Safe and effective application of topical treatments to the skin


Abstract
Skin conditions are common in all age ranges, and can significantly affect an individual’s quality of life. Nurses prescribing or applying topical treatments should have a comprehensive understanding of skin barrier function and the effects this has on the absorption of medication through the skin. This article focuses on the therapeutic options available to treat skin conditions with particular emphasis on topical treatments, including emollients and topical corticosteroids. The principles of skin barrier function and the way in which therapies applied to the skin work are also discussed.

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Keywords
Emollients, skin barrier, skin conditions, topical corticosteroids, topical treatments

Introduction
Surveys suggest that around 54% of the UK population experience a skin condition in a given 12-month period and, at any one time, 23-33% of patients with a skin problem could benefit from medical care (Schofield et al 2009). Most individuals experiencing a skin condition (69%) self care, buying treatments over the counter (OTC) and applying these at home without medical or nursing supervision (Schofield et al 2009). OTC sales are rising annually and comprised £413.9 million or 18% of OTC sales in the UK in 2007. A further 14% of individuals seek advice, usually from medical or nursing teams in the community (Schofield et al 2009). With the development of non-medical prescribing, studies have highlighted that many patients

Aims and intended learning outcomes
This article aims to increase readers’ knowledge of the different types of topical treatments that can be applied to the skin. After reading this article and completing the time out activities you should be able to:
- Describe the function of the skin barrier.
- Explain how topical medication is administered to the skin.
- Identify the characteristics of emollients and the factors to consider in choosing an appropriate emollient.
- Discuss how to monitor the therapeutic response to topical treatments applied to the skin.
- Educate patients about different aspects of applying topical treatments to the skin.

Review
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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.
with a skin condition are seen by nurses in a variety of settings who have varying levels of knowledge or training in dermatology. Non-specialist nurses often prescribe for minor skin conditions that require one-off treatments, and specialist nurses who have had formal training generally prescribe medicines for patients with chronic skin conditions (for example eczema, psoriasis and acne) over a long period of time (Courtenay et al 2006, Courtenay et al 2009).

Skin barrier and percutaneous absorption

Percutaneous absorption is the absorption of topical medications through the epidermal barrier in the skin into the underlying tissues, with transfer to the systemic circulation. The stratum corneum of the epidermis regulates the amount and rate of percutaneous absorption (Rudy and Parham-Vetter 2003). To understand this action, it is important that nurses have a good knowledge of skin anatomy and what factors affect skin barrier function.

One of the most important factors affecting percutaneous absorption is skin hydration and environmental humidity. In healthy skin with normal hydration, medications can only penetrate the stratum corneum by passing through the tight, relatively dry, lipid barrier between cells. When skin hydration is increased or the normal skin barrier is impaired – as a result of skin disease, excoriations, erosions, fissuring or prematurity, percutaneous absorption is enhanced (Rudy and Parham-Vetter 2003). The use of topical medications under occlusive dressings, plastic gloves, bandages or nappies increases skin temperature and hydration (Lawton 2004). Increased skin hydration enhances absorption of topical treatments in the intertriginous areas (genitals and flexures) of the skin and in skin folds (Lawton 2004).

Other factors that influence absorption include site of application and vehicle (or base). Any applied treatment contains the active ingredient and the vehicle, both of which are of equal importance to the therapeutic outcome for patients. Healthcare professionals need to be aware of the vehicle and the active ingredient used in topical medications because this will influence the therapeutic effect and the potential for local and systemic side effects (Table 1). The time of application is also important, and it may be preferable to apply the medication at night because it will not be washed off and may stay on the skin longer. This will also depend on patient choice, lifestyle, disease and frequency of applications because not all treatments are applied once daily.

Complete time out activities 1 and 2

Emollients

The most important treatment for all dry skin diseases is complete emollient therapy. Complete emollient therapy consists of emollient creams or ointments, emollient wash preparations and emollient bath and shower preparations, with all products applied to the skin being emollient based (Cork and Danby 2009). The term emollient comes from Latin and means to soften, and it implies a substance that acts to smooth the skin surface.

Bathing and cleansing the skin with emollients are important aspects of any skin care regimen. Emollients cleanse the skin, remove old treatments and scale, hydrate and prepare the skin for the application of

<p>| TABLE 1 |</p>
<table>
<thead>
<tr>
<th>Vehicles for topical medications</th>
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<tbody>
<tr>
<td><strong>Cream</strong></td>
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<tr>
<td><strong>Ointment</strong></td>
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<tr>
<td><strong>Gel</strong></td>
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<tr>
<td><strong>Powder</strong></td>
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<td><strong>Lotion</strong></td>
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<td><strong>Aerosol spray</strong></td>
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<td><strong>Paste</strong></td>
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<tr>
<td><strong>Shampoo</strong></td>
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<tr>
<td><strong>Medicated paste bandages</strong></td>
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Topical treatments. The frequency of bathing or skin cleansing depends on the individual, and the length of time spent in the water can make a difference to the dryness of the skin. There is no consensus about the frequency and length of time the patient should spend in a bath, however they should not soak for too long because the epidermis can become waterlogged, the hydrophilic film can be weakened, permeability can increase and the skin can become drier (Peters 2001). The terms ‘moisturiser’ and ‘emollient’ are often used interchangeably and describe the two basic actions on the skin, which are to soften and increase hydration (Voegeli 2007, Chiodo 2008). Loss of barrier function makes the skin more susceptible to the effects of irritants and allergens, and to water loss. The application of an emollient provides a surface film of lipids and restores the skin’s barrier function. To do this the healthcare professional needs to have a good understanding of the individual emollient properties.

Consistency of emollient and patient choice
Emollients come in a variety of formulations – oils, lotions, creams, ointments and sprays. It is important that nurses are aware of the different preparations so that they can help patients to make an informed choice. Emollient routines need to be realistic and achievable for the patient. The consistency of emollient used may need to change depending on environmental factors such as temperature change and work or social activities that may affect skin barrier function. Therefore, patients may need to have a choice of emollients to use, for example from a light cream-based emollient to a more greasy ointment-based emollient. In general, the more oily the preparation the better the emollient effect; however, the consistency of the emollient has to be acceptable to the patient (Lawton 2004).

Mode of action Depending on the active ingredients of the particular emollient, it works either by occlusion or by drawing moisture into the stratum corneum from the dermis. Occlusive emollients ‘trap’ moisture in the skin, slowing the evaporation of water from the skin (Ersser et al 2007). Emollients that draw moisture into the stratum corneum contain humectants such as propylene glycol, lactic acid, urea and glycerol. These have water-attracting properties and they draw water in from the dermis as they penetrate the epidermis. Some cream and lotion emollients contain a mixture of occlusive and humectant substances, with the humectant drawing water into the epidermis and the occlusive element ensuring the water is trapped there (Ersser et al 2007, Voegeli 2007). Other benefits of emollients include anti-inflammatory, antimiotic, antipuritic, exfoliative and steroid sparing effects (Finlay 1997, Marks 1997, Cork 1998, Ersser et al 2007).

Additives Emollients usually have added ingredients such as preservatives to reduce microbial contamination and improve product stability. Some emollients have ingredients with specific therapeutic indications such as antiseptics or antipruritics. Additives have the potential to provoke an immune response or sensitisation and can cause allergy in some patients (Peters 2001, Lawton 2004). Most preservatives are found in creams, therefore ointments are preferable for patients with known allergies or who are more susceptible to allergies such as patients with leg ulceration.

Product packaging and sizing Emollients come in a variety of sizes and packaging. Patients find it useful having larger pots or pumps for home use and smaller tubes or pumps for work and school. Products should not be shared, and if pots are used, the product should be decanted to prevent bacterial contamination (Davis 2001). An inadequate supply of emollient is often a cause of treatment failure. Amounts prescribed will be based on the type of skin condition, severity and area of application, but should be a minimum of 250g for a child and 500-600g for an adult each week (Ersser et al 2007).

Application The best emollient is that which is effective, and that the patient finds acceptable and uses on a regular basis (Lawton 2004). Emollients should be used at least twice daily but, frequency of use may increase depending on the severity of the skin condition, dryness of the skin and product used. Application should be light and in smooth downward strokes in the direction of hair growth to reduce the risk of folliculitis (inflamed or infected hair follicles) (Pringle and Penzer 2002).

Adverse effects Emollients are generally safe, with some limited adverse effects, the most common of which is stinging or discomfort when applied. This is usually transient and is commonly associated with creams. If this
becomes a problem for the patient, alternative emollients and consistencies should be used. Acute or chronic inflammatory reactions to substances that come into contact with the skin are generically termed contact dermatitis. Irritant contact dermatitis (Figures 1 and 2), as in the case study in Box 1, is caused by a chemical irritant and allergic contact dermatitis by an allergen (Fitzpatrick et al 2001). If an allergy is suspected, specialist referral for patch testing is required.

**Safety alerts** Paraffin-based emollients pose a fire risk and caution is necessary if these preparations are used (British National Formulary (BNF) 2011). Bandages, dressings and clothing in contact with paraffin-based products are easily ignited with a naked flame or cigarette. The National Patient Safety Agency (NPSA) (2007) highlighted this risk following a reported death and further guidance is available.

The evidence regarding the use of aqueous cream has shown that this product is detrimental to skin barrier function and will exacerbate atopic eczema. Aqueous cream was designed as an emollient soap substitute—a wash-off preparation. However, it is often prescribed incorrectly and used as a leave-on emollient and is a common cause of irritant reactions. This negative effect is associated with the presence of sodium lauryl sulphate (SLS) 1%, a harsh surfactant. Aqueous solutions of SLS have been shown to cause cutaneous irritation, increase transepidermal water loss and disrupt the skin barrier (Cork and Danby 2009, Cork and Danby 2011). A recent alert regarding the use of aqueous cream has further highlighted these issues (Medicines and Healthcare products Regulatory Agency 2013). Aqueous cream should not be left on the skin and should not be used. There are better emollient formulations that have a positive effect on skin barrier function.

**BOX 1**

**Case study of a patient with an atopic eczema exacerbation**

Sophie (age 13) experienced an acute exacerbation of atopic eczema. The GP prescribed systemic corticosteroids and antibiotics, both oral and topical. Sophie’s patient oriented eczema measure (POEM) score (Charman et al 2004, Centre of Evidence Based Dermatology 2013) was 28/28. POEM is a practical self-assessed measurement tool for monitoring aspects of atopic eczema that are important to patients in clinical practice, and the higher the score, the greater the impact on the patient. Sophie had been missing school and was conscious about the appearance of her skin.

When initially seen on referral, Sophie had dyed her hair and the possibility of a contact allergy to the hair dye was considered. She was prescribed an emollient and potent topical corticosteroid. Patch tests were negative and despite the treatment plan, her skin condition was no better, especially on the skin on the thighs and legs (Figures 1 and 2). On further questioning, she explained that she was using a bath oil. This bath oil contained the antiseptic benzalkonium chloride, which has previously been recognised as a cause of allergic contact dermatitis (Hann et al 2007). In addition, she was not measuring the amount of oil used, but poured more than the recommended amount into the bath, causing irritant contact dermatitis. Once the use of the oil was stopped, her skin condition settled.

Any topical preparation applied to the skin requires close monitoring, patient education and ongoing evaluation regarding use and effect.
In addition, skin treatments are available that have no proven efficacy and are potentially unsafe (Box 2).

**Topical corticosteroids**

The most commonly used treatments for many inflammatory skin conditions are topical corticosteroids, which can be used safely if certain precautions are taken. They have anti-inflammatory, immuno-suppressive, vasoconstrictive and antimitotic effects (Burns et al 2010). Topical corticosteroids are effective in reducing inflammation associated with skin conditions such as eczema. However, they are not curative and should only be used for short periods (three to seven days) to treat exacerbations of skin disease. Longer use may be indicated depending on disease severity, site of application and potency of the topical corticosteroid, but use and therapeutic effect require close monitoring. Once the exacerbation is treated, many patients require emollients only to control their symptoms. Many patients are reluctant to use topical corticosteroids because of the fear of local and systemic side effects (Box 3).

The potency of topical corticosteroids is determined by the amount of vasoconstriction they produce, the degree to which they inhibit inflammation, and their potential for causing side effects. Clear explanations and discussions are needed to dispel preconceived myths and to ensure patients have an understanding of (Lawton and Gill 2009):

- Their skin condition and expected outcomes of treatment.
- The various potencies of each corticosteroid preparation. The different potencies and labelling of topical corticosteroid containers can be confusing, for example hydrocortisone 1% has mild potency whereas betamethasone valerate 0.1% is potent (Lawton 2008).
- The area(s) of the body where each product should be used.
- The duration of application of the product.
- The frequency of application in relation to other treatments. There should be a gap between the application of emollients and other active treatments, to ensure there is no dilution of active treatments and no spreading to areas that do not require treatment.

Topical corticosteroids should only be used where treatments such as emollients do not provide sufficient relief. They should only be used intermittently to treat exacerbations. While it is important that patients use a sufficient amount of corticosteroid to control their condition, patients should use the least potent formulation that relieves their symptoms and apply it in the smallest amount and for the shortest possible time, to minimise the risk of side effects.

Topical corticosteroid ointments are generally preferable to creams (some patients prefer to apply creams to the face) because they produce a deeper, more prolonged emollient effect and occlude the affected area, thereby increasing the efficacy of the active ingredient. If the condition does not improve after three to seven days of corticosteroid use, diagnosis should be reassessed and other potential causes examined.

### BOX 2

**Fraudulent skin treatments**

A report by the All Party Parliamentary Group on Skin (1999) examined fraudulent practice in the area of skin disease care and defined it as:

‘A situation in which skin care or a skin care product is given, sold or promoted to an individual with a skin disease or condition, but which is either not what it purports to be, or has no proven efficacy and/or safety’

It specifically looked at four problem areas:

- Situations where patients are not told what the contents or active ingredients are.
- Ineffective products that contain no active ingredients.
- So-called ‘clinics’ making a diagnosis that is dangerous and fraudulent advice and treatment is given, perhaps by an unqualified practitioner, providing a useless product or one containing an undeclared ingredient. Advice could include advising a patient to pursue a dangerously deficient diet.
- Herbal products sold as ‘natural’ remedies but which contain a synthetic ingredient, for example a potent corticosteroid. A study by Ramsay et al (2003) examined 24 herbal creams used by 19 patients with a median age 3.82 (0.69–798) years. The creams had been used with good effect for atopic eczema, and the majority of the creams analysed illegally contained potent or very potent topical corticosteroids.

### BOX 3

**Side effects of topical corticosteroids**

- Skin atrophy – thinning, erythema, telangiectasia, purpura and striae.
- Peri-oral dermatitis, acne (rash around the mouth).
- Bruising easily, as a result of loss of collagen support of the blood vessels in the dermis.
- Tinea incognito (atypical fungal infection), bacterial and viral infections may worsen.
- Allergic contact dermatitis to an ingredient in the product. 2% of patients are allergic to the corticosteroid itself rather than the vehicle.
- Systemic absorption – suppression of pituitary-adrenal axis, cushingoid appearance, growth retardation.
- Rebound phenomenon, with the condition worsening when the corticosteroid is stopped, especially in patients with psoriasis.
- Tachyphylaxis.

(Gawkrodger 2002, Ashton and Leppard 2005)
These may include infection, hypersensitivity to the active ingredient or the vehicle, non-adherence with the treatment regimen due to fear of side effects, and tachyphylaxis (tolerance developed by the skin to the action of a topical corticosteroid) (Lawton 2008). If tachyphylaxis to a topical corticosteroid is suspected in children with atopic eczema, a different topical corticosteroid of the same potency should be considered as an alternative to stepping up treatment (National Institute for Health and Clinical Excellence 2007).

Steroid preparations should be applied once or twice daily. It is not necessary to apply them more often and the less frequently a steroid is applied, the lower the risk of side effects (National Institute for Clinical Excellence (NICE) 2004). While there is no consensus about when to apply corticosteroids in relation to emollients, using emollients before applying topical medications ensures the skin is moisturised fully and generally makes the application of other treatments easier. However, topical corticosteroids should be applied at least 30 minutes after emollient application to avoid spreading the steroid to other areas of the skin (BNF 2011) (Box 4). Healthcare professionals should consider treating problem areas of atopic eczema with topical corticosteroids for two consecutive days per week to prevent exacerbations, instead of treating exacerbations as they arise, in patients with frequent exacerbations (two or three per month), once the eczema has been controlled (Berth-Jones et al 2003, NICE 2007). This strategy should be reviewed within three to six months to assess effectiveness (NICE 2007).

Complete time out activity

**Topical medications**

It is possible to categorise topical medications further into specific drug classifications. Commonly used topical therapies include emollients and topical corticosteroids. Other preparations applied directly to the skin include the following (Gawkrodger 2002, BNF 2011):

- **Antifungal preparations**—used to treat fungal infections of the skin and candidiasis. They include nystatin, clotrimazole, miconazole, econazole, terbinfine, ketoconazole and amorolfin.
- **Antibacterial agents**—used to treat acne, rosacea, folliculitis, impetigo and infected eczema. They include neomycin, bacitracin, polymyxin, fusidic acid and mupirocin. Metronidazole is used for rosacea. The use of these medications may lead to potential problems with resistance and sensitisation.
- **Antiviral preparations**—used to treat viral infections of the skin and candidiasis. They include aciclovir and penciclovir.
- **Parasiticidal preparations**—used to treat scabies and lice. They include benzyl benzoate, permethrin and malathion for scabies, and malathion, permethrin and dimeticon for lice.
- **Keratolytics**—used for scaly conditions with skin thickening, and include salicylic acid.
- **Disease-specific preparations**—there are several disease-specific topical medications, including coal tar, an anti-inflammatory and anti-proliferative treatment for psoriasis and eczema. Dithranol has an anti-inflammatory effect, and is used to treat psoriasis. Vitamin D analogues are used to treat psoriasis, inhibit keratinocyte proliferation and promote differentiation, and include calcipotriol, calcitriol and tacalcitol. Calcineurin inhibitors pimecrolimus and tacrolimus are topical immunosuppressants.

The vehicles used with these topical medications will vary depending on active ingredient and site or disease indication and include lotions, creams, ointments, gels,

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**TIME OUT**

Discuss the use of topical corticosteroids with colleagues, patients and family members. Ask them what they know about topical corticosteroids, how they should be used and the potential side effects, myths and concerns. Review the amount of product to apply by reading guidance regarding the finger tip unit for patients at: www.patient.co.uk/pdf/4854.pdf

Access the Electronic Medicines Compendium and become familiar with the topical medications listed in this article, looking specifically at the Summary of Product Characteristics and Patient Information Leaflets: www.medicines.org.uk/EMC/default.aspx

When you have completed the article, you might like to write a practice profile. Guidelines to help you are on page 60.
Learning zone dermatology nursing

shampoos, pastes and bandages, which sometimes incorporate active treatments. **Complete time out activity 5**

**Conclusion**

Topical treatments are therapeutic preparations applied to the skin to treat underlying skin conditions. Nurses prescribing or applying topical treatments should have an understanding of skin barrier function, and the effects this has on absorption of medication through the skin. To monitor the efficacy of these topical medications and optimise treatment regimens, nurses need to be knowledgeable about the condition being treated, be able to educate patients about the condition and the safe and effective use of the treatments, monitor quantities used and understand the potential side effects associated with these treatments. **NS**

**Complete time out activity 6**

**References**


Centre of Evidence Based Dermatology (2013) Patient-Oriented Eczema Measure: tinyurl.com/or4Ym7l (Last accessed: May 31 2013)


