CHAPTER 9 – SKIN

First Nations and Inuit Health Branch (FNHIB) Clinical Practice Guidelines for Nurses in Primary Care.
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Table of contents

ASSESSMENT OF THE INTEGUMENTARY SYSTEM ................................................. 9–1
  History of Present Illness and Review of Systems ............................................ 9–1
  Physical Examination .................................................................................. 9–2

COMMON PROBLEMS OF THE SKIN ................................................................. 9–3
  Cellulitis ........................................................................................................ 9–3
  Chronic Wounds ........................................................................................... 9–5
  Cutaneous Infections (Uncomplicated) ............................................................. 9–5
  Cutaneous Infections (Complicated) ................................................................. 9–6
  Eczema (Atopic Dermatitis) ........................................................................... 9–7
  Impetigo ......................................................................................................... 9–9
  Methicillin-Resistant Staphylococcus Aureus ................................................... 9–10
  Hospital-Acquired MRSA ............................................................................. 9–10
  Community-Acquired MRSA (CA-MRSA) ....................................................... 9–10
  Pediculosis (Lice Infestation) ....................................................................... 9–13
  Ringworm (Tinea) .......................................................................................... 9–14
  Scabies .......................................................................................................... 9–16
  Stasis Dermatitis ........................................................................................... 9–18
  Urticaria (Hives) ............................................................................................ 9–19
  Warts (Verrucae) ........................................................................................... 9–20

DERMATOLOGICAL EMERGENCIES ................................................................. 9–21
  Burns ............................................................................................................ 9–21
  Frostbite ....................................................................................................... 9–27
  Skin Wounds of Traumatic Origin ................................................................. 9–30

APPENDIX A ...................................................................................................... 9–35

SOURCES ......................................................................................................... 9–38
ASSESSMENT OF THE INTEGUMENTARY SYSTEM

HISTORY OF PRESENT ILLNESS AND REVIEW OF SYSTEMS

The following characteristics of each symptom should be elicited and explored:

- Onset (sudden or gradual) and duration
- Chronology
- Relationship to season, travel history, heat, cold, previous treatment, drug ingestion, occupation, hobbies and pregnancy
- Current situation (improving or deteriorating)
- Location
- Quality
- Timing (frequency, duration)
- Time of day when symptoms are most severe
- Severity
- Precipitating and aggravating factors
- Relieving factors
- Associated symptoms
- Effects on daily activities
- Previous diagnosis of similar episodes
- Efficacy of previous treatments

CARDINAL SYMPTOMS

In addition to the general characteristics outlined above, additional characteristics of specific symptoms should be elicited, as described below. When skin changes are the chief complaint, it may be necessary to perform a complete investigation for multisystem disease which includes the history and physical exam, basic laboratory studies and may require a biopsy, immunofluorescence and imaging. Skin symptoms may include pruritus, pain or paresthesia.¹

Skin
- Changes in texture or colour
- Unusual dryness or moisture
- Itching, burning, pain, numbness
- Rash
- Bruises, petechiae
- Changes in pigmentation
- Lesions, blisters, crust
- Changes in moles or birthmarks

Hair
- Changes in amount, texture, distribution

Nails
- Changes in texture, structure

Other Associated Symptoms
- Site of onset, spreading
- Date(s) and site(s) of recurrence(s)
- Intermittent or continuous
- Influence of environmental or occupational factors
- Others at home with similar symptoms

MEDICAL HISTORY (SPECIFIC TO INTEGUMENTARY SYSTEM)

- Allergic manifestation (for example, asthma, hay fever, urticaria)
- Recent or current viral illness
- Recent or current bacterial illness
- Fever, malaise, arthralgias
- Allergies to drugs, foods, other chemical substances
- Medications (for example, steroids, OCPs [oral contraceptive pills], antibiotics, OTCs [over-the-counter drugs])
- Immunosuppression from health condition or medication use (for example, HIV/AIDS or glucocorticoids)
- Seborrheic dermatitis
- Psoriasis
- Diabetes mellitus
- Photosensitivity
FAMILY HISTORY (SPECIFIC TO INTEGUMENTARY SYSTEM)
- Allergies (for example, seasonal, to food)
- Seborrheic dermatitis
- Others at home with similar symptoms (for example, rash)
- Psoriasis

PERSONAL AND SOCIAL HISTORY (SPECIFIC TO INTEGUMENTARY SYSTEM)
- Obesity
- Poor hygiene
- Hot or humid environment, poor environmental sanitation
- Stress (may precipitate flares of chronic skin problem such as psoriasis)
- Exposure to new chemicals (for example, soaps), foods, pets, plants
- Emotional disturbance
- History of sensitive skin
- Others at home, work or school with similar symptoms
- Recent travel

PHYSICAL EXAMINATION
- Apparent state of health
- Appearance of comfort or distress
- Colour (for example, flushed, pale)
- Nutritional status (obese or emaciated)
- State of hydration
- Match between appearance and stated age
- Vital signs (temperature may be elevated)

INSPECTION AND PALPATION OF THE SKIN
- Colour
- Temperature, texture, turgor
- Dryness or moisture
- Scaling
- Pigmentation
- Vascularity (erythema, abnormal veins)
- Bruises, petechiae
- Edema (dependent, facial)
- Induration
- Blanching
- Individual lesions (colour, type, general shape, texture, arrangement, margination, pattern of distribution, character of edge [whether raised or flat])
- Hair (amount, texture, distribution)
- Nails (shape, texture, discoloration, grooving)
- Mucous membranes
- Flexural folds

OTHER ASPECTS
- Examine lymph nodes
- Examine area distal to enlarged lymph nodes

MAJOR TYPES OF SKIN LESIONS
The major types and characteristics of skin lesions are given in Table 1, “Major Types of Skin Lesions.”

Jaundice, spider angiomata, palmar erythema or a necklace of telangiectasia may indicate alcoholic liver disease. Petechiae or purpura suggest a coagulation problem.
Table 1 – Major Types of Skin Lesions

<table>
<thead>
<tr>
<th>Type of Lesion</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic lesions</strong></td>
<td></td>
</tr>
<tr>
<td>Atrophy (also can be sequential)</td>
<td>Skin thin and wrinkled</td>
</tr>
<tr>
<td>Bulla</td>
<td>Circumscribed, elevated lesion &gt; 5 mm in diameter containing fluid</td>
</tr>
<tr>
<td>Excoriation</td>
<td>Linear or hollowed-out crusted area, caused by scratching, rubbing or picking</td>
</tr>
<tr>
<td>Macule</td>
<td>Flat, circumscribed, discoloured spot; size and shape variable (for example, freckle, mole, port-wine stain)</td>
</tr>
<tr>
<td>Nodule</td>
<td>Palpable, solid lesion that may or may not be elevated (keratinous cyst, small lipoma, fibroma)</td>
</tr>
<tr>
<td>Papule</td>
<td>Solid elevated lesion (for example, wart, psoriasis, pigmented mole)</td>
</tr>
<tr>
<td>Plaque</td>
<td>Well defined plateau-like elevation that occupies a relatively large surface compared to its height above the skin (for example eczema, psoriasis)</td>
</tr>
<tr>
<td>Pustule</td>
<td>Superficial elevated lesion containing pus (impetigo, acne, furuncle, carbuncle)</td>
</tr>
<tr>
<td>Purpura</td>
<td>Ecchymosis or small hemorrhages in the skin, mucous membranes or serosal surfaces between blue and red in colour</td>
</tr>
<tr>
<td>Ulcer (also sequential)</td>
<td>Loss of epidermis and at least part of the dermis; may go deeper depending on grade of ulcer</td>
</tr>
<tr>
<td>Telangiectasia</td>
<td>Fine, often irregular red line produced by dilatation of a normally invisible capillary</td>
</tr>
<tr>
<td>Vesicle</td>
<td>Circumscribed, elevated lesion &lt; 5 mm in diameter containing fluid (for example, insect bite, allergic contact dermatitis, sunburn)</td>
</tr>
<tr>
<td>Wheal</td>
<td>Transient, irregularly shaped, elevated, indurated, changeable lesion caused by local edema (for example, allergic reaction to a drug, a bite, sunlight)</td>
</tr>
<tr>
<td><strong>Sequential lesions</strong></td>
<td></td>
</tr>
<tr>
<td>Erosion</td>
<td>Loss of part or all of the epidermis</td>
</tr>
<tr>
<td>Exudation: dry (crust or scab)</td>
<td>Dried serum, blood or pus</td>
</tr>
<tr>
<td>Exudation: wet (weeping)</td>
<td>Drainage of serum, blood or pus</td>
</tr>
<tr>
<td>Lichenification</td>
<td>Skin thickened, skin markings accentuated (for example, atopic dermatitis)</td>
</tr>
<tr>
<td>Scales</td>
<td>Heaping-up of the horny epithelium (for example, psoriasis, seborrhoeic dermatitis, fungal infection, chronic dermatitis)</td>
</tr>
<tr>
<td>Scar</td>
<td>Various skin manifestations of healed process (for example keloid or acne cicatrisation)</td>
</tr>
</tbody>
</table>

**COMMON PROBLEMS OF THE SKIN**

**CELLULITIS**

Acute, diffuse, spreading infection of the skin, involving the deeper layers of the skin and the subcutaneous tissue.

**CAUSES**

- Bacteria: most commonly Staphylococcus or Streptococcus
- Predisposing factors: local trauma, furuncle, carbuncle, underlying skin ulcer
- Increase risk in clients with venous or lymphatic compromise, diabetes mellitus and prior skin lesion or trauma

If a bite was the original trauma, different organisms are involved (see “Skin Wounds of Traumatic Origin”).

**HISTORY**

- Localized pain
- Redness
- Swelling
- Area increasingly red, warm to touch, painful
- Area around skin lesion also tender
- Fever and headache may be present, note onset
- Any trauma, rash
PHYSICAL FINDINGS
- Temperature may be elevated
- Heart rate may be elevated
- Redness, swelling
- Advancing edge of lesion diffuse, not sharply demarcated
- Small amount of purulent discharge may be present
- Skin surrounding lesion red and swollen, may be tense
- Edema
- Tenderness
- Induration (firm to touch)
- Regional lymph nodes may be enlarged, tender

DIFFERENTIAL DIAGNOSIS
- Folliculitis
- Foreign body
- Abscess
- Necrotizing fasciitis

COMPLICATIONS
- Progression of infection
- Abscess
- Sepsis
- Thrombophlebitis
- Deep vein thrombosis (more likely to be seen in elderly with lower extremity cellulitis)\(^6\)
- Osteomyelitis

DIAGNOSTIC TESTS
- Swab any wound discharge for culture and sensitivity (consider MRSA)
- Consider blood cultures if fever present

MANAGEMENT
If the condition is mild, physician consultation and referral are not usually required, and the client can be treated on an outpatient basis. If the condition is moderate to severe, IV therapy and referral are necessary.

Goals of Treatment
- Control infection
- Identify formation of abscess

Appropriate Consultation

Mild Cellulitis
Consultation not usually required.

Moderate-to-Severe Cellulitis
Consult physician if any of the following conditions pertain:
- Cellulitis is moderate to severe (for example, large area is involved)
- Cellulitis is progressing rapidly, which may indicate an invasive streptococcal infection
- Cellulitis involves hands, feet, face or a joint
- Client is immunocompromised (for example, has diabetes mellitus)
- Client is febrile, appears acutely ill or shows signs of sepsis
- Foreign body is suspected

Nonpharmacologic Interventions

Mild Cellulitis
- Apply warm saline compresses to affected areas qid
- Elevate, rest and gently splint the affected limb
- Counsel client about appropriate use of medications (dose, frequency, compliance)
- Encourage proper hygiene of all skin wounds to prevent future infection
- Stress importance of close follow-up

Adjuvant Therapy

Mild Cellulitis
If original lesion caused by trauma, check for tetanus vaccination; if not up to date, administer tetanus vaccine.

Moderate-to-Severe Cellulitis
- Start IV therapy with normal saline to keep vein open; adjust rate according to state of hydration and age
- If original lesion caused by trauma, check tetanus vaccination record; if not up to date, administer tetanus vaccine

Pharmacologic Interventions

Mild Cellulitis
Oral antibiotics:
- cephalexin (Keflex), 500 mg PO qid for 10 days
- or cloxacillin, 500 mg PO qid for 10 days

For clients with allergy to penicillin:
azithromycin (Zithromax), 500 mg on day 1 followed by 250 mg PO daily for 4 days

Antipyretics and analgesia:
acetaminophen (Tylenol), 325 mg, 1–2 tabs PO q4–6h prn

Moderate-to-Severe Cellulitis (non-facial)
Administer IV antibiotics only as directed by a physician. Often, the following is used:
cefazolin (Ancef), 1 g IV/IM q8h
or
cefazolin (Ancef) 2 g IV q24h
+
probenecid 1 g po once daily given 30 minutes prior to cefazolin*
*avoid concomitant use of probenecid with ketorolac

For clients with allergy to penicillin:
clindamycin 600 mg IV/IM q8h

Antipyretics and analgesia:
acetaminophen (Tylenol), 325 mg, 1–2 tabs PO q4–6h prn

Monitoring and Follow-Up

Mild Cellulitis
– Follow up daily to ensure that infection is controlled
– Instruct client to return for reassessment immediately if lesion becomes fluctuant, if pain increases or if fever develops

Moderate-to-Severe Cellulitis
Monitor vital signs and affected area frequently for progression.

Referral

Moderate-to-Severe Cellulitis
May need medevac for IV antibiotic therapy.

CHRONIC WOUNDS

Foot ulcers, diabetic leg ulcers, peripheral vascular disease ulcers and pressure ulcers are not specifically covered in these guidelines. However, the general principals in the ongoing management of wounds include the need for debridement, control of the bacterial burden and control of the moisture balance.7

A number of Best Practice Guidelines from the Registered Nurses Association of Ontario address common wound care issues. Of interest are the guidelines on:
– Assessment and Management of Foot Ulcers for People with Diabetes (see http://www.rnac.org/Page.asp?PageID=924&ContentID=719)
– Assessment & Management of Stage I to IV Pressure Ulcers (see http://www.rnac.org/Page.asp?PageID=924&ContentID=721)
– Assessment and Management of Venous Leg Ulcers (see http://www.rnac.org/Page.asp?PageID=924&ContentID=722)
– Risk Assessment and Prevention of Pressure Ulcers (see http://www.rnac.org/Page.asp?PageID=924&ContentID=816)

A selection of decisional tools in the management of wounds can be found in Appendix A.

CUTANEOUS INFECTIONS
(UNCOMPLICATED)

Folliculitis
Superficial infection of a hair follicle; acute lesion consists of dome-shaped pustule at the mouth of a hair follicle; pustule ruptures to form a crust; primary sites include scalp, shoulders, anterior chest, upper back and other hair-bearing areas.

Furuncle
Red, hot inflammatory nodule(s) involving subcutaneous tissue that arise from a hair follicle; primary sites include thigh, neck, face, axillae, perineum and buttocks.

Carbuncles
Deep-seated abscess formed by multiple coalescing furuncles; lesions drain through multiple points to the surface.

CAUSES
– Infection with Staphylococcus aureus (most common), anaerobes, other microorganisms
– Predisposing factors: obesity, diabetes mellitus, poor hygiene, excessive friction or perspiration, seborrhoea, local trauma (for example, from plucking hairs), use of immunosuppressive drugs (for example, systemic steroids)
HISTORY
- Pain, swelling, redness at infected site
- Fever may be present

PHYSICAL FINDINGS
- Localized redness, swelling
- Lesion may be draining, crusted
- Localized induration
- Tenderness
- Fluctuance (may be difficult to palpate if abscess is deep)
- Regional lymph nodes may be enlarged and tender
- Temperature may be elevated
- Heart rate may be elevated

DIFFERENTIAL DIAGNOSIS
- Cellulitis
- Abscess

COMPLICATIONS
- Scarring
- Spread of infection (for example, lymphangitis, lymphadenitis)
- Abscess
- Recurrence
- Sepsis

DIAGNOSTIC TESTS
- Swab discharge for culture and sensitivity (consider MRSA)
- Determine blood glucose level if infection is recurrent or if symptoms suggestive of diabetes mellitus are present

MANAGEMENT

Goals of Treatment
- Control infection
- Prevent complication
- Identify predisposing underlying conditions (for example, diabetes mellitus)

Appropriate Consultation
Consult a physician if client is febrile or appears acutely ill; if extensive cellulitis, lymphangitis or adenopathy is present; or if infection is suspected or detected in a critical region (for example, perirectal area) or in an immunocompromised client (for example, diabetic person).

Nonpharmacologic Interventions
- Apply warm saline compresses to soften and soak away crusts qid and prn
- Cleanse with antiseptic antimicrobial agent to decrease bacterial growth
- Incise and drain localized large furuncles or carbuncles to relieve pain and pressure
- Counsel client about appropriate use of medications (dose, frequency, compliance) and if on antibiotics, reinforce the need to complete a course despite feeling better within days
- Recommend proper hygiene (that is, daily washing with prescribed soap)
- Counsel client about prevention of future episodes

Pharmacologic Interventions
Apply topical antibiotic preparation:
- mupirocin (Bactroban) ointment, tid for 10 days
Oral antibiotics may be necessary if client is febrile or there are multiple lesions that appear infected:
- cephalexin (Keflex), 500 mg PO qid for 10 days
  or
- cloxacillin 500 mg PO qid for 10 days
For clients with allergy to penicillin:
- azithromycin (Zithromax), 500 mg on day 1 followed by 250 mg PO daily for 4 days

Antipyretics and analgesia:
- acetaminophen (Tylenol), 325 mg, 1–2 tabs PO q4–6h prn

Monitoring and Follow-Up
Follow up daily until infection resolves.

Referral
Referral usually not required.

CUTANEOUS INFECTIONS
(COMPLICATED)

Appropriate Consultation
Consult a physician if client is febrile or appears acutely ill; if extensive cellulitis, lymphangitis or adenopathy is present; or if infection is suspected or detected in a critical region (for example, perirectal area, face, feet, decubitus ulcers) or in an
immunocompromised client (for example, diabetic person).

**Adjuvant Therapy**
Start IV therapy with normal saline; adjust rate according to state of hydration and age.

**Pharmacologic Interventions**
If ordered by a physician, IV antibiotics such as the following may be considered before transfer:
- **cefazolin (Ancef), 1–2 g IV/IM q8h**
If abscess is in the perirectal area:
- **cefazolin (Ancef), 1–2 g IV/IM q8h**
  and
- **metronidazole (Flagyl), 500 mg IV q8h**
The physician may also add gentamicin to this combination for more polymicrobial coverage.

**Referral**
Medevac as soon as possible, for continued IV drug therapy and possible surgical drainage.

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**ECZEMA (ATOPIC DERMATITIS)**
Chronic, itchy, inflammatory condition of the skin.

**CAUSES**
- Largely unknown
- Inherited skin sensitivity
- Allergy

**HISTORY**
- Typically begins in infancy
- May last throughout entire life
- Pattern in adulthood differs from that in infancy and childhood
- Periods of remission and exacerbation
- Family history of eczema, allergies and asthma common
- Characterized chiefly by itching and scaling
- Eruptions of small groups of vesicles may occur
- Scratching leads to rupture of vesicles
- Clear serous fluid oozes from vesicles, leading to development of rash
- Vicious cycle of itch, scratch, rash, itch
- Usually affects face, neck, upper arms and back, flexural folds, feet
- May be more generalized
- Secondary bacterial infection common
- Specific irritating agents can be identified
- Wool, solvents, perfumed creams, lotions, soaps bothersome
- Allergies, hay fever, asthma, contact dermatitis often present
- Hot humid or cold dry weather and emotional stress may aggravate symptoms

**PHYSICAL FINDINGS**
- Skin scaly, dry, thickened (lichenified)
- Fissures may be present
- Excoriations
- Mild redness and edema often present
- Vesicles may be present in some areas
- Lesions may be weeping
- Pustular or crusted lesions may be present
- Some areas of skin usually show chronic changes (thin skin, scarring, lichenification)
DIFFERENTIAL DIAGNOSIS
- Seborrheic dermatitis
- Dry skin (winter itch)
- Allergic contact dermatitis
- Psoriasis
- Scabies

COMPLICATIONS
- Scarring
- Secondary bacterial infection
- Chronic irritation of skin
- Side effects of medication (for example, steroid preparations)

DIAGNOSTIC TESTS
- None

MANAGEMENT

Goals of Treatment
- Relieve symptoms
- Prevent secondary infection

Appropriate Consultation
Consult a physician if no response to therapy after 1 week.

Nonpharmacologic Interventions
- Offer support to client, as it can be difficult to live with this irritating and cosmetically unattractive condition
- Advise client to stop using steroid preparations once acute lesions have healed, since steroids do not have any preventive benefit and may further irritate and damage skin
- Assist client to identify precipitating and aggravating factors, and encourage avoidance
- If lesions are wet, promote drying and cooling with compresses qid prn (aluminum acetate [Burow’s solution] or normal saline)
- If lesions are dry, promote lubrication with Glaxal base or petroleum jelly (Vaseline) bid, after bathing and prn

Client Education
- Counsel client about appropriate use of medications (dose, frequency, application)
- Encourage proper hygiene to prevent secondary bacterial infection
- Recommend loose-fitting cotton clothing
- Recommend avoidance of coarse materials and wool
- Recommend avoidance of overheating (hot showers)
- Recommend avoidance of irritants at work and at home
- Recommend use of a soap substitute (for example, Aveeno) and avoidance of soaps
- Suggest that cotton gloves be worn inside rubber gloves when client works with liquids
- Suggest that greasy lubricants (such as Lubriderm) be applied within minutes of leaving shower or bath to “lock in” moisture

Pharmacologic Interventions
Reduce inflammation if itch moderate or severe:
- hydrocortisone 1% cream (Topicort), bid-tid for 1–2 weeks

Gels and creams are used for acute, weeping eruptions. Ointments are used for dry or lichenified lesions. Lotions are used for hairy areas.

Pruritus associated with eczema is not mediated by histamine, so histamine blockade is generally ineffective. Hydroxyzine (Atarax) may provide some relief through central sedation. Sedative effect of hydroxyzine is useful to break the itch-scratch cycle.
- hydroxyzine (Atarax), 10–25 mg PO bid and hs prn
Start with 10 mg if client is small, elderly or taking anxiolytics.

Monitoring and Follow-Up
Follow up in 1–2 weeks to assess response. If no response, discuss use of a more potent topical steroid with physician. Advise client to return sooner if signs of infection develop.

Referral
Arrange elective follow-up with a physician if there is no response to treatment.
**IMPETIGO**

Highly contagious superficial bacterial infection of skin.

**CAUSES**
- Streptococcus, Staphylococcus or a mixture of both
- Predisposing factors: local trauma, insect bites, skin lesions from other disorders (for example, eczema, scabies, pediculosis)

**HISTORY**
- More common on face, scalp and hands, but may occur anywhere
- Involved area is usually exposed
- May complicate chickenpox, eczema and other skin disorders marked by open lesions
- New lesions usually due to auto-inoculation
- Rash begins as red spots, which may be itchy
- Lesions become small blisters and pustules, which rupture and drain
- Discharge dries to form characteristic golden yellow crusts
- Lesions painless
- Fever and systemic symptoms rare
- Mild fever may be present in more generalized infections

**PHYSICAL FINDINGS**
- Thick, golden yellow, crusted lesion on a red base
- Numerous skin lesions at various stages present (vesicles, pustules, crusts, serous or pustular drainage, healing lesions, bullae may be present)
- Lesions and surrounding skin may feel warm to touch
- Regional lymph nodes may be enlarged, tender

**DIFFERENTIAL DIAGNOSIS**
- Infected eczema, contact dermatitis, scabies
- Herpes simplex infection with blisters or crusts
- Chickenpox infection with blisters or crusts
- Shingles (herpes zoster) with blisters or crusts
- Bullous insect bites

**COMPLICATIONS**
- Localized or widespread cellulitis
- Post-streptococcal glomerulonephritis (uncommon in adults)

**DIAGNOSTIC TESTS**
- None
- Consider swabbing if MRSA is known in community or if there is no response to initial treatment

**MANAGEMENT**

**Goals of Treatment**
- Control infection
- Prevent auto-inoculation
- Prevent spread to other household members

**Appropriate Consultation**
Consult a physician if there is failure to respond to therapy.

**Nonpharmacologic Interventions**
- Apply warm saline compresses to soften and soak away crusts qid and prn
- Cleanse with antiseptic antimicrobial agent to decrease bacterial growth
- Counsel client about appropriate use of medications (dose, frequency, compliance)
- Recommend proper hygiene (that is, daily washing with prescribed soap)
- Counsel client about prevention of future episodes
- Suggest strategies to prevent spread to other household members (for example, proper hand-washing, use of separate towels)

**Pharmacologic Interventions**
Apply topical antibiotic preparation:

- mupirocin (Bactroban) ointment, tid for 7 to 10 days

Oral antibiotics may be necessary if there are multiple lesions that appear infected:

- cloxacillin, 500 mg PO qid for 7 to 10 days
- cephalaxin (Keflex), 500 mg PO qid for 7 to 10 days

For clients with allergy to penicillin:

- erythromycin, 1 g/day divided bid, tid or qid for 7 to 10 days
**Monitoring and Follow-Up**

- Follow up in 2–3 days to assess response to treatment
- Instruct client to return for reassessment if fever develops or infection spreads despite therapy

**Referral**

Not usually necessary unless complications develop.

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**METHICILLIN-RESISTANT STAPHYLOCCUS AUREUS**\(^{10,11,12}\)

Methicillin-resistant *Staphylococcus aureus* (MRSA) are bacteria that are resistant to partly synthetic penicillins like cloxacillin and methicillin. The bacteria can also be resistant to other antibiotics. It is difficult to treat, as drugs used to treat other strains of *Staphylococcus aureus* may not be of benefit.\(^{13}\) *Staphylococcus aureus* is normally found on the skin and in the nares of healthy people. Currently, there are two strains of MRSA that have different molecular and antibiotic resistance profiles.\(^{14}\)

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**HOSPITAL-ACQUIRED MRSA**

Hospital-acquired MRSA happens most often in those who have been in a hospital or health care facility, or had medical procedures done and who have a weakened immune system.\(^{15}\)

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**COMMUNITY-ACQUIRED MRSA (CA-MRSA)**

A person is considered to have CA-MRSA if they have not been in the hospital or had a medical procedure done within the past year and they have a positive culture report for MRSA. The infection usually presents on the skin as pimple(s) or boil(s) and is seen in persons that are otherwise healthy.\(^{15}\) Currently, the CA-MRSA strains are more likely to be susceptible to antibiotic classes, other than beta-lactams, than hospital-acquired MRSA strains.\(^{13}\)

Primary Care Health Practitioners must become aware of the emergence of CA-MRSA as a cause of infection in Canada, particularly when overcrowding is an issue.

The prevalence of CA-MRSA in Canada is currently thought to be low but rising in Canadian communities. Most cases are skin infections with principal sites of colonization being the skin, nares and perineum.

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**CAUSES**

- Methicillin-resistant Staphylococcus aureus

**Mechanism of Spread**

- Skin to skin contact
- Skin to instrument contact
- Cat or dog bite\(^{16}\)

**Risk Factors for MRSA Carriage**

- Crowded housing
- Lack of quality running water
- Antibiotic use
- Hospitalization or recent outpatient attendance
- Chronic illness
- Intravenous drug abuse
- Close contact with an individual with any of these risk factors

**HISTORY**

- Localized pain
- Redness
- Swelling
- Drainage of fluids or pus from lesion may be present
- Fever may be present
- Skin abscess may be present
- Area around skin lesion may be warm
- History of MRSA (hospital or community acquired)
- History of cat or dog bite\(^{16}\)

For more serious infections chills, fatigue, malaise, headache, muscle aches or shortness of breath may be present.

**Suspect Hospital-Acquired MRSA**

- If a person has been hospitalized or had a medical procedure done in the past year
- If a person has a weakened immune system
Suspect CA-MRSA

- In communities where it is known that approximately 10% to 15% of community isolates of S. aureus are methicillin resistant, CA-MRSA should be suspected in any patient who presents with a suspected staphylococcal skin infection
- When risk factors for CA-MRSA are present
- When there is a poor response to beta-lactam therapy in individuals with presumed staphylococcal infection
- In severe infections compatible with S. aureus (for example, sepsis, necrotizing fasciitis, necrotizing pneumonia and emphysema)

PHYSICAL FINDINGS

- Temperature may be elevated
- Heart rate may be elevated
- Redness, swelling
- Tenderness
- Small or large amount of purulent or serous discharge may be present
- Skin surrounding lesion may be red, swollen, and/or tense
- Edema may be present
- May have induration (firm to touch)
- Regional lymph nodes may be enlarged, tender

DIFFERENTIAL DIAGNOSIS

- Cellulitis
- Impetigo
- Folliculitis
- Furuncle or carbuncle
- Foreign body
- Abscess
- Animal bite

COMPLICATIONS

- Progression of infection
- Abscess
- Sepsis
- Endocarditis
- Pneumonia
- Toxic shock syndrome

DIAGNOSTIC TESTS

Obtain a swab for culture and sensitivity in the following situations:

- Skin lesions are suspect for MRSA
- Recurrent furuncles or abscesses (two or more in six months)
- Any severe presentation of the disease (should include blood cultures)
- An outbreak is suspected (in consultation with public health)
- Prior to beginning antibiotics, from areas of cellulitis for patients who are going to be admitted for inpatient therapy or whose cellulitis progresses once starting treatment

Screening Recommendations

- Routine screening of individuals infected with CA-MRSA or their contacts for colonization of nares or other sites is not recommended
- In communities in which MRSA is known to occur, general efforts to determine carriage rates among asymptomatic household contacts are not recommended
- In selected circumstances, following consultation with public health or a physician, nasal and/or additional site screening may be considered

These selected circumstances include the following:

- Individuals with recurrent S. aureus skin infections (two or more in six months), in whom eradication therapy is being considered
- In a family setting, where recurrent skin infections continue despite repeated review and reinforcement of hygiene measures, and there is not known to be a high prevalence of CA-MRSA in the community
- To investigate an outbreak in a closed population with continuing new infections despite repeated reinforcement of hygiene practices. When a colonization survey is performed as part of an outbreak investigation, assessing carriage sites other than the nares may be considered, in consultation with public health officials and/or other experts

MANAGEMENT

Goals of Treatment

- Prevention
- Infection control
- Treatment of skin infections
**Appropriate Consultation**

Consult a physician for all cases of suspected or confirmed MRSA infections.

**Nonpharmacologic Interventions**

**Prevention**
The goal of MRSA control is to prevent spread of the bacteria from an infected or colonized individual to other persons.

- Use antibiotics appropriately to reduce or minimize antibiotic resistance
- Optimize the water supply in First Nations communities
- Provide instruction, beginning in early childhood, regarding the method and value of frequent hand washing
- Educate clients about appropriate hygiene practices at all times and in all settings. These include but are not limited to the following: regular hand washing to limit personal contamination and transmission and regular bathing with soap and water
- Families, school and daycare centre personnel and sports teams should be actively encouraged to practice meticulous hand washing, the most important measure to control transmission of MRSA

If skin lesions are present, educate clients to:

- cover lesions with appropriate dressings to contain drainage or exudate
- ensure that appropriate medical care has been received
- not share creams, lotions, soaps, cosmetics and other personal products that are in contact with the skin;
- not share unwashed towels;
- not share personal items that come in contact with the skin lesions – such as razors, toothbrushes, towels, nail files, combs and brushes – without cleaning
- discard contaminated waste, including used dressings, in a safe manner to avoid exposure to other individuals
- wash hands with soap and water after touching any skin lesions and potentially infected materials, such as soiled dressings

**Role of Health Care Practitioners**

- Health care practitioners should use antibiotics judiciously; overuse of antibiotics continues to contribute to antibiotic resistance
- Patients should be encouraged to complete all courses of antibiotics as prescribed
- Frequent handwashing and decontamination of examination equipment to prevent spread from infected individuals
- Public health officials should be notified if spread occurs beyond a family unit to a localized community group, such as a school or sports team (that is, if an outbreak of the disease is suspected)

**Acute Infection**

Mild, localized cutaneous infections such as minor abrasions: washing with antibacterial soap and water.

Superficial, localized infections such as impetigo, folliculitis, furuncles, carbuncles and small abscesses without cellulitis; local therapy using warm water soaks and elevation.

**Pharmacologic Interventions**

**Acute Infection**

Superficial, localized infections such as impetigo, folliculitis, furuncles, carbuncles and small abscesses without cellulitis, one or more of the following measures may be used:

- topical antiseptics
- topical mupirocin or bacitracin

For the immunocompromised host, antimicrobial therapy is recommended in addition to local measures, incision and drainage.

For empiric therapy of mild to moderate, more generalized infections such as cellulitis (where MRSA is not suspected or confirmed) in addition to local measures, choose one of the following antibiotics:

Start with cloxacillin, or first-generation cephalosporin such as cephalaxin or Clavulin (amoxicillin/clavulanic acid)
In a community known to have MRSA: clindamycin or trimethoprim/sulfamethoxazole (note that trimethoprim/sulfamethoxazole does not provide coverage for Group A beta-hemolytic streptococcus).

Severe or life-threatening staphylococcal infection such as necrotizing fasciitis, necrotizing pneumonia: initial coverage may include vancomycin pending physician consult, culture and sensitivity.

**Decolonization**
Decolonization refers to the process of eradicating or reducing carriage of a particular organism from the skin, nose or other mucosal surfaces. Consult a physician for guidance in decision to attempt decolonization, as success of decolonization is limited.

The available systemic options include rifampin plus another antistaphylococcal antibiotic, such as TMP-SMX, clindamycin, fusidic acid, doxycycline or minocycline.

Eradication from the skin can be attempted using topical agents such as chlorhexidine, whereas nasal decolonization usually requires intranasal mupirocin. Eradication from sites other than the nose usually requires systemic and topical therapy in addition to intranasal therapy.

**Monitoring and Follow-Up**
Closely monitor clients being treated for suspected or confirmed minor staphylococcal skin infections to ensure response to treatment. Timing of follow-up depends on type and severity of infection at presentation.

**Referral**
Medevac cases of moderate to severe infections compatible with *S. aureus* (for example, extensive cellulitis, sepsis, necrotizing fasciitis, necrotizing pneumonia) to hospital for definitive diagnosis and ongoing treatment.

**PEDICULOSIS (LICE INFESTATION)**
Infestation with human parasitic lice.

**CAUSES**
There are 3 types: head lice, body lice and pubic lice.

**Risk Factors**
- Crowded housing (for example, shared beds), crowded schools
- High pediatric population
- Failure to recognize an infestation
- Faulty application of treatments
- Failure to treat close contacts simultaneously
- Failure to eradicate lice from linens and clothing at time of treatment
- Lack of running water, which can predispose to poor hygiene and secondary skin infection

**HISTORY**
- Head lice: involve scalp
- Body lice: involve body
- Pubic lice: involve pubic area and may be found in hairs of abdomen, thighs, axillae, eyebrows, eyelashes
- Severe itching of involved area
- Excoriation of skin
- Secondary bacterial infection may occur
- Client may find lice or nits on bedclothes, in seams of clothing

**PHYSICAL FINDINGS**
- Small gray-white nits cemented to base of hair shafts
- Lice may be visualized
- Excoriation of skin

**DIFFERENTIAL DIAGNOSIS**
- Dandruff

**COMPLICATIONS**
- Recurrent infestation
- Skin infection

**DIAGNOSTIC TESTS**
- None
MANAGEMENT

Goals of Treatment
– Eradicate infestation
– Prevent recurrences
– Prevent spread to close contacts

Nonpharmacologic Interventions
– Remove dead lice and nits with tweezers or nit comb
– Avoid irritation of eyes and mucous membranes
– Remove nits on eyelashes with petroleum jelly (nits become coated, and ova die from suffocation)
– Instruct client to place small amount of petroleum jelly on tips of fingers, then close eyes and rub petroleum jelly into lids and brows; repeat two to four times daily for 10 days
– Examine all family members and close personal contacts, including schoolmates and daycare contacts, and treat if infested
– Also treat anyone who shares a bed with the person who has head lice

Client Education
Counsel client about proper use of medication and side effects

Recommend:
– that combs, brushes, hats, coats, bedding and clothing of all household members be washed in warm soapy water
– Items that cannot be washed should be sealed in a plastic bag for 3 weeks
– Recommend avoidance of sharing of combs, brushes, hats, etc.
– Suggest that mattresses (which can harbour lice) be vacuumed thoroughly

Pharmacologic Interventions
Insecticide shampoos for head lice:
  permethrin (Nix) cream rinse
  or
  pyrethrin shampoo (R&C shampoo)
Two bottles are often needed for thick or long hair.

Monitoring and Follow-Up
Follow up in 7 days. Ensure treatment is repeated in 7–10 days after original application.

Referral
Usually not necessary.

RINGWORM (TINEA)
Superficial fungal infection of skin.
– On feet: tinea pedis (athlete’s foot)
– In groin: tinea cruris (jock itch)
– On body: tinea corporis
– On scalp: tinea capitis (see “Tinea Capitis” in the chapter, “Pediatric Skin”)

Tinea versicolor, a yeast infection (Pityrosporum ovale) is described in Table 2, “History and Physical Findings for Various Forms of Tinea.” The microscopic examination of scales prepared with KOH can differentiate this tinea from other hypopigmented or scaly skin lesions.

CAUSES
Dermatophytes (fungi) that invade dead tissue, such as the skin’s stratum corneum, nails and hair.
HISTORY AND PHYSICAL FINDINGS

The history and physical findings for various forms of tinea are given in Table 2.

<table>
<thead>
<tr>
<th>Type</th>
<th>History</th>
<th>Physical Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tinea pedis</strong></td>
<td>Affects feet</td>
<td>Scaling of lateral interdigital areas</td>
</tr>
<tr>
<td></td>
<td>Itch severe</td>
<td>Moist, whitened, macerated, cracked skin may be present</td>
</tr>
<tr>
<td></td>
<td>Scaling and redness, mainly between toes</td>
<td>Skin peels off easily with red, tender area underneath</td>
</tr>
<tr>
<td></td>
<td>Foul odour may be present</td>
<td>One or several small blisters may be present</td>
</tr>
<tr>
<td></td>
<td>Area may be moist, whitened, macerated, cracked</td>
<td>Sole of foot may be involved with marked scaling</td>
</tr>
<tr>
<td></td>
<td>Skin peels off easily with red, tender area underneath</td>
<td>Fissures may become secondarily infected</td>
</tr>
<tr>
<td></td>
<td>One or several small vesicles may be present</td>
<td>(cellulitis)</td>
</tr>
<tr>
<td></td>
<td>Vesicles rupture leaving a &quot;collarette&quot; of scales</td>
<td></td>
</tr>
<tr>
<td></td>
<td>May involve sole of foot with marked scaling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(itch minimal)</td>
<td></td>
</tr>
<tr>
<td><strong>Tinea cruris</strong></td>
<td>Affects groin</td>
<td>Involves crural areas and upper inner thigh</td>
</tr>
<tr>
<td></td>
<td>Common in men</td>
<td>Scaly reddish brown lesion</td>
</tr>
<tr>
<td></td>
<td>Itch mild to severe</td>
<td>Sharply defined margin</td>
</tr>
<tr>
<td></td>
<td>Begins as erythema of crural fold</td>
<td>Central clearing absent</td>
</tr>
<tr>
<td></td>
<td>Spreads outward</td>
<td>Groin, thigh, buttock may be involved</td>
</tr>
<tr>
<td></td>
<td>May spread onto thighs or buttocks</td>
<td>May be bilateral or unilateral</td>
</tr>
<tr>
<td></td>
<td>Scrotum and penis usually not affected</td>
<td>Scrotum and penis usually not affected</td>
</tr>
<tr>
<td></td>
<td>Often spread by infected towel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Often associated with tinea pedis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Predisposing factors: excessive sweating, diabetes mellitus, friction</td>
<td></td>
</tr>
<tr>
<td><strong>Tinea versicolor</strong></td>
<td>(Pityriasis vesicolor)</td>
<td>Chronic superficial hypopigmented macules, sharply margined or raised scaly lesions</td>
</tr>
<tr>
<td></td>
<td>Yeast infection frequently seen in young adults, less common when sebum production is reduced or absent</td>
<td>Commonly affects upper trunk, proximal limbs, genitalia</td>
</tr>
<tr>
<td></td>
<td>Predisposing factors: high humidity at skin surface, high rate of sebum production</td>
<td>Varies from light brown to white or pink, with varied intensities and hues</td>
</tr>
<tr>
<td></td>
<td>Appears in summertime, fades during cooler months</td>
<td></td>
</tr>
<tr>
<td><strong>Tinea corporis</strong></td>
<td>Affects any smooth, nonhairy part of body</td>
<td>Lesions variable in size</td>
</tr>
<tr>
<td></td>
<td>Scaly, circular or oval skin lesions</td>
<td>Typically a well-circumscribed circular or oval patch</td>
</tr>
<tr>
<td></td>
<td>Frequently itchy</td>
<td>Reddish pink and scaly</td>
</tr>
<tr>
<td></td>
<td>May be asymptomatic</td>
<td>Central clearing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accentuation of redness at outer border</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Margins scaly, vesicular or pustular</td>
</tr>
</tbody>
</table>
DIFFERENTIAL DIAGNOSIS

- Soft callus
- Wart
- Seborrheic dermatitis
- Candidal infection of foot or groin
- Local chafing or irritation of groin
- Contact, atopic or allergic dermatitis
- Psoriasis

COMPLICATIONS

Secondary bacterial infection (particularly with tinea pedis).

DIAGNOSTIC TESTS

Take skin scrapings (KOH preparation) for mycologic investigation (fungal culture) and direct microscopy.

MANAGEMENT

Goals of Treatment

- Relieve symptoms
- Eradicate infection

Appropriate Consultation

Consult a physician if there is failure to respond to an adequate trial of antifungal therapy.

Nonpharmacologic Interventions

Apply compresses (Burow’s solution) bid or tid to dry and relieve itch (for tinea pedis and tinea cruris only).

Client Education

- Recommend elimination of moisture and heat
- Suggest that client modify socks and footwear
- Recommend avoidance of restrictive clothing, nylon underwear, prolonged wearing of wet bathing suit or work clothes
- Counsel client about appropriate use of medications (dose, frequency, compliance)
- Recommend proper hygiene (client should change socks frequently and avoid wearing rubber shoes)

Pharmacologic Interventions

For tinea pedis and tinea cruris, topical antifungal agent for at least 2 weeks; continue until 1 week after resolution of lesions:

- clotrimazole skin cream (Canesten), bid or tid

For tinea corporis, apply a topical antifungal agent such as clotrimazole for 4 weeks.

For tinea versicolor, apply selenium sulfide (2.5%) lotion or shampoo, daily to affected areas for 10–15 minutes, followed by shower, for 7–14 days.\(^2^1\)

Monitoring and Follow-Up

Follow up in 2 weeks to ensure resolution.

Referral

Refer to physician if fungal infections are recurrent, if they develop in an immunosuppressed or diabetic client, if there is no response to therapy or if the nails become involved.

SCABIES\(^2^2\)

Infestation of the skin by a parasitic mite.

CAUSE

- Sarcoptes scabiei
- Direct (skin to skin) contact with contaminated articles for up to 48 hours

Risk Factors

- Faulty application of treatment regimens
- Failure to treat close contacts
- Failure to eradicate mites from clothing and bed linen
- Daycare settings

The Aboriginal population is particularly at risk because of a number of additional factors:

- Crowded housing, shared beds, crowded schools and daycare centres
- High pediatric population
- Reduced access to medical or nursing care
- Lack of running water, which may predispose to poor hygiene and secondary skin infection
- Mites can survive much longer than 36 hours in colder conditions with high relative humidity\(^2^3\)
**HISTORY**
- Severe itching
- Itching generally worse at night or after a hot shower
- Rash of hands, feet, flexural folds
- Transmitted by intimate or sexual contact with infected person
- Transmitted by clothes
- Symptoms may take 6 weeks to develop after initial contact with mite
- Symptoms are due to hypersensitivity to mite and its products

**PHYSICAL FINDINGS**
- Usually affects interdigital web spaces, flexures of wrists and arms, axillae, belt line, lower folds of buttocks, genitalia, areolae of nipples
- Diffuse red rash
- Primary lesions: papules, vesicles, pustules, burrows
- Secondary lesions: scabs, excoriations, crusts, nodules, secondary infection
- Lesions in various stages present at the same time
- Secondary lesions may predominate
- Burrows (gray or flesh-coloured ridges 5–15 mm long) may be few or many
- Burrows commonly seen on anterior wrist or hand and in interdigital web spaces

**DIFFERENTIAL DIAGNOSIS**
- Pediculosis
- Impetigo
- Eczema
- Contact and irritant dermatitis

**COMPLICATIONS**
- Secondary bacterial infection

**DIAGNOSTIC TESTS**
- None

**MANAGEMENT**

**Goals of Treatment**
- Eradicate infestation
- Control secondary infection
- Relieve symptoms

**Appropriate Consultation**
Consult physician if unsure of diagnosis.

**Nonpharmacologic Interventions**

**Client Education**
Counsel client about proper use and side effects of medication.

**Control Measures**
- Prophylactic therapy essential for all household members, since signs of scabies may not appear for 1–2 months after the infection is acquired
- Treat all household members at the same time to prevent re-infection
- All bed linen (sheets, pillow slips) and clothing worn next to the skin (underwear, T-shirts, socks, jeans) should be laundered in a hot soapy wash and dried with a hot drying cycle, as available
- If hot water is not available, place all bed linen and clothing into plastic bags and store away from family for 5–7 days, as the parasite cannot survive beyond 4 days without skin contact
- Children may return to daycare or school the day after treatment is completed
- Health care workers who have had close contact with clients with scabies may themselves require prophylactic treatment
- Community education, aimed at early recognition and awareness of scabies, is important
- In widespread scabies epidemics, prophylactic treatment of a whole community may be optimal management

**Pharmacologic Interventions**
Scabicide cream or lotion, to be applied to entire body, from chin to toes (emphasize that scabicide must be applied in skin creases, between fingers and toes, between buttocks, under breasts and to external genitalia):

- **permethrin 5% dermal cream (Nix) (drug of choice)**
  Leave on skin for 8–14 hours. A single application is usually curative but medication may be reapplied after 1 week if symptoms persist.
  The safety of permethrin in pregnant and lactating women has not been established.
  Pruritus may be a problem, particularly at night.
  **hydroxyzine (Atarax), 10–25 mg PO bid and hs prn**
  Instruct client that itching, nodular skin lesions and dermatitis may persist for weeks or months, even after successful treatment. Mid-potency topical corticosteroids such as betamethasone valerate cream 0.1% may help manage these.24
**STASIS DERMATITIS**

Inflammation of skin caused by pooling of venous blood in lower limb and chronic edema. Characterized by eczema of the legs with edema, hyperpigmentation and persistent inflammation.

**CAUSES**
- Impaired circulation resulting in chronic venous insufficiency (venous valvular incompetence)
- Secondary to peripheral vascular diseases affecting legs such as varicose veins, previous deep vein thrombosis

**HISTORY**
- Itchiness
- Itch worsens with use of soaps, drying, bathing
- Swelling of ankles
- Initially, swelling is relieved by elevation; later, swelling may become constant

**PHYSICAL FINDINGS**
- Affects lower leg or sites of trauma or irritation
- Over-distended veins
- Localized swelling
- Tiny petechiae, crusting, exudates
- Dusky red deposits of hemosiderin in skin
- May progress to edema, redness and scaling of large area of legs
- Ulceration may occur

**DIFFERENTIAL DIAGNOSIS**
- Contact dermatitis
- Cellulitis

**COMPLICATIONS**
- Skin breakdown, ulceration
- Infection
- Deep venous thrombosis

**DIAGNOSTIC TESTS**
- None

**MANAGEMENT**

**Goals of Treatment**
- Control edema
- Prevent formation of ulcers
- Prevent infection

**Appropriate Consultation**
Consult physician if condition progresses despite treatment or if there is skin breakdown and ulceration.

**Nonpharmacologic Interventions**
- Encourage client to elevate legs as much as possible and prevent venous stasis
- Application of compression stockings (30–40 mm Hg) when ambulatory (prescribed by a physician or nurse practitioner)
- Application of cool normal-saline soaks or wet normal-saline dressings in acute phase
- Lubrication of area twice daily with emollient cream
- Advise not to scratch or use irritants (soap, hot water, rough clothes, rubbing)

**Pharmacologic Interventions**
None

**Monitoring and Follow-Up**
- Follow up in 1 week to determine if there is a response to conservative therapy
- Monitor for signs of skin breakdown, infection
- Advise client of the signs of infection and instruct him or her to return to clinic immediately if they occur

**Referral**
Arrange elective follow-up with physician as necessary. Patient will require a prescription for compression stockings (30–40 mm Hg).
URTICARIA (HIVES)

Local wheal and erythema of skin.

CAUSES
- Often unknown
- Chronic idiopathic
- Hypersensitivity to foods, drugs, inhaled allergens, insect bite or sting
- Hormones
- Physical agents (for example, heat, cold, sun)
- Systemic disease (for example, systemic lupus erythematosus)
- Infection (for example, hepatitis, mononucleosis or other viral illness)
- Cholinergic trigger (heat, exercise, stress)

HISTORY
- Recent medication intake including vitamins, ASA, NSAIDs, antacids, opioids and progesterone
- Recent exposure to one of above causes
- Itchy white-to-pink patches
- Client may feel unwell

PHYSICAL FINDINGS
- May occur anywhere on body
- May be localized or generalized
- Lesions multiple, irregular in shape and size
- Raised white or light rose-pink patches, usually surrounded by red halo
- Peripheral extension and coalescence of patches may occur
- Patches may wax and wane
- Individual wheals rarely persist for > 12–24 hours
- Signs of scratching may be evident
- Anxiety
- May progress to gasping for air, respiratory stridor and hoarseness

DIFFERENTIAL DIAGNOSIS
- Vasculitis
- Insect bites
- Erythema multiforme
- Systemic lupus erythematosus

COMPLICATIONS
- Recurrence
- Severe itching
- Systemic allergic response with bronchospasm
- Anaphylaxis

DIAGNOSTIC TESTS
Referral to a dermatological specialist can be considered in consultation with a physician.

MANAGEMENT

Goals of Treatment
- Relieve symptoms
- Identify precipitating factor
- Prevent recurrence
- Desensitization to the trigger antigen may be possible

Appropriate Consultation
Contact physician if any of the following pertain:
- Symptoms are severe
- Complications are present
- Client is pregnant or lactating
- Condition recurs

If shortness of breath, wheezing or swelling of tongue or mouth occurs, see “Anaphylaxis” in the chapter, “General Emergencies and Major Trauma.”

Nonpharmacologic Interventions
- Application of cool compresses to reduce itching
- Avoidance of overheating
- Temporary avoidance of hot, spicy food

Client Education
- Counsel client about appropriate use of medications (dose, frequency, side effects)
- Recommend proper skin hygiene to prevent infection
- Recommend avoidance of scratching; client should keep fingernails short and clean
- Assist client in identifying causative agent (including any recent changes in food or brands, as different food companies put different additives into their products)
- Reassure client that episodes are self-limited
**Pharmacologic Interventions**

Apply topical antipruritic agents:
- calamine lotion qid prn

Oral antihistamine to relieve itch and suppress formation of new lesions:
- diphenhydramine (Benadryl), 25–50 mg PO q6–8h for 2–7 days
  - or
- hydroxyzine (Atarax), 25–50 mg PO q6–8h for 2–7 days
  - or a second generation antihistamine
cetirizine (Reactine), 10 mg PO od

**Monitoring and Follow-Up**
- Follow up in 2–7 days
- Instruct client to return for reassessment if lesions progress despite therapy
- Instruct client to return to clinic immediately if shortness of breath, wheezing or swelling of tongue or mouth occurs; in this situation, see “Anaphylaxis” in the chapter, “General Emergencies and Major Trauma.”

**Referral**
Refer to a physician for evaluation if lesions are recurrent (to rule out allergies or an underlying organic pathology).

**WARTS (VERRUCAE)**

Common, benign epithelial hyperkeratotic tumours categorized by location and appearance. Viral transmission is through direct contact but auto-inoculation is possible.

**CAUSES**
- Human papillomavirus

**HISTORY**
- Occur most commonly in children
- Single or multiple lesions
- Risk factors: break in skin, nail biting

**PHYSICAL FINDINGS**
- Usually occur on hands, fingers, feet and face
- May be small or large
- May be single or in clusters
- Raised tumours with thickened, rough surface
- White, gray, yellow or brown
- Black dots (thrombosed capillaries) may be seen within wart
- Well-defined round or irregular margin
- Surface may be flat (flat wart)
- Firm, rough
- Lesions bleed from central capillaries when pared

**DIFFERENTIAL DIAGNOSIS**
- Corns
- Molloscum contagiosum

**COMPLICATIONS**
- Unacceptable cosmetic appearance
- Recurrence, enlargement or spread of warts
- Formation of keloid

**DIAGNOSTIC TESTS**
- None

**MANAGEMENT**

**Goals of Treatment**
- Eradication of lesion
- Control of spread

**Appropriate Consultation**

Do not treat facial warts; do not treat any warts if client is pregnant. In both of these situations, arrange consultation with physician.

**Nonpharmacologic Interventions**
- Give the client support and encouragement to persevere, as the treatment is long and tedious
- Before each application of medication: soak affected area in warm water to soften wart; use a pumice stone to remove dead tissue, or pare away dead skin with scalpel
Client Education
- Counsel client about appropriate use of medications (dose, frequency, application, protection of surrounding skin)
- Suggest strategies to avoid spread to other areas of body and to other persons

Pharmacologic Interventions
Explain to client how to apply topical treatment to warts:
- salicylic and lactic acid (Duo Film) liquid, od for up to 3 months

Remind client to protect normal surrounding skin with Vaseline petroleum jelly.

Monitoring and Follow-Up
Follow up every 2 weeks to assess response and adherence to treatment regimen.

Referral
Refer electively to a physician if no response after 12 weeks of therapy.

DERMATOLOGICAL EMERGENCIES

BURNS
Tissue injury caused by thermal contact.

Types of Burns

First-Degree (Superficial)
Involves epidermal layer of skin only.

Second-Degree (Partial thickness)
Superficial: Involves epidermis and superficial portions of the dermis
Deep: Extends to deeper dermis, damaging hair follicles and glandular tissue. Differentiation from full thickness burns is often difficult. Deep partial thickness burns can easily convert to full-thickness burn if secondary infection, mechanical trauma or progressive thrombosis occurs

Third-Degree (Full thickness)
Extends through and destroys dermis. Involves every body system and organ and extends to subcutaneous tissue, damaging muscle, bones and interstitial tissue.

CAUSES

Thermal
- Flame; tends to cause full-thickness burn, especially if clothing burns
- Molten metal, tars or melted synthetics lead to prolonged skin contact

Electrical
- Similar to crush injuries: muscle necrosis, rhabdomyolysis, myoglobinuria occur
- Require special consideration as these burns are often more serious than they appear; always assume that an electrical burn is severe

Chemical
- Strong acids are quickly neutralized or quickly absorbed
- Alkalis cause liquefaction necrosis and can penetrate deeply, leading to progressive necrosis up to several hours after contact

Radiation
- Initially appear hyperemic; may later resemble third-degree burns
- Damage can extend deep into the tissue
- Sunburns are of this type and involve moderate superficial pain
HISTORY
Defer history until airway, breathing and circulation (ABC) have been assessed and stabilized.

- Obtain accurate description of exact mechanism of injury and onset
- Inquire about any treatment given at home (for example, cooling, application of oils)
- Obtain medical history (when time permits)
- Determine medications (when time permits)
- Determine allergies (when time permits)
- Determine tetanus vaccination status

PHYSICAL FINDINGS
- Assess ABC
- Look for singed nasal hair, hypoxia, soot-stained sputum persistent cough and/or respiratory obstruction to indicate inhalational injury
- Temperature may be elevated if inflammation and infection is developing
- Heart rate may be elevated
- Blood pressure may be low if client is in shock
- Determine depth (see Table 3, “Burn Depth”) and extent (see Table 4, “Assessing Extent of a Burn [Rule of Nines]” and chart) of the burn

### Table 3 – Burn Depth

<table>
<thead>
<tr>
<th>Depth</th>
<th>Cause</th>
<th>Appearance</th>
<th>Sensation</th>
<th>Healing time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superficial (First-Degree)</td>
<td>Ultraviolet exposure</td>
<td>Dry, red</td>
<td>Painful</td>
<td>3–6 days</td>
</tr>
<tr>
<td></td>
<td>Very short flash</td>
<td>Blanches with pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superficial partial-thickness (Second-Degree)</td>
<td>Scald (spill or splash) Short flash</td>
<td>Blisters</td>
<td>Painful to temperature and air</td>
<td>7–20 days</td>
</tr>
<tr>
<td>Deep partial-thickness (Second-Degree)</td>
<td>Scald (spill) Flame Oil Grease</td>
<td>Blisters (easily unroofed) Wet or waxy dry Variable color (patchy to cheesy white to red) Does not blanch with pressure</td>
<td>Perceptive of pressure only</td>
<td>&gt; 21 days</td>
</tr>
<tr>
<td>Full-thickness (Third-Degree)</td>
<td>Scald (immersion) Flame Steam Oil Grease Chemical Electrical</td>
<td>Waxy white to leathery gray to charred and black Dry and inelastic No blanching with pressure</td>
<td>Deep pressure only</td>
<td>Never (if &gt; 2 percent total body surface area)</td>
</tr>
</tbody>
</table>
Table 4 – Assessing Extent of a Burn (Rule of Nines)

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Surface Area</th>
<th>Percentage of Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Both arms</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Anterior trunk</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Posterior trunk</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Both legs</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Palm of hands</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Adult Rule of Nines

Table 5 – Classification of Burns by Severity (Surface Area Involved)

<table>
<thead>
<tr>
<th>Severity</th>
<th>Injuries and Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>&lt; 10% total body surface area in second-degree burn&lt;br&gt; &lt; 2% total body surface area in third-degree burn</td>
</tr>
<tr>
<td>Moderate</td>
<td>10% to 20% total body surface area in second-degree burn&lt;br&gt; 2% to 5% total body surface area in third-degree burn&lt;br&gt; High voltage injury&lt;br&gt; Suspected inhalation injury&lt;br&gt; Circumferential burn&lt;br&gt; Medical problem predisposing to infection (for example, diabetes mellitus, sickle cell disease)</td>
</tr>
<tr>
<td>Severe</td>
<td>&gt; 20% total body surface area in second-degree burn&lt;br&gt; &gt; 5% total body surface area in third-degree burn&lt;br&gt; Any significant burns on hands, feet, face, eyes, ears, perineum or joints&lt;br&gt; Any known inhalation injury&lt;br&gt; High voltage burn&lt;br&gt; Significant associated head injury, fracture or soft-tissue trauma</td>
</tr>
</tbody>
</table>

Adapted from Joffe MD. (2009, May). Emergency care of moderate and severe thermal burns in children. UpToDate Online 17.2.

DIFFERENTIAL DIAGNOSIS

- Small areas of deep burning (full-thickness – 3rd degree) within superficial burn (partial-thickness – 2nd degree)
- Toxic epidermal necrolysis

COMPLICATIONS

- Increasing depth of burn
- Shock
- Secondary infection
- Sepsis
- Renal failure

DIAGNOSTIC TESTS

- None

MANAGEMENT

Management is based on the depth of the burns and an accurate estimate of total body surface area (see Table 4, “Assessing Extent of a Burn (Rule of Nines)” and Table 5, “Classification of Burns by Severity [Surface Area Involved]”).

Goals of Treatment

– Promote healing and restoration of tissue
– Prevent complications

Adjuvant Therapy

Check whether tetanus vaccination is up to date; give tetanus vaccine as needed (refer to the most recent Canadian Immunization Guide at http://www.phac-aspc.gc.ca/publicat/cig-gci/index-eng.php)

Nonpharmacologic Interventions

The first step is general first aid, cleansing and cooling the affected area.

– Thermal burn: Rapidly remove clothing or jewellery and any obvious debris in contact with the area to decrease contact time and allow accurate assessment. Immerse in cool water or apply cool compresses to reduce heat and prevent extension of burn (see “Nonpharmacologic Interventions,” “Second-Degree Burns”). Exercise caution if cooling burns of > 10% and < 20% in size. Severe burns should not be immersed or be cooled if core body temperature is below 35 degrees Celsius. Use warm intravenous fluids to maintain core temperature33

– Chemical burn: Irrigate. If dry powder is still visible on the skin, brush it away before irrigating the skin with water. Irrigate with copious amounts of water for at least 15 (preferably 30) minutes after powders have been removed. This process should be started at the accident scene if possible. Alkali burns should be irrigated for 1–2 hours after injury. Call poison control centre for specific instructions. Chemical burn depth is difficult to assess until tissue begins to slough days later. All chemical burns should be considered deep partial-thickness or full thickness until proven otherwise34

– Tar burn: Cool, clean gently and apply a petrolatum-based antibacterial ointment (for example, Polysporin) or other petroleum-based product. Do not attempt to scrape tar off the skin surface, as this can cause further damage. Avoid chemical solvents, which may cause additional burns. After 24 hours the tar can be washed away and the injury treated as a thermal burn

– Electrical burn: Be cautious and observe the client closely. Watch for cardiac arrhythmias, fractures secondary to muscle contraction and compartment syndromes.32 Cardiac monitoring for 24 hours is essential if there was significant exposure to electrical current. Apply a cervical collar. An electrical burn may cause thrombosis of any vessel in the body. Clean and dress as for a thermal burn.

TREATMENT OF MINOR BURNS

Appropriate Consultation

Consult a physician if there are any concerns about the burn or client (for example infection, age, pain).

Nonpharmacologic Interventions29,33

First-Degree Burns

– Cleanse with normal saline or sterile water

– Dressings: Cover area lightly with sterile, dry gauze, hydrogel sheet (for example, 2nd Skin™) or a non-adherent mesh gauze dressing (for example, Jelonet™, Adaptic™ dressings)

Second-Degree Burns

– Remove any attached clothing and debris

– Cleanse with sterile water or normal saline

– If using silver-coated dressing, cleanse with sterile water only

– In small and moderate size burns, cooling of the burn area using cool water or saline-soaked gauze can minimize the zone of injury. Saline-soaked gauze at 12 degrees Celsius applied for 15–30 minutes for the first several hours after injury, effectively decreases burn pain. Monitor core temperature while cooling especially if > 10% burns are involved. Discontinue cooling if body temperature is below 35 degrees Celsius. Use warm intravenous fluids to maintain core temperature

– Gently debride using sterile technique
Ruptured blisters should be removed but the management of clean, intact blisters is controversial. Never attempt needle aspiration of a blister as this increases the risk of infection. Unroofing blisters with cloudy fluid or if rupture is imminent, such as over a joint, can be recommended. Blisters present for several weeks without resorption may indicate an underlying deep partial or full thickness burn which will necessitate a referral.

Dressings: Silver-coated, low-adherent dressing (for example Acticoat™) can be used as an antimicrobial barrier layer for partial and full-thickness wounds. Use sterile water for cleansing and soaking of the dressing prior to application, if using this class of dressing. Refer to Appendix A for additional decisional tools for the ongoing management of wounds.

There is some evidence for the use of topical antibiotics (for example, Bactracin or antibiotic-impregnated dressings such as Sofratulle™) in the management of superficial partial-thickness burns. However there is no clear evidence demonstrating improved outcomes in minor burns using such treatments.

The application of non-adherent porous mesh gauze dressing to superficial partial-thickness burns can also be considered.

There is no role for steroids in the treatment of minor burns.

Client Education

- Counsel client about appropriate use of medications (dose, frequency)
- Suggest that analgesics be taken 1 hour before dressing changes
- Recommend that dressing be kept clean and dry until area healed

Pharmacologic Interventions

Analgesia:

- ibuprofen (Motrin), 200 mg, 1–2 tabs PO q6h prn
- acetaminophen (Tylenol), 325 mg, 1–2 tabs, q4h prn
- acetaminophen with codeine (Tylenol #3), 1–2 tabs q4–6h prn (maximum 12 tabs/day)

Regular dosing may be necessary rather than prn.

Larger, more severe deep partial-thickness burns require topical antibiotic ointment or impregnated dressings (ointments can make evaluation of drainage difficult). Apply:

- framycetin sulfate (Sofratulle) dressing od
- silver sulfadiazine (Flamazine), od

**Absolute contraindication** to silver sulfadiazine: term pregnancy.

Relative contraindication to silver sulfadiazine: possible cross-sensitivity to other sulfonamides, pregnancy.

Prophylactic antibiotics should rarely be required but may be considered for:

- immunocompromised clients
- clients at high risk of endocarditis
- clients with artificial joints

Broad-spectrum coverage with first-generation cephalosporin or with a penicillinase-resistant penicillin plus an aminoglycoside may be used if necessary.

Discuss choice with a physician.

**Monitoring and Follow-Up**

- Follow up in 24 hours and daily until the burn is healed
- Re-evaluate depth and extent of injury
- Monitor for healing and development of infection
- Cleanse and débride prn; tub soaks can help loosen coagulum and speed separation of necrotic debris
- Reapply Sofratulle dressing or silver sulfadiazine and dry sterile dressing

Absolute sterility is not mandatory during dressing changes; however, cleanliness and thorough cleaning of hands, sinks, tubs and any instruments used is emphasized.
TREATMENT OF MODERATE AND SEVERE BURNS

Always watch for renal failure from rhabdomyolysis and sepsis in clients with severe burns.

Appropriate Consultation

Consult a physician as soon as the client’s condition is stabilized.

Adjuvant Therapy

Perform Primary Survey

– Stabilize ABC
– Establish airway and assist ventilation as required
– Administer oxygen at 6–10 L/min or more; keep oxygen saturation > 97% to 98%
– Start IV therapy with Ringer’s lactate or normal saline
– Replace fluid losses:
  – Initiate fluids if > 15% to 20% of body surface area
  – Infuse warm Normal saline or Ringer’s lactate
  – In adults: 2–4 mL X body weight in kilograms X % of Total Body Surface Area (TBSA) burned
  – Administer one half of fluid in the first 8 hours from time of burn injury; remainder of fluid is administered over the next 16 hours
– Maintain hourly urine output at 0.5 to 1 mL/kg in adults. If output exceeds that rate, test for glucose
– Clinical signs of volume status, such as heart rate, blood pressure, pulse pressure, distal pulses, capillary refill and color and turgor of uninjured skin are monitored every hour for the first 24 hours. Inadequate fluid resuscitation is the most common cause of diminished distal pulses in the newly burned patient
– Moderate burn areas (see Table 5, “Classification of Burns by Severity [Surface Area Involved]”) can be cooled using cool water or saline soaked gauze, which can also minimize the zone of injury. Saline-soaked gauze at 12 degrees Celsius can be applied for 15–30 minutes for the first several hours after injury. Monitor core temperature while cooling especially if > 10% burns are involved. Discontinue cooling if body temperature is below 35 degrees Celsius. Use warm intravenous fluids to maintain core temperature.

Burn shock usually takes hours to develop. If shock is evident on initial presentation, look for other causes of volume loss such as a major injury elsewhere in the body. Refer to “Shock” in the chapter, “General Emergencies and Major Trauma.”

Special Considerations for Resuscitation

– Restlessness may be secondary to hypoxia
– Assume smoke inhalation (see “Inhalation of Toxic Materials” under the section, “Emergencies of the Respiratory System” in the chapter, “Respiratory System”)
– Monitor for respiratory distress or respiratory failure

Perform Secondary Survey and Identify Associated Injuries

– Insert urinary catheter if appropriate
– Insert nasogastric tube if appropriate
– Assess peripheral circulation if client has circumferential burn on extremities
– Monitor colour, capillary refilling, paresthesia and deep tissue pain

Nonpharmacologic Interventions

Wound Care

– Cover burns with sterile, dry dressings
– See “Treatment of Minor Burns,” “Nonpharmacologic Interventions,” “Second-Degree Burns” for the management of blisters
– Do not immerse or apply cold water to severe burns (see Table 5, “Classification of Burns by Severity [Surface Area Involved]”)

Pharmacologic Interventions

For analgesia, consult a physician first, if possible; otherwise give:

  morphine 5–10 mg IM or SC, or morphine 2.5–5 mg IV stat
**Monitoring and Follow-Up**

- Monitor ABC and vital signs frequently
- Watch for signs of shock (it usually takes hours for burn shock to develop)
- In circumferential burns, extensive extremity burns or electrical burns, watch for vascular or neurologic compromise, which indicates a developing compartment syndrome; immediate escharotomy is required
- Elevate extremities to minimize swelling

**Referral**

Medevac as soon as possible (using criteria in Table 6, “Criteria for Transfer of Burn Patient”).

**Table 6 – Criteria for Transfer of Burn Patient**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combination partial and full-thickness burns of 10% or more in children &lt; 10 years or adults &gt; 50 years</td>
<td>Rewarm as for frostbite (see Nonpharmacologic Interventions); pain medication should be provided</td>
</tr>
<tr>
<td>Combination partial and full-thickness burns greater than 20% in other age group (≥ 10 and ≤ 50 years)</td>
<td>Rewarm as for frostbite (see Nonpharmacologic Interventions); pain medication should be provided</td>
</tr>
<tr>
<td>Full-thickness burns of &gt; 5 % or more of body surface in any age group</td>
<td></td>
</tr>
<tr>
<td>Partial and full-thickness burns involving face, eyes, ears, hands, feet, genitalia, perineum or major joints</td>
<td>Rewarm as for frostbite (see Nonpharmacologic Interventions); pain medication should be provided</td>
</tr>
<tr>
<td>Circumferential chest or extremity burns</td>
<td></td>
</tr>
<tr>
<td>Any inhalation injury: high voltage electrical burns, lightening, significant chemical burns</td>
<td>Rewarm as for frostbite (see Nonpharmacologic Interventions); pain medication should be provided</td>
</tr>
<tr>
<td>Any patient requiring social, emotional services or children suspected of child maltreatment</td>
<td>Rewarm as for frostbite (see Nonpharmacologic Interventions); pain medication should be provided</td>
</tr>
<tr>
<td>Presence of pre-existing illness that may complicate recovery (for example, diabetes mellitus)</td>
<td>Rewarm as for frostbite (see Nonpharmacologic Interventions); pain medication should be provided</td>
</tr>
</tbody>
</table>

**FROSTBITE**

Thermal injury to tissue caused by cold. Injury may occur without (see Table 7, “Types of Cold Injury without Frostbite”) or with (see Table 8, “Classification of Frostbite”) freezing of the tissue. Freezing of the tissue is defined by the formation of ice crystals.

**Table 7 – Types of Cold Injury Without Frostbite**

<table>
<thead>
<tr>
<th>Type of Injury</th>
<th>Cause</th>
<th>Clinical Observations</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilblain (peripheral cold injury without freezing of tissue)</td>
<td>Prolonged dry exposure at temperatures above freezing</td>
<td>Affected areas are pruritic, reddish blue; may be swollen; may have blisters or superficial ulcerations; areas may be more temperature sensitive in future; no permanent injury</td>
<td>Rewarm as for frostbite (see Nonpharmacologic Interventions); pain medication should be provided</td>
</tr>
<tr>
<td>Trench foot and immersion injury</td>
<td>Prolonged wet exposure at temperatures above freezing</td>
<td>May have tissue destruction resembling partial-thickness burns, including blisters, pain, hypersensitivity to cold; temperature sensitivity may be permanent</td>
<td>Rewarm as for frostbite (see Nonpharmacologic Interventions)</td>
</tr>
</tbody>
</table>
Table 8 – Classification of Frostbite\textsuperscript{38,39}

<table>
<thead>
<tr>
<th>1st degree injury (frostnip)</th>
<th>2nd degree injury</th>
<th>3rd degree injury</th>
<th>4th degree injury</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross appearance of the injured area</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superficial, skin changes reversible</td>
<td>Superficial blisters containing clear or milky fluid with or without erythema and edema in surrounding tissue</td>
<td>Deeper blisters containing red or purple fluid, OR darkly discoulered skin without blisters</td>
<td>Extensive dark and cyanotic skin without blisters or edema</td>
</tr>
<tr>
<td>White to yellow firm plaque, numb; loss of sensation</td>
<td>Blisters appear in 24–48 hours; fluid reabsorbs; hard, blackened eschar may develop; remains sensitive to heat and cold</td>
<td>Tissue feels woody under skin; affects muscles, tendons, etc.</td>
<td></td>
</tr>
<tr>
<td>Comparable to superficial (first-degree) hot thermal burn</td>
<td>Treat conservatively; generally resolves without surgical intervention in 3–4 weeks</td>
<td>Hemorrhagic blisters and loss of distal function; may take several months to determine extent of injury</td>
<td>Frozen tissue will eventually slough</td>
</tr>
</tbody>
</table>

| **Outcome** | | | |
| Central pale area surrounded by erythema with no tissue lost but pain may be present | Limited superficial skin loss with blisters surrounded by erythema and edema | Hemorrhagic blisters and eschar formation leading to various outcomes depending on depth of injury. | Necrosis and tissue lost. Gangrene can occur within a few hours |


**CAUSE**
Exposure to cold.

**HISTORY**
Ninety percent of frostbite cases involve the hand and feet, while cheeks, nose, ears and penis are commonly affected.\textsuperscript{40}

\textit{Frostnip}
- Initially cold, burning pain
- Area becomes blanched
- With rewarming, area becomes reddened

\textit{Frostbite}
- Cold burning pain progresses to tingling
- Later, numbness or heavy sensation
- Area becomes pale or white
- Rewarming causes pain, throbbing or burning sensation
- Evaluate for hypothermia
- Contributing factors: alcohol intoxication, homelessness, inappropriate clothing for weather

**PHYSICAL FINDINGS**
- Variable
- Temperature may be reduced if there is associated hypothermia or elevated if there is infection
- Client in mild-to-acute distress
- Affected area may be reddened, blue or white
- Edema may be present
- Blisters may be present
- Infection may be evident if client presents later
- Area is initially cold and hard to touch
- Sensation reduced
- If rewarming has occurred, area will be warm and tender
- Excessive sweating
- May be necrosis present

\textit{See also Table 7, “Types of Cold Injury without Frostbite” and Table 8, “Classification of Frostbite.”}
DIFFERENTIAL DIAGNOSIS
- Superficial versus deep frostbite

COMPLICATIONS
- Infection
- Hypothermia
- Tissue loss
- Hypersensitivity to cold in affected area may last several years or be permanent

MANAGEMENT

Goals of Treatment
- Identify associated hypothermia and/or dehydration (see “Hypothermia” in the chapter “General Emergencies and Major Trauma”; see “Dehydration” in the adult chapter “Gastrointestinal System”)
- Rewarm parts
- Control pain (active rewarming is very painful)
- Address wound care
- Prevent infection
Treat frostnip and superficial frostbite as you would a superficial first-degree thermal burn (see “Nonpharmacologic Interventions,” “First-Degree Burns”).

Appropriate Consultation
Consult a physician for all but first-degree (frostnip) injury.

Adjuvant Therapy
Check whether tetanus vaccination is up to date; give tetanus vaccine as needed (refer to the most recent Canadian Immunization Guide at http://www.phac-aspc.gc.ca/publicat/cig-gci/index-eng.php).

Nonpharmacologic Interventions
- Rapidly rewarm affected part by immersing it in 40° C water (slow rewarming is not good)
- Continue warming until skin is warm, soft, pliable and flushed red
- Rest affected limb; avoid irritation to skin
- Be careful; do not rub and do not use hot water bottles
- Prevent refreezing; if in the field, do not thaw extremity until it is certain that it will not refreeze
- Elevate limb once it is warmed; leave exposed if possible
- Do not break blisters unless they interfere with range of motion in a limb
- Separate toes and fingers with dry cotton gauze
- Wrap client loosely in bulky soft material and protect from injury and exposure during transport
- Give warm fluids to drink
- Forbid smoking; nicotine narrows small arteries reducing blood flow

Prevention Education
- Dress in layers with appropriate cold-weather gear
- Cover all exposed skin areas
- Prepare properly for trips in cold climates

Pharmacologic Interventions
Mild Frostbite
Analgesia for pain:
- ibuprofen (Motrin), 200 mg, 2 tabs PO q4h prn (preferred choice)
- or
- acetaminophen (Tylenol), 325 mg, 1–2 tabs PO q4h prn

Moderate to Severe Frostbite
For analgesia, as pain may be severe during rewarming, consult a physician first, if possible; otherwise give:
- morphine 5–10 mg IM or SC, or morphine 2.5–5mg IV stat

Upon physician consult, continue with pain control as appropriate, for example:
- morphine 2–4 mg, IV or IM or SC q3–4h prn titrating to effect

Be alert for respiratory depression with opioids.
**Types of Traumatic Wound**

Wounds that result from trauma can be categorized by type.

<table>
<thead>
<tr>
<th>Wound type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laceration</td>
<td>Open wound that results from blunt or sharp trauma to the skin</td>
</tr>
<tr>
<td>Abrasion</td>
<td>Skin lesion caused by tangential trauma to the dermis and epidermis, similar to a burn</td>
</tr>
<tr>
<td>Avulsion</td>
<td>Full thickness tissue loss that prevents the approximation of the edges of the wound. Clean edges, low cellular injury and low risk of infection</td>
</tr>
<tr>
<td>Puncture wound</td>
<td>Tissue penetration by a blunt or sharp object</td>
</tr>
<tr>
<td>Foreign body</td>
<td>Any object (for example, wood or metal splinter, body jewellery, glass, fishhook, fragment from gunshot, needles) that becomes embedded in any part of the body. Vegetative foreign bodies (for example, thorns or wood) are highly reactive, lead to infection and should be removed as soon as possible</td>
</tr>
<tr>
<td>Missile or velocity wound</td>
<td>Skin lesions caused by an object entering the body at a high speed</td>
</tr>
<tr>
<td>Bites</td>
<td>Skin lesion self-inflicted (human) or as a result of a person-to-person (human) or animal contact are at increased risk of infection</td>
</tr>
</tbody>
</table>

**Monitoring and Follow-up**

**Mild Frostbite**

Reassess and re-dress wound daily for 4–7 days, until the wound is healing well. Monitor for signs of infection.

**Referral**

Medevac anyone with moderate-to-severe frostbite to hospital as soon as possible.

**Skin Wounds of Traumatic Origin**

Breach in the integrity of the external surface of the body

**Causes**

- Blunt trauma: split- or crush-type injuries will swell more and tend to have more devitalized tissue and a higher risk of infection
- Sharp trauma: clean edges, low cellular injury and low risk of infection
- Bite injury: animal or human bites have a high risk of infection

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2010  Clinical Practice Guidelines for Nurses in Primary Care
HISTORY
- Mechanism of injury, risk of foreign body
- Contaminants: wound contact with manure, rust, dirt, etc., will increase risk of infection
- Wounds sustained in barnyards or stables should be considered contaminated (Clostridium tetani is indigenous in manure)
- Time of injury (after 3 hours, the bacterial count in a wound increases dramatically)
- Amount of blood lost
- Loss of function in nearby tendons, ligaments, nerves (sensation)
- Medical illnesses, conditions, treatments (for example, diabetes mellitus, chemotherapy, steroids, peripheral vascular disease and malnutrition may delay wound-healing and increase the risk of infection)
- Allergies (to drugs, dressings, local anesthetics)
- Medications currently used (especially steroids, anticoagulants)
- Status of tetanus vaccination

PHYSICAL EXAMINATION
- Temperature
- Heart rate, blood pressure (if significant blood loss from wound)
- Dimensions of wound, including depth
- Assess for infection:
  - Redness
  - Heat
  - Tenderness
  - Discharge
  - Fever
  - Local lymphadenopathy

Assess integrity of underlying structures (nerves, ligaments, tendons, blood vessels):
- Vascular injury: Capillary refill should be checked distally
- Neurologic injury: Check distal muscle strength, movement distal to wound and sensation. Always check sensation before administering anesthesia. For hand and finger lacerations check two-point discrimination, which should be < 1 cm at the fingertips
- Tendons: Can be evaluated by inspection, but individual muscles must also be tested for full range of motion and full strength. Assess range of motion of all body parts surrounding the wound site
- Bones: Check for open fracture or associated fractures
- Foreign bodies: Inspect the area

COMPLICATIONS
- Infection
- Poor healing
- Laceration of nerve
- Compartment syndrome: loss of sensation may be the first sign; pain severe, out of proportion to injury
- Crush injury may decrease two-point discrimination, and it may take several months to recover
- Injury to major vascular structures (for example, artery)
- Injury to tendon
- MRSA from animal bites
- Rabies infection

DIAGNOSTIC TESTS
- Usually none
- If there is strong clinical suspicion of foreign body, x-ray or ultrasound may be necessary

MANAGEMENT

Goals of Treatment
- Restore function
- Minimize risk of infection
- Repair injured tissue integrity
**Appropriate Consultation**
Consult a physician if any of the following pertain:
- Wound is extensive, deep or infected
- Muscle, tendon, nerve or vascular compromise is present or suspected
- Significant tissue deficit is present
- Wound is more than 12 hours old
- The wound is a result of a bite

**Adjuvant Therapy**
Check whether tetanus vaccination is up to date; give tetanus vaccine as needed (refer to the most recent Canadian Immunization Guide at http://www.phac-aspc.gc.ca/publicat/cig-gci/index-eng.php).

**Nonpharmacologic Interventions**

**Wound Repair: General Principles**
- Most wounds may be closed with tissue adhesive or sutures up to 12 hours after the injury. Refer to the Pediatric Procedures chapter for indications and contraindications to the use of tissue adhesives. Use clinical judgement when choosing which wounds to close and by which method.
- Do not suture or glue wounds that are infected or inflamed, dirty wounds, human or animal bites, puncture wounds, neglected wounds or severe crush wounds
- Do not suture diabetic or steroid-dependent patients with dissolvable sutures
- Wounds on the face that are up to 24 hours old may be closed after thorough cleaning. The blood supply in this area is much better and the risk of infection therefore much lower
- Do not clamp vascular structures until it is determined if the vessel is a significant one needing repair

**Homeostasis**
Direct pressure is the first choice for controlling bleeding. If a fracture is involved, immobilization will help control bleeding.

**Skin Preparation**
- Debridement: Using aseptic technique, remove devitalized tissue; avoid taking healthy tissue.
  High-pressure irrigation is the most effective means of cleansing a wound. Use normal saline in a 60 mL syringe with an 18- or 19-gauge needle or IV catheter attached
  Scrubbing does not cleanse the wound as well, and using any disinfectant in the wound damages healthy cells needed for healing.
- Skin disinfection: Can be performed with povidone-iodine solution. Avoid getting the solution in the wound, because it will impede healing. Hair can be clipped in the area if necessary. Shaving hair is not recommended.
  Never shave eyebrows. They are needed for alignment of the wound and may not grow back.

**Open Wound Care**
- To keep the wound open, pack it with bulky, wet saline gauze dressings daily. This will keep the tissue moist and help debride
- Avoid iodine dressings because they damage healthy tissue and slow granulation
- When clean granulation tissue is apparent, secondary closure may be considered; alternatively, the dressing can be changed to dry, sterile, packing material

**Wound Closure**
- Steri-Strips: If the wound is small and shallow and falls together naturally along lines where there is no tension, it may only need to be reinforced with steri-strips. Dress the wound with dry sterile gauze. Instruct client to keep wound clean and dry for 48 hours
- Tissue adhesive (TA): If a laceration is above the fascia and measures 5 centimetres (cm) or less in length and 0.5 cm or less in width, and if edges can be approximated easily, with no or minimal tension, tissue adhesives may be considered.
  Refer to the Pediatric Procedures chapter for contraindications to the use of TA
- Suturing: Larger wounds need suturing (see Table 10, “Types of Suture Material for Particular Sites”). Close in layers as necessary using simple interrupted sutures
Table 10 – Types of Suture Material for Particular Sites

<table>
<thead>
<tr>
<th>Type of Suture</th>
<th>Size</th>
<th>Body Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-absorbable</td>
<td>Nylon-Dermalon, Ethilon</td>
<td>#3-0, 4-0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#5-0, 6-0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#3-0, 4-0, 5-0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#3-0, 4-0, 5-0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#3-0, 4-0, 5-0</td>
</tr>
<tr>
<td>Absorbable</td>
<td>Polygalactin (Vicryl, Dexon)</td>
<td>#5-0, 6-0</td>
</tr>
<tr>
<td></td>
<td>Monofilament (Monocryl)</td>
<td>#4-0, 5-0</td>
</tr>
</tbody>
</table>

Types of Suture Needles

- Precision-point cutting needles and small sutures (#5-0 or #6-0) should be chosen when a cosmetic closure is important (for example, on the face).
- Conventional cutting needles with #4-0 or #3-0 nylon sutures are used for routine skin closure.

Local Anesthetic for Suturing

Lidocaine (1% is the most frequently used local anesthetic [onset 2–5 minutes, duration 30–60 minutes]):

- lidocaine (Xylocaine), 1% without epinephrine, 4.5 mg/kg (maximum 30 mL)

Nurses should use 1% lidocaine without epinephrine as the first choice when suturing a wound as epinephrine prolongs the anesthetic effect and is contraindicated for areas with end arteries or poor circulation (digits, nasal tip, ears, penis). Although rare, an allergic reaction to lidocaine is possible; ensure access to an anaphylaxis kit.

Never use lidocaine with epinephrine on the ears, nose, fingers, toes or penis.

- Use a 27- or 30-gauge needle to inject the lidocaine
- Infiltrate the anaesthetic slowly through the open wound edge, avoiding the intact skin
- Always pull back on plunger to ensure the needle is not in a blood vessel
- Administer subsequent injections into an area that has already been anaesthetized
- It may be of value to dribble a small amount of lidocaine onto the wound before infiltration to provide some initial anaesthesia
- Give anaesthetic 5 minutes to be effective

- If extensive suturing is required, it may be necessary to anaesthetize and suture a small area at a time to prevent the anaesthetic from wearing off before suturing is complete
- Toxic effects of lidocaine: Observed if anaesthetic is injected into a blood vessel inadvertently; symptoms include dizziness, tinnitus, nystagmus, seizures, coma, respiratory depression, arrhythmias and seizures (all symptoms are usually self limiting)

Ongoing Management of Wounds

The general principals in the ongoing management of wounds include the need for debridement, control of the bacterial burden and control of the moisture balance. A number of Best Practice Guidelines from the Registered Nurses Association of Ontario address common wound care issues. Refer to the “Chronic Wounds” section for the list of guidelines available. A selection of decisional tools in the management of wounds can be found in Appendix A.

Pharmacologic Interventions

Antibiotic Prophylaxis

There is no medical indication for prophylactic antibiotics in routine, uncontaminated skin wounds. However, consider prophylactic antibiotic use for clients prone to endocarditis, clients with hip prostheses or lymphedema, diabetic clients with a contaminated foot wound, or other clients with peripheral vascular disease or immunocompromise:

- cloxacillin, 500 mg PO qid for 7 days
- For clients with allergy to penicillin:
  - erythromycin, 1g PO daily divided bid, tid or qid
Topical Antibiotics
Consider topical antibiotic ointment for wounds on face and torso:
- bacitracin/polymyxin B (Polysporin) ointment, tid or qid for 5 days

Alternatives include the use of antibiotic-impregnated dressings such as Sofratulle™ or silver-coated low-adherent dressing (for example, Acticoat™) which act as an antimicrobial barrier.

Antibiotic ointment should not be left on wounds of the distal extremities for more than 24–48 hours because it may lead to maceration and could delay wound-healing.

Antibiotics for Bites

Human Bites
Antibiotics should be given prophylactically for all human bites:
- amoxicillin/clavulanate (Clavulin), 875 mg PO bid for 3–5 days

Antibiotics for an infection that is already present, the drug of choice for all human bites:
- amoxicillin/clavulanate (Clavulin), 875 mg PO bid for 7–10 days

Cefuroxime axetil or doxycycline (for those > 8 years of age) are acceptable alternatives.

Consider IV antibiotics if infection has already occurred, especially for a bite on the hand.

Cat Bites
Antibiotics should be given prophylactically for all cat bites:
- amoxicillin/clavulanate (Clavulin), 875 mg PO bid for 3–5 days

Antibiotics for an infection that is already present, the drug of choice for all cat bites:
- amoxicillin/clavulanate (Clavulin), 875 mg PO bid for 7–10 days

Cefuroxime axetil or doxycycline (for those > 8 years of age) are alternatives.

Dog Bites
About 20% of dog bites become infected and prophylaxis is only recommended under certain circumstances: moderate/severe bites; crush injury/edema; age > 50 years; puncture wounds; bone/joint involvement; injuries to hand, foot, face, genitalia; splenectomized patients; immunocompromised. These should be discussed with a physician. If there is a need to treat, amoxicillin/clavulanate is the drug of choice (as for other types of bites). Consider need for rabies prophylaxis (see “Rabies” in the chapter, “Communicable Diseases” and the most recent Canadian Immunization Guide for details at http://www.phac-aspc.gc.ca/publicat/cig-gci/index-eng.php).

Monitoring and Follow-up
- Risk of infection highest in the first 48 hours, so all wounds should be rechecked daily until it is clear that infection is not developing
- After that, follow up when it is time to remove sutures
- Instruct client to return for reassessment if redness, swelling, discharge, pain or fever develops

General Guidelines for Removing Sutures
- Wound appears clean and healed
- Wound appears dry; no drainage evident
- For larger wounds it is advisable to initially remove alternate sutures to ensure that wound edges stay approximated
- Sutures should be removed according to the recommendations in Table 11, “Timing of Removal of Sutures”
Table 11 – Timing of Removal of Sutures

<table>
<thead>
<tr>
<th>Wound location</th>
<th>Removal time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face</td>
<td>3–5 days; steri-strip reinforcement after suture removal</td>
</tr>
<tr>
<td>Scalp</td>
<td>5–8 days</td>
</tr>
<tr>
<td>Neck</td>
<td>3–5 days</td>
</tr>
<tr>
<td>Chest</td>
<td>7–10 days</td>
</tr>
<tr>
<td>Abdomen</td>
<td>7–10 days</td>
</tr>
<tr>
<td>Back</td>
<td>10–12 days</td>
</tr>
<tr>
<td>Upper extremity</td>
<td></td>
</tr>
<tr>
<td>Nonjoint surface</td>
<td>7–10 days</td>
</tr>
<tr>
<td>Joint surface</td>
<td>10–12 days (consider splinting)</td>
</tr>
<tr>
<td>Lower extremity</td>
<td></td>
</tr>
<tr>
<td>Thigh</td>
<td>7–10 days</td>
</tr>
<tr>
<td>Knee</td>
<td>12–14 days</td>
</tr>
<tr>
<td>Lower leg</td>
<td>7–10 days</td>
</tr>
<tr>
<td>Foot</td>
<td>7–10 days</td>
</tr>
</tbody>
</table>

Increase time before removal of sutures in diabetic or steroid-dependent clients in whom healing may take several weeks. The use a heavier type of suture (for example, #3-0) and close monitoring for signs of infection may be required.

Referral

Consider consulting a physician:

- When there is suspicion of injury to major structures (for example, tendons, ligaments, nerves, vessels). They may require plastic surgery repair
- For lacerations involving eyelid or ear cartilage, that cross vermilion border of lip, and that are complex or very irregularly shaped
- Open fracture is an indication for surgical debridement and repair (except in the case of fracture of a distal phalanx, where copious irrigation and oral antibiotics are acceptable treatment if the injury can be monitored carefully for infection and the bone is aligned)


**APPENDIX A – DECISIONAL TOOLS IN THE ONGOING MANAGEMENT OF WOUNDS**

<table>
<thead>
<tr>
<th>Key Factors in Deciding Method of Debridement</th>
<th>Surgical</th>
<th>Enzymatic</th>
<th>Autolytic</th>
<th>Biologic</th>
<th>Mechanical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Tissue selectivity</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Painful wounds</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Exudate</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Infection</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Cost</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Where 1 is most desirable and 5 is least desirable.
Clinical Signs and Symptoms of Wound Infection

<table>
<thead>
<tr>
<th>Clinical Signs and Symptoms of Wound Infection</th>
<th>Superficial, Increased Bacterial Burden (Critically Colonized)</th>
<th>Deep Wound Infection</th>
<th>Systemic Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-healing</td>
<td>Pain</td>
<td>Fever</td>
<td></td>
</tr>
<tr>
<td>Bright red granulation</td>
<td>Swelling, induration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frangible and exuberant granulation</td>
<td>Erythema</td>
<td>Rigors</td>
<td></td>
</tr>
<tr>
<td>New areas of breakdown or necrosis on the wound surface (slough)</td>
<td>Increased temperature</td>
<td>Chills</td>
<td></td>
</tr>
<tr>
<td>Increased exudates that may be translucent or clear before becoming purulent</td>
<td>Increased size or satellite areas</td>
<td>Hypotension</td>
<td></td>
</tr>
<tr>
<td>Foul odor</td>
<td>Undermining</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probing to bone</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cleansing Solutions

<table>
<thead>
<tr>
<th>Agent</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium hypochlorite solution</td>
<td>High pH causes irritation to skin. Dakins Solution and Eusol (buffered preparation) can select out gram-negative micro-organisms.</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>De-sloughing agent while effervescting. Can harm healthy granulation tissue and may form air emboli if packed in deep tissue.</td>
</tr>
<tr>
<td>Mercuric chloride, crystal violet, Proflavine</td>
<td>Bacteriostatic agents active against gram-positive species only. May be mutagens and can have systemic toxicity.</td>
</tr>
<tr>
<td>Cetrimide (quartemary ammonium)</td>
<td>Good detergent, active against gram-positive and –negative organisms, but high toxicity to tissue.</td>
</tr>
<tr>
<td>Chlorhexidine</td>
<td>Active against gram-positive and –negative organisms, with small effect on tissue.</td>
</tr>
<tr>
<td>Acetic acid (0.5% to 5%)</td>
<td>Low pH, effective against Pseudomonas species, may select out S. aureus.</td>
</tr>
<tr>
<td>Providone iodine</td>
<td>Broad spectrum of activity, although decreased in the presence of pus or exudates. Toxic with prolonged use or over large areas.</td>
</tr>
</tbody>
</table>

Topical Antimicrobials Useful in Wounds with Overt and Covert Infection

<table>
<thead>
<tr>
<th>Agent</th>
<th>S. Aureus</th>
<th>MRSA</th>
<th>Streptococcus</th>
<th>Pseuromonas</th>
<th>Anaerobes</th>
<th>Comments</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadexomer Iodine</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>Also debrides. Low potential for resistance. Caution with thyroid disease.</td>
<td>Low risk and effective</td>
</tr>
<tr>
<td>Silver</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>Do not use with saline. Low potential for resistance.</td>
<td></td>
</tr>
<tr>
<td>Silver Sulfadiazine</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>Caution with sulphonamide sensitivity</td>
<td></td>
</tr>
<tr>
<td>Polymycin B Sulphate/Bacitracin Zinc</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>Bacitracin in the ointment is an allergen; the cream formulation contains the less-sensitizing gramicidin.</td>
<td>Use selectively</td>
</tr>
<tr>
<td>Mupirocin</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Reserve for MRSA and other resistant Gram+ species</td>
<td></td>
</tr>
<tr>
<td>Metronidazole</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td>Reserve for anaerobes and odour control. Low or no resistance of anaerobes despite systemic use.</td>
<td></td>
</tr>
<tr>
<td>Benzoyl peroxide</td>
<td>Weak</td>
<td>Weak</td>
<td>Weak</td>
<td>Weak</td>
<td></td>
<td>Large wounds. Can cause irritation and allergy.</td>
<td>Use with caution</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td>Reserve for oral/IV use-topical use may encourage resistance.</td>
<td></td>
</tr>
<tr>
<td>Fusidin ointment</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td>Contains lanolin (except in the cream).</td>
<td></td>
</tr>
<tr>
<td>Polymyxin B Sulphate/Bacitracin Zinc neomycin</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>Neomycin component causes allergies, and possibly cross-sensitized to aminoglycosides.</td>
<td></td>
</tr>
</tbody>
</table>

Where “+” indicated the infection(s) to which the agent is useful.
## Modern Classes of Dressing

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
<th>Tissue Debridement</th>
<th>Infection</th>
<th>Moisture Balance</th>
<th>Indications/Contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Films/Membranes</td>
<td>Semi-permeable adhesive sheet. Impermeable to H₂O molecules and bacteria</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Moisture vapour transmission rate varies from film to film. Should not be used on draining or infected wounds. Create occlusive barrier against infection.</td>
</tr>
<tr>
<td>2. Non-adherent</td>
<td>Sheets of low adherence to tissue. Non-medicated tulles.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Allow drainage to seep through pores to secondary dressing. Facilitate application of topicals.</td>
</tr>
<tr>
<td>3. Hydrogels</td>
<td>Polymers with high H₂O content. Available in gels, solid sheets or impregnated gauze.</td>
<td>++</td>
<td>-</td>
<td>+</td>
<td>Should not be used on draining wounds. Solid sheets should not be used on infected wounds.</td>
</tr>
<tr>
<td>4. Hydrocolloids</td>
<td>May contain gelatin, sodium carboxymethylcellulose, polysaccharides and/or pectin. Sheet dressings are occlusive with polyurethane film outer layer</td>
<td>+++</td>
<td>-/+</td>
<td>++</td>
<td>Should be used with care on fragile skin. Should not be used on heavily draining or infected wounds. Create occlusive barrier to protect the wound from outside contamination. Characteristic odour may accompany dressing change and should not be confused with infection.</td>
</tr>
<tr>
<td>5. Calcium alginates</td>
<td>Sheets or fibrous ropes of calcium sodium alginate (seaweed derivative). Have hemostatic capabilities.</td>
<td>++</td>
<td>+</td>
<td>+++</td>
<td>Should not be used on dry wounds. Low tensile strength – avoid packing into narrow deep sinuses. Bioreabsorbable.</td>
</tr>
<tr>
<td>6. Composite dressing</td>
<td>Multi-layered, combination dressings to increase absorbency and autolysis.</td>
<td>+</td>
<td>-</td>
<td>+++</td>
<td>Use on wounds where dressing may stay in place for several days.*</td>
</tr>
<tr>
<td>7. Foams</td>
<td>Non-adhesive or adhesive polyurethane foam. May have occlusive backing. Sheets or cavity packing. Some have fluid lock.</td>
<td>-</td>
<td>-</td>
<td>+++</td>
<td>Use on moderate to heavily draining wounds. Occlusive foams should not be used on heavily draining or infected wounds.*</td>
</tr>
<tr>
<td>8. Charcoal</td>
<td>Contains odour-adsorbent charcoal within product.</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>Some charcoal products are inactivated by moisture. Ensure that dressing edges are sealed.</td>
</tr>
<tr>
<td>9. Hypertonic</td>
<td>Sheet, ribbon or gel impregnated with sodium concentrate.</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>Gauze ribbon should not be used on dry wounds. May be painful on sensitive tissue. Gel may be used on dry wounds.</td>
</tr>
<tr>
<td>10. Hypropillic fibres</td>
<td>Sheet or packing strip of sodium carboxymethylcellulose. Converts to a solid gel when activated by moisture (fluid lock).</td>
<td>+</td>
<td>-</td>
<td>+++</td>
<td>Best for moderate amount of exudate. Should not be used on dry wounds. Low tensile strength – avoid packing into narrow deep sinuses.</td>
</tr>
<tr>
<td>11. Antimicrobials</td>
<td>Silver or cadexomer iodine with vehicle for delivery: sheets, gels, alginates, foams or paste.</td>
<td>+</td>
<td>+++</td>
<td>+</td>
<td>Broad spectrum against bacteria. Not to be used on patients with known hypersensitivities to any product components.</td>
</tr>
<tr>
<td>12. Other devices</td>
<td>Negative pressure wound therapy (NPWT) applies localized negative pressure to the surface and margins of the wound. Dressings consist of polyurethane or polyvinyl alcohol materials.</td>
<td>-</td>
<td>+</td>
<td>+++</td>
<td>This pressure-distributing wound dressing actively removes fluid from the wound and promotes wound edge approximation. Advanced skill required for patient selection for this therapy.</td>
</tr>
<tr>
<td>13. Biologics</td>
<td>Living human fibroblasts provided in sheets at ambient or frozen temperatures. Extracellular matrix. Collagen-containing preparations. Hyaluronic acid. Platelet derived growth factor.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Should not be used on wounds with infection, sinus tracts, excessive exudate, or on patients known to have hypersensitivity to any of the product components. Cultural issues related to source. Advanced skill required for patient selection for this therapy.</td>
</tr>
</tbody>
</table>

Where "++" indicates the appropriateness of the dressing to address tissue debridement, infection and/or moisture balance. Where the local wound care situation is identified by "-", the dressing is not considered beneficial. * Use with caution if critical colonization is suspected.
Internet addresses are valid as of June 2010.


INTERNET GUIDELINES


ENDNOTES


21 Goldstein BG, Goldstein AO. (May 2009). Tinea versicolor. Available at: http://www.uptodate.com/online/content/topic.do?sessionid=38FA1A7C03A302BF20D364EC67E74CA5.0604?topicKey=drug_a_k/138286&drug=true
29 Morgan ED, Miser WF. (May 2009). Treatment of minor thermal burns. Available at: http://www.uptodate.com/online/content/topic.do?topicKey=ad_traum/4555&selectedTitle=1~150&source=sear ch_result


