Management of patients with cellulitis of the lower limb


Abstract
This article aims to help practitioners develop an understanding of cellulitis of the lower limb. It focuses on the identification of cellulitis, differentiating it from other common conditions, and discusses treatment and management strategies. The article includes information for prevention and early recognition of the condition in an attempt to reduce frequent recurrences.

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Keywords
Cellulitis, skin conditions, vascular disorders, wound care
These keywords are based on subject headings from the British Nursing Index.

Review
All articles are subject to external double-blind peer review and checked for plagiarism using automated software.

Online
Guidelines on writing for publication are available at www.nursing-standard.co.uk. For related articles visit the archive and search using the keywords above.

Aims and intended learning outcomes
The aim of this article is to assist practitioners in identifying cellulitis and those at risk of developing the condition, enabling early recognition and prompt treatment to prevent unnecessary hospital admission. The article identifies other skin disorders that may be mistaken for cellulitis and provides generic advice about treatment. It is aimed at general nurses. After reading this article and completing the time out activities you should be able to:
- Recognise the signs and symptoms of cellulitis.
- Differentiate between cellulitis and other common skin conditions.
- Understand the management of the different classes of cellulitis.
- Recognise the ongoing complications associated with cellulitis.
- Identify interventions that will assist in the prevention of cellulitis of the lower limb.

Introduction
Cellulitis is a bacterial infection of the dermis and subcutaneous tissues. Cellulitis of the lower limb is common and patients with the condition occupy a large proportion of acute hospital beds (Clinical Research Efficiency Support Team (CREST) 2005). The actual number of people with cellulitis is likely to be greater than estimated as the majority of people are treated at home. However, many people are admitted to hospital unnecessarily either because of misdiagnosis or because facilities are not available for effective treatment and follow up in the community (Beldon and Burton 2005).
The risk factors for cellulitis are well documented (Cox et al. 1998, Cox 2002, Björnsdóttir et al. 2005, Halpern et al. 2008), but few prevention strategies have been identified (Stalbow 2004). Those with cellulitis often have repeated episodes of this debilitating condition so it would seem prudent to develop a service that can highlight the importance of prevention while developing self-care strategies alongside prompt and effective treatment.

### Defining cellulitis

Cellulitis is a bacterial infection of the dermis and subcutaneous tissues as stated previously. It is usually caused by *Streptococcus* or *Staphylococcus aureus*, but can also be caused by a wide range of other aerobic and anaerobic bacteria. A portal for bacterial entry will be present, such as a break or fissure of the skin, but this may not always be obvious or identifiable. Symptoms of cellulitis include (CREST 2005):

- Fever.
- Pain or tenderness in the affected area.
- Skin redness or inflammation.
- Skin eruptions or a rash that starts suddenly, spreading quickly in the first 24 hours.
- Tight, glossy, stretched appearance of the skin.
- Sensation of heat in the area of redness.

Common signs of systemic infection may include:

- Chills or shaking.
- Fatigue.
- General malaise.
- Muscle aches and pains.
- Sensation of heat in the area affected.
- Sweating.

Other less common symptoms may include hair loss at the site of infection, joint stiffness caused by swelling of the tissue over the joint, and nausea and vomiting.

### Risk factors

Patients who have any breaks in their skin are particularly at risk of developing cellulitis—a break in the skin may provide a portal of entry for bacteria. High numbers of patients with lower limb cellulitis were identified in a study examining tinea pedis (athlete’s foot) (Roujeau et al. 2004). Cellulitis in this study was not caused by the fungal infection, but by damage to the skin, leading to scaling and fissuring, thus creating a portal of entry for bacteria.

The presence of oedematous tissue can lead to the development of a bacterial infection. Increased permeability of the capillary network can induce an inflammatory response because of the deposit of plasma proteins in the interstitial spaces (Stalbow 2004). This can lead to excoriated and/or ulcerated skin, allowing easy access of bacteria.

Patients with lymphoedema of the lower limb are also susceptible to developing cellulitis because of skin changes and excessive oedema. Cellulitis in these patients is frequently termed an acute inflammatory episode as symptoms may differ from the classical signs of cellulitis (British Lymphology Society (BLS) 2010). The sensation of heat and pain experienced may be less pronounced and there may be excessive leakage of exudate and blistering.

### Evaluation

*Cellulitis can be mistaken for a number of common lower limb conditions, including varicose eczema, lipodermatosclerosis, gout and deep vein thrombosis (DVT), so it is important that healthcare professionals can differentiate between the various conditions and commence the most appropriate treatment. Cellulitis of the lower limb can be identified by redness, heat, pain and swelling of (usually) one leg. The patient may have influenza-like symptoms and will feel unwell and feverish with possible rigors. The area of erythema will have developed suddenly, with rapid spreading, and will be tender to touch. The area affected will be well demarcated. Blistering may be present with possible leakage of serous exudate from the swollen limb, causing risk of maceration and possible ulceration. The entry site of the infection may not be obvious, but tinea pedis, insect bites or any minor injuries may act as a portal of entry for bacteria. The patient’s white cell count and C-reactive protein levels will be markedly raised (the number of white cells, especially neutrophils, increases when a clinical infection is present; C-reactive protein levels in the blood rise when an area of soft tissue is inflamed) (Beldon 2011).

The most common causative organisms of cellulitis are *Staph. aureus* and Group A *Streptococcus*, which cause infections when there is a breach in the skin’s barrier (CREST 2005). Patients are commonly treated with Flucloxacillin, but there has been some recent discussion around treatment with Amoxicillin, especially when treating patients with lymphoedema (BLS 2010). Some patients...
may be allergic to penicillin and some may develop side effects such as nausea, abdominal upset, vomiting, diarrhoea and/or skin rashes. Therefore patients should be assessed fully before prescribing takes place. Antibiotic resistance is also common and is another reason why antibiotics should be used with caution. Being able to differentiate between cellulitis and other common skin disorders may help to reduce over-use of antibiotics. Complete time out activity 

Venous eczema

Venous eczema, stasis eczema or varicose eczema are terms used to describe changes in the upper layer of the skin associated with venous hypertension. Signs of venous hypertension include pitting oedema, stasis purpura resulting in haemosiderin deposits, dry itchy skin, inflammation and induration (Wingfield 2009). These signs and symptoms can be mistaken for cellulitis. Symptoms of venous eczema that may help to differentiate from cellulitis include bilateral scaliness, itch and crusting of the skin with no pain and tenderness of the leg (CREST 2005).

Lipodermatosclerosis

The inverted champagne bottle-shaped leg caused by lipodermatosclerosis is associated with induration, redness and pain in the acute phase, but does not include symptoms of pyrexia, heat and tenderness associated with systemic infection. The patient will give a venous history of, for example, DVT, varicose veins or a family history of leg ulcers. This condition tends to develop slowly over time, unlike the rapid onset of cellulitis, and is more likely to be bilateral (Nazarko 2009).

Gout

Gout is an arthritic condition commonly found in the first metatarsopharangeal joint, but can also occur in the ankle, heel and knee, as well as in the joints of the arm. It has a rapid, extremely painful onset and is associated with symptoms of severe pain in the joint, swelling and warmth, red and shiny skin, mild fever and firm, white lumps beneath the skin (urate crystals called tophi). Gout can easily be mistaken for cellulitis because of similar symptoms, but is always associated with the joint (unlike cellulitis, which is less localised). Blood tests will show raised urate levels in gout and raised white cell and C-reactive protein levels in cellulitis (Hardy 2011).

Deep vein thrombosis

DVT of the leg can be characterised by pain, swelling and tenderness, a heavy ache in the affected area, warm skin in the area of the clot and redness or discolouration of the skin, particularly at the back of the leg below the knee. Unlike cellulitis, the redness does not tend to spread rapidly and is much more localised to the area of the clot (CREST 2005). The patient will not be pyrexial or demonstrate the symptoms of infection previously noted. If DVT is suspected the patient should be sent for a D-dimer test, ultrasound scan and/or venogram to confirm diagnosis (Meetoo 2010).

Management of cellulitis

Cellulitis can be managed safely in the community, but the decision to admit a person to hospital must be based on the level of systemic illness (BLS 2010). A classification system such as that described in Box 1 (Eron 2000, CREST 2005) can help to guide management decisions. Complete time out activity 

The lack of National Institute for Health and Clinical Excellence (NICE) guidance on cellulitis management means that treatment of patients across the country is not standardised and quality of care may therefore be affected. Clear audit and clinical outcome data collection tools such as those provided by NICE (2005) would assist practitioners in comparing quality of care as well as helping to prioritise services. Some trusts have developed their own pathways to address this lack of guidance (Leicester County and Rutland Primary Care Trust 2008), CREST (2005) and BLS (2010) guidance on the management of cellulitis has proved invaluable in directing these local pathways.

Kilburn et al (2003) stated that it was not possible to define the best route of treatment for cellulitis based on existing evidence. The majority of patients will therefore be able to be treated at home with oral antibiotics, but it is important that they, and any healthcare professionals involved in their care, continue to monitor progress and resolution of the infection. It is also important to commence antibiotic therapy as soon as possible, so it may not be possible to wait for swab results. Local policies and antibiotic guidelines should be followed until bacterial sensitivities are isolated.
The patient’s temperature should be monitored as well as any reduction in erythema, pain and oedema to ensure that treatment is effective. Different antibiotics may be required and hospital admission may be necessary if cellulitis does not resolve. It is important to remember that pyrexia may be masked in older adults because the febrile response is impaired. An older patient with a severe infection may only display a mild fever (Roghmann et al 2001), therefore temperature may not prove an effective means of monitoring this population group. It is vital that all baseline symptoms are recorded, monitored and observed so that any alteration can be noted.

To observe if cellulitis is spreading it is important that the area of erythema is marked with an indelible pen and that the circumference of the leg is measured. This will allow patients and healthcare professionals to assess if the cellulitis is continuing to spread or is resolving with treatment.

Older patients can also become dehydrated easily as a result of infection and possible high levels of exudate loss. It is important to encourage the uptake of more fluids than usual to replace any loss. Urine should be the colour of straw, which for most people will mean drinking more than they usually do (Ellins 2006).

Cellulitis is a painful condition and analgesics need to be taken on a regular basis. Elevation of the limb will encourage reduction of swelling, but further medical advice will be required if erythema continues to spread. Accurate record-keeping is essential and healthcare professionals should document the site of cellulitis, which leg is affected and any measurements taken to provide comparative baseline data.

The HAMMMER acronym (Beasley 2010) is a helpful tool for patients and healthcare professionals, enabling deterioration to be detected early and necessary therapy to be commenced. The HAMMMER acronym involves consideration of the following:

1. Hydrate – drink plenty of fluids, two litres per day if possible.
2. Analgesia – take pain relief on a regular basis.
3. Monitor pyrexia – is the temperature still rising?
4. Mark off the area – is the redness spreading?
5. Measure the circumference of the limb – is the leg increasing in size?
6. Elevate the limb – reduce swelling if possible.
7. Record the site – accurate documentation.

**Complications**

Failure to respond to prescribed treatment can lead to subcutaneous abscesses, fasciitis, septicemia, osteomyelitis and possibly tissue death (Mandell et al 2009). If the patient fails to respond to first-line treatment it may be necessary to alter the antibiotic, extend the course or increase the dose of the antibiotic or admit the patient to hospital for intravenous therapy.

Continued skin care is an important aspect during the recovery phase. Hydration will improve the elasticity of the skin and help to prevent breaks, thus reducing the possible portals of entry for bacteria. Patients should be advised to maintain leg hygiene by washing with an emollient instead of soap to prevent the reduction of natural oils in the skin, and apply an emollient regularly to moisturise and maintain the hydration and elasticity of the skin (Peters 2006).

It is important to attempt to reduce oedema, and so diminish the risk of recurrence of cellulitis. In the acute phase, the leg may be too tender and sensitive to tolerate dressings, bandages or compression hosiery. Leg elevation may help to drain the oedema (Stalbow 2004). When elevating a patient’s legs, it is vital that the person is fully and correctly supported to ensure comfort and prevent joint pain (Beldon 2011).

**Classification of cellulitis**

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<thead>
<tr>
<th>Class 1</th>
<th>No signs of systemic toxicity.</th>
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<tbody>
<tr>
<td></td>
<td>No uncontrolled co-morbidities.</td>
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<td></td>
<td>Usually managed with oral antibiotics as an outpatient.</td>
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<th>Class 2</th>
<th>Systemically ill.</th>
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<tr>
<td></td>
<td>Systemically well with co-morbidity, for example peripheral vascular disease, chronic venous insufficiency or morbid obesity, which may complicate or delay resolution of infection.</td>
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<td></td>
<td>Can be managed with oral antibiotics or intravenous antibiotics in the community.</td>
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<th>Class 3</th>
<th>Significant systemic symptoms, for example acute confusion, tachycardia, tachypnoea or hypotension.</th>
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<tr>
<td></td>
<td>Unstable co-morbidities that may interfere with response to therapy.</td>
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<tr>
<td></td>
<td>Limb-threatening infection as a result of vascular compromise.</td>
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<td></td>
<td>Requires hospital admission for intravenous antibiotics.</td>
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<th>Class 4</th>
<th>Sepsis syndrome.</th>
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<tr>
<td></td>
<td>Severe life-threatening infection, for example necrotising fasciitis.</td>
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<tr>
<td></td>
<td>Requires urgent hospital admission for intensive multiple therapy.</td>
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(Eron 2000, Clinical Research Efficiency Support Team 2005)
Ankle and calf exercises will assist venous return. If there is no risk of arterial compromise or congestive fluid overload, compression therapy (usually in the form of compression hosiery) can be used to reduce the oedema (Stalbow 2004). It is important to perform a vascular and holistic assessment before choosing and fitting any compression hosiery, and to assess the patient’s ability to apply and remove the garments. Lack of consideration of these aspects can lead to poor adherence or, at worst, arterial compromise and amputation of the limb (Wounds UK 2005).

Vascular assessment should include calculation of the ankle brachial pressure index. Patients with cardiac oedema need to be treated with caution when considering application of compression therapy, as rapid fluid displacement can further overload the heart (Muldoon 2011). If the patient is suitable for compression therapy and the legs continue to leak exudate, a compression bandage system may be more appropriate as this will retain the exudate more effectively.

Recurrence of cellulitis is common (Cox et al 1998), possibly because the cause of the infection may not have been identified and therefore not treated effectively, or because ongoing lymphoedema, tinea pedis, leg ulcers or other chronic skin conditions have been previously identified as risk factors. Patients should be advised of these risk factors and given information on how to reduce the risk of recurrence of the condition.

**Complete time out activity**

**Prevention and on-going treatment**

Admission to hospital is costly both for the NHS and the patient, so avoiding admission is preferable. As people with conditions of the lower limb are more prone to cellulitis, it is prudent to attempt to prevent this debilitating condition if at all possible. Patients with lymphoedema are sometimes prescribed long-term antibiotic prophylaxis with a low dose of erythromycin for up to two years (BLS 2010). This should be discussed with the GP and microbiologist and the patient needs to be committed to this regimen. Further research into this prophylactic approach is under review (PATCH 2010).

Once the patient has recovered from cellulitis, he or she should remain vigilant for any early signs of return of the condition. One of the long-term effects of cellulitis is oedema, which in turn is a risk factor for cellulitis. Therefore it is advisable to reduce oedema and encourage an intensive regular skin care regimen as previously discussed.

A multi-professional approach to prevention is key so that all healthcare professionals play their part in recognising risk factors of cellulitis and implement early treatment.

Providing the patient with information, explanations and educational material can assist recovery and adherence to treatment. Movement of the ankle is important to aid venous return, so maintaining and improving this movement will assist the reduction of oedema, which can become recalcitrant following an episode of cellulitis (Davies et al 2008).

Pain has been identified as the most common symptom of cellulitis (Carter et al 2007), causing high levels of anxiety. Some patients also complain of continued pain in the previously cellulitic area even when the acute infection has resolved. Thorough pain assessment can be helpful in determining the most appropriate pain relief. Non-steroidal anti-inflammatory drugs can be effective in reducing pain in these patients (Dall et al 2005).

It is important to ensure that patients are aware of the risks to their health when they develop cellulitis and that it can lead to serious complications. Education about when and how to take antibiotic therapy is important to ensure that the full dose and course is taken as prescribed. Patients should be advised to return to the GP if they experience diarrhoea or vomiting, or develop a rash from the antibiotics. They should be provided with information on how to care for their skin (as outlined previously) and how to elevate the limb and perform calf exercises.

Patients wearing compression hosiery should be instructed in the easiest method of application and provided with application aids as appropriate. They should also be given the contact details of a healthcare professional who can give them advice and guidance. This reassurance can prove invaluable in both treating recurrence speedily and preventing further complications.

Cellulitis of the lower limb, similar to chronic leg ulceration, may prevent people from leaving their homes or from interacting with others (Brown 2008). Individuals may feel the need to hide their condition or may find it difficult to mobilise. Drop-in clinics and regular group sessions can provide a social network for those who may otherwise become...
isolated and can be useful in maintaining contact with these patients.

**Complete time out activity**

**Conclusion**

Cellulitis of the lower limb is a debilitating condition that can affect anyone, but especially those who are vulnerable and have leg ulcers, dermatitis, tinea pedis or lymphoedema. These high-risk factors should be treated promptly in an attempt to avoid cellulitis. Nurses need to be able to recognise signs and symptoms of cellulitis so that other conditions can be ruled out and appropriate antibiotic therapy commenced as soon as possible. The HAMMER acronym can be a useful tool in monitoring patient progress, ensuring deterioration is detected early while also making the patient more comfortable and enabling prompt resolution of the infection.

It is common for cellulitis to recur and therefore providing the patient with a prevention tool kit, including contact numbers of relevant healthcare professionals, information on signs and symptoms, and steps to take regarding skin care, oedema reduction and pain management, can help reduce the frequency of re-infection.

**Complete time out activity**

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**References**


