



# What I tell my patients about intravenous iron therapy

Anaemia is a condition in which you have a lower than normal amount of haemoglobin in your blood. Haemoglobin is the red pigment in the red blood cells (erythrocytes), which transports oxygen. An important cause of anaemia is the lack of sufficient iron in the body to produce a normal amount of haemoglobin. If red blood cells contain less haemoglobin, they become pale or 'hypochromic' (see Figure 1). As a renal patient, you may require intravenous (IV) iron therapy (where iron is injected into your veins) to boost your iron levels.

## What causes anaemia in renal patients?

You are prone to get anaemia if you suffer from chronic renal failure. Patients with chronic kidney disease and those on maintenance dialysis often cannot maintain their red blood cell count (the correct amount of blood cells) and hence their haemoglobin level. This is because your kidneys produce a hormone called erythropoietin (EPO), which helps the body to produce red blood cells. So when your kidney function deteriorates, this hormone production diminishes and causes anaemia. Patients with renal disease may have iron deficiency anaemia for the following reasons (other causes are listed in Table 1):

- Less absorption of iron from the diet
- Repeated blood sampling
- Blood loss during dialysis
- Blood loss due to hidden gastrointestinal bleeding.

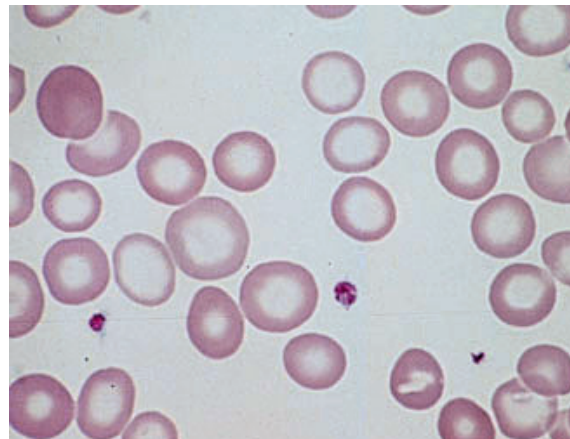


Figure 1. Hypochromic red blood cells (erythrocytes)

**Sathish Kallankara**  
MRCP(UK) Clinical Research Fellow  
**Sunil Bhandari**  
MBChB FRCP PhD Consultant Nephrologist and Physician, Honorary Senior Lecturer, Department of Renal Medicine, Hull Royal Infirmary, Kingston Upon Hull

The iron balance in dialysis patients is different to that of people not on dialysis.

## What are the symptoms of anaemia?

Symptoms of anaemia can be varied and may include:

- Feeling lightheaded
- Weakness, tiredness, fatigue
- Dizziness or fainting
- Loss of concentration
- Shortness of breath, palpitations
- Less frequently, headache and chest pain may occur.

If left untreated, anaemia results in an increased workload on the heart as it has to pump more blood to deliver the required oxygen throughout the body. This will result in a rapid heartbeat and may later lead to heart failure.

**Table 1. Causes of iron deficiency anaemia**

Your body needs more iron due to:	You experience blood loss due to:
<ul style="list-style-type: none"> <li>● Pubertal growth</li> <li>● Heavy menstruation</li> <li>● Pregnancy</li> <li>● Breast feeding</li> </ul>	<b>Gastrointestinal</b> <ul style="list-style-type: none"> <li>● Ulcers</li> <li>● Bleeding veins in the gullet</li> </ul>
<b>Your body does not absorb iron due to:</b> <ul style="list-style-type: none"> <li>● Gastrectomy (removal of the stomach)</li> <li>● Sprue (a tropical disease)</li> <li>● Chronic atrophic gastritis</li> <li>● Drugs</li> </ul>	<ul style="list-style-type: none"> <li>● Tumours</li> <li>● Inflammation</li> </ul> <b>Urinary tract</b> <ul style="list-style-type: none"> <li>● Kidney stones</li> </ul>
	<b>Genital tract</b> <ul style="list-style-type: none"> <li>● Excessively heavy or prolonged menstruation</li> </ul>
	<b>Medical interventions</b> <ul style="list-style-type: none"> <li>● Blood tests</li> <li>● Drugs</li> </ul>



## Why is iron so important?

Iron is an essential nutrient in all living cells. In particular, the production of red blood cells requires a large amount of iron.

## How does iron work?

Iron is an important part of the protein haemoglobin, which is present in the red blood cells that carry oxygen from the lungs to the rest of the body (Figure 2). Hence, without iron you cannot effectively use the oxygen you breathe in because it cannot be transported to the vital organs.

## What causes iron deficiency?

Your body's iron stores get depleted when:

- There is a diminished intake of iron
- There is excessive loss of iron from bleeding (the causes of which can include abnormally heavy and prolonged menstruation)
- There is diminished absorption of iron from the gut.

Figure 3, opposite, shows some factors that affect the iron balance in haemodialysis patients.

## How is iron absorbed in the body?

Iron is mainly absorbed in the upper parts of the small intestine called the duodenum and the jejunum. Iron present in food is mainly in the oxidised state (called ferric iron or  $Fe_3$ ), which is insoluble and hence difficult to absorb. The low pH of the gastric secretions in the stomach convert the ferric iron into more soluble ferrous iron ( $Fe_2$ ), which is readily absorbed in the gut.

## What helps absorption of iron in the intestine?

Iron absorption is enhanced by a high intake of fruits and vegetables, as well as vitamin C (ascorbic acid), which all increase the solubility of iron. However, foods like eggs, spinach and tea, as well as certain medications like antacids, form insoluble complexes with iron, hindering its absorption.

## How much iron can I absorb from my diet?

The average diet contains about 10 mg of iron per day. Under normal conditions only about 10%

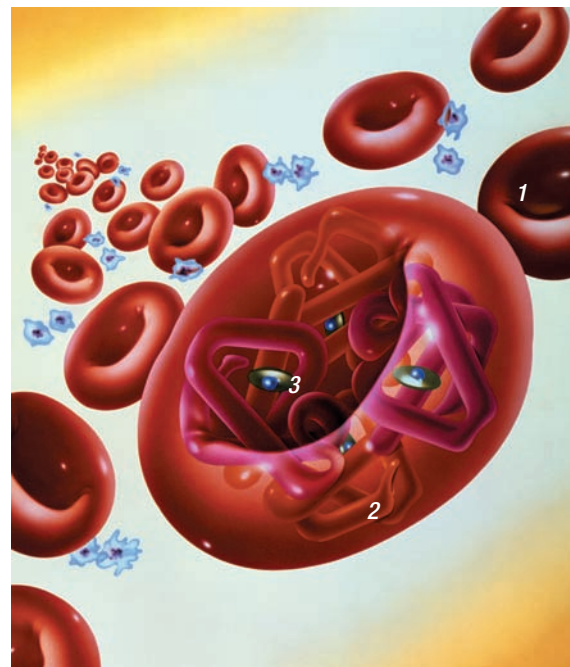


Figure 2. Red blood cells (erythrocytes – 1) contain the oxygen-carrying pigment haemoglobin (2). Oxygen binds to a protein in the haemoglobin, called haem (3)

(1 mg) of this is absorbed. During periods of high iron requirements, as in iron deficiency, puberty, pregnancy and breast feeding, this can increase by 20–40%.

## How is iron distributed in the body?

A healthy human body contains about 3–4 g of iron in total. About 65% of this is contained in haemoglobin and a further 15% is contained in other proteins like myoglobin. Most of the remainder is stored as ferritin and haemosiderin. About 0.1% is available as transport (circulating) iron called transferrin. This small circulating pool is the only way in which iron can be made biologically available.

## How do I know that I have enough iron in my body?

You will have regular blood tests to check the iron status of your body. The usual laboratory tests carried out to detect iron deficiency anaemia are shown in Table 2. If your doctor finds that the iron content in your body is reduced, you will be given iron infusions.

Table 2. Factors that are tested for to determine iron deficiency anaemia

Haemoglobin (Hb) level	– Variably reduced
Mean cell volume (MCV)	– Reduced
Blood film	– Hypochromic, microcytic (pale & small) erythrocytes
Serum ferritin	– Reduced
Total iron binding capacity (TIBC)	– Raised
Plasma iron	– Reduced
Hypochromic red cells	– Raised

### Why can't I take iron tablets?

Although iron tablets are given to anaemic patients, they may not be right for you because, in some chronic renal failure patients, iron is not absorbed effectively from the gut. In addition, oral iron tablets tend to cause stomach upset in many patients, which stops them from taking the tablets. You may also need a significant boost in your blood iron levels, which can only be achieved through IV iron therapy.

### Why am I having both iron and EPO infusions?

EPO therapy will not work effectively if adequate iron is not available in the body. The rapid increase in erythropoiesis (production of erythrocytes) induced by EPO therapy will demand large amounts of iron. This leads to functional iron deficiency when, despite adequate iron stores, iron is not being delivered rapidly enough for erythropoiesis.

### How will the iron infusions help me?

EPO therapy requires significant quantities of iron faster than oral iron tablets can provide. Iron infusion is the fastest and most efficient way to replenish the iron stores in your body.

### How will I get the infusions?

Iron infusions come as sterile, dark brown, liquid solutions in vials or ampoules (small sterile bottles). Each ampoule contains 5 ml of the solution, which is equivalent to 100 mg of iron. This solution is then dissolved in 100–200 ml of normal saline and given as a drip infusion. It is therefore similar to receiving a blood transfusion or a routine infusion.

If you are having dialysis, the infusion will be given for about an hour towards the end of your session. If you are not on dialysis, the infusion will be given in the day case suite. You will be asked to lie on a bed or sit on a chair. The attending nurse or doctor will then insert a needle into a suitable vein in your hand or arm and the iron infusion will be given to you with close monitoring.

### Might I have any reactions to the infusion?

Iron is generally well tolerated. However, like many other drugs, iron infusions can cause reactions in some patients. To reduce such reactions, you will be given a test dose initially and will be closely monitored by the attending nurse for about 30–60 minutes. If all is well, you will be given the remaining dose over the following 3–4 hours.

During this time, you will also be closely monitored for any discomfort. Anaphylactic reactions (allergy or hypersensitivity) to IV iron

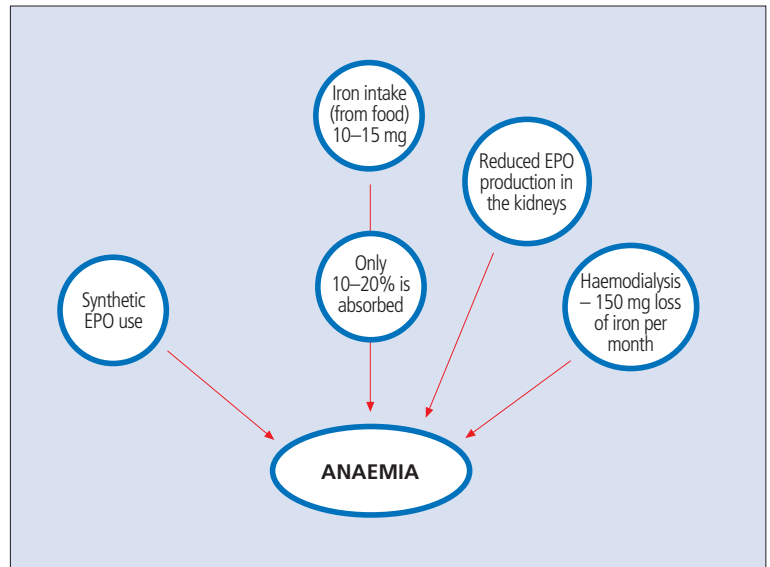


Figure 3. Factors affecting the iron balance in dialysis patients

are very rare – less than 1 in every 1,000 doses. You should inform the attending nurse or doctor if you experience a reaction. Some of the reactions include:

- Breathing problems
- Hives, rashes or itching
- Chest pain or discomfort
- Pain in joints or muscles
- Backache
- Headache
- Dizziness
- Shivering.

A full list of all the common, uncommon and rare complications of IV iron therapy are shown in Table 3, overleaf.

### How many infusions will I have?

Your physician will decide on the number of infusions to give you after taking into consideration your blood reports and clinical status. You may be given small regular doses at weekly, fortnightly or monthly intervals.

### Do I have to be admitted for the infusions?

You don't have to be admitted for the infusions but you will have to be observed for a few hours after they have been administered.

### What precautions should I take?

Before giving you the infusion, the doctor will ask whether you have any history of infections or allergic diseases like asthma or eczema. He will also ask whether you have any chronic liver disease like cirrhosis or hepatitis, in which case it may be better to avoid IV iron therapy. For women, it is important to tell your doctor if you are pregnant, as IV iron should usually be avoided during early pregnancy.



**Table 3. The side-effects and complications of intravenous iron therapy**

System affected	Common	Uncommon	Rare
Central and peripheral nervous system	● Metallic taste	● Headache ● Dizziness	● Pins and needles ● Confusion
Cardiovascular		● Rapid heart rate ● Low blood pressure ● Collapse	
Respiratory		● Wheeze ● Breathing difficulty	
Gastrointestinal	● Nausea	● Vomiting ● Abdominal pain ● Diarrhoea	
Skin		● Itching ● Hives ● Rashes	
Locomotor		● Muscle cramps ● Muscle pains	● Joint pain and swelling
General	● Fever ● Shivering ● Flushing	● Chest pain ● Chest tightness ● Burning, swelling and similar reactions around the injection site	● Allergic reactions involving swelling of the hands, feet, face and tongue ● Anaphylaxis (hypersensitivity)

After the infusion you should watch the needle's entry site for any pain or swelling over the next few days. Infusion site reactions can occur that may lead to infection or skin discoloration, if left untreated.

### How do I prepare for the infusion?

You should bring an overnight bag and any medications that you take regularly. If you are taking oral iron preparations, these should be stopped at least five days before the iron infusion, but discuss this with your nephrologist first.

### What happens when I am ready for the infusion?

The attending nurse will show you where your bed or chair is. She might take some blood samples if necessary. You will then be asked about your general health. You will be reviewed by one

of the nephrologists to ensure the infusion can proceed. The doctor will ask you to sign a consent form, which confirms that you have:

- Understood the reason for the infusion
- Understood how it will be carried out
- Understood the risks involved
- Agreed to receive the infusion.

If you are unclear about anything, please ask the doctor or any of the ward nurses. You may have breakfast or lunch before you come to the ward.

### Can I drive myself home after the infusion?

An iron infusion is unlikely to impair the ability to drive and operate machines. But it is better if somebody drives you home after the infusion in case you feel ill or emotionally upset.

### What follow-up takes place after the infusion?

You will be requested to attend the clinic regularly. At each visit you will be asked about your wellbeing and routine blood tests will be arranged to monitor your blood count and iron status ■

## Key points

- Anaemia is a condition in which you have a lower than normal amount of red cells (erythrocytes) in your blood. It is common in patients with chronic renal failure.
- The most important cause of anaemia is the lack of sufficient iron in the body to produce a normal amount of haemoglobin.
- An intravenous iron infusion is the fastest and most efficient way to replenish the iron stores of the body.

If you would like to receive additional copies of this feature, please send your request to BJRM Patient Information, Hayward Medical Communications, Rosalind Franklin House, The Oaks, Fordham Road, Newmarket CB8 7XN.

