

# Management guidelines for lower limb cellulites

Cellulitis, a bacterial infection of the soft tissue, is frequently encountered in both primary and secondary care settings. It can be difficult to diagnose as it shares many symptoms with pre-existing chronic diseases. It is important that nurses working in primary care can recognise the symptoms of this infection and act promptly in order to minimise distress and pain for the patient. The primary and secondary care cellulitis management algorithms presented in this paper can be used as a prompt and an aid to differential diagnosis and swift action.

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## KEY WORDS

Cellulitis

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Primary and secondary care

It is important that the clinician can appropriately manage soft tissue infections of the skin because these types of infection are commonly encountered and vary in severity. Cellulitis, a deep soft tissue infection, is a common diagnosis made by clinicians. In some patients, however, it may be misdiagnosed since pre-existing chronic diseases such as acute venous insufficiency (Dupuy et al, 1999) or acute onset cardiac failure, can result in similar, misleading signs and symptoms.

Erysipelas is a superficial tissue infection, often affecting only the dermal tissues, causing large areas of painful blistering.

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Differential diagnosis can be difficult and may be further complicated by acute problems such as venous thrombosis (Cantrell and Norman, 1998).

Many patients are still unnecessarily admitted to hospital with a diagnosis of cellulitis when they could be successfully treated at home, provided prompt action is taken. The guidelines presented in this paper aim to help the nurse practitioner make clear treatment choices based on a thorough assessment of the patient and differentiation of symptoms.

## The causes of cellulitis and erysipelas

Clinical infections are caused by micro-organisms which evade the host's immunological defences on entering a breach in skin integrity and then establish themselves within the tissue of the host where they multiply successfully (Gould, 1994).

Obesity, lymphoedema and pre-existing leg ulceration are all risk factors associated with the conditions. Both cellulitis and erysipelas are often preceded by a history of trauma (Figure 1), abrasion, skin ulceration, or an insect bite (El-Daher and Magnussen, 1996),



Figure 1. Cellulitis preceded by a traumatic wound on the foot.

although some patients cannot recall any skin injury. Another condition which frequently precedes cellulitis or erysipelas is tinea pedis (Athlete's foot) (Dupuy et al, 1999), which encouraged by moisture, leads to a breach in skin integrity, resulting in toe-web intertrigo.

#### Common pathogenic causes of cellulitis/erysipelas

The location of the cellulitis on the body will usually be linked to the microbiological cause, e.g. cellulitis of the groin is most likely to be caused by anaerobic bacteria (Brook and Frazier, 1995). The bacterial cause of cellulitis may also be haemolytic streptococci, staphylococci, or aerobic or anaerobic gram-negative bacteria.

In those patients with traumatic injury, group A  $\beta$ -haemolytic streptococci has been identified as the most common pathogen to cause erysipelas, although groups G, C and B and occasionally staphylococci may also be responsible (Bisno and Stevens, 1996).

#### Erysipelas

Erysipelas is an acute superficial infection, the first symptoms of which are a flu-like general malaise, shivering, and fever. After a few hours the affected area becomes red and epidermal blistering occurs, spreading with a well-defined advancing edge (Hughes and Van Onselen, 2001; Hunter et al, 2002). Erysipelas has been found to occur most frequently among the elderly population (Eriksson et al, 1998), and lower limb ulceration has been found to exist in 67% of patients admitted with erysipelas in a study of 229 patients (Eriksson et al, 1996).

#### Cellulitis

Cellulitis is defined as a bacterial infection which occurs when bacteria invade the soft tissues through small wounds or abrasions on the skin surface often resulting from an existing condition, e.g. leg ulceration or tinea pedis (Hughes and Van Onselen, 2001). Cellulitis extends deeper into the dermis than erysipelas and may involve subcutaneous tissue. The area may be raised as a result of oedema and the erythema is not clearly demarcated as it is with erysipelas (Hunter et al, 2002).

Baddour and Bisno (1982) first described recurrent cellulitis as a previously unreported complication of coronary bypass grafting; they discussed 5 patients who had 20 episodes of cellulitis occurring in the lower extremity upon which saphenous venectomy had been performed. They suggested that if lymphatic drainage is impaired, this appears to provide a static pool of protein-rich lymph; an excellent medium for bacterial growth.

In a further paper, Baddour and Bisno (1984) noted that although many of the patients observed produced clinical symptoms consistent with infection, pyrexia, and rigor, in only 3 instances (n=23 patients with more than 50 episodes) were  $\beta$ -haemolytic streptococci isolated. They postulated that bacterial toxins which were 'pooled' in poorly drained lymphatic tissue were responsible for these symptoms. This was further explained by Streilan (1984), who stated that the marked inflammatory response of cellulitis was attributable to the dendritic Langerhans cells in the epidermis, which release cytokines, such as interleukin-1 and tumour necrosis factor, when exposed to bacteria. The cytokines clear the bacteria but in doing so increase the inflammatory response.

#### Conditions which may be mistaken for cellulitis/erysipelas

It is unfortunate that the symptoms of infection which lead to cellulitis and erysipelas are so similar to those of other conditions: erythema, heat, oedema and pain, associated pyrexia, and raised white cell count are often seen. Allergic contact dermatitis is caused by sensitisation resulting from exposure to an allergen, while irritant dermatitis is caused by exposure to a substance that damages the normal barrier function of the skin. Both of these conditions may cause inflammation, oedema, pain and exudate leading to misdiagnosis (English, 1997). In both eczema and contact dermatitis, erythema (caused by dilated blood vessels) and blistering (caused by oedema between epidermal cells and within them) result in excessive production of keratin and thickening of the epidermis, both of which are

commonly seen in venous insufficiency (Baker et al, 1991). Patients with leg ulcers often develop contact dermatitis as a result of the large variety of wound management products, various bandages and the use of latex gloves (Tavadia et al, 2003). Every effort should be taken during the treatment of patients with leg ulcers to minimise contact with possible allergens, including latex gloves (Gooptu and Powell, 1999).

In addition, another syndrome, post-venectomy cellulitis, has been detected in patients who have previously undergone saphenous venectomy for coronary artery bypass graft surgery (Baddour, 1993). This complication has been identified in more than 6% of patients (Greenberg et al, 1982) and can cause protracted problems.

Patients with pressure ulcers to the heel who develop persistent cellulitis may have underlying osteomyelitis and should undergo X-ray and possibly bone scan (Sugarman, 1983). More rarely, cellulitis has been reported following pelvic surgery such as vulvectomy (Bouma and Dankert, 1988) or hysterectomy with lymphadenectomy (Dankert and Bouma, 1987), or following pelvic irradiation (Chmel and Hamdy, 1984). However, it is possible that such patients were suffering from acute venous insufficiency secondary to damage to the lymphatic circulation (Pierce and Daigird, 1991).

#### Lower limb cellulitis algorithms

Patients with a diagnosis of cellulitis are encountered on a regular basis in both primary and secondary care. While it is important that nurses working in primary care recognise symptoms and act promptly in order to minimise pain and distress for the patient, it is also important that the patient's medical condition is correctly identified and not mistaken for a condition that produces similar symptoms, potentially leading to unnecessary prescription of antibiotics.

The lower limb cellulitis algorithms (Figures 2 and 3) are recommended as a prompt and aid to differential diagnosis in order that patients will receive the appropriate medical

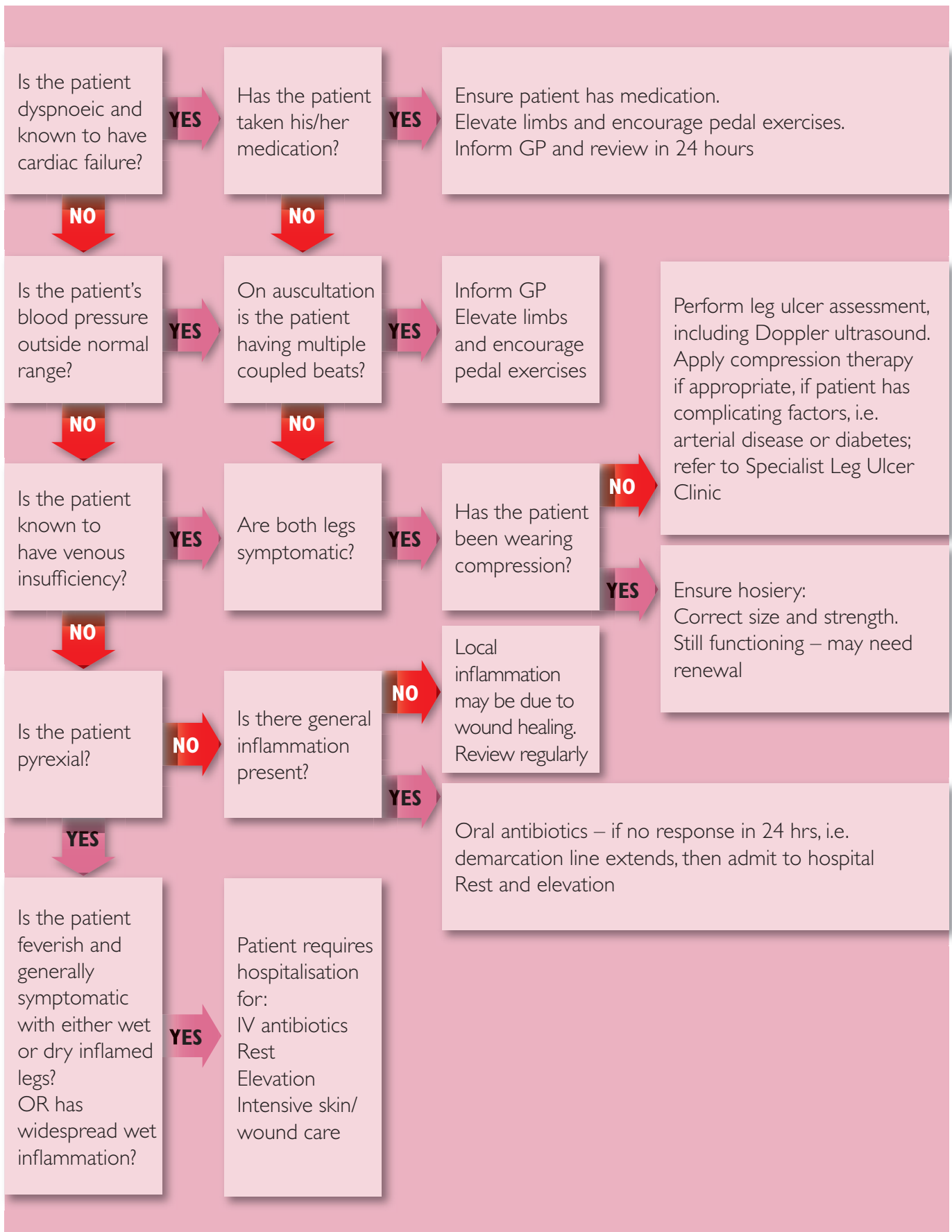


Figure 2. Lower limb cellulitis algorithm for primary care.

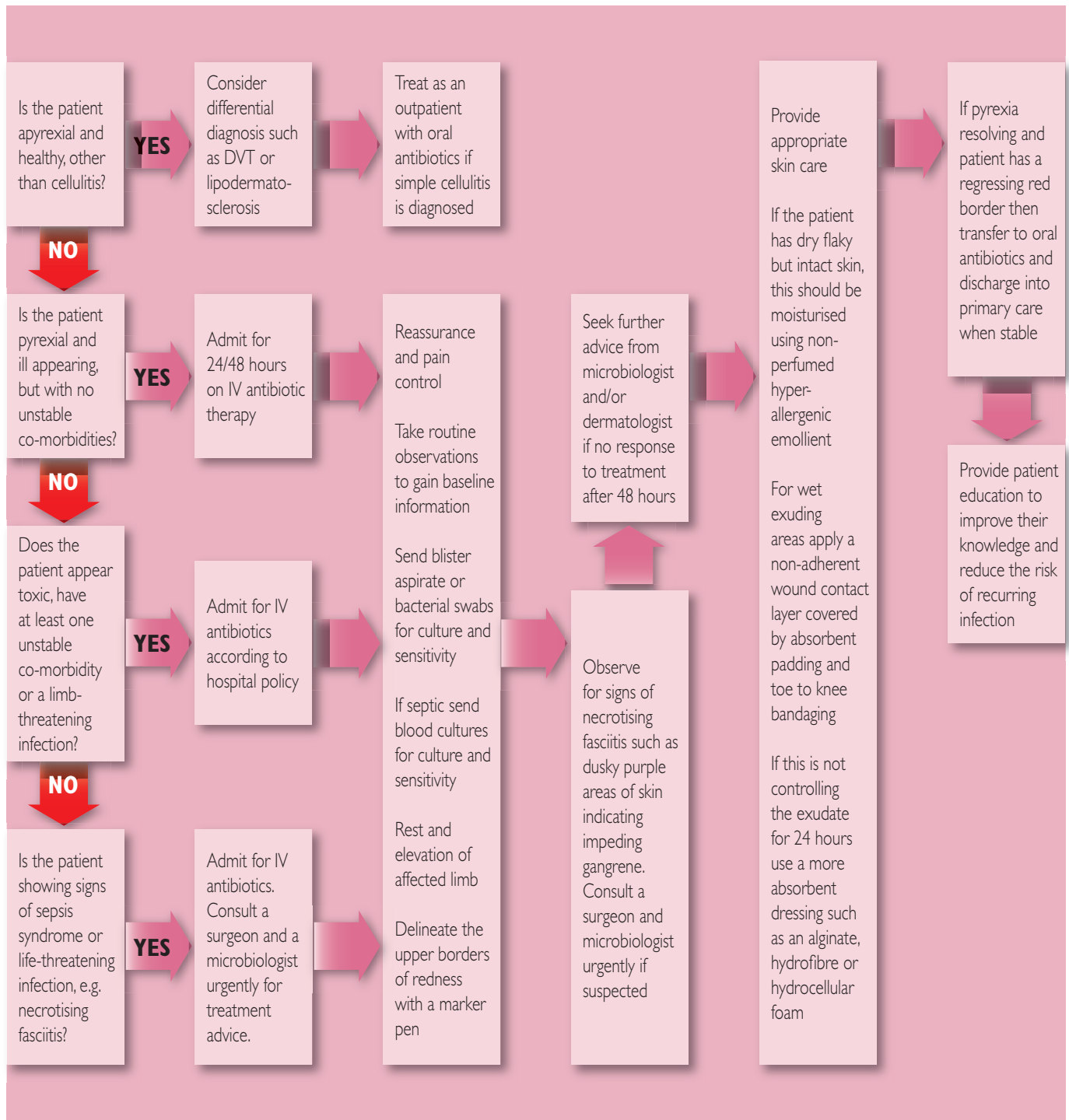
and nursing care that they deserve. The algorithm should be used in conjunction with a thorough nursing assessment of the patient, in order to ensure correct and prompt action.

**Immediate nursing management of cellulitis**

Management is dependent upon first recognising the cause of the problem

and making a correct assessment of the patient. Once a diagnosis of cellulitis has been made, nursing action may vary depending on whether the cellulitis is wet or dry, however; in both instances the patient will require systemic antibiotic therapy. The common treatment for both wet or dry cellulitis is a combination of

benzylpenicillin (unless contraindicated by allergy), and a broad-spectrum antibiotic such as flucloxacillin, which is active against both streptococci and staphylococci. Antibiotics may be given intravenously initially and then orally once a therapeutic effect is noted, i.e. a reduction in white cell count (Baxter and McGregor, 2001). Wound



**Figure 3. Lower limb cellulitis algorithm for secondary care.**



swabs should always be obtained from the affected area or limb in order to determine both the causative organism and sensitivity to antibiotic therapy (Holzapel et al, 1999).

#### Managing dry cellulitis

A wound with dry cellulitis (Figure 4) should remain so and not be cleansed. The affected area or limb will react as an erythematous burn injury and will be oedematous, acutely painful, and inflamed. The demarcated area of cellulitis should be outlined with a skin marker pen (Figure 1), as an indicator of whether the cellulitis is resolving or extending. The patient's symptoms should guide treatment. Pain management is the priority as any affected patient will say. Analgesia must always be taken regularly and patients may need this reinforcing; elderly patients especially are not enthusiastic about analgesia (Gloth, 2000).

Elevation is key to reducing oedema, and patients should be encouraged to rest with the affected area raised. Bed rest with the foot of the bed elevated may be necessary, but elderly patients especially should still be encouraged to mobilise for toilet purposes in order to avoid further complications such as deep vein thrombosis and loss of mobility. Elevation will also aid pain relief as the oedema resolves. Dorsiflexion foot exercises will also aid resolution of oedema by activating the calf muscle pump (Hofman, 1998). As oedema resolves, the skin becomes wrinkled and often sloughs away in thin sheets, much like the effect of sunburn. At this time, the application of a simple emollient such as the generic 50/50 liquid paraffin in white soft paraffin will help to reduce the insensible loss of moisture from the skin and so aid recovery.

#### Wet cellulitis

The nursing management of wet cellulitis is more problematic (Figure 5). As with dry cellulitis, analgesia is vital to enable the patient to participate in his/her care and the affected area or limb also requires elevation. Control



Figure 4. Dry cellulitis.



Figure 5. Blistering cellulitis.

of exudate to reduce the danger of maceration is often difficult and may require the use of absorbent dressings, i.e. foams, hydrofibres, or alginates. These will require very frequent changes in the initial period of treatment since there is a danger that once the primary dressing is saturated with exudate, the surrounding skin will become affected. An alternative is to use a non-adherent contact layer, i.e. Mepitel™ (Molnlycke Health Care, UK), N/A Ultra™ (Johnson and Johnson, UK), or Urgotulle™

(Laboratoires Urgo, France) and to leave this in situ while changing the outer dressing. This may be more comfortable for the patient and prove cost-effective.

The effectiveness of potassium permanganate soaks as a weak antiseptic is debatable and there are no randomised controlled trials examining its effectiveness. If using potassium permanganate, care must be taken to obtain the correct dilution of 1:10,000. Instruction is generally given to dilute

until a 'rose-pink' colour is obtained. In addition, there have been instances of skin irritation caused by potassium permanganate solution (Hughes and Van Onselen, 2001), although this may have been caused by use of a stronger than directed dilution.

### Long-term treatment of cellulitis

Once the initial period of infection has subsided, the skin of the affected area may still require treatment with an emollient for several weeks in order to regain normal elasticity and integrity. Scarring and permanent 'tattooing' of the skin is not uncommon, although in most instances this will fade in time. Care should be taken to avoid exposure to the sun or trauma as the new skin will remain delicate for several weeks (Baxter and McGregor, 2001).

In addition, the patient may need to wear compression hosiery in order to prevent a recurrence if the initial trigger has been venous disease and ulceration. It is also vital that the patient recognises the importance of preventing a recurrence and understands how he/she can take responsibility for this prevention. Patient information sheets are valuable to reinforce information and to act as a prompt.

### Conclusion

Cellulitis must be identified by a knowledgeable practitioner who is able to instigate the correct treatment and to identify when the underlying cause is not infection, but a concurrent disease. Use of guidelines helps to standardise practice and disseminate knowledge of a disorder, giving both the practitioner and the patient confidence in both the outcome of treatment and the prevention of recurrence. **WUK**

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### Key Points

- ▶▶ Cellulitis is defined as a bacterial infection which occurs when bacteria invades the soft tissues through small wounds or abrasions in the skin.
- ▶▶ Many patients are still unnecessarily admitted to hospital with a diagnosis of cellulitis when they could be treated at home.
- ▶▶ It is important that nurses working in primary care recognise symptoms and act promptly to reduce pain and distress for the patient.
- ▶▶ The algorithms are recommended as a prompt and aid to differential diagnosis.

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