CHAPTER 16 – SKIN

First Nations and Inuit Health Branch (FNIHB) Pediatric Clinical Practice Guidelines for Nurses in Primary Care.
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HISTORY OF PRESENT ILLNESS AND REVIEW OF SYSTEMS

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

- Onset (sudden or gradual)
- Skin site(s) involved
- Chronology, evolution of skin lesions
- Date(s) and site(s) of recurrence(s)
- Current situation (improving or deteriorating)
- Nature of symptom: intermittent or continuous
- Influence of environmental factors
- Potential causative factors
- Measures taken to relieve symptoms
- Associated systemic symptoms (for example, fever, anorexia, myalgia)

CARDINAL SYMPTOMS

In addition to the general characteristics outlined above, additional characteristics of specific symptoms should be elicited, as follows.

Skin
- Changes in texture, colour, pigmentation
- Unusual dryness or moisture
- Discharge or bleeding
- Itching, burning
- Pain
- Numbness
- Rash
- Bruises, petechiae
- Lesions
- Changes in moles or birthmarks

Hair
- Changes in amount, texture, distribution

Nails
- Changes in texture, structure, colour

MEDICAL HISTORY
- Allergic manifestation (for example, asthma, hay fever, urticaria, eczema)
- Recent or current viral or bacterial illness
- Allergies to drugs, foods or other chemical substances
- Sensitivity to sunlight
- Medications: current and past prescription and over-the-counter drugs, including antibiotics, steroid creams
- Immunosuppression (for example, HIV/AIDS)
- Seborrheic dermatitis
- Dermatitis
- Psoriasis
- Diabetes mellitus

FAMILY HISTORY
- Allergies (for example, seasonal hay fever, allergies to foods)
- Asthma
- Seborrheic dermatitis
- Psoriasis
- Others at home with similar symptoms (for example, rash)

PERSONAL AND SOCIAL HISTORY
- Obesity
- Inadequate personal hygiene
- Hot or humid environment, poor environmental sanitation
- Exposure to new chemicals (for example, soaps), foods, pets or plants
- Emotional disturbance
- History of sensitive skin
- Others at home, work or school with similar symptoms
- Recent travel

For more information on the history and physical examination of the skin in older children and adolescents, see the chapter, “Skin” in the adult clinical guidelines.
**PHYSICAL EXAMINATION**

**GENERAL APPEARANCE**

- Apparent state of health
- Appearance of comfort or distress
- Colour (for example, flushed, pale)
- Nutritional status (obese or emaciated)
- State of hydration
- 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)
- Bruising, petechiae
- Edema (dependent, facial)
- Induration (firm to touch)
- Individual lesions (colour, type, texture, shape, general pattern of distribution, character of edge, whether raised or flat)
- Hair (amount, texture, distribution)
- Nails (shape, texture, discolouration, grooving)
- Mucous membranes (for example, moisture, lesions)
- Skin folds (for example, rashes, lesions)
- Joint involvement

**Skinned Lesions Up to 1 cm in Greatest Dimension**

A: Macule – a flat, circumscribed area of discoloration of the skin or mucous membrane up to 1 cm in its greatest dimension.

B: Papule – a solid, elevated lesion of the skin or mucous membrane up to 1 cm in its greatest dimension.

C: Vesicle – a fluid-filled, superficial, elevated lesion of the skin or mucous membrane, up to 1 cm in its greatest dimension.

**OTHER ASPECTS**

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

**DESCRIBING LESIONS**

Lesions of the skin and mucous membranes are recognized by:

- Type of lesion (see the figures, “Skin Lesions Up to 1 cm in Greatest Dimension,” “Skin Lesions Greater than 1 cm in at Least One Dimension,” and “Skin Lesions of Variable Size”)
- Colour
- Margination (ill or well defined)
- Palpation:
  - consistency (soft, firm, hard, fluctuant, board like)
  - temperature on palpation (hot, cold)
  - mobility
  - Shape
  - Number and arrangement on the skin (grouped or disseminated)
- Distribution:
  - extent (for example, isolated, localized, generalized)
  - pattern (for example, symmetric, exposed areas, pressure points or random)

For more descriptions also see Table 1, “Major Types of Skin Lesions” in the chapter “Skin” in the adult clinical practice guidelines.
Skin Lesions Greater than 1 cm in at Least One Dimension

A: Patch – a flat, circumscribed area of discolouration of the skin or mucous membrane, with at least one dimension greater than 1 cm.

B: Plaque – a solid, elevated lesion of the skin or mucous membrane, with at least one dimension greater than 1 cm.

C: Nodule – a solid, elevated lesion of the skin or mucous membrane, with the added dimension of depth into the underlying tissue, with at least one dimension greater than 1 cm.

D: Tumour – a solid, elevated lesion of the skin or mucous membrane, with the added dimension of depth into the underlying tissue (to a greater extent than for a nodule), with at least one dimension greater than 1 cm.

E: Bulla, a fluid-filled, superficial, elevated lesion of the skin or mucous membrane, with at least one dimension greater than 1 cm.

Skin Lesions of Variable Size

Wheal – an irregularly shaped, elevated, solid, changing, transient lesion of the skin or mucous membrane, due to cutaneous edema. Other lesions of variable size include pustules (vesicle or bulla containing pus rather than clear fluid) and telangiectasias (fine, often irregular red lines produced by dilatation of a capillary).
ACNE VULGARIS

Chronic inflammatory disease of the skin with an eruption of papules or pustules. Most common skin disorder in adolescents and seen to some degree in all adolescents.

Non-inflammatory lesions, such as open and closed comedones, are precursors to inflammatory lesions.

Although not life-threatening, acne may have serious psychological effects on self-conscious adolescents.

CAUSES AND PATHOGENESIS

Acne involves the sebaceous follicles, which are sebaceous glands emptying into hair follicles. Found mainly on the face, chest and back, these follicles are stimulated at puberty by increasing levels of androgen. The follicles produce greater amounts of sebum (oil), which combines with keratin from the lining of the follicle to form plugs (comedones). Bacteria (specifically Propionibacterium acnes) invade the comedones and produce lipases, which break down the sebum into free fatty acids. These compounds cause inflammation and subsequent rupture of the follicle.

HISTORY

– Rash, lesions on face
– Psychological effects, including embarrassment and social withdrawal

PHYSICAL FINDINGS

Non-Inflammatory Lesions

Comedones
– Blocked follicle
– Open comedo (blackhead): epithelium-lined sac filled with keratin and lipids with a widely dilated orifice, cylindrical, 1–3 mm in length; black colour because of melanin pigment in dermis and exposure to air (which causes discoloration of lipids and melanin); colour is not due to dirt
– Closed comedo (whitehead): precursor to inflammatory lesion; small, flake-shaped, white or skin-coloured, slightly elevated papule just beneath the surface of the skin

Inflammatory Lesions

Papules
– Develop from obstructed follicles that become inflamed

Pustules
– Larger lesions, more inflamed than papules; superficial or deep, contain a small amount of white pus-like material

Nodules and Cysts
– Nodules: Formed when deep pustules rupture and form abscesses
– Cysts: End product of pustules or nodules
– Seen in more severe cases
– Prone to re-inflammation
– May scar on healing

Table 1 – Determining Acne Severity

<table>
<thead>
<tr>
<th>Mild (localized, inflammatory)</th>
<th>Moderate (widespread, resistant, inflammatory)</th>
<th>Severe (scarring, inflammatory)</th>
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<tr>
<td>Comedones</td>
<td>Comedones</td>
<td>Scars may be present</td>
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<tr>
<td>Papules</td>
<td>Many papules</td>
<td>Scars on face/ chest and back</td>
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<tr>
<td>Few pustules</td>
<td>Many pustules</td>
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DIFFERENTIAL DIAGNOSIS

– Fungal infection
– Rosacea
– Flat warts
– Molluscum contagiosum

COMPLICATIONS

– Scarring
– Hyper-pigmentation of affected areas of the skin

DIAGNOSTIC TESTS

– None

MANAGEMENT

Goals of Treatment

– Control symptoms
– Prevent complications
**Appropriate Consultation**

Consult a physician if there is failure to respond to the therapies recommended in Table 2, “Acne Treatments According to Severity” or if the person has moderate to severe inflammatory disease. Retinoids, topical antibiotics or isotretinoin may be required.

**Nonpharmacologic Interventions**

**Client Education**
- Explain how acne happens
- Encourage regular use of non-irritating soaps, since strong soaps may cause irritation and lead to increased production of sebum
- Recommend mild soaps or soapless cleansers (for example, Spectro Gel or Cetaphil)
- Affected areas should be cleansed two or three times daily

**Pharmacologic Interventions**

Interventions depend on the severity of acne. See Table 1, “Determining Acne Severity” and then base treatment according to severity.

**Table 2 – Acne Treatments According to Severity**

<table>
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<tr>
<th>Mild (localized, inflammatory)</th>
<th>Moderate (widespread, resistant, inflammatory)</th>
<th>Severe</th>
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| Topical benzoyl peroxide (such as Benzagel)  
  or Topical retinoids such as tretinoin (such as Stieva-A)  
  + if necessary add Topical antibiotics such as clindamycin (for example, Dalacin T solution) | Topical benzoyl peroxide  
  or Topical antibiotics (for example, Dalacin T solution)  
  and Oral antibiotics (for example, tetracycline*)  
  +/- Oral contraceptive pills (for example, Alesse) (women only)  
  or Oral retinoids for acne scarring (isotretinoin [Accutane]) | Oral antibiotics (for example, tetracycline*)  
  +/- Oral contraceptive pills (for example, Alesse) (women only)  
  or Antiandrogen (for example, spironolactone)  
  or Oral retinoids for acne scarring (isotretinoin [Accutane]) |

*Note: Never give tetracycline to children 8 years of age and younger or to a pregnant woman.

**Monitoring and Follow-Up**

See the adolescent every 2 or 3 weeks at the beginning of treatment to encourage compliance and monitor efficacy of interventions. Consult with a physician as needed.

**Referral**

Referral to a dermatologist may be warranted in severe cases and those unresponsive to recommended treatments.
CELLULITIS

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

Periorbital cellulitis is a special form of cellulitis that usually occurs in children. In this form of cellulitis, unilateral swelling and redness of the eyelid and orbital area as well as fever and malaise are usually present. Be alert for any child who is unable to elevate or move the eyeball and any child with forward displacement of the eyeball, which indicates that the infection has extended into the orbit (orbital cellulitis) (see “Preseptal Cellulitis” in the chapter, “Eyes”).

Facial, periorbital and orbital cellulitis are particularly worrisome, as they can lead to meningitis.

CAUSES

- Bacteria: most commonly Streptococcus or Staphylococcus, including MRSA
- Predisposing factors: local trauma, furuncle, underlying skin ulcer, impetigo, dermatitis

If a bite was the original trauma, different organisms may be involved. (see “Skin Wounds” in the chapter, “Skin” in the adult clinical practice guidelines).

Facial cellulitis in children < 3 years old may be due to Hemophilus influenzae or Streptococcus pneumoniae.

HISTORY

- May be localized pain
- Redness
- Swelling
- Area increasingly red, increasing in size, warm to touch, painful
- Area around skin lesion may also be tender
- Mild fever and headache may be present
- History of skin trauma or rash
- Immunodeficiency

PHYSICAL FINDINGS

- Temperature may be elevated
- Heart rate may be elevated
- Redness, swelling
- Advancing edge of lesion diffuse, not sharply demarcated (measure area so you can compare approximate length and width on follow-up)
- 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 and tender

DIFFERENTIAL DIAGNOSIS

- Folliculitis
- Foreign body
- Abscess
- Contact dermatitis
- Necrotizing fasciitis
- Osteomyelitis

COMPLICATIONS

- Extension of infection
- Abscess formation
- Sepsis

DIAGNOSTIC TESTS

- Swab any wound discharge for culture and sensitivity

MANAGEMENT

Goals of Treatment

- Control infection
- Identify abscess formation

Appropriate Consultation

Consult physician if any of the following conditions exist:

- Cellulitis is moderate to severe (for example, large area is involved)
- Cellulitis is progressing rapidly, which may indicate an invasive streptococcal infection
- Condition affects hands, feet, face, joint or eye area
- Child is immunocompromised (for example, has diabetes mellitus)
- Child is febrile, appears acutely ill or shows signs of sepsis

Do not underestimate cellulitis. It can spread very quickly and may progress rapidly to necrotizing fasciitis. It should be treated aggressively.
MILD CELLULITIS

Treat on an outpatient basis.

Nonpharmacologic Interventions
– Apply cool sterile saline compresses to affected areas qid to remove any purulent exudates and/or necrotic tissue
– Elevate, rest and gently splint an affected limb

Client Education
– Counsel parents or caregiver about appropriate use of medications (dose, frequency, compliance)
– Encourage proper hygiene of all skin wounds to prevent future infections
– Stress importance of close follow-up

Adjuvant Therapy
If original lesion was caused by trauma, check for tetanus immunization; if not up to date, administer tetanus vaccine.

Pharmacologic Interventions
Oral antibiotics:
cephalexin (Keftx), 25–50 mg/kg/day, divided qid for 10 days (maximum 4 g/day)

For children who are allergic to penicillin:
azithromycin 10 mg/kg/day first day then 5 mg/kg/day PO for remaining four days

Analgesic and antipyretic for pain and temperature control:
acetaminophen (Tylenol), 10–15 mg/kg PO q4-6h prn

Monitoring and Follow-Up
– Follow up daily to ensure that infection is controlled
– Instruct parents or caregiver to bring child back for reassessment immediately if lesion becomes fluctuant, if pain increases, or if fever develops

MODERATE TO SEVERE CELLULITIS

Adjuvant Therapy
– Start IV therapy with normal saline to keep vein open; adjust rate according to state of hydration and age
– If original lesion was caused by trauma, check tetanus immunization; if not up to date, administer tetanus vaccine

Pharmacologic Interventions
Administer IV antibiotics only as directed by a physician:
cefazolin (Ancef), 100 mg/kg/day IV/IM divided q8h
or
ceftiraxone 75 mg/kg/day IV/IM divided q12-24h (maximum 2 g/day)

For children who are allergic to penicillin:
clindamycin 25–40 mg/kg/day IV/IM divided q8h (maximum 3.6 g/day IV)

Antipyretic and analgesic for fever and pain:
acetaminophen (Tylenol), 10–15 mg/kg/dose PO q4-6h prn

Monitoring and Follow-Up
Monitor vital signs and affected area frequently for progression.

Referral
– Medevac

DIAPER RASH

Inflammation of skin over area covered by diaper; may include erythema, papules, vesicles and occasionally bullae. Ulceration may also be evident.

CAUSES
– Reaction to friction and prolonged irritant contact with urine and feces
– Candidal dermatitis may be present

HISTORY
– Sore, red rash in diaper area
– Candidal infection may be associated with oral antibiotics being given for other reasons
– Candidal infection may be seen in other creased areas, such as neck and axillae, and may be associated with thrush

PHYSICAL FINDINGS

Contact Diaper Dermatitis
– Erythematous rash over area covered by diaper
– Creases usually spared in cases of simple contact dermatitis associated with exposure to urine
**Candidal Infection**
- Erythematous rash with sharply demarcated edges
- Weepy, red rash of diaper area
- Satellite pustules outside demarcated edge
- Rash often involves creases

**DIFFERENTIAL DIAGNOSIS**
- Irritative contact dermatitis
- Candidal infection
- Staphylococcal infection
- Seborrheic dermatitis

**COMPLICATIONS**
- Secondary infection with other bacteria

**DIAGNOSTIC TESTS**
- None

**MANAGEMENT**

**Goals of Treatment**
- Reduce exposure to irritants
- Treat any secondary infection

**Nonpharmacologic Interventions**
- Frequent diaper changes, disposable diapers
- Washing with warm water and mild soap and air drying at each change
- Exposure of child’s bottom to air for longer periods
- Application of topical protection (for example, zinc oxide cream [Zincofax] or silicone-based products [Barrier cream]) at each change
- Family and caregiver education about bathing, diaper changing and skin maintenance

**Pharmacologic Interventions**
Contact diaper dermatitis may require mild steroids:
- hydrocortisone 0.5% cream (Cortate), applied sparingly tid until rash resolves (5–7 days)

For candidal diaper dermatitis:
- clotrimazole cream (Canesten), bid until rash resolves (1–2 weeks)

For severe cases of candidal diaper dermatitis:
- clotrimazole cream (Canesten), bid
- hydrocortisone 0.5% cream (Cortate), applied sparingly tid

Apply topical barrier cream (Zinc oxide) over medicated creams.

**Monitoring and Follow-Up**
Advise follow-up in 1 week if the rash has not improved, or sooner if there are signs that the infection is worsening.

**Referral**
Not usually necessary, unless the condition is recurrent or unresponsive to therapy.

**ECZEMA (ATOPIC DERMATITIS)**
Inflammatory skin disorder characterized by erythema, edema, pruritus, exudate, crusting, pustules and vesicles. It may be an allergic phenomenon.

Eczema is a common problem in children, and those affected are predisposed to impetigo. Eczema can begin in infancy, often becoming quiescent later in childhood. Recurrences and exacerbations are common.

**CAUSES**
- Largely unknown
- Often a familial predisposition
- May be associated with allergic rhinitis and asthma

**HISTORY**
- Erythema
- Weeping patches
- Pruritus
- In infancy, cheeks, face and extensor surfaces of arms and legs are involved
- In childhood and adolescence, flexural surfaces are common sites

**PHYSICAL FINDINGS**
- Erythematous, dry, pruritic lesions
- In severe cases, lesions may weep
- Multiple sites
- Purulent fluid under scabs and crusts, indicating superimposed infection, may be present
- Lesions may be indurated
- Chronic lesions may be dry, scaly and lichenified

**DIFFERENTIAL DIAGNOSIS**
- Seborrheic dermatitis
- Scabies
- Allergic dermatitis
- Hereditary polymorphic light eruption
COMPLICATIONS
- Drying and thickening of skin (lichenification)
- Secondary infection: impetigo, cellulitis, molluscum contagiosum, eczema herpeticum

DIAGNOSTIC TESTS
- None

MANAGEMENT

Goals of Treatment
- Relieve symptoms
- Identify and control environmental causes (for allergic cases)
- Prevent secondary infection

Appropriate Consultation
Consult a physician if there is no response to therapy after a 1- to 2-week trial. Higher-potency steroids, if necessary, must be ordered by a physician. Child will likely need a more potent topical steroid or may need a calcineurin inhibitor such as tacrolimus.

Nonpharmacologic Interventions
- Offer support to child and family, as it can be difficult to live with this irritating chronic condition
- Assist parents (or caregiver) and child to identify precipitating and aggravating factors, and encourage avoidance
- Avoid elimination diets, which do not help but do compromise nutrition

Client Education
- Counsel parents (or caregiver) and child about appropriate use of medications (dose, frequency, application)
- Encourage proper hygiene to prevent secondary bacterial infection
- Recommend that child wear loose-fitting cotton clothing and avoid coarse materials and wool
- Recommend that soap not be used on face
- Recommend avoidance of overheating
- Recommend avoidance of irritants
- Recommend avoidance of perfumes, detergents and soap, as much as possible (and use of a soap substitute, such as Aveeno); double-rinse laundered clothes

- Suggest that greasy lubricants be applied within minutes of leaving shower or bath to “lock in” moisture (for example, Lubriderm, Sofsyn, Dermabase)
- Advise parents or caregiver to stop application of steroid preparations once acute lesions have healed, as steroids do not have any preventive effect and can further irritate and damage the skin
- Recommend a humidifier in child’s room
- Recommend emollients, such as Vaseline or Glaxal Base, in areas where medication is not needed

Wet Lesions
Promote drying and cooling:
- normal saline compresses, qid prn
- or aluminum acetate compresses (Burow’s solution, diluted 1:20), qid prn

Dry Lesions
Promote lubrication:
- Glaxal base or petroleum jelly (Vaseline) bid after bathing and prn

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

Hydrocortisone should be used only sparingly on the face and then only for brief periods.

Gels and creams are used for acute, weeping eruptions. Ointments are used for dry or lichenified lesions. Lotions are used for hairy areas. In general, ointments are less irritating and have better penetration than creams but adherence is lower because they are cosmetically less acceptable.

For itching:
Pruritus associated with eczema is not mediated by histamine so histamine blockade is generally ineffective. Diphenhydramine (Benadryl) given 30–60 minutes prior to bedtime may provide some relief through central sedation.¹⁰ It should only be given at bedtime.

children 2 to < 12 years: diphenhydramine 1 mg/kg/ dose PO hs prn (maximum 50 mg/dose)

children ≥ 12 years: diphenhydramine 50 mg PO hs prn¹¹

Use with caution in children < 2 years of age.
Monitoring and Follow-Up
Follow up in 1–2 weeks to assess response. Advise parents or caregiver to bring child back to the clinic sooner if there are signs of infection developing.

Referral
Arrange elective follow-up with a physician if there is no response to treatment as outlined above.

HEMANGIOMA
Vascular nevi, which may be superficial or deep, capillary or cavernous. Often most visible in infancy, tending to diminish in size with age.

CAUSE
– Congenital vascular defect with genetic propensity

HISTORY
– Visible vascular lesion
– Usually from birth or early infancy
– Lesion changes over time

Capillary (Strawberry) Hemangioma
– Usually presents between birth and 2 months of age
– Most common on face, scalp, back or chest
– Expands rapidly initially
– Involuted by 5 years of age in 60% of cases
– Involuted by 9 years of age in 95% of cases

Cavernous Hemangioma
– Red hemangioma
– Deeper, not as well defined or demarcated as strawberry hemangioma
– Period of growth followed by period of regression

PHYSICAL FINDINGS

Capillary (Strawberry) Hemangioma
– Red, protuberant, compressible and sharply demarcated lesion

Cavernous Hemangioma
– Poorly defined red hemangioma
– Lesion may be compressible
– Lesion may be completely covered with skin

DIFFERENTIAL DIAGNOSIS

Capillary (Strawberry) Hemangioma
– Cavernous hemangioma

Cavernous Hemangioma
– Capillary (strawberry) hemangioma

COMPLICATIONS

Capillary (Strawberry) Hemangioma
– Secondary infection or breakdown with involution
– Trauma
– Small scars may remain after involution

Cavernous Hemangioma
– Secondary infection
– May involve underlying structures, including bone
– Large cavernous hemangioma may be associated with hemorrhage or thrombocytopenia

DIAGNOSTIC TESTS
– None

MANAGEMENT

Goals of Treatment
– Reassure child and parents or caregiver
– Treat secondary infection

Nonpharmacologic Interventions
– Reassurance of family

Pharmacologic Interventions
For serious cavernous hemangioma, steroids (intralosomal or systemic) (for example, prednisone, 1 mg/kg/day) may be useful. However, steroids can be prescribed only by a physician.

Referral
– Refer child electively to a physician for assessment
– More urgent evaluation may be necessary if there is significant secondary infection, if the hemangioma obscures a vital organ (for example, the eye), or if the lesion is large enough to trap platelets
– Some children require plastic surgery consultation
HEREDITARY POLYMORPHIC LIGHT ERUPTION
Skin lesions occurring in areas exposed to the sun, without other cause. Commonly seen in Aboriginal people throughout North and South America.

CAUSES
- Hypersensitivity to sunlight
- Hereditary condition
- Probably an immunologic phenomenon

HISTORY
- Erythematous, vesicular, bullous rash and papules in exposed areas, usually occurring in late winter through summer
- Recurrence common
- Often pruritic

PHYSICAL FINDINGS
- Erythematous rash on face, hands and other exposed surfaces
- Often involves cheilitis (inflammation of the lips)
- Distribution is a significant clue to diagnosis

DIFFERENTIAL DIAGNOSIS
- Eczema (atopic dermatitis)
- Contact dermatitis
- Impetigo
- Seborrheic dermatitis

COMPLICATIONS
- Secondary infection
- Lichenification
- Depigmentation

DIAGNOSTIC TESTS
- None

MANAGEMENT
Goals of Treatment
- Relieve symptoms
- Decrease exposure to sunlight

Nonpharmacologic Interventions
- Use of high-level (> 30 SPF) sunscreens
- Coverage of exposed parts (with clothing, wide-brimmed hats, etc.)
- Family education about dress and sunscreen use

Pharmacologic Interventions
Topical steroids may be tried, starting with:
- hydrocortisone 0.5% cream (Cortate), bid-tid for 1–2 weeks

More potent topical steroids, such as betamethasone, may be necessary on body parts other than the face. Such drugs must be ordered by a physician.

Referral
Refer child to a physician for evaluation if the treatment is unsuccessful.

IMPETIGO
Highly contagious, superficial bacterial infection of the skin.

CAUSES
- *Streptococcus, Staphylococcus* or both
- Consider community-acquired MRSA
- 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
- Usually occurs during summer
- 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
- Local lymph nodes may be enlarged, tender

**Differential Diagnosis**
- Infection associated with eczema, contact dermatitis or scabies
- Herpes simplex infection with blisters or crusts
- Chickenpox infection with blisters or crusts
- Shingles (herpes zoster) with blisters or crusts
- Insect bites

**Complications**
- Localized or widespread cellulitis
- Post-streptococcal glomerulonephritis, but not rheumatic fever
- Invasive group A streptococcal disease (invasive GAS)

**Diagnostic Tests**
- Wound swab for culture and sensitivity (may be confirmatory)

**Management**

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

**Appropriate Consultation**
Consult a physician if there is no response to therapy.

**Nonpharmacologic Interventions**
- Warm saline compresses to soften and soak away crusts qid and prn
- Cleanse with an antiseptic antimicrobial agent to decrease bacterial growth

**Client Education**
- Counsel parents or caregiver about appropriate use of medications (including dose, frequency and compliance)
- Offer recommendations about hygiene as necessary, including single use of towels, and wash clothes while acute infection is present
- Cut fingernails to prevent scratching
- Counsel parents or caregiver 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 cream (Bactroban), tid for 7 to 10 days

Oral antibiotics may be necessary if there are multiple lesions that appear infected:
- cephalexin (Keflex), 25–50 mg/kg/day, divided qid for 7 to 10 days (maximum 4 g/day)

For penicillin allergy:
- erythromycin 30–40 mg/kg/day, divided q6-8h, PO for 7 to 10 days (maximum 2 g/day)

Topical antibiotics such as mupirocin (Bactroban) may be used alone for small areas or in conjunction with oral antibiotics for larger areas.

**Monitoring and Follow-Up**
- Follow up in 3 to 5 days to assess response to treatment
- Instruct parents or caregiver to bring the child back for reassessment if fever develops or infection spreads despite therapy

**Referral**
Not usually necessary unless complications develop.
METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS\textsuperscript{12,13,14}

Methicillin-resistant \textit{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 \textit{Staphylococcus aureus} may not be of benefit\textsuperscript{15}. \textit{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.\textsuperscript{16}

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.\textsuperscript{17}

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.\textsuperscript{17} Currently, the CA-MRSA strains are more likely to be susceptible to antibiotic classes, other than beta-lactams, than hospital-acquired MRSA strains.\textsuperscript{15}

Primary care health practitioners must become aware of the emergence of CA-MRSA as a cause of infection in Canada, particularly in First Nations communities.

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

CAUSES
- Methicillin-resistant \textit{Staphylococcus aureus}

Mechanism of Spread
- Skin to skin contact
- Skin to instrument contact
- Cat or dog bite\textsuperscript{18}

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\textsuperscript{18}

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 \textit{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 \textit{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 asymptomatic 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 practise meticulous hand-washing, the most important measure to control transmission of MRSA

If skin lesions are present, educate clients in the following:

- Cover lesions with appropriate dressings to contain drainage or exudate
- Ensure that appropriate medical care has been received
- Do not share creams, lotions, soaps, cosmetics and other personal products that are in contact with the skin
- Do not share unwashed towels
- Do 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
- Encourage patients to complete all courses of antibiotics as prescribed
- Practise frequent hand-washing and decontamination of examination equipment to prevent spread from infected individuals
- Notify public health officials 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: wash with antibacterial soap and water.

Superficial, localized infections, such as impetigo folliculitis, furuncles, carbuncles and small abscesses without cellulitis, use:

- 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 cephalexin or Clavulin (amoxicillin/clavulanic acid)

In 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.

MOLLUSCUM CONTAGIOSUM

A benign viral condition of the skin. Humans are the only known source of the virus and it is more common in children and adolescents. It is a common cutaneous manifestation of HIV infection. The infection is spread by direct contact, including sexual contact. It is self-limiting and usually spontaneously clears in 6–9 months.

CAUSE

– Viral infection: poxvirus

HISTORY

– Clusters of papules occurring anywhere on the body

PHYSICAL FINDINGS

– Discrete, dome-shaped, pearly white or skin-coloured papules of various sizes
– Central umbilication (indentation)
– Occurring anywhere on the body, but with predilection for face, eyelids, neck, axillae and thighs

DIFFERENTIAL DIAGNOSIS

– Warts

COMPLICATIONS

– Rare
– Scarring, if papule becomes infected

DIAGNOSTIC TESTS

– None

MANAGEMENT

Goals of Treatment

– Make accurate diagnosis
– Prevent secondary infection

Nonpharmacologic Interventions

– Benign neglect is the treatment of choice (most of the lesions disappear within 6–9 months)
– Reassure child and parents or caregiver as to benign nature of lesions
– Advise against scratching or picking at lesions, to prevent secondary infection

Pharmacologic Interventions

Liquid nitrogen cryotherapy may be used to eradicate genital lesions in sexually active adolescents, to prevent spread via sexual contact. Do not use this therapy unless it is ordered by a physician.

Referral

Refer child electively to a physician regarding definitive treatment if the parents (or caregiver) are concerned and desire such treatment.

MONGOLIAN SPOTS

Benign lesions, presenting as bluish black discoloration of the skin. Commonly seen in black, oriental, Inuit and First Nations children. They diminish or disappear during childhood.


**CAUSE**
- Unknown

**HISTORY**
- Bluish discolouration, present since birth
- Asymptomatic
- Lesions fade with age

**PHYSICAL FINDINGS**
- Bluish spots of various sizes
- May occur anywhere on the body, but most common in lumbosacral areas and on back, shoulders and legs

**DIFFERENTIAL DIAGNOSIS**
- Bruising from trauma

These lesions are sometimes confused with bruising and can be inaccurately interpreted as evidence of child abuse.

**COMPLICATIONS**
- None

**DIAGNOSTIC TESTS**
- None

**MANAGEMENT**

**Goals of Treatment**
- Make accurate diagnosis

**Nonpharmacologic Interventions**
- Reassurance of family

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**POISON IVY DERMATITIS**

A type of contact dermatitis, secondary to exposure to poison ivy. Exposure may be indirect, through clothing and pets.

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**CAUSE**
- Exposure to poison ivy oleoresin

**HISTORY**
- Recent work or play in the bush
- Intensely pruritic, erythematous, weeping rash

**PHYSICAL FINDINGS**
- Erythema
- Vesicular, bullous lesions
- Weeping rash
- Linear streaks
- Edema of affected tissue

**DIFFERENTIAL DIAGNOSIS**
- Eczema (atopic dermatitis)
- Psoriasis
- Other contact dermatitis

**COMPLICATIONS**
- Secondary bacterial skin infection

**DIAGNOSTIC TESTS**
- None

**MANAGEMENT**

**Goals of Treatment**
- Prevent infection
- Relieve itch

**Appropriate Consultation**
Consult a physician for advice if the rash is severe or widespread.

**Nonpharmacologic Interventions**
- Cleanse the skin as soon as possible after contact to prevent further eruption
- Wash hands, cleaning especially well under nails
- Wash clothing contaminated by the oleoresin

**Client Education**
- Counsel parents (or caregiver) and children about appropriate clothing to be worn for outside (bush) activities (for example, long sleeves, long pants)
**Pharmacologic Interventions**

For mild cases:
- Hydrocortisone 1% cream (Cortate), applied tid to affected area

For moderate to severe cases, discuss a more potent topical steroid with a physician.

For intense pruritus:
- Suggest diphenhydramine hydrochloride (Benadryl):
  - Children 2 to < 6 years: 6.25 mg PO q4-6h prn (maximum 37.5 mg/day)
  - Children 6 to < 12 years: 12.5–25 mg PO q4-6h prn (maximum 150 mg/day)
  - Children ≥ 12 years: 25–50 mg PO q4-6h prn (maximum 300 mg/day)
  - Use with caution in children < 2 years of age due to sedative effects

Occasionally, a tapering course of oral corticosteroids (prednisone) is required (1 mg/kg/day tapering over 14–21 days). Steroids should be given only with a physician order.

**Monitoring and Follow-Up**

Reassess as necessary in 2 or 3 days.

**Referral**

Usually a self-limiting problem.

**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”)

**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 3, “History and Physical Findings for Various Forms of Tinea”](#).

<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&lt;br&gt;Itch severe&lt;br&gt;Scaling and redness, mainly between toes&lt;br&gt;Foul odour may be present&lt;br&gt;Area may be moist, whitened, macerated, cracked&lt;br&gt;Skin peels off easily, with red, tender area underneath&lt;br&gt;One or several small vesicles may be present&lt;br&gt;Vesicles rupture leaving a “collarette” of scales&lt;br&gt;May involve sole of foot with marked scaling (itch minimal)</td>
<td>Scaling of lateral interdigital areas&lt;br&gt;Moist, whitened, macerated, cracked skin may be present&lt;br&gt;Skin peels off easily with red, raw, tender area underneath&lt;br&gt;One or several small blisters may be present&lt;br&gt;Sole of foot may be involved, with marked scaling&lt;br&gt;Fissures may become secondarily infected (cellulitis)</td>
</tr>
<tr>
<td><strong>Tinea cruris</strong></td>
<td>Affects groin&lt;br&gt;Common in men&lt;br&gt;Itch mild to severe&lt;br&gt;Begins as erythema of crural fold&lt;br&gt;Spreads outward&lt;br&gt;May spread onto thighs or buttocks&lt;br&gt;Scrotum and penis usually not affected&lt;br&gt;Often spread by infected towel&lt;br&gt;Often associated with tinea pedis&lt;br&gt;Predisposing factors: excessive sweating, diabetes mellitus, friction</td>
<td>Involves crural areas and upper inner thigh&lt;br&gt;Scaly reddish brown lesion&lt;br&gt;Sharply defined margin&lt;br&gt;Central clearing absent&lt;br&gt;Groin, thigh, buttock may be involved&lt;br&gt;May be bilateral or unilateral&lt;br&gt;Scrotum and penis usually not affected</td>
</tr>
<tr>
<td><strong>Tinea corporis</strong></td>
<td>Affects any smooth, nonhairy part of body&lt;br&gt;Scaly, circular or oval skin lesions&lt;br&gt;Frequently itchy&lt;br&gt;May be asymptomatic</td>
<td>Lesions variable in size&lt;br&gt;Typically a well-circumscribed circular or oval patch&lt;br&gt;Reddish pink and scaly&lt;br&gt;Central clearing&lt;br&gt;Accentuation of redness at outer border&lt;brMargins 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 the client is under 2 years of age or 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 parent and child modify socks and footwear
- Recommend avoidance of restrictive clothing, nylon underwear and prolonged wearing of wet bathing suit
- Counsel parent and child 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 in children under 2 years of age, a physician must be consulted before starting treatment. For children over 2 years of age, apply a topical antifungal agent such as clotrimazole for 4 weeks.

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.

RINGWORM OF THE SCALP
(TINEA CAPITIS)
Superficial infection of the scalp by the fungus Microsporum or Trichophyton.

CAUSE
- Fungal infection, usually acquired through direct contact with an infected person

HISTORY
- Alopecia
- Other family members with same condition (very contagious)

PHYSICAL FINDINGS
- Alopecia or patchiness of hair
- Gray scaling
- Broken hairs at scalp level
- Lesion usually well demarcated
- Kerion (boggy mass)
- Pustules

DIFFERENTIAL DIAGNOSIS
- Seborrhea
- Trichotillomania (hair-pulling)
- Psoriasis
- Alopecia areata

COMPLICATIONS
- Damaged hair follicles
- Spread of infection
**DIAGNOSTIC TESTS**
- Take scrapings of skin or hair for fungal examination
- Wood’s lamp test if available
- Potassium hydroxide (KOH) wet prep

**MANAGEMENT**

**Goals of Treatment**
- Make accurate diagnosis
- Relieve infection

**Appropriate Consultation**
Consult a physician about treatment if you confirm this diagnosis, since topical antifungal agents are ineffective on the scalp. Oral antifungal medication will have to be prescribed.

**Nonpharmacologic Interventions**
- Provide reassurance to parents or caregiver
- Offer support, as therapy is long and arduous
There is no need to shave the head.

**Pharmacologic Interventions**
Topical antifungal agents are ineffective on the scalp.
Consult a physician to order:
- an antifungal such as terbinafine (Lamisil), which can be obtained on prescription through NIHB from a retail pharmacy
Oral antifungals can have many side effects, including gastrointestinal (GI) disturbances, skin rash, hepatotoxicity and blood dyscrasias, but are generally well tolerated in children.

**Monitoring and Follow-Up**
Follow up every 2 or 3 weeks while the child is receiving medication, to assess adherence, to determine whether there are signs of improvement and to offer support to the parents or caregiver.

It may be necessary to monitor liver function or complete blood count (CBC) depending on which antifungal is chosen. Discuss these tests with a physician.

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**SCABIES**
Infestation of the skin with a mite parasite. Skin eruptions consist variably of wheals, papules, vesicles, burrows and superimposed eczematous dermatitis. The lesions are intensely pruritic, especially at night, which leads to marked excoriation.

In infants, the face, scalp, palms and soles are most commonly involved. In adolescents, the lesions, which often appear as threadlike burrows, occur in the interdigital spaces, groin and genitalia, umbilicus, axillae and on the wrists, elbows, ankles and buttocks.

**CAUSE**
- Itch mite, *Sarcoptes scabiei hominis*, which burrows under the skin
- Usually transmitted by direct (skin to skin) contact with contaminated articles for up to 48 hours

**Risk Factors**
- Faulty application of treatment
- Failure to treat close contacts
- Failure to eradicate mites from clothing and bedding
- Daycare settings

The Aboriginal population in some areas may be at risk from a number of additional factors, such as:
- Crowded housing, shared beds, crowded schools and daycare centres
- High pediatric population
- 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

**HISTORY**
- Severe itching
- Itching generally worse at night or after warm bath
- Rash on hands, feet, flexural folds
- Symptoms may take 3–6 weeks to develop after initial contact with mite (incubation period is 3–6 weeks)
- 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; infants will look dermatitic
- 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
- In infants, burrows are much less common, but pruritic pustules on palms and soles are characteristic

DIFFERENTIAL DIAGNOSIS
- Pediculosis
- Impetigo
- Eczema (atopic dermatitis)
- Contact or irritant dermatitis
- Viral exanthem
- Chickenpox
- Drug reaction

COMPLICATIONS
- Impetigo
- Cellulitis

DIAGNOSTIC TESTS
- None

MANAGEMENT

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

Appropriate Consultation
Consult physician if you are unsure of the diagnosis.

Nonpharmacologic Interventions

Client Education
- Counsel parents or caregiver (and child, if old enough) about proper use of medication and its side effects

Control Measures
- Prophylactic therapy is essential for all household members since signs of scabies may not appear for 1–2 months after the infection is acquired
- Examine family and household members
- 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 the 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 people who have 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 constitute optimal management

Pharmacologic Interventions

Scabicide cream or lotion, 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)

Leave on skin for 8–14 hours. A single application is usually curative, but medication may be re-applied after 1 week if symptoms persist.

The safety of permethrin for infants < 3 months old has not been established. Discuss with physician if the patient is < 3 months old.
Precipitated sulphur (5–10%) in petroleum jelly is a safe alternative therapy for very young infants and pregnant and lactating women. The pharmacist prepares it. It is applied on three consecutive days, left on for 24 hours after application and washed off before the next application. However, data supporting its use are limited.23

Pruritus may be a problem, particularly at night. Advise the child and the parents or caregiver that itching may persist for many weeks. To manage itching, suggest:

- **diphenhydramine hydrochloride (Benadryl):**
  - Children 2 to < 6 years: 6.25 mg PO q4-6h prn (maximum 37.5 mg/day)
  - Children 6 to < 12 years: 12.5–25 mg PO q4-6h prn (maximum 150 mg/day)
  - Children ≥ 12 years: 25–50 mg PO q4-6h prn (maximum 300 mg/day)20
  - Use with caution in children < 2 years of age due to sedative effects

If diphenhydramine is too sedating for daytime, a second-generation antihistamine, such as cetirizine (Reactine), can be used during the day with diphenhydramine reserved for bedtime use.21

Topical steroids may be useful after scabicide treatment because the rash and itching may persist for several weeks. Nodular lesions may persist for months; on the advice of a physician a mid-potency topical steroid may help21:

- betamethasone valerate 0.1% cream (Betaderm), applied bid

**Monitoring and Follow-Up**
- Follow up in 1 week to assess response to treatment and compliance with treatment
- Advise parents or caregiver to bring child back to the clinic immediately if signs of secondary infection develop

**Referral**
Rarely necessary if original diagnosis is correct and adequate eradication treatment is adhered to by the child and his or her contacts.

**URTICARIA (HIVES)**24
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 parent and client about appropriate use of medications (dose, frequency, side effects)
- Recommend proper skin hygiene to prevent infection
- Recommend avoidance of scratching; parent and client should keep fingernails short and clean
- Assist parent and client in identifying causative agent (including any recent changes in food or brands, as different food companies put different additives in their products)
- Reassure parent and 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 hydrochloride (Benadryl)25
  Children 2 to < 6 years: 6.25 mg PO q4-6h prn (maximum 37.5 mg/day)
  Children 6 to < 12 years: 12.5–25 mg PO q4-6h prn (maximum 150 mg/day)
  Children ≥ 12 years: 25–50 mg PO q4-6h prn (maximum 300 mg/day)
- Use with caution in children < 2 years of age due to sedative effects

or a second-generation antihistamine
- cetirizine (Reactine)26
  Children 6 to 12 months: 2.5 mg once daily
  Children 12 to 23 months: Initial 2.5 mg once daily; dosage may be increased to 2.5 mg twice daily
  Children 2 to 5 years: 2.5 mg/day; may be increased to a maximum of 5 mg/day given either as a single dose or divided into 2 doses
  Children 6 years to adult: 5–10 mg/day as a single dose or divided into 2 doses

Monitoring and Follow-Up

- Follow up in 2–7 days
- Instruct parent to return with client for reassessment if lesions progress despite therapy
- Instruct parent to return to clinic immediately with client 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)

Skin

DERMATOLOGICAL EMERGENCIES

BURNS

Tissue injuries resulting from thermal injury to skin (epidermis) or mucosal surfaces. May include injury to the underlying dermis, subcutaneous tissue, muscle or bone. The extent of injury (the depth of the burn) depends on the intensity of heat (or other exposure) and the duration of exposure.

Burns are common in children and can cause significant morbidity and mortality. They are the leading cause of accidental death in children.

TYPES OF BURNS

First-Degree (Superficial)

Involves epidermal layer of skin only. Blisters only after 24 hours.

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

- Hot fluids
- Steam
- Flame: tends to cause full-thickness burn, especially if clothing burns
- Hot objects: Molten metal, tars or melted synthetics lead to prolonged skin contact
- Open flames and hot liquids are the most common cause (heat usually 15°C to 45°C or greater)

Electrical

- Similar to crush injuries; muscle necrosis, rhabdomyolysis, myoglobinuria occur
- Require special consideration as it may result in significant injury with very little damage to overlying skin; always assume that it is severe as these burns are often more serious than they appear

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
- There may be few signs or symptoms for the first few days after exposure

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

Risk Factors

- Excessively hot baseboard heaters
- Wood stoves
- Excess sun exposure
- Hot water heaters set too high (keep set at 49°C [120°F])
- Exposure to chemicals or electricity
- Young children with thin skin are more susceptible to injury
- Carelessness with burning cigarettes
- Inadequate or faulty electrical wiring

Specific Pediatric Issues

- Body surface area is proportionately high for weight in younger children
- The relative contribution of various body parts to body surface is different in children than in adults (for example, head relatively larger, legs relatively smaller)
- In children < 3 years old, scald burns from spilled hot liquids are the most common type of burn
- Electrical burns to the mouth can occur in toddlers who chew electrical cords
Intentional Burn Injuries

This is a form of child abuse that can sometimes be recognized by specific burn patterns. It can be difficult to diagnose. Accurate diagnosis requires a careful history, physical examination and assessment of the child’s developmental capabilities, as well as consultation with a physician or admission to hospital for assessment.

- Consider child abuse when a child presents with hot-water burns
- Observe distribution of burns
- Pay attention to straight-line burns, especially if bilateral, or small round burns (from cigarettes)
- Look for glove- or stocking-like burns, or burns on the buttocks without splash marks if they have been held in hot water. For pictures, see “Cutaneous Signs of Physical Abuse” at http://www.stacommunications.com/journals/pdfs/cme/julycme/i.pdf

History

Defer history until ABCs (airway, breathing and circulation) have been assessed and stabilized.

- Obtain accurate description of exact mechanism of injury
- Inquire about any treatment given at home (for example, cooling, application of oils)

Physical Findings

- Assess ABCs
- Look for singed nasal hair, hypoxia, soot-stained sputum, persistent cough, and/or respiratory obstruction to indicate inhalational injury
- Temperature may be elevated if wounds are infected or if inflammation and infection is developing
- Heart rate may be elevated because of pain
- Blood pressure may be low if child is in shock
- Determine depth (see Table 4, “Assessing Depth of a Burn”), extent (see Table 5, “Assessing Extent of Burns in Children” and child or infant Rule of Nines diagrams) and classification (see Table 6, “Classification of Burns by Severity [Surface Area Involved]”)
- Determine nature of the burn according to injury pattern

Table 4 – Assessing Depth of a Burn

<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</td>
<td>Ultraviolet exposure</td>
<td>Dry, red</td>
<td>Painful</td>
<td>3 to 6 days</td>
</tr>
<tr>
<td>(First-Degree)</td>
<td>Very short flash</td>
<td>Blanches with pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superficial</td>
<td>Scald (spill or splash)</td>
<td>Blisters</td>
<td>Painful to</td>
<td>7 to 20 days</td>
</tr>
<tr>
<td>partial-thickness</td>
<td>Short flash</td>
<td>Moist, red, weeping</td>
<td>temperature and</td>
<td></td>
</tr>
<tr>
<td>(Second-Degree)</td>
<td></td>
<td>Blanches with pressure</td>
<td>air</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep partial-thickness</td>
<td>Scald (spill)</td>
<td>Blisters (easily unroofed)</td>
<td>Perceptive of</td>
<td>&gt; 21 days</td>
</tr>
<tr>
<td>(Second-Degree)</td>
<td>Flame</td>
<td>Wet or waxy dry</td>
<td>pressure only</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oil</td>
<td>Variable colour (patchy to cheesy white to red)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grease</td>
<td>Does not blanch with pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-thickness</td>
<td>Scald (immersion)</td>
<td>Waxy white to leathery gray to charred and black</td>
<td>Deep pressure only</td>
<td>Never (if &gt; 2 percent total body surface area)</td>
</tr>
<tr>
<td>(Third-Degree)</td>
<td>Flame</td>
<td>Dry and inelastic</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Steam</td>
<td>No blanching with pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5 – Assessing Extent of Burns in Children

<table>
<thead>
<tr>
<th>Area</th>
<th>Birth to 11 months</th>
<th>1 year</th>
<th>5 years</th>
<th>10 years</th>
<th>15 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>19</td>
<td>17</td>
<td>13</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Neck</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Trunk</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Buttocks</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Genitals</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Arm</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Hand</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Thigh</td>
<td>5.5</td>
<td>6.5</td>
<td>8</td>
<td>8.5</td>
<td>9</td>
</tr>
<tr>
<td>Leg</td>
<td>5</td>
<td>5</td>
<td>5.5</td>
<td>6</td>
<td>6.5</td>
</tr>
<tr>
<td>Foot</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
</tbody>
</table>


Child Rule of Nines

Infant Rule of Nines

### Table 6 – Classification of Burns by Severity (Surface Area Involved)

<table>
<thead>
<tr>
<th>Minor</th>
<th>Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5% total body surface area in second-degree burn</td>
<td>5% to 10% total body surface area in second-degree burn</td>
</tr>
<tr>
<td>&lt; 2% total body surface area in third-degree burn</td>
<td>2% to 5% total body surface area in third-degree burn</td>
</tr>
<tr>
<td></td>
<td>High voltage injury</td>
</tr>
<tr>
<td></td>
<td>Suspected inhalation injury</td>
</tr>
<tr>
<td></td>
<td>Circumferential burn</td>
</tr>
<tr>
<td></td>
<td>Medical problem predisposing to infection (for example, diabetes mellitus, sickle cell disease)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 10% total body surface area in second-degree burn</td>
<td>&gt; 5% total body surface area third-degree burn</td>
</tr>
<tr>
<td>Any significant burns on hands, feet, face, eyes, ears, perineum or joints</td>
<td>Any known inhalation injury</td>
</tr>
<tr>
<td>Any known inhalation injury</td>
<td>High voltage burn</td>
</tr>
<tr>
<td>Significant associated head injury, fracture or soft-tissue trauma</td>
<td></td>
</tr>
</tbody>
</table>

### Table 7 – Classification of Burns by Injury Pattern

<table>
<thead>
<tr>
<th>Sunburn</th>
<th>Splash or scald burns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas exposed to sun</td>
<td>Maximal burns at location of impact, with lesser burns in dependent areas where fluid has cooled and dropped</td>
</tr>
<tr>
<td></td>
<td>Multiple small satellite areas of burned skin may occur around scalded areas of skin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical burns</th>
<th>Forced immersion burn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burns of the mouth and lip, mucosal swelling and coagulation</td>
<td>Indicative of abuse</td>
</tr>
<tr>
<td>May have minor entrance and exit wounds, with severe underlying tissue destruction along route of current</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact burns</th>
<th>Flame burns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burned areas bear patterns of specific hot object in contact with the skin (for example, grate, stove element)</td>
<td>Associated inhalation damage may cause acute respiratory failure</td>
</tr>
<tr>
<td>May be accidental or intentional</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cigarette burns</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Usually discrete circular lesions, well circumscribed</td>
<td>May be a form of child abuse and can be confused with impetigo</td>
</tr>
</tbody>
</table>

DIFFERENTIAL DIAGNOSIS

- Toxic epidermal necrolysis
- Scalded skin syndrome
- Small areas of deep burning (third-degree) within superficial burn (second-degree)

COMPlications

- Increasing depth of burn
- Shock
- Hypoglycemia (may occur in children because of limited glycogen storage)
- Burn wound sepsis (usually gram-negative organisms)
- Decreased mobility, with possibility of future flexion contractures
- Gastroduodenal ulceration (Curling’s ulcer)
- Pneumonia

DIAGNOSTIC TESTS

- Glucose level (hypoglycemia may occur in children because of limited glycogen storage)
- For electric burns, electrocardiogram

MANAGEMENT

Management is based on the depth of the burns and an accurate estimate of total body surface area (see Table 5, “Assessing Extent of Burns in Children” and Table 6, “Classification of Burns by Severity [Surface Area Involved]”).

Goals of Treatment

- Promote healing and restoration of tissue
- Prevent complications
- Prevent recurrences

First Aid Measures for All Burns

- **Thermal burn**: Rapidly remove clothing or jewellery and any obvious debris in contact with the area to decrease contact time and allow accurate assessment. Cool the burned area with water or apply normal saline cool compresses at no less than 8°C, for 10–20 minutes immediately after injury. Do not apply ice. Prevent hypothermia by monitoring core body temperature and use warm intravenous fluids if below 35°C.

- **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 the 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 otherwise.

- **Tar burn**: Cool, clean gently and apply a petrolatum-based antibacterial ointment (for example, Polysporin) or other petroleum-based products. 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. 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 THERMAL BURNS (≤ 10% BODY SURFACE AREA)

Appropriate Consultation

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

Adjuvant Therapy

Check whether tetanus immunization is up to date; give tetanus vaccine as needed (see the Canadian Immunization Guide at http://www.atlantique.phac.gc.ca/naci-ccni/index-eng.php)

Nonpharmacologic Interventions

First-Degree Burns

- Cleanse with normal saline or sterile water
- **Dressings**: Cover area lightly with sterile, dry gauze or a non-adherent mesh gauze dressing (for example, Jelonet, Adaptic dressings)
Second-Degree Burns
- Remove any attached clothing and debris
- Cleanse with normal saline or sterile water
- If using silver-coated dressing, cleanse with sterile water only
- Gently débride using sterile technique (use sterile gloves)
- 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
- Cool the burned area with water or apply normal saline cool compresses, at no less than 8 degrees Celsius, for 10–20 minutes immediately after injury. Do not apply ice. Monitor core temperature while cooling, especially if > 10% and < 20% burns are involved, to prevent hypothermia. Use warm intravenous fluids if core temperature drops below 35°C
- **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
- There is some evidence for the use of topical antibiotics (for example, bacitracin 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 (for example, Jelonet)
- Elevate a burned extremity to reduce swelling
- Increase fluid intake over the next 24 hours
- There is no role for steroids in the treatment of minor burns

Client Education
- Advise caregivers about the signs of infection
- Counsel family 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 the area has healed
- Recommend use of sunscreen
- Recommend that child’s access to wood stoves, electrical cords and outlets be prevented
- Suggest that household chemicals be placed out of child’s reach
- Suggest low temperature setting for hot water heater
- Recommend that household smoke detectors be installed, with special emphasis on maintenance
- Recommend a family and household evacuation plan in case of fire
- Recommend proper storage and use of flammable substances

Pharmacologic Interventions
**Analgesia:**
- **ibuprofen (Motrin)**
  - Children 6 months to 12 years of age: ibuprofen 5–10 mg/kg PO q6-8h prn;
  - Children > 12 years of age: ibuprofen 200–400 mg PO q4-6h prn
  - Use lowest effective dose, shortest treatment duration; give with food
  - or
  - **acetaminophen (Tylenol)**
    - Children < 12 years of age: acetaminophen 10–15 mg/kg/dose, Po q4h prn
    - Children ≥ 12 years of age: acetaminophen 325 mg, 1–2 tabs PO q4h prn (maximum 4 g/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:

- Jelonet dressing every other day with an antibiotic ointment
- framycetin (Sofratulle) dressing, daily
- silver sulfadiazine (Flamazine), daily

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

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

- immunocompromised children
- any child at high risk of endocarditis

Broad-spectrum coverage with first-generation cephalosporin or with 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 then 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 cleansing of hands, sinks, tubs and any instruments used is emphasized.

TREATMENT OF MODERATE AND MAJOR BURNS

**Appropriate Consultation**

Consult a physician as soon as the child’s condition is stabilized, and prepare to medevac.

---

**Adjuvant Therapy**

Perform Primary Survey

- Stabilize ABCs
- Establish airway and assist ventilation as required
- Give oxygen so as to keep oxygen saturations > 97% to 98%
- Initiate IV therapy with normal saline or Ringer’s lactate using the largest bore cannula possible if more than 10% of child’s body surface area has been burned (or ≥ 5% if third-degree burns) (see Table 5, “Assessing Extent of Burns in Children”)

Fluid Resuscitation for Major Burns (see Table 6, “Classification of Burns by Severity”)

- Replace fluid losses
  - Infuse warm normal saline or Ringer’s lactate
  - In infants and children: 3 to 4 mL X body weight in kilograms X % of Total Body Surface Area (TBSA) burned (see Table 5, “Assessing Extent of Burns in Children”)
    - Administer one half of fluid in the first 8 hours from time of burn injury; remainder fluid is administered over the next 16 hours
    - For children < 5 years, in addition to the fluid requirement above, also give maintenance fluids of 5% dextrose according to Table 8, “Hourly Maintenance Fluid Requirements”
      - Maintain urine output at 1 to 2 mL/kg/hour for children < 30 kg and 1 mL/kg/hour for children > 30 kg
      - Fluid volume may be adjusted according to vital signs (particularly heart rate), after consultation with a physician

**Table 8 – Hourly Maintenance Fluid Requirements (1-hour periods)**

<table>
<thead>
<tr>
<th>Calculation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4 mL/kg/hour for first 10 kg of body weight</td>
<td>+ 2 mL/kg/hour for the next 10 kg of body weight</td>
</tr>
<tr>
<td>+ 1 mL/kg/hour for each kilogram over 20 kg of body weight</td>
<td>Maximum of 100 mL/hour or 2400 mL a day needed for maintenance</td>
</tr>
</tbody>
</table>

**Examples**

For 10 kg child: 10 kg x 4 mL/kg/hour = 40 mL/hour

For 15 kg child: (10 kg x 4 mL/kg/hour) + (5 kg x 2 mL/kg/hour) = 50 mL/hour

For 25 kg child: (10 kg x 4 mL/kg/hour) + (10 kg x 2 mL/kg/hour) + (5 kg x 1 mL/kg/hour) = 65 mL/hour
Burn shock usually takes hours to develop. If shock is evident on initial presentation, look for other causes of volume loss, such as major injury elsewhere in the body (see “Shock” in the chapter, “General Emergencies and Major Trauma”).

Special Considerations for Resuscitation
- Restlessness may be secondary to hypoxia
- Monitor for respiratory distress or failure
- Assume smoke inhalation (see “Inhalation of Toxic Material” in the adult chapter, “Respiratory System”)

Perform secondary survey and identify associated injuries.
- Insert urinary catheter, if appropriate; record hourly input and output
- Insert nasogastric tube, if appropriate and upon consultation a physician supports its use
- Assess peripheral circulation if child has circumferential burns on extremities
- Monitor colour, capillary refill, paresthesia and deep tissue pain

Nonpharmacologic Interventions

Wound Care
- Cover burns with dry sterile dressings for transfer to burn centre. Refer to the Nonpharmacologic Interventions of second-degree burns for the management of blisters
- Do not immerse or apply cold water to severe burns (see Table 6, “Classification of Burns by Severity [Surface Area Involved]”)

Pharmacologic Interventions

For analgesia, consult a physician first; consider:
- morphine in small, frequent doses (0.1 mg/kg/dose), IV

Be alert for respiratory depression with opioids.
There is no indication for prophylactic antibiotics.

Monitoring and Follow-Up
- Monitor ABCs 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
- Wrap child in clean sheet and cover with blankets to conserve heat and prevent hypothermia

Referral
Medevac (using criteria in Table 9, “Criteria for Transfer of Burn Patient to Hospital [All Serious Burns],” along with consultation with a physician).

Table 9 – Criteria for Transfer of Burn Patient

| Combination partial- and full-thickness burns of 10% or more in children < 10 years or adults > 50 years |
| Combination partial- and full-thickness burns > 20% in other age group (≥ 10 and ≤ 50 years) |
| Full-thickness burns of > 5 % or more of body surface in any age group |
| Partial- and full-thickness burns involving face, eyes, ears, hands, feet, genitalia, perineum or major joints |
| Circumferential chest or extremity burns |
| Any inhalation injury, high voltage electrical burns, lightening, significant chemical burns |
| Any child requiring social, emotional services or suspected victim of child maltreatment |
| Presence of preexisting illness that may complicate recovery (for example, diabetes mellitus) |

FROSTBITE

Thermal injury to tissue caused by cold. Injury may occur without (see Table 10, “Types of Cold Injury Without Frostbite”) or with (see Table 11, “Classification of Frostbite”) freezing of the tissue. Freezing of the tissue is defined by the formation of ice crystals.
### Table 10 – 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 11 – Classification of Frostbite

<table>
<thead>
<tr>
<th>Gross appearance of the injured area</th>
<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>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 discoloured skin without blisters</td>
<td>Extensive dark and cyanotic skin without blisters or edema</td>
<td></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>
<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>
<td></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 hands and feet, while cheeks, nose, ears and penis are commonly affected.  

### Frostnip

- Initially cold, burning pain
- Area becomes blanched
- With rewarming, area becomes reddened

### 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

See also Table 10, “Types of Cold Injury Without Frostbite” and Table 11, “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
- Rewarm parts
- Control pain (active rewarming is very painful)
- Address wound care
- Prevent infection

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 (see 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 rewarming 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 rewarmed; 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
- Treat frostnip and superficial frostbite as you would a first-degree burn (see “Burns”)

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), 4–10 mg/kg/dose PO q6-8h prn
- acetaminophen (Tylenol) 10–15 mg/kg/dose PO q4-6h prn

Moderate to Severe Frostbite

As pain may be severe during rewarming, consult a physician, as morphine may be considered for pain control. Be alert for respiratory depression if opioids are used.

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 as soon as possible.

SKIN WOUNDS

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

TYPES OF TRAUMATIC WOUND

Wounds that result from trauma can be categorized by type.

### Table 12 – Classification of Wound 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. Commonly seen in fingertip, tip of nose, ear lobe or loss of permanent teeth injuries. A severe form of avulsion is “degloving” where the full thickness of the skin is peeled away from a finger, hand, foot or an area of limb, causing devascularization of the skin and damage to underlying tissues.</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>

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 (see 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**

- **Débridement:** 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-iode 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 débride.

- 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 centimeters (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 chapter 2, “Pediatric Procedures” for contraindications to the use of TA.

- **Suturing:** Larger wounds need suturing (see Table 13, “Types of Suture Material for Particular Sites”). Close in layers as necessary using simple interrupted sutures.

**Table 13 – 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>Nonabsorbable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nylon-Dermalon, Ethilon</td>
<td>#3-0, 4-0</td>
<td>Scalp</td>
</tr>
<tr>
<td></td>
<td>#5-0, 6-0</td>
<td>Forehead</td>
</tr>
<tr>
<td></td>
<td>#3-0, 4-0, 5-0</td>
<td>Back</td>
</tr>
<tr>
<td></td>
<td>#3-0, 4-0, 5-0</td>
<td>Torso</td>
</tr>
<tr>
<td></td>
<td>#3-0, 4-0, 5-0</td>
<td>Limbs</td>
</tr>
<tr>
<td>Nylon coated with polypropylene glycol (Prolene)</td>
<td>#5-0, 6-0</td>
<td>Face</td>
</tr>
<tr>
<td>Absorbable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polygalactin (Vicryl, Dexon)</td>
<td>#4-0, 5-0</td>
<td>Subcutaneous tissue</td>
</tr>
<tr>
<td>Monofilament (Monocryl)</td>
<td></td>
<td>Muscle</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, 3–4 mg/kg (0.3 to 0.4 mL/kg of a 1% solution without epinephrine; maximum 28 mL). The lowest effective doses should be used in children to avoid systemic toxic effects.
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 anesthetic 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 anesthetized
- It may be of value to dribble a small amount of lidocaine onto the wound before infiltration to provide some initial anesthesia
- Give anesthetic 5 minutes to be effective
- If extensive suturing is required, it may be necessary to anesthetize and suture a small area at a time to prevent the anesthetic from wearing off before suturing is complete

**Toxic effects of lidocaine:** Observed if anesthetic 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)

**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, diabetic clients with a contaminated foot wound or other clients with immunocompromise:

- **Cloxacillin** 25–50 mg/kg/day PO divided qid for 7 days (maximum 2g/day)

For clients with allergy to penicillin:

- **Erythromycin** 30–40 mg/kg/day PO divided tid or qid for 7 days (maximum 2g/day)

**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), 40 mg/kg/day PO divided tid for 3–5 days

Duration of antibiotic use is longer for the treatment of an infection that is already present. Contact a physician to discuss this.

Cefuroxime axetil is a suitable alternative. For those with beta-lactam allergy contact a physician, who may suggest one of the following:

- Children ≤ 8 years: clindamycin + TMP/SMX
- Children > 8 years: doxycycline

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

**Cat Bites**

Antibiotics are routinely given prophylactically for all cat bites. The drug of choice is:

- amoxicillin/clavulanate (Clavulin), 40 mg/kg/day PO divided tid for 3–5 days

Duration of antibiotic use is longer for the treatment of an infection that is already present. Contact a physician to discuss this.

Cefuroxime axetil is a suitable alternative. For those with beta-lactam allergy contact a physician, who may suggest one of the following:

- Children ≤ 8 years: clindamycin + TMP/SMX
- Children > 8 years: doxycycline
Dog Bites

About 20% of dog bites become infected, and prophylaxis is only recommended under certain circumstances: moderate/severe bites; crush injury/edema; 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 at http://www.phac-aspc.gc.ca/publicat/cig-gci/index-eng.php for details)

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 14, “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>7–10 days</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.

Referral

Consider referral to 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 vermillion border of lip, and that are complex or very irregularly shaped
- Open fracture is an indication for surgical débridement 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)
Internet addresses are valid as of June 2010.

BOOKS AND MONOGRAPHS


INTERNET GUIDELINES


ENDNOTES


8 Lau E (Editor). SickKids drug handbook and formulary.


