covers assessing and diagnosing recent chest pain in people aged 18 and over and managing symptoms while a diagnosis is being made. It aims to improve outcomes by providing advice on tests (ECG, high-sensitivity troponin tests, multislice CT angiography, functional testing) that support healthcare professionals to make a speedy and accurate diagnosis.

The NICE [CG95] guideline makes recommendations for people presenting with acute chest pain and those presenting with stable chest pain and for providing advice to people with chest pain.<sup>18</sup>

### Acute Coronary Syndrome (ACS)

ACSs are medical emergencies; both the [BHF](#) and [NHS UK Conditions](#) websites advise people who are experiencing the symptoms of a heart attack to immediately dial 999.

NICE quality standard [Acute coronary syndromes in adults \[QS68\]](#) states that 'Acute myocardial infarction can have a poor prognosis so prompt and accurate diagnosis is important to ensure that appropriate treatment and care is offered as soon as possible. Treatment for adults with suspected acute coronary syndrome is often started before a diagnosis is confirmed. Confirming the diagnosis using the criteria in the universal definition of myocardial infarction is important to ensure that any ongoing treatment is appropriate, and any inappropriate treatment is stopped.'<sup>19</sup>

More information about the diagnosis and assessment of those who present with chest pain can be found in the NICE guideline [Recent-onset chest pain of suspected cardiac origin: assessment and diagnosis \[CG95\]](#).<sup>18</sup>

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### Pharmacological treatment

#### Stable angina

Sections 1.3, *General principles for treating people with stable angina* and 1.4, *Anti-anginal drug treatment* of NICE clinical guidance [Stable angina: management \[CG126\]](#), outline the antianginal therapies that should be offered, in which order they should be offered, and the additional add-on therapies that are recommended.<sup>20</sup>

Note: Since this guidance [CG126] was produced, the Medicines and Healthcare products Regulatory Agency (MHRA) have published new advice about safety concerns related to ivabradine ([June 2014](#) and [December 2014](#)) and nicorandil ([January 2016](#)).

NICE CKS [Angina Scenario: New diagnosis](#) describes the information, support and treatment options for people with stable angina.

The BMJ Best Practice overview of [Stable ischaemic heart disease](#) describes the treatment goals, and approach to the management and monitoring of stable ischaemic heart disease (SIHD).<sup>17</sup>

Additionally, the Scottish Intercollegiate Guidelines Network (SIGN) national clinical guideline [\[SIGN 151\] Management of stable angina 2018](#) provides evidence-based recommendations and best practice guidance on the management of patients with stable angina.<sup>21</sup>

### ACS

#### Initial management

NICE guideline [NG185] [Acute coronary syndromes](#)<sup>22</sup> covers the early and longer-term (rehabilitation) management options in those presenting with ACS; NICE has also produced three visual summaries to support healthcare professionals.

- [STEMI](#)
- [Unstable angina/NSTEMI](#)
- [Secondary prevention and cardiac rehabilitation](#)

### Ongoing management

Those who experience ACS are usually offered [cardiac rehabilitation and secondary prevention](#) with the following:

- angiotensin-converting enzyme inhibitor (ACE inhibitor) to reduce cardiac remodelling (changes in ventricular size and shape)
- dual antiplatelet therapy (aspirin plus a second antiplatelet agent) to reduce the risk of coronary thrombosis
- beta-blocker to reduce heart rate, limit myocardial oxygen demand and reduce the incidence of arrhythmias and cardiac death
- high-potency statin to reduce LDL levels.<sup>22</sup>

For more details see NICE [NG185] Section 1.4, *Drug therapy for secondary prevention*, which outlines the standard pharmacological therapies and refers to further guidance as necessary.

The NICE British National Formulary (BNF) also has a treatment summary for the initial and long-term management of *Acute coronary syndromes*, which also links to the individual monographs for each recommended medicine.<sup>23</sup>

In their 2022 *Age and Ageing* journal article, [New horizons in Type 2 myocardial infarction: pathogenesis, assessment and management of an emerging geriatric disease](#). Putot A, *et al.*<sup>3</sup> describe how the features of MI can differ in older people with co-morbidities and discuss how these differences may impact on diagnosis, investigations, interventions, therapeutics, rehabilitation and prevention.

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### Non-pharmacological treatment

There are several non-pharmacological treatment options which can be offered to those with both stable angina and ACS.

### Information and support

As part of long-term management, information and support can be provided. This should include information about a person's condition and the way it may affect their lifestyle. The person should also be encouraged to ask questions about their condition and be offered support to manage it. Information about how to reduce cardiovascular risk should also be offered.

For more details about current recommended lifestyle advice see [NICE CKS MI – secondary prevention](#)<sup>4</sup> and [NICE \[NG185\] Acute Coronary Syndromes](#)<sup>22</sup> – see Section 1.9, [Lifestyle changes after an MI](#), which outlines the standard non-pharmacological approaches and refers to further guidance as necessary.

### Cardiac rehabilitation

Cardiac rehabilitation involves exercise and information and should be offered to all patients who experience ACS. For more information, watch the following BHF video, which can be found on their [Cardiac rehabilitation](#) page:

[British Heart Foundation – Joining a cardiac rehabilitation programme](#)



For a person's perspective of cardiac rehabilitation, access [Moving forward after a heart attack – Mark's story](#).

The BHF's [Tests](#) information booklet is a general guide for people about the range of tests which are used to help diagnose and assess heart disease.

### Coronary angioplasty and stents

Coronary angioplasty, also known as percutaneous coronary intervention (PCI) or percutaneous transluminal coronary angioplasty (PTCA), can be used to improve symptoms of angina or in an emergency situation to open a blocked coronary artery and re-perfuse the heart.

Watch the BHF video ***Your guide to angioplasty and stents***, which can be found on their **Coronary angioplasty and stents** page, to learn about what happens during an angioplasty and the use of stents.



The location of the stents may be described in terms of which coronary artery they have been placed in. For more information about the anatomy of the coronary arteries, visit the Heart & Vascular Institute's [Anatomy and function of the coronary arteries](#) page. In most circumstances, a drug-eluting stent is used.

The technology for stents is still evolving, and knowing the type of stent used is important for deciding on the duration of dual antiplatelet therapy. Dual antiplatelet therapy should be offered in accordance with the stent's instructions for use (IFU), which are device specific.<sup>24</sup>

### Coronary bypass surgery

Coronary bypass surgery involves grafting a blood vessel to bypass a blockage in a coronary artery. The graft is referred to as a coronary artery bypass graft (CABG).

Watch the BHF's video [Your guide to coronary bypass surgery, heart disease treatment](#), which can be found on their [Coronary bypass surgery](#) page, to learn about what happens during coronary bypass surgery.



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### Patient support

The BHF offers information about specific conditions and support for those with heart conditions. More information can be found on their [Information & support](#) page.

The NHS has a dedicated [Coronary heart disease](#) page with information on symptoms, causes, diagnosis, treatment, recovery and prevention.

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### Further resources

CPPE's [Coronary heart disease](#) gateway page provides further learning on stable angina, health checks and links to NICE guidance.

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### External websites

CPPE is not responsible for the content of any non-CPPE websites mentioned on this page or for the accuracy of any information to be found there.

All web links were accessed on 23 May 2023.

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### References

1. National Institute for Health and Care Excellence (NICE). Clinical knowledge summary (CKS): Health topics A to Z: [Chest pain](#). August 2022.
2. National Institute for Health and Care Excellence (NICE). Clinical knowledge summary (CKS): Health topics: A to Z: [Angina](#). October 2022
3. Putot A, et al. [New horizons in Type 2 myocardial infarction: pathogenesis, assessment and management of an emerging geriatric disease](#). *Age and Ageing*. April 2022;51(4):afac 085.
4. National Institute for Health and Care Excellence (NICE). Clinical knowledge summary (CKS): Health topics: A to Z: [MI – secondary prevention](#). May 2020.
5. BMJ. Clinical Review: [Acute coronary syndrome: Assessment of acute chest pain of suspected cardiac origin](#). 2015;351:h5153.
6. BHF. [England Factsheet](#). February 2023.
7. Office for Health Improvement and Disparities (OHID). [PHE Fingertips Cardiovascular disease profiles data](#). January 2023.
8. National Institute for Health and Care Excellence (NICE). Clinical knowledge summary (CKS): [Health topics A to Z: CVD risk assessment and management](#). May 2023.
9. National Institute for Health and Care Excellence (NICE). Clinical guideline [CG181]: [Cardiovascular disease: risk assessment and reduction, including lipid modification](#). May 2023.
10. Ruparelia N, Choudhury R. [Acute coronary syndromes. Inflammation and atherosclerosis: what is on the horizon?](#) *Heart* 2020;106:80–85.
11. Ford TJ, Corcoran D, Berry C. [Stable coronary syndromes: pathophysiology, diagnostic advances and therapeutic need](#). *Heart* 2018;104:284–292.
12. BMJ Best Practice. [Overview of acute coronary syndrome](#). 2023.
13. BMJ Best Practice. [ST-elevation myocardial infarction](#). 2023.
14. BMJ Best Practice. [Non-ST-elevation myocardial infarction](#). 2023.
15. BMJ Best Practice. [Unstable angina](#). 2023.
16. European Society of Cardiology. [State of the Art Review Left ventricular remodelling post-myocardial infarction: pathophysiology, imaging and novel therapies](#). *European Heart Journal*, July 2022;43(27):2549-2561.
17. BMJ Best Practice. [Stable ischaemic heart disease](#). 2023.
18. National Institute for Health and Care Excellence (NICE). Clinical guideline [CG95] [Recent-onset of chest pain of suspected cardiac origin: assessment and diagnosis](#). November 2016.
19. National Institute for Health and Care Excellence (NICE). Quality standard [QS68] [Acute coronary syndromes in adults](#). November 2020
20. National Institute for Health and Care Excellence (NICE). Clinical guideline [CG126]: [Stable angina: management](#). August 2016.

21. Healthcare Improvement Scotland. Scottish Intercollegiate Guidelines Network (SIGN) National clinical guideline [SIGN 151]: [Management of stable angina](#). 2018.
22. National Institute for Health and Care Excellence (NICE). NICE guideline [NG185]: [Acute coronary syndromes](#). November 2020
23. National Institute for Health and Care Excellence (NICE). BNF Treatment summaries: [Acute coronary syndromes](#). November 2020.
24. National Institute for Health and Care Excellence (NICE). Technology appraisal guidance [TA71]: [Guidance on the use of coronary artery stents](#). November 2020.

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**Last review:** May 2023

**Next review due:** May 2024