



Module 1908

Sepsis: symptoms, causes and management

From this pharmacy CPD module on sepsis you will learn about:

- The importance of being aware of the signs of sepsis and early treatment
- The causes and consequences of sepsis; and when to refer
- How pharmacists can support patients, raise awareness and reduce the risk of sepsis

JACOB WARNER, PHARMACIST

In 2017, the then health secretary, Jeremy Hunt, announced plans to increase awareness of sepsis. "Every death from sepsis is a tragedy, yet too often the warning signs are missed," he said. The statistics support Mr Hunt's view – as many as 260,000 people in the UK develop sepsis each year and it is responsible for an estimated 44,000 deaths annually.

What is sepsis?

Sepsis is a rare, but serious reaction to an infection. It occurs when the body's normal immune response becomes overactive, and starts to damage the body itself.

Sepsis exists on a scale that ranges from infection at one end, to sepsis and septic shock at the other. Septic shock is a subset of sepsis, with circulatory and cellular/metabolic dysfunction associated with a higher risk of mortality. Hospital mortality rates of septic shock can be higher than 40%.

What is the cause?

Sepsis is caused by an infection that can occur in any part of the body. The normal response to

an infection is for the body's cells to recognise an invader (eg bacterial pathogen) and initiate a host response.

This response typically involves the release of proinflammatory cytokines by macrophages to recruit additional inflammatory cells to the area, resulting in bacteria being inactivated within the tissue. The body tissue then repairs and heals. This response is usually localised and contained in one area.

Sepsis occurs when the response quickly spreads through the blood to other parts of the body, which may happen if the immune system is weak or the infection is more severe. The result is widespread inflammation that causes problems with blood flow, and results in tissue damage. The blood flow problems can cause a dangerous drop in blood pressure and lead to oxygen no longer reaching the organs and tissues.

Some sites, if infected, are more likely to lead to sepsis – the lungs, urinary tract, abdomen and pelvis. Bacterial infections are the most common cause, but viral or fungal infections can also cause sepsis. The infections listed below are those that are more commonly involved with sepsis:

- lung infections (eg pneumonia)
- appendicitis (see *Appendicitis: diagnosis and treatment* at tinyurl.com/CDAppendicitis)
- infections of the gallbladder or bile ducts
- skin infections (cellulitis)
- flu (in some cases)
- infections of the brain and nervous system (meningitis or encephalitis)
- bone infections (osteomyelitis)
- infections after surgery
- heart infection (endocarditis).

Is sepsis the same as septicaemia?

Septicaemia is the name given to sepsis of the bloodstream, and is sometimes referred to as blood poisoning.

Other types of sepsis can occur without bacteria being present in the bloodstream and can affect multiple organs or the entire body. Approximately half of all cases of sepsis are blood culture negative – ie no organism is identified.

Risk factors

Anyone can develop sepsis, but older patients, especially those over 65 years of age, account for the majority of cases. Other people at risk include those who:

- are very young (below one year of age)
- have had recent surgery or other invasive procedure
- have serious injuries or wounds as the result



Lung infections, such as pneumonia, are a common cause of sepsis, as is appendicitis

- of an accident or burns
- are immunocompromised due to illness or medications (eg chemotherapy, long-term steroids)
- have an indwelling line or catheter
- are suffering from alcohol abuse or liver disease
- have diabetes mellitus
- misuse intravenous drugs
- are pregnant.

Prevalence

More people lose their life to sepsis each year in the UK than to breast, bowel and prostate

cancer combined. Globally, six million lives are lost each year. Rates of sepsis have generally been increasing since the 1970s, with one retrospective, population-based US analysis reporting cases of sepsis and septic shock increasing from 13 to 78 cases per 100,000 between 1998 and 2009.

Some possible reasons for levels of increased incidence include multidrug resistance, advancing age and immunosuppression. The incidence of sepsis is higher during winter – possibly due to higher levels of respiratory infections. It is predicted that the occurrence of sepsis is likely to increase, due to an ageing population.



Older patients, especially those over 65 years of age, account for the majority of sepsis cases

Signs and symptoms

The signs and symptoms of sepsis are vague and non-specific. They may appear like flu, gastroenteritis or a chest infection. A high degree of vigilance and suspicion is therefore required at all times.

Early recognition is essential in order to save lives. In primary care, it is strongly recommended to assess any patient for sepsis if they:

- have not responded, or deteriorated, while on antibiotic treatment
- are elderly or immunocompromised and have signs of infection
- have symptoms of flu
- have symptoms of gastroenteritis
- are unwell without a clear cause
- have symptoms of a systemic infection (fever)
- have altered mental state or behaviour.

Symptoms in older children and adults may include:

- high or low body temperature
 - chills and shivering
 - rapid heart rate
 - fast breathing
 - previous infection (patients may have deteriorated despite appropriate oral antibiotics)
 - non-specific symptoms – nausea and vomiting, lethargy, abdominal pain and/or diarrhoea.
- Symptoms in younger children may include:
- being very lethargic or difficult to wake
 - mottled, bluish or pale appearance
 - abnormally cold to touch
 - very fast breathing
 - rash that does not fade when pressed
 - fits or convulsions
 - not feeding
 - vomiting repeatedly
 - not passing urine for 12 hours.

Diagnosis

Sepsis is often underdiagnosed at an early stage, when it is typically easier to reverse. Diagnosis of sepsis is based on evaluation of clinical presentation and physiological measurements.

The UK Sepsis Trust has created the following acronym to help aid recognition of sepsis in adults:

- **S**lurred speech or confusion
- **E**xtrême shivering or muscle pain
- **P**assing no urine (in a day)
- **S**evere breathlessness
- **I**t feels like you are going to die
- **S**kin mottled or discoloured

The physiological parameters assessed include temperature, heart rate, respiratory rate, blood pressure, level of consciousness and oxygen saturation.

In children under 12 years of age, instead of taking blood pressure, the capillary refill time should be measured. This is the time it takes for colour to return to an external capillary bed (eg finger tip) after pressure is applied. Blanching of three seconds or longer is an intermediate risk group marker for serious illness.

The National Institute for health and Care Excellence (Nice) recommends using a person's history, physical examination results and age to grade the risk of severe illness or death from sepsis. This can be done by referring to the appropriate table for risk stratification within the Nice guideline, found at tinyurl.com/CDsepsis51.

Some other tests that are done may include urine or stool samples, wound cultures, respiratory secretion testing and imaging studies, such as X-ray or ultrasound. These tests can help to determine the type of infection, where it is located, and which body functions have been affected.

The non-specific nature of sepsis symptoms means the condition can sometimes be misdiagnosed. Other conditions, such as pancreatitis or acute respiratory distress syndrome, can present similarly.

Prognosis and complications

Up to 80% of patients survive sepsis and most will go on to make a good recovery within 12-18 months of the illness. However, some people may



The management of sepsis typically involves antibiotics – usually within one hour of diagnosis

develop septic shock and even die – with mortality rates over 40%.

There are several factors that may play a role in the severity of sepsis and therefore the outcome; for example, the:

- site and type of infection
- timing and type of antimicrobial therapy
- host's response to the infection.

After discharge from hospital, there is an increased risk of death and increased risk of further sepsis and recurrent hospital admissions. Most deaths occur within the first six months, but the increased risk can remain for two years.

Survivors of sepsis may go on to experience physical, emotional and psychological difficulties, which may persist for several years. This is known as post-sepsis syndrome. Sepsis can affect the

organs and some people experience problems with their heart, lungs, brain or kidneys.

Other physical symptoms of post-sepsis syndrome include tiredness, muscle weakness, poor appetite, oedema, breathlessness, visual disturbances and recurrent infections. Psychological symptoms can include insomnia, depression, post-traumatic stress disorder, anxiety and poor concentration and memory.

There is no specific treatment for post-sepsis syndrome – the symptoms are managed individually. The UK Sepsis Trust has produced booklets on post-sepsis syndrome and has a support helpline for patients.

Management

Sepsis, if identified early, can be treated quickly,

with most patients making a full recovery. However, every hour that treatment is delayed increases mortality. Treatment varies and depends on the site and cause of the initial infection and the organs affected. People with possible early sepsis should be referred to hospital for diagnosis and treatment.

Management of sepsis usually involves three treatments and three tests, commonly referred to as the “sepsis six”:

- antibiotics – started within one hour of diagnosis, as this helps to reduce the risk of serious complications or death
- intravenous fluids
- oxygen (if levels are low)
- blood cultures
- blood samples
- monitoring urine output.

Other treatments that may be considered by the critical care team include vasopressor medication to increase blood pressure, corticosteroids, insulin, dialysis, mechanical ventilation and blood transfusion.

Reducing risk of sepsis

To reduce the risk, the initial infection needs to be controlled and prevented from turning into sepsis. It is vital that the signs and symptoms of sepsis are recognised early, medical care is sought promptly, antibiotics are given and treatment reassessed. Vaccinations against pneumococcus pathogens can also help prevent deaths from sepsis.

In order to reduce the risk of being infected by bacteria, you can advise patients to practise good hygiene, such as hand washing and safe food preparation. In addition, it is important to care for wounds appropriately, ensuring they are cleaned as quickly as possible – monitoring for signs of infection – and then kept clean.

What advice can the pharmacy provide?

As frontline healthcare providers, pharmacists and pharmacy staff are in an ideal position

to help prevent deaths from sepsis. Early recognition of sepsis is vital to increasing chances of survival, and your pharmacy team needs to ensure they are familiar with the symptoms and – if they suspect sepsis – are able to refer the patient appropriately and promptly.

You can also help prevent cases of sepsis by increasing awareness within your community; for example, displaying posters with common symptoms or speaking at local groups. Ensure people understand that sepsis can develop from any infection, but it is preventable.

Give customers advice on measures that can be employed to prevent sepsis, such as washing hands regularly, using the correct technique and using antibacterial hand gels where possible. Encourage them to consume a well-balanced, nutritional diet and explain the importance of good hygiene when preparing food for consumption.

Make sure they stay up to date with vaccinations and seek treatment for possible infections. Counselling patients appropriately to ensure they take medication correctly when they receive a prescription for antibiotics will also help to reduce the possibility of the infection turning into sepsis.

If you are aware of someone who has survived sepsis, they may have difficulties with their recovery. Make sure they know that you are there to help them with their recovery. If you notice they are becoming frustrated or upset with their progress, explain that it is perfectly normal to be weak initially and that recovery may take a while.

You can tell them to set small, achievable goals and you may suggest they keep a diary, which they can log their daily progress in. This will help them to see that they are slowly becoming stronger and improving each week. Finally, you can give patients advice about light exercises that can be performed to help with recovery: the UK Sepsis Trust – www.sepsistrust.org – has produced a booklet, *Sepsis: survivor's information*, which contains examples of these exercises.

Sepsis CPD – planned learning

What are you planning to learn?

I want to learn more about sepsis, including the importance of being aware of the signs and early treatment, its causes and consequences and when to refer. I also want to improve my knowledge of how pharmacists can support their patients, raise awareness and reduce the risk of sepsis.

This learning will help me to improve my knowledge of the symptoms and treatment of sepsis and to be able to provide better, more effective advice to the patients I serve in my pharmacy.

How are you planning to learn it?

- I plan to find out more about sepsis on the NHS Inform website at tinyurl.com/sepsis21.
- I plan to read more about post-sepsis syndrome on the UK Sepsis Trust website at tinyurl.com/sepsis22.
- I plan to look at the educational resources, including videos, which may be useful for patients and for training my staff, on the UK Sepsis Trust website at tinyurl.com/sepsis23.
- I plan to find out about promotional posters and leaflets that could help raise awareness of sepsis, such as those on the World Sepsis Day website at tinyurl.com/sepsis24.

Give an example of how this learning has benefited the people using your services


I have learned about sepsis, including the importance of being aware of the signs of sepsis and early treatment, the causes and consequences of sepsis and when to refer. I have also improved my knowledge of how pharmacists can support their patients, raise awareness and reduce the risk of sepsis.

A patient was referred to me by the counter staff for more information about sepsis. She had elderly parents and two young children who were always getting scrapes and bumps, especially when playing outside or gardening. She asked for information about reducing the risk of sepsis. I was able to discuss symptoms, treatment and reducing risks with her.

Take the 5-minute test online

1. Sepsis is responsible for an estimated 44,000 deaths in the UK each year.
True or false
2. Septic shock is when the infection affects the bloodstream only.
True or false
3. Infections of the lungs, urinary tract, abdomen and pelvis are more likely to lead to sepsis.
True or false
4. Viral infections are the most common cause of sepsis.
True or false
5. Over 75% of cases of sepsis are blood culture negative.
True or false
6. Those aged over 65 years or under one year have an increased risk of sepsis.
True or false
7. The signs and symptoms of sepsis are vague and non-specific and may appear similar to flu, gastroenteritis or a chest infection.
True or false
8. Up to 80% of patients survive sepsis and most people will go on to make a good recovery within 12-18 months of the illness.
True or false
9. After sepsis, patients have an increased risk of death, further sepsis and hospital admission for up to three years.
True or false
10. The 'sepsis six' involves giving antibiotics, IV fluids and oxygen, as well as testing blood cultures and samples, and monitoring urine output.
True or false

CD Update Plus


**An Update Plus
subscription
gives you...**



Update module

A typical module that allows you to read the content and then complete the short 5 minute quiz to test.



Practical approach

A pharmacy-based clinical scenario asks what you would do and provides expert advice.



Podcast

Listen to expert interviews on speciality areas, from Alzheimer's to the Zika virus.



Interactive quiz

Have a competitive edge? Try our new interactive quizzes and see where you rank against your peers.