



## Module 1849

# Warfarin and INR testing

From this pharmacy CPD module on warfarin and INR testing you will learn:

- What warfarin is used for
- How the dose of warfarin is determined, and the target international normalised ratios (INRs) for different conditions
- What INR testing involves
- Common warfarin interactions and contraindications

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Over 840,000 people in the UK are on long-term anticoagulant treatment. Warfarin is a member of the coumarin class of anticoagulants and accounts for the single largest proportion of prescribed anticoagulants.

Warfarin is indicated for the treatment and prevention of strokes, heart attacks and blood clots, among others.

The formation of a clot in the body is a complex process that involves multiple substances, known as 'clotting factors'.

Warfarin decreases the body's ability to form blood clots, by blocking the formation of vitamin K-dependent clotting factors. By reducing these factors, warfarin stops harmful clots from forming and prevents clots from getting larger.

### How is it determined?

Loading doses of warfarin usually begin at 5mg or 10mg daily for two days, and this is then adjusted according to initial response, usually

to within a range of 3-9mg daily. If a patient requires emergency anticoagulation therapy, a



combination of heparin and warfarin together may be necessary.

One of the most important aspects of warfarin therapy is that the dose changes depending on the results of blood tests.

These tests are used to determine a patient's international normalised ratio (INR). The INR gives an indication of how quickly blood clots – the longer it takes your blood to clot, the higher your INR. Blood that has not been anticoagulated – ie has not been 'thinned' – has an INR of 1.

Community pharmacy clinics are one of the ways that patients can have their INR checked. Other options include GP and nurse-run clinics, as well as outpatient clinics.

Regardless of whether they are involved in INR testing, the pharmacist should always make sure that patients understand the importance of having regular blood tests and not assume that another healthcare professional has instructed them about this.

### Target INRs

Target INRs depend on the condition being treated. The National Patient Safety Agency (NPSA) has produced a guide ([tinyurl.com/CDWarf1](https://www.npsa.nhs.uk/CDWarf1)) for community pharmacists, which includes a table listing different indications for warfarin therapy and their target INRs.

For example, the target INR for the treatment of pulmonary embolism, proximal deep vein thrombosis or calf vein thrombosis is 2.5, while the target INR for patients with a mechanical prosthetic heart valve is between 2.5-3.5. For patients suffering from a recurrence of venous thromboembolism while on warfarin, the target INR is 3.5.

### What is involved in INR testing?

Patients will need to have their INR tested every seven to 14 days – in some cases, this may be even more frequent – when first initiated on warfarin, until they are within their target range. An INR within 0.5 of the target is generally deemed to be satisfactory.

When a patient has a satisfactory INR, their prescriber will decide on timing for follow-up tests – this interval is often between four and 12 weeks, depending on previous INR test results. For patients with prosthetic valves, the maximum amount of time between INR tests should be no more than six weeks.

Unlike some other types of blood tests, there is no need to fast in advance of an INR check. Patients should, however, tell the healthcare professional performing their test if they have made any recent lifestyle adjustments – eg if they have recently quit smoking – or if they have had any recent health changes.

A blood sample is taken from a vein in the arm and then analysed. Results of this test are immediate and are recorded in the patient's yellow anticoagulant therapy book.

Based on the outcome of this test, a patient may need to adjust their dose of warfarin to keep the INR within their personal target range.

There are very few risks associated with having

a blood test to check INR levels. However, some patients may:

- feel a bit faint at the sight of blood
- develop a small bruise at the injection site following the test – this is harmless and will fade away within a short time.

### Side effects of warfarin

If patients are taking warfarin, their blood will not clot as easily. This means that if they accidentally cut themselves, they are likely to have a heavier bleed. Patients who are older than 75 or take other blood-thinning medication are at a higher risk of bleeding.

It is important to remember that patients are at the greatest risk of bleeding in the first few weeks of starting warfarin treatment, and that higher doses of warfarin increase the likelihood of bleeding.

Patients are also more likely to have bleeding

problems if they have:

- hypertension
- a history of stroke
- kidney problems
- cancer
- alcoholism
- liver disease.

Symptoms of bleeding include:

- long-lasting nose bleeds
- passing blood in urine
- black, tarry stools
- bleeding gums
- heavier periods than normal
- unexplained bruising.

You should recommend urgent medical attention to patients taking warfarin if they:

- have a fall or are in an accident
- experience a blow to their head
- are unable to stop any of their bleeding
- have significant bleeding.

Other side effects of warfarin include headaches, nausea and diarrhoea. You should be aware that if a patient is suffering from vomiting and diarrhoea, this may reduce the absorption – and therefore the effectiveness – of warfarin. Under these circumstances, INR levels may need to be monitored more closely and doses adjusted accordingly.

In addition, skin rashes and hair loss are also common side effects of warfarin.

### Common warfarin interactions

Patients taking warfarin can be subject to a number of interactions, ranging from drug-drug and drug-food, to interactions with alcohol or smoking.

### Drug-drug interactions

Some drugs should never be taken by patients on warfarin therapy, whereas for others the dose of warfarin will need to be adjusted and INR levels monitored more closely.

Drugs to avoid completely include: non-steroidal anti-inflammatory drugs (NSAIDs), as these may increase the risk of bleeding; clopidogrel, which may enhance the anticoagulant effect of warfarin; selective serotonin reuptake inhibitors (SSRIs), which may also enhance the anticoagulant effect of warfarin; and dipyridamole, the antiplatelet action of which is enhanced by warfarin.

Drugs that are classed as enzyme inducers or enzyme inhibitors can have an impact on warfarin therapy. St John's Wort, carbamazepine and rifampicin are all examples of enzyme inducers, so taking these with warfarin will decrease the effect of a particular warfarin dose, potentially meaning that the patient will experience a clot.

In contrast, allopurinol,azole antifungals and omeprazole are all enzyme inhibitors. They will potentiate the effect of warfarin, increasing the risk of bleeds. When taking enzyme inducers or inhibitors alongside warfarin, monitoring needs to be more frequent, as doses may need to be adjusted more often.

### Drug-food interactions

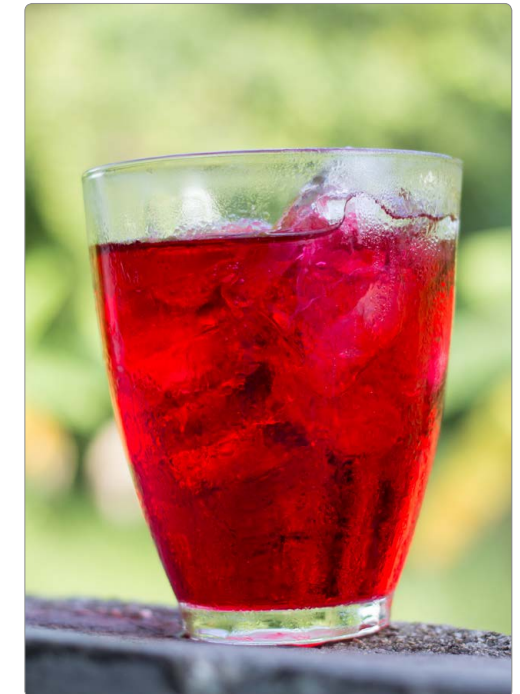
#### Vitamin K-containing foods

Those taking warfarin should be cautious about making any drastic changes to their diet without first consulting a healthcare professional. In particular, foods high in vitamin K should be consumed with caution, for example:

- green, leafy vegetables
- broccoli
- liver
- chickpeas
- brussels sprouts.

#### Cranberry juice

Consuming cranberry juice should also be advised against while taking warfarin, as it may increase INR levels, resulting in a higher risk of bleeding. Individuals who regularly drink cranberry juice and want to continue while taking warfarin will need to go for more regular INR monitoring.



### Alcohol

Alcohol in moderation is fine, but consuming in excess can have an impact on a patient's INR levels. One-off alcohol binges can cause reduced warfarin metabolism, resulting in increased INR levels.

### Smoking

Smoking enhances the metabolism of warfarin; therefore smokers may require higher doses to maintain their INR levels within the target range. However, problems may arise when a smoker decides to quit, as the higher warfarin doses may no longer be required.

As pharmacists, you want to encourage customers to give up smoking, so those taking warfarin need to be informed of the risk and supported by their prescriber with



careful monitoring of INR levels, as well as dose adjustments when required, to ensure overall health.

### Contraindications for warfarin

#### Pregnancy

Warfarin is contraindicated in pregnancy, particularly during the first and third trimester, due to risks associated with foetal malformation and death.

Instead, low-molecular-weight heparin (LMWH) or unfractionated heparin (UFH) are the preferred anticoagulants during pregnancy, as they do not cross the placenta. You should also be aware that warfarin should be avoided within 48 hours of childbirth.

#### Ischaemic stroke

Warfarin may increase the risk of haemorrhage in the brain in the immediate aftermath of an ischaemic stroke.

A short break from warfarin of between

two and 14 days should therefore be taken following a stroke.

#### Surgery

For patients undergoing surgery, the advice a prescriber should offer depends on the risk of bleeding associated with the procedure.

Those having surgery with a low risk of bleeding can continue to take their warfarin, as long as INR levels are kept below 2.5.

Those undergoing surgery with a high risk of bleeding should stop taking warfarin three days in advance of the operation.

Patients scheduled for dental work should inform their dentist that they are taking warfarin, but do not need to stop taking it if going for routine work.

## Warfarin and INR testing CPD

### Reflect

What is the target international normalised ratio (INR) for patients taking warfarin for deep vein thrombosis? Which patient groups have a higher risk of bleeding if they are prescribed warfarin? What foods does warfarin interact with?

### Plan

This article contains information about what warfarin is used for, how the dose of warfarin is determined, target INRs for different conditions, and what is involved with INR testing. Common warfarin interactions and contraindications are also discussed.

### Act

- Find out more about warfarin on the Patient website at [tinyurl.com/warfarin11](http://tinyurl.com/warfarin11)
- Read the information for pharmacists about anticoagulant therapy on the NHS patient safety website at [tinyurl.com/warfarin12](http://tinyurl.com/warfarin12)
- Identify any patients taking warfarin who would benefit from an MUR
- Consider completing a training course about anticoagulant therapy to further your knowledge of warfarin and how it is used

### Evaluate

Are you now confident in your knowledge of warfarin and its uses? Could you give advice to patients about the side effects and interactions of warfarin?

## Take the 5-minute test online

1. Over 840,000 people in the UK are on long-term anticoagulant treatment.  
**True or false**
2. Warfarin works by inhibiting the synthesis of vitamin K dependent clotting factors.  
**True or false**
3. Warfarin treatment usually starts with a loading dose of 3-5mg daily for four days.  
**True or false**
4. Warfarin cannot be given at the same time as heparin.  
**True or false**
5. Blood that has not been anticoagulated has an international normalised ratio (INR) of 1.  
**True or false**
6. The target INR for the treatment of pulmonary embolism and deep vein thrombosis is 3.5.  
**True or false**
7. Patients with hypertension, kidney problems or liver disease have an increased risk of bleeding if taking warfarin.  
**True or false**
8. Side effects of warfarin include headaches, nausea, diarrhoea, skin rashes and hair loss.  
**True or false**
9. St John's Wort, carbamazepine and rifampicin potentiate the effect of warfarin.  
**True or false**
10. Patients taking warfarin are advised to avoid drinking cranberry juice.  
**True or false**