



Industrial Clinical Practice Guidelines (CPG)

**April 2015
Version 3**



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(Includes Amendments to AHS Protocols)

The *AMS Industrial Clinical Practice Guidelines (CPG)* are designed to address acute non-urgent and routine primary care medical conditions. The companion manual, *AMS Industrial BLS/ALS Field Medical Protocols* addresses all urgent/emergent medical situations and should be utilized first in those situations.

The *AMS Industrial Clinical Practice Guidelines (CPG)* have been adapted from the *International Medical Guide for Ships*, 3rd Edition, published by the World Health Organization and where necessary modified to reflect Canadian standards of medical care.

All patients require consultation with the Most Responsible Physician. However, this may not always be possible in the remote environment. The industrial healthcare provider may practice to the extent of their licensure and in accordance with the *AHS Medical Control Protocols (Adult)* when communication with the Medical Director is not possible and lifesaving interventions are required.

Within Canada, industrial healthcare providers hold different territorial or provincial licenses with varying designations and skill sets. AMS has adopted the *AHS Medical Control Protocols (Adult)* and as such any AMS industrial healthcare provider employed by the Company shall receive bridge training to the Alberta standards. The following territorial or provincial licenses are considered interchangeable within the document:

- AHS Emergency Medical Responder (EMR) = Emergency Medical Responder (EMR)
- AHS Emergency Medical Technician (EMT) = Primary Care Paramedic (PCP)
- AHS Emergency Medical Technician – Paramedic (EMT-P) = Advanced Care Paramedic (ACP)

*** Physician Assistants (PA) will adhere to all protocols where indicated for AHS EMT-P unless otherwise specified.

*** ANY URGENT/EMERGENT MEDICAL CASES PLEASE REFER TO THE AMS INDUSTRIAL FIELD MEDICAL PROTOCOLS ***

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1.0 Delegation of Authority and Medical Control

This set of protocols titled “*AMS Industrial Clinical Practice Guidelines (CPG) – April 2015 Revision*” is intended to provide AMS industrial healthcare providers with a comprehensive, up to date, algorithmically based approach to non-urgent and routine medical situations in primary care medicine. The companion source, *AMS Industrial BLS/ALS Field Medical Protocols* is a publication that addresses the urgent/emergent medical conditions. The protocols within are to be used in conjunction with the *AHS Medical Control Protocols (Adult)* 2014. Any protocols found within this document supersede the *AHS Medical Control Protocols* unless otherwise specified.

AMS Industrial Medical Providers function in an expanded scope of practice and are reliant on the delegated authority and medical control of the Medical Director to perform this expanded range of interventions and administration of medications.

AMS Industrial Medical Providers require certification to use these Medical Protocols. After reviewing credentials and ensuring that personnel are familiar with the protocols and with AMS procedures, this certification is provided by the Medical Director. Certification is reviewed every two years.

Regardless of this delegated authority, it is expected that AMS industrial healthcare providers operate within their level of training and their personal comfort, experience, and competency. Patient safety is paramount and the overriding expectation is that we do nothing to worsen a clinical situation or to harm our clients.

However, no set of medical control protocols can provide direction in all clinical circumstances nor can it replace good judgment and hands-on decision-making. Sound clinical judgment in an urgent situation will be supported should an industrial healthcare providers perform outside the medical control protocols.

When conditions do not allow for the strict adherence to these guidelines Medical Director guidance should be sought. If this is impossible due to the urgency of the patient’s condition or due to technical problems, intentional deviations from protocol must be clearly documented with rationale and the Medical Director must be informed as soon as reasonably possible. AMS provides comprehensive Medical Director – Field Staff are encouraged to use this resource liberally.

Medical Director is available 24/7/365 via telephone for urgent consultation and via e-mail for non-urgent questions. Your local receiving facility Emergency Department is also available 24/7/365 as a back up.

The AMS Industrial BLS/ALS Field Medical Protocols include numerous mentions of situations in which Medical Control must be contacted. In addition to these, the list below outlines situations in which Medical Control **must** be consulted / informed in a timely manner:

Any critical intervention including:

1. Advanced Airway Interventions
 - Oral, nasal, or supraglottic airways
 - Positive pressure ventilation / BVM
 - Intubation
2. Advanced Cardiac Interventions
 - AED
 - Manual & Semi-Automated Defibrillation
 - Cardioversion
 - Cardiopulmonary Resuscitation (CPR)
3. Use of ALS medications as outlined in the AHS BLS/ALS Medical Control Protocols 2014.
4. Prior to initiation of any oral or IV antibiotics
5. If a client is unable to work due to illness or injury and is off work for a full shift or more
6. If a client is evacuated offsite for an injury and/or illness via routine charter or medevac.
7. Any adverse effects from medication administration.

2.0 General Principles

2.1 Patient Autonomy

As medical professionals our primary goal is to provide the highest level of patient care possible. It is important that the patient retains decision-making rights over their own assessments and treatments by a healthcare provider. The patient may refuse assessment and treatment except in situations that apply under the Mental Health Act and the Public Health Act. Patients have the right to be informed of what assessments and treatments require to be performed and all potential risk and benefits of a treatment.

2.2 Employee Safety

AMS is dedicated to ensuring employee safety. It is important to keep your own personal safety in mind while performing the duties of your job. This can be difficult when responding to an emergency. Please remember dead or injured emergency responders are unable to help anyone. Emergency response duties are inherently dangerous. It is important to use the established safety measures to reduce your chances of becoming ill or injured and to always keep your personal safety in the forefront of your mind. If you encounter a situation that is beyond the usual risk of the job, employees are expected to utilize whatever resources are required to reduce the risk to an acceptable level. This may sometimes require us to wait for other personnel to arrive before attending to the patient.

2.3 Patient Safety

Advanced Medical Solutions is dedicated to ensuring a safe environment for their patients. Any patient safety incidents such as a medication error, an adverse reaction to a medication, aggravation of an injury during treatment will be reported to the Industrial Operations Manager and Medical Director.

2.4 Protective Equipment and Universal Precautions

Universal precautions are designed to protect both the client and the caregiver. AMS industrial healthcare providers are required to utilize universal precautions such as gloves, masks, sterile technique, and safe sharps handling and disposal as appropriate. N95 masks will be stocked on site in the event they are required for respiratory protection. Depending on the situation, employees may also utilize gowns, masks, helmets, ear protection, and cold weather protection gear. Anytime an employee is working on or near a roadway or other traffic area, reflective vests and/or clothing must be worn, and all emergency and hazard lights on vehicles must be activated. All entry requirements for industrial sites must be followed. Industrial healthcare providers must not wear or utilize any safety apparel or equipment where training and competency has not been demonstrated and confirmed. Please refer to Appendix B of this document for the selection of appropriate level of PPE.

2.5 Patient Assessment

Our clients should be treated with respect and their privacy and confidentially guarded. A complete physical and focused assessment will be completed on every client.

2.6 Record Keeping

Records should be thorough, accurate, and maintained in a locked secure area accessible only to medical staff. The basic essentials of a patient care record include the presenting complaint, the history of present illness, past medical history, allergies, medications, objective findings including vital signs and physical exam, impression, and management plan. All interventions, phone consults, and medications and physician orders/directives should be recorded. When administering interventions or medications, reference should be made to the name of the protocol that you are following or the name of the physician whose instructions you are following.

2.7 Medication Administrations and Storage

Narcotic storage and record keeping will be conducted as per company policy. All industrial healthcare providers are responsible for ensuring that all drugs on the approved drug list are stocked and are available on site at no less than the minimum quantities specified. Drugs not on the approved drug list are not to be stocked nor administered by industrial healthcare providers.

A number of medications appear on the master drug list but not in the protocols. For example, many antibiotics and some critical care medications such as dopamine and phenytoin. These drugs are to be given only after receiving verbal orders from Medical Director or the receiving physician.

Medication should only be administered if a clear indication exists and only after it is ensured that no allergy or other contraindication is present. It is prudent to start with a small dose and titrate upwards. It is also prudent to observe the patient after the first dose of a new medication is given. IV medication should be administered slowly and the patient closely observed for at least 30 minutes after the first administration. The dose and time of medication administration should be recorded on the care record.

Any medication adverse effects must be reported to the Medical Director.

2.8 Sharing of Confidential Information

Medical information is strictly confidential. AMS operates in industrial sites and therefore has a relationship with the site owner/operator. It is essential that patient confidentiality be respected in this environment.

In the case of non-occupational injuries and/or illnesses, only very limited information should be shared with the employer. This will typically include only communicating work restrictions and plan for reassessment only. The diagnosis and other details should not be shared without the patient's explicit consent.

In the case of work related injury or other work related conditions, it may be necessary to share more information. In addition to work restrictions, this may include the nature of the injury, how it occurred, and the management plan. Information not directly related to the injury or to site safety should not be disclosed.

Under certain circumstances client information might be required by law by the workers compensation board, public health department, or other government or judicial agency. Always seek permission from the Industrial Operations Manager prior to sharing any patient care information and ensure appropriate permission has been obtained by the client.

When transferring care or seeking consultation, it may be necessary to fax patient records or ECGs to the receiving physician or facility.

In non-emergent situations, written consent must be sought from the client prior forwarding patient records or disclosing information to other caregivers or parties.

2.9 Transfer of Care Guidelines

Some situations require the transfer of care of a patient from AMS industrial healthcare provider(s) to other health care professionals such as air medical staff. It is incumbent upon the staff handing off a patient to ensure that the individuals who are receiving the patient are able to provide the care needed. If this is not possible it may be necessary in certain circumstances for the AMS staff to accompany the patient during transport. It is important to explore this possibility before such an event should arise so that contingency plans can be made with all involved parties.

Written and verbal communication is a requirement of standard of care when handing over a patient. The minimum requirements include a time record of physical findings, vital signs, and interventions and drugs administered.

2.10 Local Resources and Disaster Planning

AMS industrial healthcare providers are required to be aware of the local medical and transport resources. These resources include nearest medical clinics, hospitals, ground and/or air ambulance, charters services, and routes. Contact information and procedures to access those should also be available to the industrial healthcare provider and posted in readily accessible area.

2.11 Legislation and Regulations

Staff are required to be registered in good standing with their relevant professional College. AMS and its staff will comply with all applicable legislation and regulations in the jurisdictions in which it operates including relevant workers compensation board regulations and reporting requirements.

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Date

Assessment of the Eyes

History of Present Illness And Review of System

General

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

- Onset (sudden or gradual)
- Chronology
- Current situation (improving or deteriorating)
- Location
- Radiation
- Quality
- Timing (frequency, duration)
- Severity
- Precipitating and aggravating factors
- Relieving factors
- Associated symptoms
- Effects on daily activities
- Previous diagnosis of similar episodes
- Previous treatments
- Efficacy of previous treatments

Cardinal Symptoms

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

Vision

- Recent changes
- Blurring
- Halos
- Floaters
- Corrective measures (glasses, contact lenses)

Other Associated Symptoms

- Pain
- Irritation
- Foreign-body sensation
- Photophobia
- Diplopia
- Lacrimation

- Itching
- Discharge
- Ear pain
- Nasal discharge
- Sore throat
- Cough
- Nausea or vomiting
- Urethral, vaginal or rectal discharge
- Pain or inflammation of the joints (or both)

Medical History (Specific to Eyes)

- Eye diseases or injuries
- Eye surgery
- Use of corrective eyeglasses or contact lenses
- Concurrent infection of the upper respiratory tract
- Sexually transmitted infections
- Immunocompromise
- Exposure to eye irritants (environmental or occupational)
- Allergies (especially seasonal)
- Current medications
- Systemic inflammatory disease (inflammatory bowel disease, Reiter's syndrome)
- Diabetes mellitus
- Hypertension
- Chronic renal disease
- Bleeding disorders

Personal And Social History (Specific to Eyes)

- Occupational exposure to irritants
- Use of protective eyewear
- Housing and sanitation conditions
- School or daycare exposure to contagious organisms (e.g. pinkeye)

General Physical Examination

Eye

Examine the bony orbit, lids, lacrimal apparatus, conjunctiva, sclera, cornea, iris, pupil, lens and fundi. Note the following:

- Visual acuity (which is decreased in keratitis, uveitis and acute glaucoma)
- Swelling
- Discharge or crusting
- Discoloration (erythema, bruising or hemorrhage)
- Lipid deposits
- Arcus senilis (white circle) around iris
- Position and alignment of eyes
- Reaction of pupil and its accommodation to light
- Extraocular movements (which are associated with pain in uveitis)
- Visual field by confrontation
- Corneal clarity, abrasions and lacerations
- Corneal light reflex
- Lens opacities (cataracts)
- Red reflex (which indicates intact retina)
- Hemorrhage or exudate
- Optic disk and retinal vasculature

Palpate the bony orbit, eyebrows, lacrimal apparatus and pre-auricular lymph nodes for tenderness, swelling or masses.

Apply fluorescein stain (to test for corneal integrity).

Measure intraocular pressure (by Schiøtz tonometry) (10 to 20 mm Hg is normal).

The ear, nose and throat should also be examined if there are symptoms of an upper respiratory tract

infection or if sexually transmitted infection (e.g. gonorrhea) is suspected.

Lymphatic System

Assess the lymph nodes of the head and neck if a systemic condition, such as a viral infection of the upper respiratory tract or a sexually transmitted infection, is suspected.

Assess for pre-auricular adenopathy, which might indicate chlamydial, viral or invasive bacterial infection of the eye (e.g. gonorrhea).

Abdomen

Assess liver for tenderness and enlargement if eye symptoms are associated with symptoms of a sexually transmitted infection (e.g. disseminated gonorrhea).

Genitourinary System And Rectal Area

Assess for urethral, cervical or vaginal discharge if eye symptoms are associated with symptoms of a sexually transmitted infection (e.g. disseminated gonorrhea).

Musculoskeletal System And Extremities

Examine the joints to assess for warmth, redness, pain or swelling if eye symptoms are associated with joint symptoms (e.g. disseminated gonorrhea).

Differential Diagnosis of Eye Symptoms or Ocular Pain

- Hordeolum
- Chalazion
- Acute dacryocystitis
- Exposure to irritants
- Conjunctival infection
- Corneal abrasion
- Foreign-body irritation
- Corneal ulcers
- Ingrown lashes
- Abuse of contact lens
- Scleritis
- Acute angle-closure glaucoma
- Uveitis (iritis)
- Referred pain from extraocular sources such as sinusitis, tooth abscess, tension headache, temporal arteritis or prodrome of herpes zoster

Common Problems of the Eye

Red Eye

Red eye is common in a wide variety of ocular conditions (Table 1), some of which are a serious threat to vision and require immediate referral to an ophthalmologist.

Causes

- Infection: conjunctivitis, keratitis (bacterial, viral [herpetic or non-herpetic] or other)
- Ocular inflammation: uveitis, iritis, episcleritis, scleritis
- Dry eyes
- Blepharitis with secondary conjunctivitis or keratitis (or both)
- Allergy (e.g. allergic conjunctivitis)
- Glaucoma (e.g. acute angle-closure glaucoma)
- Toxic, chemical or other irritants such as topical eye drugs, contact lens solution, acids or alkalis, smoke, wind or ultraviolet rays
- Traumatic injury (e.g. corneal abrasion, foreign-body irritation, hyphema, subconjunctival hemorrhage)
- Pterygium or inflamed pinguecula

- Infection of lacrimal system (e.g. dacryocystitis)

Features Of Dangerous Red Eye

The first step is to differentiate major or serious causes of red eye from minor causes. The following danger signs call for referral to an ophthalmologist.

- Severe ocular pain (especially if unilateral)
- Photophobia
- Persistent blurring of the vision
- Proptosis (exophthalmos)
- Reduced ocular movement
- Ciliary flush
- Irregular corneal reflection of light
- Corneal epithelial defect or opacity
- Pupil unreactive to direct light
- Worsening of signs after 3 days of pharmacologic treatment for conjunctivitis
- Compromised host (e.g. neonate, immunosuppressed patient, user of soft contact lenses)

Table 1: Partial Differential Diagnosis of Red Eye

	Conjunctivitis			Corneal injury or infection	Uveitis (Iritis)	Glaucoma
	Bacterial	Viral	Allergic			
Vision	Normal	Normal	Normal	Reduced or very reduced	Reduced	Very reduced
Pain	-	-	-	+	+	+++
Photophobia	+/-	-	-	+	++	-
Foreign body sensation	+/-	+/-	-	+	-	-
Itch	+/-	+/-	++	-	-	-
Tearing	+	++	+	++	+	-
Discharge	Mucopurulent	Mucoid	-	-	-	-
Pre-auricular adenopathy	-	+	-	-	-	-
Pupils	Normal	Normal	Normal	Normal or small	Small	Moderately dilated or fixed
Conjunctival hyperemia	Diffuse	Diffuse	Diffuse	Diffuse with ciliary flush	Ciliary flush	Diffuse with ciliary flush
Cornea	Clear	Sometimes faint punctate staining or infiltrates	Clear	Depends on disorder	Clear or lightly cloudy	Cloudy
Intraocular pressure	Normal	Normal	Normal	Normal	Reduced, normal or absent	Increased

+, present (to various degrees); -, absent; +/-, may be present *Hyperthyroidism may cause conjunctival injection.

Blepharitis

Definition

Inflammation of the eyelid margins.

Causes

- Seborrhea or bacterial infection (with *Staphylococcus aureus*); both may be present in some people (mixed form)
- Lice infestation of the lashes

History

- Burning, itching or irritation of lid margin
- Condition commonly chronic, with frequent exacerbations
- Usually bilateral
- History of seborrhea (of the scalp, brows or ears)
- Loss of lashes

Physical Findings

- Lid margin red, scaly
- Crusting may be present
- Visual acuity normal
- PERRLA
- Conjunctival redness may be present

Bacterial Form

- Dry scales
- Lid margin red
- Ulceration may be present
- Lashes tend to fall out

Seborrheic Form

- Greasy scales
- Lid margins less red
- No ulceration

Mixed Form

- Dry and greasy scales
- Lid margins red
- Ulceration may be present

Differential Diagnosis

- Allergic blepharitis
- Hordeolum (stye)
- Chalazion
- Conjunctivitis

- Skin cancer (unilateral) (e.g. sebaceous-cell carcinoma)

Complications

- Secondary bacterial infection common in seborrheic form
- Recurrence

Diagnostic Tests

- Swab exudate for culture and sensitivity prn

Management

Goals of Treatment

- Keep lid margin clean and free of scaly buildup
- Prevent infection

Appropriate Consultation

Consult a physician if the inflammation or infection is extensive (i.e. includes more than the lid margins), as in orbital cellulitis.

Treat for several weeks, until the blepharitis is completely gone, to reduce chance of recurrence.

Non-Pharmacologic Interventions

Lid Hygiene (to be performed twice daily). First, apply warm compresses for 5 minutes to soften the scales and crusts. Next, scrub the eyelid margin and the bases of the eyelashes with a solution of water and baby shampoo (90 mL [3 oz] water and 3 drops of shampoo). Rinse with clear water and then remove lid debris with a dry, cotton-tipped applicator.

Client Education

- Counsel client about appropriate use of medications (dose, frequency, application)
- Instruct client in proper hygiene of eyelids
- Recommend that client avoid rubbing or irritating eyelids
- Recommend avoidance of cosmetics, wind, smoke and other irritants

Pharmacologic Interventions

Apply a topical antibiotic eye ointment to the lid margins and into the lower conjunctival sac:

*polysporin ointment bid for 1-2 months,
or
erythromycin ointment bid for 1-2 months*

Identify and manage underlying seborrhea (scalp, eyebrows or other skin areas).

Monitoring and Follow-Up

Follow up in 10-14 days.

Referral

Usually not necessary unless there is no response to therapy or if infection becomes more extensive (e.g. orbital cellulitis).

Conjunctivitis

Definition

Inflammation of the conjunctiva.

Causes

Conjunctivitis is usually one of three types:

- Bacterial: *Chlamydia*, *Hemophilus influenzae*, *Neisseria gonorrhoeae*, *Staphylococcus aureus*, *Streptococcus pneumoniae*
- Viral: adenovirus, coxsackie virus, ECHO virus
- Allergic: seasonal pollens or environmental exposure

Predisposing factors: contact with another person who has conjunctivitis, exposure to a sexually transmitted infection, other atopic (allergic) conditions.

History

Bacterial Conjunctivitis

- Acute redness and purulent discharge
- Burning, gritty sensation in eyes
- Recent contact with others with similar symptoms

Viral Conjunctivitis

- Acute onset of redness
- Watery discharge
- Foreign-body sensation
- Lasts 1-4 days; infectious for up to 2 weeks
- Systemic symptoms (e.g. sneezing, runny nose, sore throat)
- Recent contact with others with similar symptoms

Allergic Conjunctivitis

- History of seasonal allergies, eczema, asthma, urticaria
- Watery, red, itchy eyes, without purulent drainage

Physical Findings

- Vital signs normal (unless associated with systemic illness)
- Visual acuity usually normal
- PERRLA; extraocular eye movements normal
- Unilateral or bilateral diffuse conjunctival redness

- Discharge: purulent, thin and watery, or thick and stringy
- Crusts on lashes in viral and bacterial forms
- Eyelids red or edematous
- Pre-auricular adenopathy present in gonococcal conjunctivitis and viral

Differential Diagnosis

- Blepharitis
- Corneal abrasion
- Uveitis (iritis)
- Herpetic keratoconjunctivitis

Complications

- Spread of infection to other eye structures
- Spread of infection to other household members

Diagnostic Tests

- Measure visual acuity
- Swab and culture exudate

Management

Goals of Treatment

- Rule out more serious infections such as gonorrhea or chlamydial infection
- Prevent household spread
- Chronic (>3 weeks) recurrent or atypical conjunctivitis may be diagnosed as
 - blepharitis
 - dry eye
 - chlamydial

Appropriate Consultation

Consult a physician if any of the following pertain:

- Significant associated eye pain
- Any loss in visual acuity
- Suspicion of kerato conjunctivitis or other more serious cause of red eye
- Client has periorbital cellulitis
- No improvement with treatment in 48-72 hours
- Client wears contact lenses (and would thus be at high risk for *Pseudomonas* conjunctivitis and keratitis)

- Suspicion of gonorrhea or chlamydial conjunctivitis, either of which requires systemic antibiotics.

Non-Pharmacologic Interventions

Apply cool compresses to eyes, lids and lashes as frequently as possible.

Client Education

- Counsel client about appropriate use of medications (dose, frequency, instillation)
- Advise client to avoid contamination of tube or bottle of medication with infecting organisms
- Suggest ways to prevent spread of infection to other household members and school or daycare contacts
- Instruct client about proper hygiene of hands and eyes
- For allergic form: recommend that client avoid going outside when pollen count is high and that protective glasses be worn to prevent pollen from entering the eyes
- Do not allow client to use an eye patch

Pharmacologic Interventions

Never use steroid or steroid-and-antibiotic combination eye drops, because the infection may progress or a corneal ulcer may rapidly form and cause perforation.

Bacterial Conjunctivitis

Topical antibiotic eye drop:

sulfacetamide 10%, 2 or 3 drops q2h for 3 days followed by gradual tapering over the next 4 days

or

polymyxin B gramicidin eye drops, 2 or 3 drops qid for 5-7 days if the infection is mild

An antibiotic eye ointment may be used at bedtime in addition to the antibiotic eye drops prn:
gentamicin hs

or

erythromycin 0.5% hs

Viral Conjunctivitis

Boric acid washes often provide excellent symptomatic relief (antibiotics are not helpful and are not indicated). May cause irritation. Cool compresses only/vasoconstrictive drops.

Allergic Conjunctivitis

Topical antihistamine eye drops are recommended if symptoms are not controlled by oral medications.

Vasocon A eye drops

Consult a physician for any others.

Monitoring and Follow-Up

Clients with moderate or severe symptoms should be seen for follow-up at 24 and 48 hours.

Referral

Refer to a physician if condition deteriorates, if symptoms persist despite treatment, or if symptoms recur.

Hordeolum Or Sty

Definition

Acute infection of a hair follicle of an eyelash, a Zeis (sebaceous) gland or a Moll (apocrine sweat) gland of the eyelid.

Cause

Bacterial infection (*Staphylococcus aureus*).

History

- Pain
- Swelling of eyelid
- Redness of eyelid
- Vision not affected
- Similar eyelid infection in the past

Physical Findings

- Localized redness and swelling of eyelid
- Mild conjunctival injection
- Possible purulent drainage along the lid margin
- Acutely tender

Differential Diagnosis

- Chalazion
- Blepharitis
- Dacryocystitis
- Orbital cellulitis

Complications

- Conjunctivitis

Diagnostic Tests

- Swab any drainage for culture and sensitivity

Management

Goals Of Treatment

- Relieve symptoms
- Prevent spread of infection to other eye structures

Appropriate Consultation

Usually not necessary for simple sty.

Nonpharmacologic Interventions

Apply warm, moist compresses qid.

Client Education

- Stress importance of not squeezing the hordeolum
- Teach the client eyelid hygiene: wash lid with mild soap and water; use a separate area of washcloth for each eye
- Stress importance of washing hands to prevent spread of infection
- Recommend avoidance of cosmetics during acute phase (current eye cosmetics should be discarded because they may harbor bacteria and cause recurrent infection)
- Client should not wear contact lenses until infection clears
- Counsel client about appropriate use of medications (dose, frequency, application)
- Stress importance of follow-up if symptoms do not improve with treatment or if inflammation extends to involve the periorbital tissues

Pharmacologic Interventions

gentamicin ointment (C class drug), qid for 10 days

Antibiotic eye drops can be used, but they require more frequent dosing, every 3-4 hours, and are generally less effective.

Monitoring and Follow-Up

Follow up in 3-4 days if symptoms do not respond; follow up sooner if infection spreads.

Referral

Consult a physician if the lesion does not respond to therapy or if there is evidence of infection of the periorbital soft tissue.

Chalazion

Definition

Chronic inflammatory lipogranuloma of a meibomian gland. It occurs deeper within the lid than a sty.

Cause

Results from obstruction of the meibomian gland duct. Secondary bacterial infection from *Staphylococcus aureus* may develop. Rare cause - chemical cellulitis (e.g. make-up).

History

- Lump on the eyelid area
- Redness, swelling and pain, if secondary infection develops
- Blurry vision if chalazion is large (pressure on the eye globe may cause astigmatism)
- Conjunctival injection (if associated with conjunctivitis)
- Tearing may be present (if conjunctiva irritated)

Physical Findings

- Hard, non-tender nodule (tender if acute) on the middle portion of the tarsus, away from the lid border; may be pointing to the inner surface of tarsus and causing pressure on the globe
- Inflammation of the lids and conjunctiva may be seen if secondary infection present

Differential Diagnosis

- Hordeolum (sty)
- Blepharitis
- Sebaceous-cell carcinoma (rare)

Complications

- Secondary infection
- Astigmatism

Diagnostic Tests

None.

Management

Goals of Treatment

- Prevent infection and visual disturbances.

A small asymptomatic chalazion does not require treatment and usually resolves spontaneously in a few months. If the chalazion is large or if there is secondary infection, treatment is needed.

Nonpharmacologic Interventions

Apply warm moist compresses qid for 15 minutes.

Client Education

- Stress importance of not squeezing the chalazion
- Teach the client eyelid hygiene: wash lid with mild soap and water; use a separate area of washcloth for each eye
- Stress importance of washing hands to prevent spread if infection occurs
- Recommend avoidance of cosmetics during acute phase (current eye cosmetics should be discarded because they may harbor bacteria and cause recurrent infection)
- Client should not wear contact lenses until infection clears
- Counsel client about appropriate use of medications (dose, frequency, application)
- Stress importance of follow-up if symptoms do not improve with treatment

Pharmacologic Interventions

gentamicin ointment, qid for 7 days

Antibiotic eye drops can be used, but they require more frequent dosing, every 3-4 hours, and are generally less effective.

Monitoring and Follow-Up

Follow up in 1-2 weeks.

Referral

Refer to a physician if a large chalazion does not respond to medical therapy. Incision and drainage with excision may be necessary if the chalazion does not resolve spontaneously within 2 or 3 months.

Chronic Open-Angle Glaucoma

Acute angle-closure glaucoma usually presents with acute symptoms and is a medical emergency (see *"Emergency Problems of the Eye,"* below, this chapter).

Definition

Glaucoma is a disease usually related to increased intraocular pressure, which may result in damage to the optic nerve that can lead to loss of vision. A complete understanding of the pathogenesis of glaucoma remains unknown; some people with high intraocular pressure do not have glaucoma, whereas others have glaucoma without elevated intraocular pressure.

Causes

- In chronic open-angle glaucoma, the secretion of aqueous humor and its flow between the lens and the iris through the pupil into the anterior chamber is normal; however, the trabecular meshwork does not allow rapid enough drainage of aqueous humor, with a resultant elevation in pressure
- Prevalence is about 1% of people over age 40, increasing to 3% among people older than 70 years; affects men and women equally

Risk Factors

Primary

- Elevated intraocular pressure
- Advanced age
- Family history of condition
- Myopia
- Diabetes mellitus
- Systemic hypertension
- African heritage

Secondary (Acquired)

- Blunt or penetrating trauma
- Previous intraocular surgery
- Previous intraocular inflammation
- Corticosteroid use
- Drugs that cause or worsen glaucoma: corticosteroids (commonly); antihistamines, decongestants, antispasmodics, antidepressants (rarely)

Congenital

- Family history of condition

History

Symptoms do not arise until disease is very advanced.

- Loss of vision (gradual and painless)
- Peripheral vision affected first
- Halos around lights (not open-angle)
- Presence of risk factors

Physical Findings

- Peripheral field of vision decreased
- Central visual acuity decreased, in late stages
- Cupping of the optic disk

Differential Diagnosis

Vascular occlusive disease of the eye.

Complications

Blindness.

Diagnostic Tests

- Measure visual acuity
- Determine extent of peripheral fields
- Measure intraocular pressure with Schiøtz tonometry; if pressure > 21 mm Hg, investigations should be initiated, especially if patient is symptomatic

Eighty-five percent of patients with intraocular pressure > 21 mm Hg do not have glaucoma and will not develop this condition in the next 5 years. Unless tonometry is performed frequently and accurately with precise instruments, the results may be inaccurate; therefore the screening value of tonometry has been challenged. The detection of glaucoma may be more appropriately based on the periodic screening of high-risk individuals with a thorough ophthalmological assessment.

Management

Goals of Treatment

- Prevent, slow or stop progressive vision loss
- Preserve a healthy optic nerve
- Early detection of those at risk

Emergency Problems Of The Eye

Corneal Abrasion

Definition

Superficial corneal defect due to scraping or rubbing of the corneal epithelium.

Causes

Usually trauma or a foreign body in the eye.

History

- Foreign-body sensation
- Sudden unilateral eye pain (sharp or worse with blinking)
- Moderate to profuse tearing
- Mild photophobia
- Mild blurred vision (due to tearing) may be present

Physical Findings

- Vital signs normal
- Visual acuity may be slightly blurred in affected eye
- Diffuse conjunctival injection
- Pupils react briskly to light
- Fluorescein staining will reveal area of abrasion
- Presence of a foreign body under the upper or lower eyelid must be ruled out

Differential Diagnosis

Rule out other causes of red eye (*see Table 1, in "Red Eye," above, this chapter*).

Complications

- Corneal ulceration
- Secondary bacterial infection
- Corneal scarring if abrasion recurs
- Uveitis (iritis)

Diagnostic Tests

- Measure visual acuity
- Apply fluorescein stain: corneal cells that have been damaged or lost will stain green; cobalt blue light allows easier visualization of the abrasion

Management

Goals of Treatment

- Prevent secondary bacterial infection
- Prevent development of corneal ulceration

Appropriate Consultation

Consult a physician if there is a large or central corneal abrasion or if a penetrating corneal ulcer is found on initial examination, if pain is severe, if the abrasion does not respond to therapy after 48 hours or if a residual rust ring is evident.

Nonpharmacologic Intervention

Firm, comfortable double-patching of the eye may relieve pain associated with larger abrasions. One day is usually sufficient.

Patching is contraindicated if abrasion is associated with wearing contact lenses.

Client Education

- Advise client that daily follow-up is important to ensure proper healing
- Counsel client about appropriate use of medications (type, dose, frequency, side effects)
- Instruct client to return to clinic immediately if pain increases or vision decreases before 24-hour follow-up
- Suggest that client wear protective glasses while working to help prevent similar incidents in future

Pharmacologic Interventions

Instill topical anesthetic eye drop:

tetracaine 0.5% eye solution, 2 drops

Complaints of irritation and foreign-body sensation should resolve in 1 or 2 minutes. Instill a generous amount of antibiotic eye ointment in the lower conjunctival sac:

sulfacetamide 10% eye ointment

Monitoring and Follow-Up

- Follow-up at 24 hours to assess healing is imperative
- If no symptoms or signs, patient can be sent home with advice on preventing corneal abrasions
- If client is still symptomatic but improving, the eye should be re-treated as above with antibiotic ointment or drops and re-examined daily with fluorescein. The uptake of dye should be less than on the previous day. Re-examine daily until the abrasion has healed completely.

Referral

Referral to an ophthalmologist is required within 24 hours for large or central defects and in 48-72 hours if there is no response to therapy.

Conjunctival, Corneal Or Intraocular Foreign Bodies

Definition

- Presence of a foreign object on the conjunctiva or cornea or intraocularly (within the globe)
- May be organic or inorganic

Cause

Improper protection of eyes.

History

Get an accurate description of the material and the circumstances under which it entered the eye (slow speed or high velocity); a rapidly moving projectile object may penetrate the globe of the eye. This typically occurs when metal is hammered upon metal.

With a penetrating eye injury, the eye may appear deceptively normal.

- Sudden onset of unilateral eye pain
- Irritation (foreign-body sensation)
- Tearing
- Photophobia
- Visual disturbance may be present

Physical Findings

- Visual acuity usually normal
- PERRLA
- Tearing
- Foreign body will be found in lower conjunctival sac or under the upper lid; may need to evert upper lid to find object
- Fluorescein stain may reveal associated corneal abrasion
- If foreign body is metallic, look for a rust ring around material

Differential Diagnosis

- Other causes of red eye (*see Table 1, in "Red Eye," above, this chapter*)
- Intraocular foreign body

Complications

- Corneal ulcer
- Secondary infection

Diagnostic Tests

- Measure visual acuity of both eyes
- Apply sterile fluorescein stain to identify any associated corneal defect

Management

Goals of Treatment

- Remove foreign body
- Identify associated corneal abrasion
- Identify residual corneal rust ring
- Identify embedded corneal foreign body

Appropriate Consultation

Consult a physician immediately if the foreign body cannot be dislodged with your treatment, if there is suspicion of an intraocular foreign body or if there is continued foreign-body sensation (lasting 24 hours or longer) when no foreign body has been detected.

Nonpharmacologic Interventions

Remove a superficial, non-embedded conjunctival foreign body by gently irrigating with normal saline or by gently wiping with a sterile cotton-tipped applicator moistened with a topical anesthetic or sterile saline.

Do not try to remove an obviously embedded foreign body, because it may have penetrated more deeply than expected.

After removing the superficial foreign body, use fluorescein stain to detect any remaining fragments, a rust ring or corneal abrasion.

Client Education

- Suggest that client wear protective glasses while working to help prevent similar incidents in future
- Stress that close follow-up is very important to ensure proper healing

Pharmacologic Interventions

Instill a topical anesthetic eye drop: *tetracaine 0.5%, 2 drops* only for removal.

gentamycin ungt, qhs

Monitoring and Follow-Up

Follow up in 24 hours to ensure resolution of symptoms.

Referral

Refer immediately any client with a foreign body that cannot be dislodged with your treatment, if there is a large or central corneal abrasion or if

there is any concern that the globe has been penetrated by a high-speed object.

Refer within 24 hours any client who continues to experience a foreign-body sensation even though no foreign body is detected.

Acute Angle-Closure Glaucoma

Definition

A sudden increase in intraocular pressure due to blockage of drainage tissue by the iris

Causes

- Pre-existing narrow angle of anterior chamber
- Spontaneous dilatation of pupil by drugs or darkened environment
- Complication of penetrating intraocular foreign body

History

- Sudden onset of severe unilateral eye pain
- Vision blurred, reduced or absent
- Nausea and vomiting may be present
- Tearing
- Coloured halos

Physical Findings

- Heart rate may be elevated
- Blood pressure may be elevated
- Client may be in acute distress (from pain or fear)
- Visual acuity reduced in affected eye
- Conjunctiva diffusely injected red
- Perilimbal flush may be present
- Cornea appears steamy/cloudy
- Pupil mid-dilated and non-reactive to light
- Fundusoscopic exam of affected eye may reveal increased cupping of the disk (cannot see acutely)
- Peripheral field of vision decreased in affected eye
- Intraocular pressure elevated on tonometry (normal range is 10-20 mm Hg)
- Globe of eye is hard

Differential Diagnosis

- Rule out other causes of red eye
- Uveitis (iritis)
- Macular degeneration

Complications

- Loss of vision, loss of eye
- Development of glaucoma in other eye

Diagnostic Tests

- Measure central and peripheral visual acuity
- Measure intraocular pressure with Schiøtz tonometry (normal range is 10-20 mm Hg); if pressure > 21 mm Hg, investigations should be initiated, especially if patient is symptomatic

Management

Goals of Treatment

- Identify condition quickly
- Relieve pain
- Preserve vision by reducing intraocular pressure

If the intraocular pressure is not reduced, glaucoma may develop in the unaffected eye because of a sympathetic response.

Appropriate Consultation

Consult a physician immediately.

Nonpharmacologic Interventions

- Keep client at rest
- Support and reassure client to minimize anxiety
- Explain disease process and management

Pharmacologic Interventions

For nausea and vomiting:

dimenhydrinate, 25-50 mg IM stat

For pain:

meperidine, 50-100 mg IM stat

To decrease pressure:

mannitol 1-1.5mg/kg IV

To constrict the pupil:

pilocarpine 2%, 2 drops q15min for 1 h, then 2 drops q30-60min for 4 h, then 1 drop q4h

When pilocarpine is applied topically at frequent intervals over a short period, there is a possibility of systemic toxic side effects (sweating, retching, salivation and muscle tremors).

Referral

Call ophthalmologist. Medevac as soon as possible to ophthalmologist, after reducing pressure; this problem needs surgical intervention. May need pressurized aircraft.

Keratitis (Snow Blindness)

Definition

Inflammation of the cornea due to ultraviolet damage.

Causes

- Prolonged, unprotected exposure to ultraviolet light (e.g. welders not using protective eyewear, people suffering from snow blindness)

History

- Symptoms range from moderate to severe
- Vision blurred
- Periocular pain
- Foreign-body sensation
- Severe photophobia
- Lid spasm may be present

Physical Findings

- Moderate to acute distress
- Various degrees of lid edema, spasm
- Tearing may be present
- Conjunctiva injected red, may have ciliary flush
- Pupils equal and reactive to light
- Visual acuity should be normal, although it may be blurred
- Fragmented corneal-light reflex
- Punctate roughening of cornea seen with fluorescein staining

Differential Diagnosis

- Conjunctivitis
- Uveitis (iritis)
- Corneal abrasion
- Corneal foreign-body irritation

Diagnostic Tests

- Measure visual acuity of both eyes
- Stain tear film with sterile fluorescein strips or drops

- Determine the amount of uptake of the dye on the cornea (an indicator of the degree of corneal involvement); usually the cornea will have a punctate pattern of dye uptake across the lower half

Management

Goals of Treatment

- Relieve discomfort
- Prevent recurrence

Appropriate Consultation

Consult a physician if this disorder is suspected.

Nonpharmacologic Interventions

Double-patch the eyes firmly but comfortably (remember, the client cannot see anything with both eyes patched; provide reassurance and assistance with all movements).

Client Education

Advise client that condition can be prevented by wearing protective eyewear while outside, especially on sunny winter days, or when using welding equipment.

Pharmacologic Interventions

Instill a topical anesthetic eye drop to relieve discomfort for diagnosis only:

tetracaine 0.5%, 2 drops

Instill a generous amount of a topical antibiotic eye ointment into the lower conjunctival sac:

gentamicin, qid

Manage pain with simple analgesics:

acetaminophen, 500 mg 1-2 tabs PO q4h prn

Referral

Daily follow-up.

Herpetic Keratitis

Definition

Viral infection of the cornea with ulcer formation.

Cause

Herpes simplex or herpes zoster.

History

- May be first episode or latest of series of episodes
- Often preceded by upper respiratory tract infection with fever
- Acute onset with severe unilateral pain
- With recurrence, pain becomes less severe
- Mild photophobia
- Blurred vision
- Tearing

Physical Findings

- Heart rate may be mildly elevated
- Mild to moderate distress
- Visual acuity normal
- Diffuse redness of eye
- Perilimbal flush may be present
- Pupils react briskly to light
- Dendritic ulcer visible with fluorescein staining

Differential Diagnosis

- Rule out other causes of red eye (*see Table 1, in "Red Eye," above, this chapter*).

Complications

- Chronic scarring of the cornea with reduced vision
- Recurrent exacerbations
- Uveitis (iritis)
- Perforation of cornea

Diagnostic Tests

- Measure visual acuity
- Apply fluorescein stain to confirm dendritic ulcer on cornea (the key physical clue to the diagnosis)

Management

Goals of Treatment

- Identify or prevent associated iritis or uveitis
- Relieve symptoms
- Preserve corneal function

Pharmacologic Interventions

Instill a topical anesthetic eye drop to relieve discomfort, for diagnosis only:

tetracaine 0.5%, 2 drops

Manage pain with simple analgesics:

acetaminophen, 500 mg, 1-2 tabs PO q4h prn

Referral

Call immediately to ophthalmologist because diagnosis is complex, and expedient, specific treatment is imperative to prevent loss of vision.

Chemical Burns

Definition

Ocular injury from acidic or alkaline liquids or powders.

Alkali burns can be more serious because tiny particles may be left behind even after the agent has been removed; these residues can cause progressive damage to the eye.

Cause

Improper protection of the eyes while working with these materials.

History

Institute first-aid treatment immediately upon learning that a chemical has come in contact with the eye. The detailed history can be obtained later.

- Name of the material (alkaline burns are more serious than acidic burns)
- Time when accident occurred (as accurate as possible)
- Was irrigation attempted? For how long?
- Was exposure bilateral or unilateral?
- Did material enter the eye or was it only splashed on the lids?
- Severe pain and burning of the eye (there may be no pain if burn is severe)
- Lid spasm
- Photophobia
- Reduced vision
- If the client inhaled or swallowed any of the substance, assess other body systems (e.g. gastrointestinal, respiratory)

Physical Findings

- Heart rate may be elevated (because of pain or fear)
- Blood pressure may be elevated (because of pain or fear)
- Client may be in acute distress

Mild Injury

- Haziness of cornea
- Injection of conjunctiva
- Intraocular pressure normal

Moderate Injury

- Corneal opacity
- Blurring of iris detail
- Minimal ischemic necrosis of conjunctiva and sclera (partial blanching)
- Intraocular pressure may become elevated

Severe Injury

- Marked corneal edema and haze
- Blurring of pupillary outline
- Blanching of conjunctiva and sclera (marked whitening of the external eye)
- Intraocular pressure elevated

With alkaline burns, there is often an immediate, rapid rise in intraocular pressure.

Complications

- Various degrees of permanent loss of vision
- Loss of eye

Diagnostic Tests

- Measure visual acuity of both eyes
- Apply fluorescein stain

Management

Goals of Treatment

- Dilute the toxic chemical *immediately*
- Minimize corneal damage

Appropriate Consultation

Consult physician about further care once emergency first-aid irrigation has diluted the chemical.

Nonpharmacologic Interventions

- Irrigate the eye immediately with large amounts of normal saline IV solution; continue irrigation for 20 minutes. Drip gently into the conjunctival sac
- Have client shift gaze so that the entire cul-de-sac can be flushed
- After the eye has been well irrigated, inspect it for any residual chemical particles (e.g. small pieces of lime in the conjunctival sacs); try to remove these with further irrigation or with a moistened cotton-tipped applicator

- If a corneal defect is noted on examination, double-patch the eye with sterile eye pad and protect with an eye shield

Pharmacologic Interventions

It may be necessary to instill a topical eye anesthetic if lid spasm is severe. Do not force lid open or instill any drops if there is concern of a ruptured globe:

tetracaine 0.5%, 2 drops

To control pain:

acetaminophen, 325 or 500 mg, 1-2 tabs PO q4h prn

or

acetaminophen with codeine 30mg, 1-2 tabs PO q4h prn if pain moderate or severe

Monitoring and Follow-Up

Monitor for the development of post-burn glaucoma, usually within 25 hours.

Referral

Refer to an ophthalmologist immediately after emergency treatment if you find one or more of the following:

- Acid or alkali burn
- Subnormal visual acuity
- Severe conjunctival swelling
- Corneal clouding

Blunt Or Lacerating Ocular Trauma

Definition

Traumatic injury to the eye or surrounding structures.

Causes

Blunt or lacerating trauma may cause a variety of injuries to the eye and its surrounding structures. Blunt trauma associated with fights, sports injuries or motor vehicle crashes can also result in serious damage. Most often, blunt trauma causes a contusion, but a strong impact may cause tissues to be torn.

There are 6 types of injuries:

- Contusion of globe and/or orbital tissues
- Orbital fracture (contusions limited to the orbital tissues and fractures of the orbits are much less threatening to vision but may be associated with significant coincident facial and intracranial injuries)
- Laceration of the ocular adnexa or globe, one of the more serious injuries (a ruptured globe is the most dangerous outcome of either blunt or lacerating trauma)
- Intraocular hemorrhage
- Retinal detachment
- Complicated eyelid lacerations (less dangerous but potentially serious)

Lacerations of the globe may be hard to find. Presume rupture of the globe if it has occurred before or if there is evidence of severe forceful trauma.

History

- Note mechanism of injury: What hit the eye? Where did it hit (eye, forehead or cheek)?
- How hard was the blow? When did it occur?
- Determine whether a penetrating injury is possible or whether the injury is limited to the structures around eye
- Swelling and pain around eye
- Pain deep in the eye may be present
- Reduced vision due to lid edema, retinal damage, corneal damage, dislocated lens, ruptured globe

Physical Findings

Inspect only. Do not palpate the globe. It may be difficult or impossible to examine the globe because of associated swelling. Do not force the lid open. Avoid putting direct pressure on globe and bony structures.

- Moderate to severe distress
- Pulse may be elevated
- Blood pressure may be elevated
- Swelling and bruising around the eye
- Deformity of the bone may be present
- Visual acuity may be diminished (do not test if doing so requires forcing the lid open or instilling drops)
- Conjunctival ecchymosis and swelling
- Pupil reaction to light should be normal; suspect globe damage if it is abnormal
- Red reflex should be present; suspect retinal detachment or lens damage if it is abnormal
- Note presence of hyphema (blood in the anterior chamber)
- Extraocular movement should be normal; suspect a fracture of *the floor of the bony orbit* if there is some limitation of the upward gaze of the affected eye
- Tenderness of bony structures

Complications

- Loss of vision
- Retinal detachment
- Dislocation of lens
- Acute angle-closure glaucoma
- Rupture of globe
- Hyphema
- Fracture of orbital bone
- Laceration of eyelid

Diagnostic Tests

Measure visual acuity in both eyes (but do not perform this test if doing so requires forcing open the lid or use of anesthetic drops).

Management**Goals of Treatment**

- Identify serious injuries to the eye or orbital bone
- Protect the eye from further damage

Appropriate Consultation

Consult a physician immediately if serious injuries are identified or suspected.

Nonpharmacologic Interventions

- Cover the eye loosely with a sterile gauze and apply an eye shield to prevent further injury; do not instill any medications into the eye
- Keep the client at rest in a half-sitting position

Referral

Call eye team first. Medevac to the care of an ophthalmologist if any of the following are suspected or confirmed after inspection:

- Severe pain
- Subnormal visual acuity
- Severe conjunctival ecchymosis
- Hyphema (blood in the anterior chamber)
- Irregular pupil
- Corneal or scleral laceration
- Deformation or laceration of globe
- Laceration of lid

Minor Soft-Tissue Contusion

If serious injuries to the eyeball, eyelids or orbit have been ruled out, swelling or bruising of the soft tissues around the eye is not considered serious.

Management

Goals of Treatment

- Symptomatic care
- Prevent further injury

Nonpharmacologic Interventions

- Cold compresses several times daily to reduce the swelling
- Eye shield for 1-2 days to protect eye from further injury

- Use of protective eyewear when engaged in high-risk activities or occupations such as contact sports, carpentry or sheet-metal work

Pharmacologic Interventions

Analgesia to control discomfort:

acetaminophen, 325 or 500 mg, 1-2 tabs PO q4h prn

or

ibuprofen, 200 mg, 1-2 tabs PO q4h prn

Monitoring and Follow-Up

See client in 2 or 3 days, once swelling goes down, to re-examine the eye thoroughly for injury.

Uveitis (Iritis)

Definition

Inflammation of the uveal tract (iris, ciliary body or choroid). This may involve one or all three portions of the uveal tract. The most frequent form is acute anterior uveitis (iritis).

Causes

Usually idiopathic, but may be associated with systemic disease (Reiter's syndrome, ankylosing spondylitis, sarcoidosis, juvenile arthritis, herpes simplex, herpes zoster) or may be a complication of ocular trauma such as corneal abrasion.

History

- Acute onset with moderate to severe unilateral periocular pain
- Photophobia
- Tearing
- Vision blurred and may be decreased
- Possible history of similar previous episodes
- History of other associated systemic disease

Physical Findings

- Patient may appear to be in acute distress
- Heart rate may be elevated
- Visual acuity reduced in affected eye
- Conjunctiva reddened
- Perilimbal (ciliary) flush present
- Cornea clear with white precipitates
- Border of iris may be blurred
- Pupil small, possibly irregular in shape and poorly reactive to light
- Hypopyon (pus in the anterior chamber) may be present

Differential Diagnosis

- Rule out other causes of red eye (*see Table 1, in "Red Eye," above, this chapter*).

Complications

- Acute angle-closure glaucoma

- Posterior adhesions (synechiae)
- Reduced vision

Diagnostic Tests

Measure visual acuity, if possible.

Management

Goals of Treatment

Early identification.

Appropriate Consultation

Consult a physician immediately for a management plan.

Nonpharmacologic Interventions

- Explain disease process and management plan
- Support and reassure client to reduce anxiety
- Do not put any pressure on the eyeball
- Client should wear sunglasses if a shield is unavailable

Pharmacologic Interventions

Initial management usually consists of a fast-acting topical eye drop to dilate the pupil. This relieves pain (caused by spasm of ciliary and iris muscles) and prevents formation of a scar between the pupillary border and the anterior lens capsule (posterior synechia):

*atropine 1%, 1 drop q12h or
tropicamide 1%, 1 drop q6h*

The dilating and antispasmodic effects are maximal in 30-60 minutes, and usually last from 3 to 6 hours.

Referral

Contact Medical Director

Assessment Of The Ears, Nose And Throat

History Of Present Illness And Review Of System

General

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

- Onset (sudden or gradual)
- Chronology
- Current situation (improving or deteriorating)
- Location
- Radiation
- Quality
- Timing (frequency, duration)
- Severity
- Precipitating and aggravating factors
- Relieving factors
- Associated symptoms
- Effects on daily activities
- Previous diagnosis of similar episodes
- Previous treatments
- Efficacy of previous treatments

Cardinal Symptoms

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

Ears

- Recent changes in hearing
- Compliance with and effectiveness of hearing aid
- Itching
- Earache
- Discharge
- Tinnitus
- Vertigo
- Ear trauma

Nose

- Nasal discharge or postnasal drip, colour
- Epistaxis
- Obstruction of airflow
- Sinus pain
- Itching
- Nasal trauma

- Sense of smell

Mouth and Throat

- Dental status
- Oral lesions
- Bleeding gums
- Sore throat
- Dysphagia (difficulty swallowing, solids vs. liquids, pain on swallowing)
- Hoarseness or recent voice change

Neck

- Pain, swelling, enlarged glands

- Fever
- Malaise
- Nausea or vomiting

Medical History (Specific To ENT)

- Frequent ear or throat infections
- Sinusitis
- Trauma to head or ENT area
- ENT surgery
- Audiometric screening results indicating hearing loss
- Allergies
- Prescription or over-the-counter medications used regularly
- Smoking, chewing tobacco, alcohol use

Family History (Specific To ENT)

- Others at home with similar symptoms
- Seasonal allergies
- Asthma
- Hearing loss
- Menière's disease
- ENT cancer

Personal And Social History (Specific To ENT)

- Frequent water exposure (swimmer's ear)
- Use of foreign object to clean ear
- Crowded living conditions
- Dental hygiene habits

- Exposure to smoke or other respiratory toxins
- Recent air travel
- Occupational exposure to toxins or loud noises

Examination Of The Ears, Nose And Throat

General Appearance

- Apparent state of health
- Degree of comfort or distress
- Colour (flushed or pale)
- Nutritional status (obese or emaciated)
- Match between appearance and stated age
- Difficulty with gait or balance

Ears

Inspection

- Pinna: lesions, abnormal appearance or position
- Canal: discharge, swelling, redness, wax, foreign bodies
- Ear drum: colour, landmarks, bulging or retraction, perforation, scarring, air bubbles, fluid level
- Estimate hearing with a watch or whisper test; perform screening audiometry or tympanometry (if equipment available).

Palpation

- Tenderness over tragus or mastoid process
- Tenderness on manipulation of the pinna
- Pre- or post-auricular nodes

Nose/Sinuses

Inspection

- External: inflammation, deformity, discharge, bleeding
- Internal: colour of mucosa, edema, deviated septum, polyps, bleeding points
- Transilluminate sinuses for dulling facial swelling

Palpation

- Sinus and nasal tenderness.

Percussion

- Sinus and nasal tenderness.

Mouth And Throat

Inspection

- Lips: colour, lesions, symmetry
- Oral cavity: breath odor, colour, lesions of buccal mucosa
- Teeth and gums: redness, swelling, caries
- Tongue: colour, texture, lesions, tenderness of floor of mouth
- Throat: colour, tonsillar enlargement, exudate

Neck

Inspection

- Symmetry
- Swelling
- Masses
- Redness
- Thyroid enlargement

Palpation

- Tenderness, enlargement, mobility, contour and consistency of nodes and masses
- Thyroid: size, consistency, contour, position, tenderness

Common Problems Of The Ears And Nose

Otitis Externa

Definition

Infection or inflammation of the ear canal.

Mild otitis externa

Inflammation confined to the canal. No significant narrowing of the canal. May or may not be purulent.

Moderate otitis externa

Significant narrowing of the canal and significant swelling of soft tissue.

Severe otitis externa

Significant obstruction, due to inflammation and swelling, of the canal. Invasion of soft tissues, especially along the floor of the canal and extending medially, as is often seen in malignant otitis externa.

Causes

- Gram-negative rods: *Proteus*, *Pseudomonas*
- Gram-positive cocci (less common): *Staphylococcus*, *Streptococcus*
- Fungal infection (e.g. candidiasis, aspergillosis)
- Predisposing factors: hearing aids, narrow ear canal, use of cotton-tipped applicators, use of ear plugs, swimming
- Risk factors: immunocompromise (e.g. in patients with diabetes or cancer and those who have undergone transplantation, or have had head and neck radiotherapy), use of systemic steroid medication

History

- Ear pain (otalgia)
- Pruritis or irritation
- Purulent discharge from canal (cheesy white, greenish blue or gray)
- Recent exposure to water or mechanical trauma
- Reduced hearing or feelings of fullness in ear may be present
- Will not have all of them all of the time

Physical Findings

- Usually afebrile but temperature may be elevated
- Redness and edema of ear canal and occasionally the pinna
- May have purulent exudate or debris in canal
- Tympanic membrane may be slightly reddened or thickened
- If edema and debris are severe, it may be impossible to visualize the tympanic membrane
- Manipulation of pinna or pressure on tragus causes pain in acute otitis externa
- Peri-auricular and anterior cervical nodes may be enlarged and tender

Differential Diagnosis

- Acute otitis media with perforation
- Skin condition involving the ear
- Mastoiditis
- Furuncle in canal
- Foreign-body irritation

Complications

- Severe otitis externa with closure of canal
- Cellulitis of the external ear and face

Diagnostic Tests

Swab for culture and sensitivity if there is any exudate (so that antimicrobial therapy can be tailored to the organism, should initial treatment fail).

Management

Goals of Treatment

- Relieve pain
- Prevent recurrence
- Prevent extension of infection

Appropriate Consultation

Consultation usually not needed, unless cellulitis of the external ear or face is present, the problem is recurrent or the client is immunocompromised, or significant debris in canal that cannot be safely removed.

Client Education

- Counsel client about appropriate use of medications (if possible, have another family member instill drops and clean the ear)
- Counsel client about proper ear hygiene before instilling medications
- Advise client about preventing recurrent irritation (**e.g. client should not use cotton-tipped applicators in the ears**)
- Recommend proper drying of ears after swimming or use of ear plugs while swimming
- Counsel client about proper hygiene of hearing aids and ear plugs

For recurrent episodes, start the client on prophylactic measures:

hydrogen peroxide 1/2 strength (A class drug), 2 or 3 drops tid or qid

Pharmacologic Interventions

Manage pain with simple analgesics:

acetaminophen (A class drug), 325 or 500 mg, 1-2 tabs PO q4-6h prn

Mild Otitis Externa

If condition very mild (i.e. no exudate and only mild inflammation), consider topical antiseptic: *hydrogen peroxide 1/2 strength, 2 or 3 drops tid or qid*

or

vinegar/sterile water/hydrogen peroxide 1:1:1

Some studies show no difference in clinical outcome between topical antiseptic and topical gentamicin antibiotic drops.

Moderate Otitis Externa

If inflammation and purulence are more significant, or if therapy described above has failed, start ear drops consisting of a combination of an antibiotic and an anti-inflammatory agent (steroid):

hydrocortisone/neomycin/polymyxin B, 3-4 drops tid or qid for 7-10 days

If perforation of the tympanic membrane is suspected, use of aminoglycosides such as gentamicin, should be avoided, because of the risk of ototoxicity if used for more than 7 days in the presence of such perforation.

Severe Otitis Externa

See "Referral," below.

Monitoring and Follow-Up

- Follow up in 1-3 days (instruct client to return sooner if pain increases, or if fever develops despite therapy)
- Follow up 10 days after course of therapy is complete

Referral

- Immediately refer cases of severe otitis externa
- Debriding the canal requires urgent referral
- Consult a physician for clients with recurrent episodes of otitis externa, regardless of cause

Acute Otitis Media

Definition

Infection of the middle ear.

Causes

- Viral forms (found in up to 48% of middle ear fluid) due to *human rhinovirus*, *RSV* and *coronavirus*
- Bacterial forms (absent in up to 38% of middle ear fluid) due to *Hemophilus influenzae*, *Moraxella catarrhalis*, *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*
- **Active or passive smoking is a predisposing factor.**

History

- General malaise and fever
- Ear pain (throbbing) (may be sharp needle pain)
- Sensation of fullness
- Hearing decreased
- Tinnitus or roaring in ear, vertigo (rare)
- Purulent discharge if drum perforated
- Infection of the upper respiratory tract may be present concurrently or may precede the otitis media
- Cigarette smoking
- Allergies

Physical Findings

- Temperature may be elevated
- Client may be mildly or moderately ill
- Tympanic membrane red, dull, bulging
- Bony landmarks obscured or absent
- Possible perforation and purulent discharge in canal
- Decreased mobility of tympanic membrane
- Bullae seen on tympanic membrane (but only in cases of mycoplasma infection)

Differential Diagnosis

- Acute otitis externa
- Transient middle-ear effusion (non-infection)
- Mastoiditis
- Trauma or foreign-body irritation
- Referred ear pain from dental abscess or temporomandibular joint dysfunction

Complications

- Reduced hearing
- Serous otitis media
- Mastoiditis
- Chronic otitis media
- Meningitis
- Epidural abscess

Diagnostic Tests

- Swab any drainage for culture and sensitivity

Management

Goals of Treatment

- Relieve pain
- Prevent complications

Appropriate Consultation

Usually not necessary if condition is uncomplicated.

Client Education

- Recommend increased rest in the acute febrile phase
- Counsel client about appropriate use of medications (dosage, compliance, follow-up)
- Explain disease course and expected outcome (serous otitis media may persist for several weeks)
- Recommend avoidance of flying until symptoms have resolved

Pharmacologic Interventions

To relieve pain and fever:

*acetaminophen, 325 or 500 mg, 1-2 tabs PO
q4-6h prn*

Antibiotic therapy:

amoxicillin, 250 mg PO tid for 10 days

or

cotrimoxazole, 800/160 mg PO bid for 10 days

Monitoring and Follow-Up

- Instruct client to return in 3 days if symptoms do not improve, or if symptoms progress despite therapy
- Follow up in 10-14 days: look for development of serous otitis media

Referral

Not necessary if condition is uncomplicated.

Chronic Otitis Media (Purulent Draining Ear)

Definition

Chronic tympanic perforation with non-resolving or recurrent low-grade infection of the middle ear.

Causes

- *Proteus, Pseudomonas or Staphylococcus*
- Water contamination of the middle ear

History

- Hearing decreased
- Continuous foul-smelling discharge from the ear
- Tinnitus
- Usually no pain
- No fever

Physical Findings

- Client appears generally well
- Foul-smelling purulent drainage from ear canal
- Perforation of tympanic membrane

Differential Diagnosis

- Chronic otitis externa
- Subacute otitis media

Complications

- Permanent, severe hearing loss
- Mastoiditis
- Cholesteatoma
- Meningitis
- Brain abscess
- Epi/subdural abscess

Diagnostic Tests

- Swab any drainage for culture and sensitivity, before treatment

Management

Goals of Treatment

- Prevent complications
- Avoid unnecessary use of antibiotics

Appropriate Consultation

Consult a physician if symptoms do not respond to therapy.

Client Education

- Explain disease process and expected course
- Counsel client about appropriate use of medications (including compliance)
- Counsel client about ear hygiene: ear canal should be cleaned with *3% hydrogen peroxide or half strength vinegar solution*, before instilling medication to remove any exudate or debris (demonstrate the procedure to a family member and have this person perform the routine as instructed)
- No swimming
- Counsel client about proper hygiene of hearing aids and ear plugs
- To prevent recurrence, recommend that ear canal be cleaned *with hydrogen peroxide 1/2 strength, or a solution of half vinegar and half sterile water, 4-6 drops in the ear after exposure to water*

Pharmacologic Interventions

Mild and moderate chronic otitis media
Topical antibiotic ear drop alone is sufficient.

If there is significant soft-tissue involvement, systemic antibiotics are indicated, culture prior to systemic antibiotics:

cotrimoxazole, 800/160 mg PO bid for 14 days
or
amoxicillin/clavulanate,
250 mg PO tid for 14 days

Oral antibiotics should be used in combination with consistent cleansing of the canal and topical administration of antibiotic otic drops as described for mild chronic otitis media, above. Long-standing drainage implies need for culture and appropriate treatment.

Monitoring and Follow-Up

Follow up in 7-14 days.

Referral

Referral to ENT specialist may be necessary if treatment fails or complications develop. Surgical intervention is sometimes required.

Serous Otitis Media (Otitis Media With Effusion)

Definition

Presence of non-infective fluid in the middle ear without symptoms or signs of acute infection, with intact tympanic membrane.

Causes

- Dysfunction of eustachian tube
- Predisposing factors: viral infection of the upper respiratory tract, allergies, barotrauma, enlargement of adenoids, recent acute otitis media

History

- Exposure to one of the predisposing factors
- Reduced hearing in affected ear
- Sensation of fullness in ear
- Nose and ears may be itchy
- Pain mild or absent
- Fever absent

Physical Findings

- Tympanic membrane dull, retracted, hypomobile or normal position
- Presence of fluid, air bubbles or air-fluid level behind the tympanic membrane
- Bony landmarks usually accentuated because of retraction of the tympanic membrane
- Audiometric screening may show a decrease in hearing
- Abnormal hearing test results (conductive loss)

Differential Diagnosis

- Dysfunction of eustachian tube
- Nasopharyngeal tumor (if problem longstanding)

Complications

- Secondary infection (purulent acute otitis media)
- Chronic serous otitis media
- Hearing loss

Diagnostic Tests

Tympanometry if available

Management

Goals of Treatment

- Identify underlying cause
- Relieve symptoms
- Prevent hearing loss

Appropriate Consultation

Consult a physician if effusion with significant hearing loss (more than 20 dB) persists for more than 2-3 months.

Client Education

- Explain disease process and expected outcomes
- Offer support and reassurance, as symptoms can last a long time (2-3 months)
- Counsel client about appropriate use of medications (dosage and compliance)
- Recommend avoidance of flying until signs and symptoms have resolved
- Discuss signs and symptoms of purulent otitis media; advise client to return to clinic if they occur
- Instruct client to gently try to equalize pressure between middle ear and throat, using a simple maneuver (e.g. yawning, chewing gum, plugging nose and blowing)

Pharmacological Interventions

Most studies indicate that antihistamines and decongestants are ineffective.

Monitoring and Follow-Up

Monitor any improvement in hearing or decrease in tinnitus.

Reassess hearing, preferably with screening audiometry (if available).

Referral

Refer to an ENT physician if effusion persists after 3 months.

Cerumenosis (Impacted Cerumen)

Definition

Obstruction of the ear canal by cerumen (ear wax).

Causes

Cerumen is produced naturally by the ear canal and is normally cleared by the body's own mechanisms. Occasionally, cerumen is produced in excessive amounts and partially or totally occludes the ear canal.

History

- Ear pain
- Sensation of fullness
- Itching
- Conductive hearing loss

Physical Findings

- Hardened wax blocks canal
- Canal may be reddened and swollen

Differential Diagnosis

- Foreign-body irritation
- Otitis media
- Otitis externa

Complications

- Hearing loss
- Otitis externa

Diagnostic Tests

- None

Management

Goals of Treatment

- Remove wax
- Treat any underlying irritation of the canal

Appropriate Consultation

Consulting a physician is usually not necessary.

Nonpharmacologic Interventions

- Ensure no tympanic membrane perforation - Inject lukewarm water with an ear syringe until wax is cleared
- Sometimes it is helpful to soften the wax with a few drops of slightly warmed olive oil or Auralgan before attempting to irrigate the ear
- To prevent cerumenosis, anyone who produces large amounts of cerumen can periodically (once or twice weekly) instill 3 drops of a 1:1 solution of hydrogen peroxide and water into each ear to decrease the likelihood of impaction. One or two drops of baby oil once or twice weekly will help to keep wax soft.

Monitoring and Follow-Up

Advise client to return as necessary if symptoms recur.

Labyrinthitis

Definition

Disorder of the vestibular labyrinth in the inner ear.

Causes

- Viral infection
- Mismatch of vestibular, visual and somatosensory systems, triggered by an external stimulus, such as a stop after whirling turns or motion sickness
- Tumors within the vestibular pathways
- Ototoxic drugs, especially aminoglycosides
- Head injury
- Neuronitis
- Vasculitis

History

- Vertigo (most prominent symptom) with sudden movement
- Dizziness
- Nausea and vomiting
- Fluctuating hearing loss
- Tinnitus
- Malaise
- Perspiration
- Recent respiratory tract infection (mostly upper)

Physical Findings

- Diaphoresis
- Increased salivation
- Nystagmus

Differential Diagnosis

- Benign positional vertigo
- Menière's disease
- Chronic bacterial mastoiditis
- Drug-induced damage to the vestibular labyrinth
- Acoustic neuroma
- Multiple sclerosis
- Temporal-lobe epilepsy

Complications

- Permanent hearing loss
- Falls potentially leading to injury

Diagnostic Tests

- Vestibular maneuvers may be helpful in diagnosis of the syndrome.
- Nylen-Bárány maneuver: While the patient is seated at the end of the examining table, quickly lay back and carefully hyperextend the patient onto the back, while support is provided to the head.
- First, turn the head toward one shoulder.
- Repeat the maneuver; however, the second time, turn the head toward the other shoulder.
- Hallpike maneuver: While the patient is seated in the middle of the examination table, carefully provide support to the head and neck while quickly laying the patient on one side and then the other.
- Repeat the maneuvers several times in a period of 5-10 minutes, as tolerated by the patient.
- Note the reproducibility of the vestibular symptoms, including vertigo, nausea, and malaise.

Management

Goals of Treatment

- Identify and treat underlying disorder if anything other than viral labyrinthitis is suspected
- Supportive treatment of symptoms only

Appropriate Consultation

Consult a physician if the client's symptoms persist for more than 1 week with therapy or if anything other than a simple viral illness is suspected.

Nonpharmacologic Interventions

Advise client to rest in a darkened room with eyes closed during acute attacks (otherwise activity as tolerated).

Pharmacologic Interventions

Treat nausea and vomiting:

dimenhydrinate, 50-75 mg q6h prn

Monitoring and Follow-Up

Follow up in 1 or 2 days to monitor symptom control. Ensure that the client remains hydrated if nausea or vomiting is significant.

Referral

Refer to a physician if anything other than viral labyrinthitis is suspected, especially if attacks are severe or recurrent. A neurology consult may be necessary to identify and treat underlying disorder.

Menière's Disease

Definition

An inner-ear disorder involving an increase in volume and pressure of the innermost fluid in the middle ear, which results in recurrent attacks of a cluster of symptoms.

Causes

- Unknown, but the best theory suggests that it is an inner-ear response to an injury (e.g. reduced inner ear pressure, allergy, endocrine disease, lipid disorder, vascular disorder, viral infection)
- A more recent theory suggests that it results from intracranial compression of a balancing nerve by a blood vessel

Risk Factors

- Caucasian heritage
- Stress
- Allergy
- High salt intake
- Exposure to noise

History

- Occurs as attacks with intervening periods of remission
- Fluctuating loss of low-frequency hearing
- Vertigo (spontaneous attacks lasting from 20 minutes to several hours)
- Sensation of fullness in the ear
- Nausea, vomiting
- Falling
- Prostration (inability to stand up because motion increases symptoms)

Physical Findings

- Pallor
- Sweating
- Distress, prostration
- May be some measure of dehydration if vomiting is severe
- Audiometry testing with pure tones may show low-frequency sensorineural nerve loss and impaired speech distinction
- Tuning fork tests (Weber and Rinne) confirm validity of the audiometry results

Differential Diagnosis

- Viral labyrinthitis
- Benign positional vertigo
- Acoustic tumor
- Syphilis
- Multiple sclerosis
- Vertebrobasilar disease

Complications

- Hearing loss
- Injury from falls during attacks
- Inability to work
- Failure to diagnose acoustic neuroma

Diagnostic Tests

- None

Management

Goals of Treatment

- Control symptoms
- Ascertain underlying cause

Appropriate Consultation

Consult physician for help with diagnosis (not urgent so long as client is stable and symptoms are controlled with treatment).

Client Education

Counsel client about prevention of attacks: stress-reduction strategies, avoidance of excessive salt intake, smoking cessation, avoidance of prolonged exposure to noise (client should use ear protectors), avoidance of ototoxic medications.

Pharmacologic Interventions

For acute attack, control nausea and vomiting: *dimenhydrinate, 50 mg IM or PO q4h prn*

Monitoring and Follow-Up

Assess hearing at least annually in clients with stable symptoms.

Referral

Refer to a physician if symptoms are not controlled or if hearing loss is evident. A neurology consult may be necessary to identify and treat underlying disorder.

Rhinitis

There are 3 types of rhinitis to consider in the differential diagnosis of nasal congestion and rhinorrhea (runny nose).

Definition

Allergic rhinitis: Reactive inflammation of the nasal mucosa.

Vasomotor rhinitis: Perennial inflammation of the nasal mucosa, which represents a hyper reactive state of the nasal mucosa (nonallergic).

Viral rhinitis (infection of upper respiratory tract): Viral infection confined to the upper respiratory tract. Usually mild and self-limiting.

Causes

Allergic Rhinitis

Sensitivity to inhaled allergens (pollens, grasses, ragweed, dust, molds, animal dander, smoke).

Vasomotor Rhinitis

- Unknown; symptoms do not correlate with exposure to specific allergens
- Attacks may be triggered by abrupt changes in temperature or barometric pressure, odors or emotional stress.

Viral Rhinitis (Infection of Upper Respiratory Tract)

Numerous viral agents.

History

Allergic Rhinitis

- Seasonal or perennial symptoms
- History of familial allergies
- Asthma or eczema may be present
- Paroxysmal sneezing
- Itchy nose
- Nasal congestion
- Excessive, continuous, clear, watery nasal discharge
- Eyes may be itchy or watery
- Ears may be itchy
- General malaise and headache may be present
- Symptoms worst in the morning and least during the day, worsening again during the night
- Postnasal drip
- Breathing through the mouth

- Snoring and dry cough at night may be present

Vasomotor Rhinitis

- Sudden onset of nasal congestion
- Perennial symptoms
- Persistent postnasal drip
- Intermittent throat irritation
- No response to environmental controls and medications
- Sensation of constantly needing to clear throat
- Changes in acuity of hearing or smell
- Snoring at night
- Fatigue

Viral Rhinitis (Infection of Upper Respiratory Tract)

- Non-productive cough or cough that produces clear sputum
- Low-grade fever
- Nasal congestion with clear nasal discharge
- Sneezing
- Postnasal drip
- Scratchy throat
- Mild headache and general malaise
- Pressure in ears

Physical Findings

Allergic Rhinitis

- Injected conjunctiva may be present
- Eyes may tear
- Edema of the eyelids and periorbital area may be present
- Pale, edematous nasal mucosa is pink, with clear thin secretions
- Skin around nose may be irritated

Vasomotor Rhinitis

- Nasal turbinates may be enlarged
- Throat may be slightly reddened because of irritation from postnasal drip

Viral Rhinitis (Infection of Upper Respiratory Tract)

- Temperature may be slightly elevated
- Client appears mildly ill
- Clear nasal discharge
- Skin around nares slightly irritated

- Ears normal
- Throat normal, mild erythema
- Sinuses may feel tender

Differential Diagnosis (All Types)

- Acute or chronic sinusitis
- Abuse of nose drops
- Abuse of drugs or solvents (e.g. cocaine, gas, glue)
- Foreign body in nares
- Nasal polyps
- Deviated septum
- Hypothyroidism as a cause of the nasal congestion
- Nasal congestion induced by pregnancy or use of oral contraceptives

Complications (All Types)

- Otitis media
- Nasal polyps
- Epistaxis
- Enlargement of tonsils and adenoids
- Sinusitis

Diagnostic Tests (All Types)

- Consider skin testing for allergies

Management (All Types)

Goals of Treatment

- Relieve and suppress symptoms
- Identify the underlying allergen(s)
- Prevent complications

Nonpharmacologic Interventions

Environmental control is important. Eliminate or reduce known allergen(s) in the environment wherever possible, or avoid them altogether.

Client Education

- Recommend frequent hand-washing, appropriate disposal of used facial tissues, and covering of mouth and nose when coughing or sneezing
- Recommend increasing fluid intake to improve hydration
- Counsel client about appropriate use of medications (dose, frequency, side effects, avoidance of overuse)
- Recommend avoidance of caffeine

- Recommend avoidance of known allergens (client should keep living area clear of dust, avoid going outside when pollen count is high and use synthetic fibers in bedding and clothing) and removal of pets (to eliminate animal dander)
- Counsel client about preventing spread of viral rhinitis to other household members

Pharmacologic Interventions

Allergic and Vasomotor Rhinitis

Normal saline nasal drops, prn, to wash out mucus and any inhaled allergen.

Oral antihistamines to treat acute symptoms of runny nose, sneezing, itch, and conjunctival symptoms (but these will not help nasal congestion):

cetirizine, 10 mg od

Antihistamines can cause drowsiness, dry mouth and urinary retention, and have additive effects with sedative drugs. **Use with caution in elderly patients.**

Topical nasal steroids are the mainstay of therapy for chronic allergic rhinitis and chronic vasomotor rhinitis and for maintenance and prophylactic treatment of these conditions. They can be used alone or in combination with the antihistamine and decongestant regimen.

Consult a physician about the use of inhaled nasal steroids if antihistamines and decongestants are not effective.

fluticasone, 50 µg/spray, 2 sprays/nostril daily may be prescribed.

Viral Rhinitis

The first step in relieving symptoms is to use a nasal decongestant for 3 or 4 days - consult a physician.

Salinex nasal spray may be of benefit.

Antihistamines have little proven benefit in the treatment of the common cold.

Do not prescribe decongestants for elderly clients, for people with hypertension, heart disease, peripheral vascular disease, hyperthyroidism, previous acute angle-closure

glaucoma or previous urinary retention, or for anyone taking monoamine oxidase inhibitors or antidepressants.

Manage fever:

acetaminophen, 325 or 500 mg, 1-2 tabs PO q4-6h prn

Monitoring and Follow-Up

Instruct client to return for further assessment if fever develops, or if symptoms have not resolved within 14 days.

Referral

Refer to a physician if symptoms of rhinitis are not controlled with initial treatment. Allergy testing, sinus radiography or other medications may be required.

Anterior Epistaxis

Definition

Localized bleeding from the anterior portion of the nasal septum.

Causes

- Raised blood pressure
- Trauma and irritation
- Foreign-body irritation
- Neoplasm (rare)
- Predisposing factors: allergic rhinitis, deviated nasal septum, infection of the upper respiratory tract, local vascular lesions
- Dry air

History

- Exposure to one or more of the predisposing factors
- Usually unilateral
- Profuse bleeding or blood-streaked nasal discharge
- Determine duration, amount and frequency of bleeding
- Use of anticoagulants, ASA products or other medications
- History of easy bruising or bleeding elsewhere (e.g. melena, heavy menstrual periods)
- Family history of bleeding disorders (e.g. von Willebrand's disease)
- Inhaled substance abuse (e.g. cocaine, gas)

Physical Findings

Examine client sitting up and leaning forward so that the blood will flow forward.

- Blood pressure normal unless bleeding is severe enough to cause loss of volume
- Heart rate may be elevated because of fear or if bleeding is severe enough to cause loss of volume
- Obvious deformity or displacement may be present
- Bleeding from anterior portion of septum may be present
- Inspect throat for posterior bleeding
- Sinuses may feel tender
- Septum may be deviated

Differential Diagnosis

- Mild infection of nasal mucosa
- Dryness and irritation of nasal mucosa
- Nasal fracture
- Foreign body
- Malignant lesion
- Blood dyscrasias
- Hypertension

Diagnostic Tests

- None

Management

Goals of Treatment

- Stop loss of blood
- Prevent further episodes

Appropriate Consultation

Usually not necessary unless complications arise or serious underlying pathology is a concern.

Nonpharmacologic Interventions

Most bleeding will be stopped by application of pressure to both sides of the nose, with firm pressure against the nasal septum for 5-15 minutes.

Client Education

- Recommend increasing room humidity (client should keep a pot of water on the stove at all times, especially in winter)
- Counsel client about appropriate use of medications (dosage and side effects; avoidance of overuse)
- Recommend avoidance of known irritants and local trauma (nose-picking, forceful nose-blowing)
- Instruct client about first-aid control of recurrent epistaxis (sitting up and leaning forward; applying firm, direct pressure to nasal septum)
- Recommend use of ice packs to control acute bleeding
- Recommend liberal use of lubricants such as Vaseline® in the nares to promote hydration of the nasal mucosa
- Advise client not to pick nose
- Advise BP control, if appropriate

Note: for management of posterior epistaxis, refer to Emergency Problems of Ears, Nose and Throat

Pharmacologic Interventions

If direct pressure alone is insufficient to stop the bleeding:

Merocel nasal pack

Next, apply a silver nitrate stick firmly, for 1-2 minutes, to the site of bleeding. Cauterize as small an area as possible. Do not cauterize both sides of septum at the same time. Promote healing and prevent further bleeding by applying a nasal lubricant (petroleum jelly) in both nostrils tid or qid.

Monitoring and Follow-Up

Follow up as necessary if problem is recurrent or there is concern about a serious underlying problem.

Referral

Refer to a physician to rule out other pathologies if the problem is recurrent or if the client is older.

If there has been trauma (e.g. a fist fight), it is important to rule out septal hematoma. Management of hematoma of the nasal septum is surgical, and medevac is necessary.

Acute Sinusitis

Definition

Infection of the sinuses.

Causes

- Common: *Hemophilus influenzae*, *Moraxella catarrhalis*, *Streptococcus pneumoniae*
- Less common: *Chlamydia pneumoniae*, *Streptococcus pyogenes*, viruses, fungi
- Predisposing factors: common cold, allergies, deviated nasal septum, smoking, adenoidal hypertrophy, dental abscess, nasal polyps, trauma, foreign body, diving or swimming, neoplasms, cystic fibrosis

History

- Exposure to one or more of the predisposing factors
- Headache
- Facial pain
- Pressure over involved sinuses increases when bending forward
- Purulent nasal discharge, which may be tinged with blood
- Dental pain, especially of upper incisor and canine teeth
- General malaise may be present
- Fever may be present

Physical Findings

- Temperature may be mildly elevated
- Client appears mildly to moderately ill
- Irritation of skin around nares
- Swollen nasal mucosa may be pale or dull red
- Nasal polyp may be present
- Dental abscess may be present
- Tenderness over involved sinuses
- Tenderness over a tooth
- Anterior cervical nodes may be enlarged and tender

Differential Diagnosis

- Dental abscess
- Nasal polyp(s)
- Tumor
- Presence of foreign bodies
- Periorbital cellulitis

- Infection of upper respiratory tract
- Allergic rhinitis
- Vasomotor rhinitis
- Cluster headache
- Migraine headache

Complications

- Contiguous spread of infection to intraorbital or intracranial structures
- Chronic sinusitis
- Periorbital cellulitis

Diagnostic Tests

- None

Management

Goals of Treatment

- Identify predisposing factors
- Identify underlying dental abscess
- Relieve symptoms

Nonpharmacologic Interventions

Apply moist heat (such as with steam inhalation or warm compresses) to sinuses to help relieve pressure by loosening and liquefying thickened secretions. Normal saline nasal irrigation also helps to do this.

Client Education

- Recommend increased rest during acute phase
- Recommend increasing hydration (8-10 glasses of fluid per day)
- Counsel client about appropriate use of medications (dose, frequency, side effects)
- Recommend protection of sinuses from changes in temperature
- Recommend avoidance of irritants (e.g. smoke)
- Recommend avoidance of swimming, diving or flying during acute phase

Pharmacologic Interventions

Nasal decongestant sprays or drops may be used for the first 24-48 hours if congestion is marked. Topical decongestants are more effective than oral ones. Consult physician.

Client should not use antihistamines (unless there is an allergic component to the symptoms), because these dry and thicken the secretions.

Salinex nasal spray (A class drug) may be helpful

It is very important to limit the use of a nasal decongestant spray to a period of 4 days to avoid development of "rebound" nasal congestion when the nasal spray is withdrawn (a complication called rhinitis medicamentosa).

Manage pain and fever with simple analgesics:
acetaminophen, 325 or 500 mg, 1-2 tabs PO q4h prn

or
ibuprofen, 200 mg, 1-2 tabs PO q4h prn

Oral antibiotics:
amoxicillin, 500 mg PO tid for 10 days
or
cotrimoxazole, 800/160 mg PO bid for 10 days

Monitoring and Follow-Up

Follow up in 10-14 days. Instruct client to return sooner if symptoms progress despite therapy or if symptoms fail to respond to therapy.

Chronic Sinusitis

Definition

Non-resolving inflammation of the sinuses.

Causes

- Polymicrobial infection (bacterial anaerobes, *Staphylococcus aureus*, viruses)
- Structural abnormalities

History

- Prolonged nasal congestion (more than 30 days)
- Nasal discharge, intermittently purulent
- Postnasal drip may be present
- Early-morning hoarseness may be present
- Sinus pain across the middle of the face
- Headache may be present
- Popping of ears
- Eye pain
- Halitosis
- Chronic cough
- Fatigue
- No fever
- History of allergies may be present
- Smoking

Physical Findings

- Client appears well
- Nasal mucous membranes may appear pale and "boggy"
- Poor transillumination of sinuses
- Tenderness may be present over sinuses

Differential Diagnosis

- Allergic rhinitis
- Vasomotor rhinitis
- Nasal polyp
- Infection of upper respiratory tract
- Tumor
- Migraine headache
- Cluster headache
- Dental abscess

Complications

- Recurrent acute sinusitis
- Spread of infection to the intraorbital or intracranial structures

Diagnostic Tests

- None initially
- Consider referral to physician for further diagnostic tests such as sinus x-ray or CT scan of sinuses if initial therapy fails.

Management

Goals of Treatment

- Relieve symptoms
- Identify predisposing or underlying factors
- Prevent spread of infection to other structures

Client Education

- Recommend increasing hydration (8-10 glasses of fluid per day)
- Recommend inhalation of steam or warm compresses to relieve pressure on sinuses
- Counsel client about appropriate use of medications (dosage and side effects)
- Recommend avoidance of irritants (e.g. smoke) and allergens
- Recommend avoidance of diving, swimming or flying if symptoms are acute

Pharmacologic Interventions

Individuals with chronic sinusitis may need a longer course of oral antibiotic therapy. Consult with a physician for appropriate treatment.

Monitoring and Follow-Up

Follow up in 2 weeks.

Referral

Refer to a physician for all acute episodes for management, to rule out underlying pathology (e.g. nasal polyps, deviated nasal septum, chronic allergies). Refer to a dentist if underlying dental disease is suspected.

Common Problems Of The Mouth And Throat

Dental Abscess

Definition

Infection of the soft tissue surrounding a dead tooth.

Causes

- Progressive dental decay causing pulpitis from *gram-positive anaerobes* and *Bacteroides*
- Predisposing factors: deep caries, poor dental hygiene, dental trauma

History

- Localized tooth pain
- Constant, deep, throbbing pain
- Pain worsens with mastication or exposure to extreme temperatures
- Tooth may be mobile
- Gingival or facial swelling (or both) may be present

Physical Findings

- Fever (rare but possible)
- Facial swelling may be present
- Carious tooth
- Gingival edema and erythema
- Tooth may be loose
- Localized tenderness over affected area of jaw
- Anterior cervical nodes enlarged and tender
- Localized tooth pain

Differential Diagnosis

- Disease of the salivary gland (e.g. mumps)
- Sinusitis
- Cellulitis

Complications

- Cellulitis
- Recurrent abscess formation

Diagnostic Tests

- None

Management

Goals of Treatment

- Relieve symptoms
- Prevent spread of infection

Appropriate Consultation

Consult a physician if a large fluctuant abscess is present, if client is acutely ill or if the infection has spread to the soft tissues of the neck.

Nonpharmacologic Interventions

Warm saline oral rinses qid.

Client Education

- Counsel client about appropriate use of medications (dosage and side effects)
- Recommend dietary modifications (liquids or soft diet)
- Recommend improvements to dental hygiene

Pharmacologic Interventions

Oral antibiotics:

penicillin V potassium, 300-600 mg PO qid for 7-10 days

For clients with penicillin allergy:

erythromycin, 250 mg PO qid for 10 days

Simple analgesics for mild to moderate dental pain:

ibuprofen, 300 mg, 1 tab PO q4h prn x 72 hr (not with history of gastric problems) or acetaminophen, 325 or 500 mg, 1-2 tabs PO q4-6h prn

For moderately severe dental pain:

acetaminophen with codeine phosphate, 30 mg, 1-2 tabs PO q4-6h prn (maximum 15 tabs)

Monitoring and Follow-Up

Follow up in 48-72 hours.

Referral

Refer to a dentist for definitive therapy.

Laryngitis

Definition

Inflammation of the mucosa of the larynx and vocal cords.

Causes

- Viral infection (common cold)
- Bacterial infection (*Streptococcus*)
- Chronic mouth breathing
- Overuse of voice
- Chronic sinusitis
- Excessive smoking (or exposure to secondhand smoke)
- Aspiration of caustic chemical
- Gastroesophageal reflux
- Changes due to aging (e.g. muscle atrophy, bowing of cords)
- Alcohol abuse
- Long-term exposure to dust or other irritants

History

- Presence of risk factors (*see "Causes," above*)
- Concurrent infection of the upper respiratory tract may be present
- Hoarseness or loss of voice, abnormal-sounding voice
- Throat pain, tickle or rawness
- Aphonia
- Dysphagia (trouble swallowing)
- Cough
- Fever
- Malaise

Physical Findings

- Temperature may be elevated
- Client appears mildly ill
- Throat may be mildly to moderately injected
- No exudate
- Lymph nodes may be enlarged

Differential Diagnosis

- Cancer of the throat or larynx (if condition prolonged or recurrent)
- Polyps of vocal cords

Diagnostic Tests

- None

Management

Goals of Treatment

- Relieve symptoms
- Identify and remove contributing factors (e.g. smoking)

Appropriate Consultation

Consult a physician immediately if client has stridor and shortness of breath.

Nonpharmacologic Interventions

- Voice rest is the mainstay of treatment
- Removal of contributing factors (e.g. smoking and alcohol) is also important
- Increase humidity of room air
- Increase fluid intake if febrile
- Increase rest until any fever settles

Client Education

- Explain disease course and expected outcomes
- Counsel client about appropriate use of medications (dosage and side effects)
- Stress importance of follow-up if not resolved in 3 weeks

Pharmacologic Interventions

Usually none.

Monitoring and Follow-Up

Follow up in 3 weeks if not resolved.

Referral

Refer to a physician if symptoms persist for longer than 3 weeks.

Pharyngitis (Sore Throat)

Definition

Inflammation or infection of mucous membranes of pharynx (may also affect the palatine tonsils).

Causes

Infectious

- Viruses (e.g. *rhinovirus*, *adenovirus*, *parainfluenza*, *coxsackievirus*, *Epstein-Barr virus*, *herpes virus*)
- Bacteria (e.g. group A β -hemolytic *Streptococcus* [most common], *Chlamydia*, *Corynebacterium diphtheriae*, *Hemophilus influenzae*, *Neisseria gonorrhoeae*)
- Fungi (e.g. *Candida*); rare except in immunocompromised people (e.g. those with HIV or AIDS)

Non-infectious

- Allergic rhinitis
- Sinusitis with postnasal drip
- Mouth breathing
- Trauma
- Gastroesophageal reflux disease
- Risk factors: contact with a person with group A streptococcal infection, crowded living quarters, immunosuppression (e.g. HIV/AIDS), fatigue, smoking, excess consumption of alcohol, oral sex, diabetes mellitus or use of steroids (oral or inhaled)

History

Bacterial

- Abrupt onset of sore throat
- Pain on swallowing
- Fever or chills
- Malaise
- Skin rash may be present
- Headache
- Anorexia

Viral

- Slow, progressive onset of sore throat
- Mild malaise
- Nasal congestion

Non-infectious

- Slow, progressive onset of sore throat

- Mild malaise
- Persistent, recurrent
- Pain on swallowing

Physical Findings

Bacterial

- Temperature elevated
- Pulse elevated
- Client appears acutely ill
- Posterior pharynx red and swollen
- Tonsils enlarged
- Purulent exudate may be present
- Tonsillar and anterior cervical nodes enlarged and tender
- Rash (scarlatina form in group A streptococcal infection)

Viral

- Temperature may be elevated
- Posterior pharynx red and swollen
- Purulent exudate may be present
- Tonsillar and cervical nodes may be enlarged and tender
- Petechiae on palate (in mononucleosis)
- Vesicles (in herpes)

Non-infectious

- Posterior pharynx red and swollen
- Tonsillar and anterior cervical nodes may be enlarged and tender
- Exudate may be present

Differential Diagnosis

- Distinguish bacterial from viral infection
- Infectious mononucleosis
- Sexually transmitted infection (for chronic pharyngitis, investigate sexual practices)
- Vincent's angina (necrotic tonsillar ulcers)
- Distinguish reactive inflammation from an underlying disorder (*see "Causes," above*)

Complications

- Rheumatic fever (*group A Streptococcus* only)
- Glomerulonephritis (*group A Streptococcus* only)
- Peritonsillar abscess

Diagnostic Tests

- CBC
- Monospot
- Swab the throat for culture and sensitivity (*see Appendix 1, this chapter, for indications to swab*)
- Rapid Strep A testing

Management

Goals of Treatment

- Relieve symptoms
- Prevent complications
- Prevent spread of group A *Streptococcus* to contacts

Appropriate Consultation

Consult a physician if the client has significant dysphagia or dyspnea (signalling obstruction of the upper airways) or if there is concern about an underlying pathology such as HIV.

Nonpharmacologic Interventions

- Bed rest during febrile phase
- Adequate oral intake of fluids (8-10 glasses of fluid per day)

- Avoidance of irritants (e.g. smoke)
- Gargling with warm saline qid

Pharmacologic Interventions

For pain and fever:

acetaminophen, 325 or 500 mg, 1-2 tabs PO q4h prn

or

ibuprofen, 200 mg, 1-2 tabs q4h prn

Treat with antibiotics if streptococcal disease is suspected:

penicillin V potassium, 300 mg PO qid for 10 days

For clients with penicillin allergy:

erythromycin, 250 mg PO qid for 10 days

Do not use ampicillin or amoxicillin, because these drugs may cause a generalized red "drug rash" if infectious mononucleosis is present.

Monitoring and Follow-Up

Instruct client to return to clinic for reassessment if symptoms do not improve in 48-72 hours.

Referral

Referral may be necessary if condition is recurrent or persistent or an undiagnosed underlying pathology is suspected.

Emergency Problems Of The Ears, Nose And Throat

Mastoiditis

Definition

Acute suppurative inflammation of mastoid antrum and air cells.

Causes

- Complication of inadequately treated acute otitis media, cholesteatoma or blockage of outflow tract of mastoid air cells
- Most common organisms: *Hemophilus influenzae*, group A *Streptococcus*, *Streptococcus pneumoniae*

Risk Factors

- Recurrent otitis
- Cholesteatoma
- Immunocompromise

History

- Ear pain
- Non-resolving otitis media
- Spiking fever
- Post-auricular redness, swelling and pain
- Tinnitus
- Otorrhea if ear drum is perforated

Physical Findings

- Temperature moderately to severely elevated
- Client appears moderately ill
- Post-auricular swelling and erythema
- Pinna may be displaced anteriorly if edema severe
- Manipulation of pinna and otoscopic exam of the ear causes acute pain
- Purulent drainage if tympanic membrane ruptured
- Post-auricular warmth
- Tenderness over mastoid process
- Anterior cervical and peri-auricular nodes enlarged and tender

Differential Diagnosis

- Severe otitis externa
- Post-auricular cellulitis

- Benign or malignant neoplasm
- Infection of deep neck space (Ludwig's angina)
- Post-auricular lymph node

Complications

- Residual hearing loss
- Meningitis
- Intracranial abscess
- Subperiosteal abscess

Diagnostic Tests

Swab for culture and sensitivity if ear is draining.

Management

Goals of Treatment

- Relieve pain and swelling
- Prevent spread of infection

Appropriate Consultation

Consult a physician concerning IV antibiotic therapy.

Adjuvant Therapy

Start IV therapy with normal saline. Adjust rate according to state of hydration.

Pharmacologic Interventions

IV antibiotics:

ampicillin, 1.0-2.0 g IV q6h

For clients with penicillin allergy:

clindamycin 300mg IV q6h or

cefuroxime, 750 mg IV q8h

Analgesics for pain and fever:

acetaminophen, 325 or 500 mg, 1-2 tabs PO q4-6h

Referral

Medevac to hospital as soon as possible; client may need several days of IV drug therapy and surgery.

Posterior Epistaxis

Definition

Bleeding from the posterior portion of the nose (usually occurs in the elderly).

Causes

- Idiopathic (cause unknown)
- Hypertension
- Vascular abnormalities (hereditary hemorrhagic telangiectasia)
- Trauma: deviation or perforation of the septum
- Infection (e.g. chronic sinusitis)
- Neoplasm (rare)

History

- Sudden onset of brisk, bright bleeding from nose
- May be unilateral or bilateral
- Blood running down back of throat
- May be a history of hematemesis if client has swallowed a large quantity of blood
- History of easy bruising, bleeding elsewhere (e.g. melena, heavy menses), family history of bleeding tendencies, use of anticoagulants, use of ASA products

Physical Findings

- Heart rate elevated
- Blood pressure may be reduced if loss of blood is significant
- Client appears anxious
- Client may be pale, sweaty if loss of blood is significant
- Bright red bleeding from nares (unilateral or bilateral)
- Bleeding site not visible
- Blood observed in pharynx
- Sinuses may feel tender

Differential Diagnosis

- Hypertension
- Trauma
- Vascular abnormalities (e.g. hereditary hemorrhagic telangiectasia)
- Deviation of the septum
- Perforation of the septum

- Infection (e.g. chronic sinusitis)
- Neoplasm (rare)

Complications

- Hypotension or shock (hypovolemic)
- Anemia

Diagnostic Tests

- None

Management

Goals of Treatment

- Stop bleeding
- Maintain circulating blood volume

Appropriate Consultation

Consult a physician if initial management fails to control bleeding or there is significant potential of underlying pathology.

Adjuvant Therapy

- Start IV therapy with normal saline or Ringer's lactate solution; adjust IV rate according to pulse and blood pressure response and rate of bleeding

Nonpharmacologic Interventions

- Keep client at rest with head at a 90° angle
- Apply pressure to the nose
- Insert a posterior nasal pack; use a posterior nasal pack balloon system if available
- An effective alternative is to use a 10-14 Fr. Foley catheter system using water in the balloon.
- Bilateral packing is sometimes required to achieve adequate compression. The bleeding should stop after the nasal packs are in place.

Monitoring and Follow-Up

- Monitor vital signs and loss of blood closely
- Remove packs and balloons in 48-72 hours

Referral

Medevac to hospital.

Peritonsillar Abscess

Definition

Abscess that forms behind the tonsil in the posterolateral pharyngeal wall as a complication of bacterial tonsillitis.

Causes

Bacterial infection, usually related to group A *Streptococcus pyogenes*.

History

- Recent episode of pharyngitis
- Gradually increasing unilateral ear and throat pain
- Fever
- Malaise
- Dysphagia (difficulty swallowing)
- Dysphonia
- Drooling
- Trismus (difficulty opening mouth)

Physical Findings

- Fever
- Heart rate increased
- Client may appear acutely ill or distressed
- Diaphoretic; flushed if feverish
- Affected tonsil grossly swollen medially and reddened
- Tonsil may displace uvula and soft palate to the opposite side of pharynx
- Swelling and redness of the soft palate
- Trismus (difficulty opening mouth)
- Tonsillar lymph nodes enlarged and very tender

Differential Diagnosis

- Epiglottitis
- Gonococcal pharyngitis

Complications

- Obstruction of the airways
- Sepsis
- Deep neck infection

Diagnostic Tests

Swab for culture and sensitivity of any exudate if the client is being treated as an outpatient (mild to moderate symptoms).

Management Of Mild-To-Moderate Condition

Treat on an outpatient basis.

Goals of treatment

- Relieve symptoms
- Prevent complications

Client Education

- Advise client to return immediately if pain becomes worse, or if drooling, difficulty swallowing, difficulty breathing or inability to open mouth develops
- Recommend increased fluid intake
- Recommend increased rest until fever settles
- Recommend frequent gargling with warm saline for 48 hours

Pharmacologic Interventions

Antibiotics:

penicillin V potassium, 300 mg PO qid for 10 days

or

penicillin G, 1.2 million units IM

For clients with penicillin allergy:

clindamycin, 300 mg PO qid for 10 days

Analgesics for pain and fever:

acetaminophen, 325 or 500 mg, 1-2 tabs PO q4h prn

or

ibuprofen, 200 mg, 1-2 tabs PO q4h prn

Monitoring and Follow-Up

Follow up if no improvement in 48-72 hours.

Management Of Moderate-To-Severe Condition

Client appears acutely ill and has difficulty swallowing.

Goals of Treatment

- Relieve symptoms
- Prevent complications

Appropriate Consultation

Consult a physician if the abscess is significant in size and the client appears acutely ill; immediate referral to hospital and examination by an ENT specialist are in order. Consult with a physician concerning choices for IV antibiotic treatment.

Adjuvant Therapy

- Start IV therapy with normal saline; adjust rate according to age and state of hydration

Nonpharmacologic Interventions

- Bed rest at high Fowler's position
- Give sips of cold liquids only
- Give nothing by mouth if drooling

Pharmacologic Interventions

Antibiotics:

penicillin G sodium, 500 000 to 2 million units IV q6h

For clients with penicillin allergy:

clindamycin, 600mg IV q8h

Monitoring and Follow-Up

Monitor client to ensure adequate airway is maintained.

Referral

Medevac to hospital; client may require surgical incision to drain abscess.

Assessment Of The Respiratory System

History Of Present Illness And Review Of System

General

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

- Onset (sudden or gradual)
- Chronology
- Current situation (improving or deteriorating)
- Timing (frequency, duration)
- Severity
- Precipitating and aggravating factors
- Relieving factors
- Associated symptoms
- Effects on daily activities
- Previous diagnosis of similar episodes
- Previous treatments
- Efficacy of previous treatments

Cardinal Symptoms

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

Cough

- Quality (e.g. dry, hacking, loose, productive)
- Severity
- Timing (e.g. at night, with exercise)

Sputum

- Color
- Amount
- Consistency

Hemoptysis

- Amount of blood (frank vs. streaking)
- Association with leg pain, chest pain, shortness of breath, epistaxis

Shortness of Breath

- Exercise tolerance (number of stairs client can climb or distance client can walk)
- Orthopnea (number of pillows used for sleeping)
- Association with paroxysmal nocturnal dyspnea (waking up out of sleep acutely short of breath; attack resolves within 20 to 30 minutes of sitting or standing up)

Chest Pain

- Onset (sudden or gradual)
- Location
- Radiation
- Quality
- Timing
- Severity
- Aggravating and relieving factors
- Associated symptoms

Wheeze

- Timing (e.g. at rest, at night, with exercise)

Other Associated Symptoms

- Fever
- Malaise
- Fatigue
- Night sweats
- Weight loss

Medical History (Specific To Respiratory System)

- Frequency of colds or asthma and treatment used
- Other respiratory illnesses (e.g. nasal polyps, chronic sinusitis)
- Bronchitis, pneumonia, chronic obstructive pulmonary disease (COPD), tuberculosis (TB) (disease or exposure), cancer, cystic fibrosis
- Seasonal allergies or allergies to drugs such as acetylsalicylic acid (ASA)
- Medications such as angiotensin-converting enzyme (ACE) inhibitors, β -blockers, ASA, steroids, nasal sprays, antihistamines,
- Alternative therapies (e.g. herbal, traditional medicine)
- Admissions to hospital for respiratory illness
- Date and result of last Mantoux test and chest x-ray
- Vaccination history (e.g. pneumococcal, annual influenza)

Family History (Specific To Respiratory System)

- Allergies, atopy
- Asthma, lung cancer, TB, cystic fibrosis
- Heart disease
- COPD

Personal And Social History (Specific To Respiratory System)

- Smoking history (number of packages/day,number of years)
- Alcohol abuse
- HIV risks

- Exposure to secondhand smoke
- Occupational or environmental exposure to respiratory irritants
- Exposure to pets
- Crowded living conditions
- Personal or environmental cleanliness
- Institutional living
- Injection drug use

Examination Of The Respiratory System

Examination of the ear, nose, throat and cardiovascular system should also be carried out because of the interrelatedness between these systems and structures and the functioning of the lower respiratory tract.

General Appearance

- Acutely or chronically ill
- Degree of comfort or distress
- Degree of sweatiness
- Ability to speak a normal-length sentence without stopping to take a breath
- Color (e.g. flushed, pale, cyanotic)
- Nutritional status (obese or emaciated)
- Hydration status

Vital Signs

- Temperature
- Pulse
- Pulse oximetry
- Respiratory rate
- Blood pressure

Inspection

- Color (e.g. central cyanosis)
- Shape of chest (e.g. barrel-shaped, spinal deformities)
- Movement of chest (symmetry)
- Rate, rhythm and depth of respiration
- Use of accessory muscles (sternocleidomastoid muscles)
- Intercostal indrawing
- Evidence of trauma
- Chest wall scars
- Clubbing of the fingers

Palpation

- Tracheal position (midline)
- Chest wall tenderness
- Chest expansion
- Tactile fremitus
- Spinal abnormality
- Nodes (axillary, supraclavicular, cervical)
- Masses
- Subcutaneous emphysema

Percussion

- Resonance (dull or hyperresonance)
- Location and excursion of the diaphragm

Auscultation

- Assist client to breathe effectively
- Listen for sounds of normal air entry before trying to identify abnormal sounds

Breath Sounds

- Degree of air entry throughout the chest (should be equal)
- Quality of breath sounds (e.g. bronchial, bronchovesicular, vesicular)
- Length of inspiration and expiration

Adventitious Sounds

- Wheezes: continuous sounds, ranging from a low-pitched snoring quality to a high-pitched musical quality, may clear with coughing
- Crackles: discrete, crackling sounds heard on inspiration
- Pleural rub: a creaking sound from pleural irritation, heard on inspiration or expiration

Differential Diagnosis Of Respiratory Symptoms

Acute Cough

- Infection: viral or bacterial, upper or lower respiratory tract
- Lung abscess
- Asthma
- Exacerbations of chronic bronchitis
- Bronchogenic carcinoma
- Foreign-body inhalation
- Esophageal reflux with aspiration
- Left-sided heart failure

Chronic Cough

Common Causes

- Smoking
- Exposure to environmental irritants (second hand smoke)
- Postnasal drip
- Asthma
- COPD or chronic bronchitis
- Gastroesophageal reflux with aspiration
- Lung tumors
- Mitral valve prolapse

Less Common Causes

- Carcinoma of the upper or lower respiratory tract
- Interstitial lung disease
- Medications (e.g. ACE inhibitors)
- Chronic lung infections (e.g. bronchiectasis, cystic fibrosis, TB)
- Occult left heart failure
- Disorders of the pleura, pericardium, diaphragm, stomach
- Idiopathic (e.g. psychogenic)
- Pressure from an external mass (e.g. goitre, aortic aneurysm)

Cough And Sputum Production

- Acute bronchitis
- Pneumonia
- Asthma
- TB
- COPD
- Bronchiectasis
- Lung abscess
- Lung cancer

Dyspnea

- Asthma
- COPD
- Pneumothorax
- Pneumonia
- Interstitial lung disease (e.g. sarcoidosis)
- Lung cancer
- Pulmonary emboli or infarction
- Cardiac failure, congestive heart failure
- Anxiety with hyperventilation

Hemoptysis

- Bronchitis
- Bronchiectasis
- TB
- Bronchogenic cancer
- Lung abscess
- Pneumonia, necrotizing form (e.g. caused by *Klebsiella*)
- Pulmonary contusion
- Pulmonary embolism
- Primary pulmonary hypertension
- Mitral stenosis
- Cardiac failure, congestive heart failure
- Vascular anomalies (e.g. aneurysm)
- Chest trauma
- Inhalation of toxic material
- Bleeding disorders

Wheeze

- Acute bronchitis
- COPD
- Asthma
- Bronchopneumonia (due to aspiration)
- Lung neoplasm obstructing a bronchus
- Pulmonary emboli
- Foreign-body aspiration

Chest Pain (Pleuritic)

Diseases of the Lungs or Pleura

- Pneumonia
- Pleurisy
- Pleuritis associated with connective tissue diseases
- Pneumothorax

- Hemothorax
- Empyema
- Pulmonary infarction
- Lung cancer
- TB

Diseases of the Pericardium

- Pericarditis
- Trauma

Diseases of the Chest Wall Muscle, Bone, Nerves, Skin

- Chest wall contusion
- Fractures of ribs, sternum
- Inflammation of chest wall muscles (costochondritis)
- Herpes zoster neuropathies
- Bone tumor

Gastrointestinal Diseases

- Liver abscess
- Pancreatitis
- Subdiaphragmatic abscess

Other Diseases

- Psychoneurosis

Chest Pain (Nonpleuritic) Diseases of the Pulmonary Vessels

- Pulmonary embolism
- Primary pulmonary hypertension
- Disease of the aorta
- Dissecting aortic aneurysm

Diseases of the Myocardium

- Myocardial infarction
- Angina

Referred Pain from Gastrointestinal Structures

- Reflux esophagitis, ulceration
- Esophageal motility disorders (e.g. achalasia)
- Esophageal perforation or rupture
- Esophageal spasm
- Esophageal neoplasm
- Esophageal diverticula
- Gastric or duodenal ulcer
- Cholelithiasis, cholecystitis
- Pancreatitis, pancreatic neoplasm

Common Problems Of The Respiratory System

Chronic Asthma

Definition

A disorder of the airways characterized by paroxysmal or persistent symptoms (including dyspnea, chest tightness, wheeze, sputum production and cough) with variable airflow limitation and a variable degree of airway hyperresponsiveness to a variety of stimuli.

Airway inflammation and its consequences are the important features in the pathogenesis of asthma.

Table 1: Characteristics of various forms of asthma

Mild Asthma	Moderate Asthma	Severe Asthma
Respiratory symptoms (wheeze, cough, dyspnea) up to 2 times weekly and/or respiratory symptoms lasting less than 30 minutes with activity	Respiratory symptoms > 2 times weekly, with exacerbations affecting sleep and activity and often lasting several days	Respiratory symptoms so frequent that they interfere with activities of daily living
Minimal or no shortness of breath at rest; exercise increases cough or wheeze and usually causes shortness of breath; nighttime cough, worse in early predawn hours	Shortness of breath at rest or with mild exertion; tightness in the chest; wheezing at rest; increased cough at night or with exercise	Daily symptoms and frequent nighttime symptoms
Able to do usual tasks without difficulty	Some difficulty speaking and sleeping	Occurrence of a prior near-fatal episode (intubation needed)
PEFR and FEV ₁ >80% of predicted	PEFR 60% to 80% of predicted	PEFR <60% of predicted
Asymptomatic between exacerbations	Occasional visits to emergency department	Frequent admissions to hospital or visits to emergency department
	Intermittent use of β_2 -agonist inhaler	Need for inhaled β_2 -agonists several times per day or at night. Use of more than one inhaler in 2 week period

PEFR = peak expiratory flow rate FEV₁ = forced expiratory volume in the first second

Note: cough at night or during times of emotional stress or physical activity may be the only sign of asthma.

Causes

- Unknown in many cases
- Allergic airway hyperreactivity to airborne pollens, molds, house dust mites, animal dander, feather pillows
- Nonallergic asthma triggered by drugs (such as ASA, nonsteroidal anti-inflammatory drugs

[NSAIDs], tartrates, β -blockers and ACE inhibitors), smoke and other occupational, industrial and environmental substances

- Common trigger factors: intercurrent gastroesophageal reflux disease (GERD)

Risk Factors

- Positive family history
- Frequent, severe viral infections of the lower respiratory tract in infancy, respiratory tract infections, cold air, exercise, emotional stress, sinusitis.

Determining Severity

The severity of asthma is determined by the frequency and chronicity of symptoms, the presence of persistent airflow limitations and the medication needed to maintain control of the condition.

Severity is best evaluated after an aggressive trial of therapy with inhaled corticosteroids (see Table 1 above).

Differential Diagnosis

- Mechanical airway obstruction (foreign body)
- Severe allergic reaction
- COPD with chest infection
- Congestive heart failure
- Pulmonary edema
- Inhalation of toxic material
- Inspiratory stridor
- Cough secondary to drugs such as ACE-inhibitors, β -blockers

Complications

- Severe acute attack: hypoxia, respiratory failure, atelectasis, pneumothorax, death
- Chronic: interference with activities of daily living, COPD

Diagnostic Tests

Objective measurements are needed to confirm a diagnosis of asthma and to assess severity in all but the most minimally symptomatic clients.

- Determine peak expiratory flow rate (PEFR)
- Arrange baseline pulmonary function tests

Referral to physician for consideration of the following tests:

- Methacholine challenge test
- Allergy testing

Management

Goals of Treatment

- Maintain normal activity
- Prevent symptoms
- Maintain normal pulmonary function
- Prevent exacerbations
- Avoid side effects of therapy (given that side effects may lead to poor adherence to treatment plan)

The five most important aspects of asthma care are considered to be:

1. Achievement of acceptable control of the disease is the main goal of treatment
2. Control of the environment
3. Asthma education, favouring self-management and the use of an action plan
4. Inhaled glucocorticosteroids as the first-line anti-inflammatory therapy for all ages
5. Additional therapy (e.g. long-acting β_2 -agonists, leukotrienes-receptor antagonists [LTRAs] etc.) can be added to moderate doses of glucocorticosteroids if acceptable asthma control is not obtained

Appropriate Consultation

Consult a physician to discuss appropriate medication therapy at first diagnosis and as necessary thereafter until symptoms have stabilized.

Adjuvant Therapy

- Administer annual influenza vaccine
- Administer pneumococcal vaccine

Nonpharmacologic Interventions

- Recommend that client avoid known precipitating factors such as environmental allergens and occupational irritants

- Allergens to which a person is sensitized should be identified
- A systematic program to eliminate or at least substantially reduce, allergen exposure should be undertaken
- Measures to control household dust mites can be effective in decreasing exposure and relieving asthma
- Humidity in the home, including the bedroom, should be kept below 50%
- Reduction of exposure to pet allergens cannot be effective without removing the pet from the home
- Compliance with avoidance measures must be reviewed repeatedly and its importance emphasized

- Offer counseling for smoking cessation (if applicable) to client and family
- Recommend that client avoid NSAIDs and ASA products (if allergic)

Client Education

- Discuss diagnosis and expected course of illness
- Teach client about measures to minimize exposure to allergens (see table 2)
- Counsel client about appropriate use of medications (dose, frequency, side effects)
- Advise client on proper use of aerosol delivery device, aerochamber or spacer
- Teach client how to monitor for symptoms and how to use peak flow meter (if deemed beneficial to managing symptoms)
- Advise client on an action plan to increase medication from maintenance level at first sign of exacerbation
- Counsel client on how to minimize local side effects (oral candidiasis) by careful rinsing of the mouth and gargling
- Process to re-order medications

Table 2: Measures to minimize environmental factors contributing to asthma

Avoid respiratory irritants, particularly tobacco smoke
Minimize exposure to relevant allergens, particularly indoor allergens

Household dust mites

- Maintain relative humidity below 50%
- Encase mattress, box spring and pillows in mite and mite allergen impermeable covers
- Launder bed linens in hot (55°C) water
- Remove carpeting, where possible

Note: air filters do not affect reservoir levels of household dust-mite allergen

Pet allergens

- Removal of pet from the home is the most effective approach
- Exclude pet from the bedroom
- Use HEPA room air cleaner
- Use mattress and pillow covers
- Remove carpeting
- Vacuum upholstered furniture with a HEPA-filtered vacuum frequently
- Washing the pet may temporarily reduced allergen load, but this must not be done by the allergic person

(Boulet *et al*, 1999)

Pharmacologic interventions

Medications used to treat asthma are classified as controllers and relievers. Except in cases of emergency treatment all asthma medications will be prescribed by a physician.

Table 3: Asthma medication categories

Relievers (for intermittent symptoms)
short acting β_2 -agonists
ipratropium (rarely)
Controllers (for maintenance therapy)
Anti-inflammatory medications
Steroidal - inhaled (and oral) glucocorticosteroids
Non-steroidal - leukotriene receptor antagonists
Anti-allergic agents – cromoglycate and nedocromil
Bronchodilators - long-acting inhaled β_2 -agonists (salmeterol, formoterol B class drugs)
Theophylline
Ipratropium

Inhaled Corticosteroids

Inhaled corticosteroids are the best agents for bringing and keeping asthma under control, and their use may improve the overall prognosis for clients with this condition.

Initial recommended doses of inhaled corticosteroid for mild to moderate asthma:

*fluticasone, 100-500 mcg bid or
budesonide, 40 mcg bid*

Once best results are achieved (i.e. symptoms are controlled), the dose of inhaled steroid is reduced to identify the minimum dose required to maintain control.

Inhaled steroids are safe for use during pregnancy and lactation, but the lowest dose possible to maintain control of asthma is recommended.

Short-Acting β_2 -Agonists

Short-acting β_2 -agonists are the drugs of choice to relieve asthma symptoms that break through maintenance therapy. They are most effective for preventing and treating exercise-induced bronchospasm. Their use should be limited to rescue medication and they should be used less than 3 times a week.

salbutamol, 100 mcg, 1 or 2 puffs q4h prn

Long-Acting β_2 -Agonists

The long-acting β_2 -agonists (e.g. salmeterol, formoterol B class drug) can be used as an additional treatment for people whose asthma is not adequately controlled with optimum inhaled steroids, particularly when there are nocturnal symptoms. These drugs should never be used to rescue patients with significant symptoms of an acute asthma attack.

Leukotriene Receptor Antagonists (LTRA)

LTRAs have been developed recently as it has been recognized that leukotrienes play a significant role in the inflammatory pathophysiology of asthma. Their use at present, however, is limited to add-on therapy to inhaled glucocorticosteroids, until more is known about their long-term effects on disease modification. They should not be used as first line therapy.

Anticholinergics

The anticholinergic drugs (e.g. *ipratropium bromide*) act more gradually than β_2 -agonists to offer modest bronchodilation in stable asthma patients. They are of greatest value in treating older patients and patients with a combination of asthma and COPD. During acute exacerbations they are used as an adjunct to optimal doses of short-acting β_2 -agonists.

Monitoring and Follow-Up

- Follow up every 3-6 months once stabilized
- Assess adherence to the medication regimen
- Review inhaler technique periodically
- Watch for complicating conditions such as GERD, sinusitis, nasal polyps
- Carefully monitor clients taking more than 2000 mcg daily of inhaled steroids to watch for long-term effects on bone metabolism (osteoporosis)
- Review strategies to reduce environmental allergens if applicable

Referral

Referral to a specialist is recommended for adults when more than 1000 mcg daily of inhaled beclomethasone or its equivalent is required on an ongoing basis. Ideally, a physician should review the client at least annually if stable and more often if symptoms are not well controlled.

Consider referral for respiratory assessment (if available) for clients whose activities of daily living are significantly compromised by poorly controlled symptoms despite adequate therapy and adequate compliance with the treatment plan.

Acute Asthma Exacerbation

Exacerbations should be treated promptly to reverse the symptoms and prevent them from becoming severe.

The findings depend on the acuteness and severity of the attack, which can range from mild to very severe.

Table 4: Signs, symptoms and management of mild, moderate and severe asthma attacks.

Feature	Mild	Moderate	Severe
History	• Exertional dyspnea • No acute distress • Cough	• Dyspnea at rest • Congested cough • Tightness of chest • Nocturnal symptoms • β_2-agonists needed > q4h	• Acute respiratory distress • Agitated, diaphoretic • Difficulty speaking
Physical findings	• RR normal or minimally elevated • Heart rate < 100 bpm • Low-pitched wheezes, inspiratory, expiratory or both • FEV₁ and PEFr > 60% predicted or best • PEFr > 300 L/min • Good response to short-acting β_2-agonists	• Appears short of breath • RR elevated • Heart rate > 100 bpm • Some use of accessory muscles of respiration • Audible wheeze • High-pitched wheezes in all lung fields, inspiratory, expiratory or both • FEV₁ and PEFr 40-60% predicted or best • PEFr 200-300 L/min • β_2-agonists provide only partial relief	• Heart rate > 110 bpm • Marked use of accessory muscles of respiration • Blood pressure elevated • Breath sounds decreased in intensity • Diffuse, high-pitched wheezes, inspiratory, expiratory or both • FEV₁ and PEFr: unable to perform test or < 40% predicted or best • PEFr < 200 L/min • Oxygen saturation < 90% • No pre-clinic relief from β_2-agonists
Management	Consult a physician if client is not already taking inhaled steroids	Consult a physician	Consult a physician as soon as possible
Adjuvant therapy	None	Oxygen to keep saturation $\geq 97\%$	• Oxygen to keep saturation $\geq 97\%$ • Start IV therapy with normal saline, adjust rate to maintain hydration • Aggressive fluid administration can help liquefy bronchial secretions unless otherwise contraindicated (e.g. pulmonary edema)

Pharmacologic interventions	• If client on inhaled steroids increase to 2-4 times usual dose. • If has not been taking medications recently, restart usual dose • Bronchodilators prn for bronchospasm <i>salbutamol by MDI 1-2 puffs q4h prn, to a maximum of 2-4 puffs q4h</i>	<i>salbutamol by MDI and Aerochamber, 100 mcg/puff, 4-8 puffs q15-20min, 3 times; then increase to 1 puff q30-60s (for 4-20 puffs) prn</i> <i>or</i> <i>salbutamol solution by nebulizer, 5.0 mg (1 mL in 3 mL normal saline) q15-20min, 3 times, continuous if necessary</i> $\pm$ <i>ipratropium bromide by MDI and Aerochamber, 20 mcg /puff, 4-8 puffs q15-20min, 3 times; then increase to 1 puff q30-60s (for 4-20 puffs) prn</i> <i>or</i> <i>ipratropium bromide (C class drug) by nebulizer, 0.25-0.50 mcg (1-2 mL in 3 mL normal saline) q15-20min, 3 times, continuous if necessary (may be mixed with salbutamol; decrease in recovery phase)</i> $\pm$ <i>prednisone, 1 mg/kg (40-60 mg) PO od or bid for 5-7 days</i> <i>People with steroid-dependent asthma and those who are already receiving inhaled steroids should also receive oral steroid therapy.</i>	<i>salbutamol by MDI and Aerochamber, 100 mcg /puff, 4-8 puffs q15-20min, 3 times; increase to 1 puff q30-60s (for 4-20 puffs) prn</i> <i>or</i> <i>salbutamol solution by nebulizer, 2.5-5.0 mg (0.5-1.0 mL in 3 mL normal saline) q15-20min, 3 times, continuous if necessary; + titrate to client response</i> $+$ <i>ipratropium bromide by MDI and Aerochamber, 20 mcg /puff, 4-8 puffs q15-20min, 3 times; increase to 1 puff q30-60s (for 4-20 puffs) prn</i> <i>or</i> <i>ipratropium bromide by nebulizer, 0.25-0.50 mcg (1-2 mL in 3 mL normal saline) q15-20min, 3 times, continuous if necessary (may be mixed with salbutamol; decrease salbutamol during recovery phase)</i> $+$ <i>methylprednisolone sodium succinate IV</i>
Monitoring and follow-up	Advise follow-up in 24 hours if symptoms not controlled. For exercise or cold-induced asthma: <i>salbutamol</i> 1-2 puffs 15 minutes before exercising or going out in the cold air	• PEFR and FEV₁ should be checked frequently to evaluate response to bronchodilator therapy • Client may be discharged after initial emergency treatment if there is good response and there has been no attack within the previous 24 hours	Assess response to medication by continuously monitoring oxygen saturation and by measuring PEFR and vital signs frequently. Monitor heart rate for tachycardia
Referral	As needed	Medevac after treatment if FEV₁ is < 60% predicted value or there has been another attack within the previous 24 hours	Medevac as soon as possible

Patients at risk of relapse	Previous near death episode Recent emergency room visit for acute exacerbation Frequent admissions to hospital Dependent on steroids and recent use of oral steroids History of sudden attacks Allergic or anaphylactic triggers Recent attack of prolonged duration Poor understanding of illness and poor adherence to therapy No removal of environmental triggers
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*MDI – metered dose inhaler**RR – respiratory rate*

Chronic Obstructive Pulmonary Disease (COPD)

Definition

A functional disorder of the lung characterized by progressive and incompletely reversible airflow obstruction and actual destruction of lung tissue. The clinical presentation depends on which of the following pathophysiologic processes are prominent:

- Inflammatory narrowing of the bronchioles
- Proteolytic digestion of the connective tissue framework of the lung, resulting in decreased parenchymal tethering of the airways
- Loss of alveolar surface area and capillary bed
- Lung hyperinflation caused by loss of elastic recoil
- Increased pulmonary vascular resistance caused by vasoconstriction and loss of capillary bed

Source: Guidelines for the Assessment and Management of Chronic Obstructive Pulmonary Disease (Canadian Thoracic Society Workshop Group 1992)

Causes

- Usually a combination of factors

Risk Factors

- Smoking
- Secondhand smoke
- Severe viral pneumonia early in life
- Aging
- Genetic predisposition
- Air pollution
- Occupational exposure to respiratory irritants

Former Classification

Most clients with COPD have a combination of chronic bronchitis and emphysema. However, one pattern is predominant: people with COPD either tend to have more cough and sputum production and less shortness of breath (chronic bronchitis) or tend to have more shortness of breath and less cough and sputum production (emphysema).

Chronic Bronchitis

Chronic productive cough that is present for at least 3 months each year, for 2 years in a row.

Initially, cough and sputum are present only in the morning (especially in the winter). Eventually the symptoms are present throughout the day and throughout the year. There are frequent episodes of acute chest infections superimposed on the chronic condition.

Emphysema

Chronic shortness of breath, initially with exercise. Cough is only a minor problem and sputum production is limited. The shortness of breath gradually becomes worse until the person is short of breath even at rest.

History

- Client almost always a smoker
- 40 years of age or older
- Frequent chest infections
- Weight loss and fatigue (in the advanced stages)
- Shortness of breath
- Cough with sputum (clear, white, yellow-green)
- Wheeze

Physical Findings

Physical findings vary, depending on extent of disease and whether exacerbation is acute.

The upper respiratory tract (e.g. ears, nose and throat) and the cardiovascular system should be examined, and neuromental status should be determined (to check for hypoxia) (see chapter 8).

- Temperature may be elevated with superimposed infection
- Heart rate may be elevated
- Respiratory rate elevated, depth of respiration may be decreased
- Expiratory phase is prolonged
- Oxygen saturation may be reduced
- Client may appear thin or wasted
- Degree of respiratory distress varies
- May be using accessory muscles of respiration
- Cyanosis may occur
- Clubbing of fingers may be present
- Chest diameter is usually increased ("barrel chest")
- Breathing may be pursed-lipped

- If hypoxia is significant, confusion, irritability and diminished level of consciousness may result
- Tactile fremitus decreased
- Chest excursion decreased
- Hyperresonance
- Decreased diaphragmatic excursion (chronically hyperinflated lungs)
- Air entry reduced
- Breath sounds distant (if barrel chest is present)
- Scattered wheezes and crackles may be present
- Decreased FEV1 on peak flow testing

Differential Diagnosis

- Bronchitis (acute)
- Bronchiectasis
- Asthma
- Bronchogenic carcinoma

Complications

- Acute bronchitis
- Pneumonia
- Pulmonary hypertension
- Cor pulmonale (right heart failure)
- Respiratory failure
- Polycythemia (abnormally high hemoglobin) due to hypoxemia

Diagnostic Tests

- If productive cough >3 weeks sputa for AFB and C&S.
- Arrange for baseline pulmonary function testing at some point and baseline CXR

Management

Goals of Treatment

- Reduce or eliminate dyspnea
- Reduce sputum production
- Maintain exercise tolerance
- Prevent progression of disease
- Reduce frequency of exacerbations
- Keep oxygen saturation > 90%

Appropriate Consultation

Consult a physician for previously undiagnosed clients, those whose symptoms are not controlled with their current therapy and those with an acute exacerbation.

Client Education

- Early public education about the hazards of smoking can prevent COPD
- Counsel client about smoking cessation (if applicable)
- Recommend adequate hydration (8-10 glasses of fluid per day; there is no evidence that drinking more than this quantity is of any benefit)
- Increase humidity in the air (kettle, humidifier or pot of water on the stove)
- Recommend adequate nutrition: small, frequent meals high in protein and calories
- Recommend an exercise program (e.g. walking) to improve general fitness and sense of well-being
- Recommend a weight-loss program (if applicable)
- Discuss natural history, expected course and prognosis of disease
- Counsel client about appropriate use of medications (purpose, dose, frequency, side effects)
- Counsel client about proper use of inhaler
- Perform chest physiotherapy if increased sputum production (deep breathing and coughing, pursed-lip breathing, abdominal breathing and postural drainage)
- Teach client symptoms and signs of exacerbation and acute infection to encourage self-monitoring and early presentation when condition deteriorates
- Counsel client to avoid travel at high altitudes; when air travel cannot be avoided, the client should have access to oxygen (especially when traveling in an unpressurized aircraft)

Adjuvant Therapy

- Give yearly influenza vaccine
- Give pneumococcal vaccine

Monitoring and Follow-Up

- For clients using oral theophylline medications, measure serum levels of drug every 3-6 months and teach client the symptoms and signs of toxic effects
- Follow-up every 6 months if stable
- Follow-up monthly if symptoms poorly controlled

Referral

The physician should assess the client at least annually if condition is stable, and as soon as feasible if symptoms are not controlled.

Acute COPD Exacerbation

Definition

Recent deterioration of the patient's clinical and functional state due to a worsening of his or her COPD.

History

- Worsening dyspnea, sometimes at rest
- Increased cough
- Increased sputum production, often with change in character from mucoid to purulent
- Development of or increase in wheezing
- Loss of energy
- Loss of appetite

Physical Findings

- Fever (superimposed infection)
- Anxiety level
- Increase in respiratory rate
- Tachycardia
- Increase in cyanosis
- Use of accessory muscles
- Peripheral edema
- Loss of alertness
- Worsening of airflow obstruction, as indicated by FEV1 or PEFr
- Worsening of oxygen saturation, as indicated by pulse oximetry

Evidence Of Severe Exacerbation

Loss of alertness or a combination of two of the other typical symptoms and signs of COPD exacerbation (see above) suggests severe exacerbation and a need for referral to the emergency department. These criteria are not intended to replace a healthcare provider's judgment about the need for referral.

Management

The decision as to whether to manage a client at home or to refer him or her for evaluation depends on many factors: the severity of the exacerbation; the severity of the underlying COPD; comorbid conditions; the medical sophistication, judgment and reliability of the client and caregivers; and the distance the client lives from the health center or clinic.

Exacerbations should be treated with appropriate supplemental oxygen, aggressive bronchodilator therapy, corticosteroids and antibiotics.

Appropriate Consultation

Consult a physician as soon as possible.

Adjuvant Therapy

- Oxygen 4-6 L/min or more prn; keep oxygen saturation at 90% to 92%
- Start IV therapy with normal saline; adjust IV rate according to state of hydration

Pharmacologic Interventions

The choice of medications and dosages (Fig. 3) depends on the current drug regimen and the client's compliance with it, as well as the severity of the exacerbation (particularly the degree of respiratory distress).

The maximal effective doses of short-acting β_2 -agonists (e.g. salbutamol) and long-acting β_2 -agonists (e.g. ipratropium bromide) in COPD exacerbation are unknown.

Monitoring and Follow-Up

Monitor vital signs, oxygen saturation and PEFr frequently to assess response to bronchodilator therapy.

Referral

Medevac any client who shows moderate to severe signs of respiratory distress.

Fig 3: Recommended Drug Treatment for Acute Exacerbation of COPD**Bronchodilators**

e.g. salbutamol, 3 or 4 puffs q4h prn; may increase to 6-8 puffs q2h in severe exacerbation

+

Anticholinergics

e.g. ipratropium bromide, 3 or 4 puffs q4h prn; may increase to 6-8 puffs q2h in severe exacerbation

+

Oral steroids

e.g. prednisone 40-60mg PO od for 2 weeks or methylprednisolone 125mg IV q8h

+

Oral antibiotics

e.g. amoxicillin, 500mg PO tid for 10 days or cotrimoxazole 800/160 mg, PO bid for 10 days or clarithromycin 500mg PO bid or

IV antibiotics

e.g. ampicillin 500-1000mg IV q6h or cefuroxime 750mg IV q8h

For clients with penicillin allergy use
erythromycin 500mg IV q6h

Acute Bronchitis

Definition

Inflammation of trachea and bronchi (larger airways).

Causes

- Acute bronchitis is almost exclusively viral in etiology
- Viral infection: influenza A or B, adenovirus, rhinovirus, parainfluenza
- Bacterial infection: *Hemophilus influenzae*, *Moraxella catarrhalis*, *Mycoplasma*, *Streptococcus pneumoniae*

Risk Factors

- Chronic sinusitis
- COPD
- Bronchiectasis
- Immunosuppression
- Smoking
- Secondhand smoke
- Air pollutants
- Alcoholism
- GERD

History

- Previous infection of upper respiratory tract
- General malaise
- Fever
- Cough; initially dry, later productive of white, yellow or green sputum
- Muscular aching in the chest wall or discomfort with coughing
- Wheezing may be present

Physical Findings

The presentation of acute bronchitis and pneumonia are often similar. In general, clients with pneumonia are sicker and usually have more chest abnormalities. The organisms that cause bronchitis can also cause pneumonia. The difference is in where the infection lies anatomically. Bronchitis involves the larger airways, whereas pneumonia involves the smaller airways and air sacs.

- Temperature may be mildly to moderately elevated

- Heart rate may be mildly elevated if febrile
- Respiratory rate may be slightly elevated
- Spasmodic cough
- Rhinitis may be present
- Expiratory phase may be slightly prolonged
- Wheezes (scattered, low pitched) may be present

Differential Diagnosis

- Influenza
- Acute sinusitis
- Pneumonia
- Acute exacerbation of chronic bronchitis
- Asthma
- Inhaled or aspirated chemical irritants
- TB or lung cancer (if recurrent)
- Pertussis
- Allergies

Complications

- Pneumonia
- Postbronchitis cough

Diagnostic Tests

Nasopharyngeal swab

Management

Goals of Treatment

- Relieve symptoms
- Prevent pneumonia

Appropriate Consultation

Consultation is usually not necessary if the person is otherwise healthy.

Nonpharmacologic Interventions

- Increased rest (especially if febrile)
- Adequate hydration (8-10 glasses of fluid per day)
- Increased humidity in the environment
- Avoidance of pulmonary irritants (e.g. stop or decrease smoking)

Client Education

Recommend hand washing to prevent spread of infection throughout a household.

Pharmacologic Interventions

For fever or pain:

acetaminophen, 325 or 500 mg, 1 tab q4h prn

Clients who have been unwell for more than 5-7 days and have purulent sputum, or those with underlying health concerns (e.g. asthma) may require a course of antibiotics.

Use the following:

erythromycin, 250 mg PO qid for 7 days

or

tetracycline, 250 mg PO qid for 7 days

or

cotrimoxazole, 800/160 mg PO bid for 7 days

If bronchospasm is significant, short-acting β_2 -agonist bronchodilators can be used until acute symptoms resolve:

salbutamol, 1 or 2 puffs q4h prn

Monitoring and Follow-Up

Arrange for follow-up in 5-7 days if not resolving.

Referral

Usually not necessary.

Pneumonia

Definition

Infection of the distal airways, air sacs or both.

Causes

In the past, cases of pneumonia were divided into two categories, bacterial or atypical. In community-based practices, the following classification of community-acquired pneumonia is now commonly used.

- If the patient was previously well or is under 65 years of age (or both): *Streptococcus pneumoniae* (pneumococcal) and *Mycoplasma* are the most common causes in younger healthy adults; also, less frequently, *Chlamydia pneumoniae* and *Hemophilus influenzae*, *Mycobacterium tuberculosis*
- If the patient has comorbid illness or is 65 years of age or older (or both): *Hemophilus influenzae*, *Klebsiella pneumoniae*, *Legionella pneumophila*, *Moraxella catarrhalis*, *Mycobacterium tuberculosis*, *Staphylococcus aureus* and, less commonly, *Streptococcus pneumoniae*
- Viral pneumonia uncommon except in outbreaks of influenza A and respiratory syncytial virus or as a complication of atypical measles
- *Cytomegalovirus* and herpes simplex viruses are treatable causes of pneumonia in immunocompromised patients
- *Pneumocystis carinii* pneumonia may occur in immunocompromised patients, especially those with HIV or AIDS
- Aspiration of oral pharyngeal secretions, gastric contents or chemicals may predispose a patient to bacterial pneumonia. Those at risk for this problem include alcoholic people, elderly people, those who have difficulty swallowing, those with motility or neuromuscular disorders, and stroke victims
- No cause is identified in approximately one-third to one-half of all cases

History

There is considerable overlap in the symptoms of the various types of pneumonias.

- Fever, chills
- Cough
- Sputum may be yellow, green, blood-tinged

- Chest pain: sharp, localized pleuritic chest pain is seen in acute lobar type only
- Shortness of breath may be present

In elderly or chronically ill clients, the symptoms may not be as acute or as obvious. These clients may present with only confusion or a deterioration of pre-existing medical problems.

As a general rule, pneumonia caused by *Mycoplasma*, *Chlamydia*, viruses and *P. carinii* have a slower, more insidious onset. The client may not appear as acutely ill and may have a lower fever, dry cough and scanty sputum production.

Physical Findings

- Temperature elevated
- Heart rate elevated
- Respiratory rate increased
- Oxygen saturation decreased
- May or may not appear acutely ill
- Flushed, diaphoretic if fever is high
- May "splint" the affected side if there is pleuritic pain
- Variable level of respiratory distress
- Dullness on percussion if there is consolidation
- Air entry may be decreased
- Inspiratory crackles
- Wheezes may be present
- Bronchial breathing
- Pleural rub may be present (rarely)

In elderly clients, the clinical presentation of the various types of pneumonias is often atypical or obscured. Overt respiratory signs may be absent. They may present with changes in level of consciousness, confusion, functional impairment such as loss of energy, a decrease in appetite or vomiting. These clients are at increased risk of death from bacterial pneumococcal disease.

Differential Diagnosis

- TB
- COPD
- Acute bronchitis
- Underlying lung cancer

- Aspiration pneumonia
- Lung abscess
- Atelectasis

Complications

- Decompensation of other medical problems
- Respiratory failure from hypoxia
- Sepsis (bacteremia)
- Metastatic infection such as meningitis, endocarditis, pericarditis, empyema
- Cardiac failure

Diagnostic Tests

- Chest x-ray (postero-anterior and lateral) always
- Sputum for AFB if history of cough >3 weeks or history of previous TB infection
- Sputum for C&S if cough is productive

Management

Goals of Treatment

- Relieve symptoms
- Improve or prevent respiratory distress
- Prevent complications

Appropriate Consultation

Consult a physician for any client with severe symptoms (e.g. appears acutely ill or has hemoptysis, significant respiratory distress or a significant comorbid condition such as diabetes mellitus, heart disease, renal disease or cancer) or for any client who has not responded to initial oral treatment and whose condition is worsening.

Nonpharmacologic Interventions

- Increased bed rest
- Adequate fluid intake (8-10 glasses of fluid per day)
- Increased humidity in the air (kettle, humidifier or pot of water on the stove)

Client Education

- Explain diagnosis and expected course of illness
- Counsel client about appropriate use of medications (dose, frequency, side effects)

Pharmacologic Interventions

Client < 65 years of age with no comorbid conditions and mild-to-moderate pneumonia

For fever, pain and muscle ache:

acetaminophen, 325 or 500 mg, 1-2 tabs PO q4-6h prn

Antibiotics:

erythromycin, 500 mg PO bid or 250 mg qid for 10 days

or

clarithromycin, 500 mg PO qid for 10 days

Client ≥ 65 years of age with comorbid illness and mild-to-moderate pneumonia

cotrimoxazole, 800/160 mg PO bid for 10 days

or

amoxicillin/clavulanate if there is contraindication to sulpha

Monitoring and Follow-Up

Arrange follow-up within 24-48 hours for reassessment if shortness of breath develops and again after the course of antibiotics is completed.

Referral

Usually not necessary for patients with mild to moderate symptoms unless their condition is worsening, complications occur or they have significant comorbid conditions.

Management Of Severe Pneumonia

Appropriate Consultation

Consult a physician for any client with severe symptoms (e.g. appears acutely ill or has hemoptysis, significant respiratory distress or a significant comorbid condition such as diabetes mellitus, heart disease, renal disease or cancer) or for any client who has not responded to initial oral treatment and whose condition is worsening.

Adjuvant Therapy

- Oxygen to keep saturation > 97%
- Start IV therapy with normal saline; adjust the rate to maintain hydration

Pharmacologic Interventions

IV antibiotics of choice:

cefuroxime, 750 mg q8h or

clarithromycin 500 mg bid

Monitoring and Follow-Up

Monitor oxygen saturation (with pulse oximeter if available) and vital signs closely.

Referral

Medevac to hospital.

Emergencies Of The Respiratory System

Pneumothorax

Definition

Pneumothorax is partial or complete collapse of a lung because of the presence of air in the pleural space. There are 2 categories: spontaneous and traumatic.

There are 3 mechanisms: closed, open and tension.

Closed pneumothorax: Air from the lung itself leaks into the pleural space through a tear in the lung tissue (e.g. when a fractured rib end tears the lung), causing the lung to collapse.

Open pneumothorax (a sucking chest wound): Air from the outside enters the pleural space through a hole in the chest wall (such as a knife wound), causing the lung to collapse.

Tension pneumothorax: This is a special form of closed pneumothorax, and it is life threatening. Air is trapped under pressure in the pleural space. It collapses the lung, then pushes on the heart and the opposite lung. If the pressure is not quickly released, the client will become hypotensive and die.

Causes

- Perforation of the visceral pleura and entry of air from the lung
- Penetration of the chest wall, diaphragm, mediastinum or esophagus
- Idiopathic (cause unknown, a spontaneous occurrence)

Risk Factors

- COPD (rupture of an emphysematous bulla or bleb)
- TB
- Cystic fibrosis
- Asthma
- Lung neoplasm
- Flying
- Diving
- Spontaneous vigorous exercise
- Smoking

- Penetrating chest trauma (e.g. knife or gunshot wound)
- Blunt chest trauma (e.g. rib fracture)

History

- Recent trauma
- Known COPD
- Young, tall, healthy, thin, male, 20-40 years of age (idiopathic)
- Smoking
- Sudden onset of one-sided chest or shoulder pain
- Shortness of breath
- Symptoms may develop more slowly if the collapse is gradual and the person is able to partially compensate.

Physical Findings

Physical findings vary, depending on the extent of the lung tissue that has collapsed and the mechanism of the pneumothorax.

- Heart rate elevated
- Respiratory rate elevated
- Blood pressure variable: normal to hypotensive
- Mild to severe respiratory distress, oxygen saturation decreased
- Movement of air may be felt over an open chest wound
- Hyperresonance (hollow) over the pneumothorax
- Breath sound decreased or absent over the pneumothorax
- Cyanosis (late feature of hypoxia)
- Decreasing level of consciousness with progression
- Loss of radial pulse on affected side

Late sign: The trachea deviates toward the side of an open or a closed pneumothorax, but away from the side of a tension pneumothorax; the mediastinum (apex of the heart) shifts in the same direction as the trachea.

Differential Diagnosis

- Pleurisy
- Pericarditis
- Pulmonary embolism
- Myocardial infarction
- Dissecting aneurysm

Diagnostic Tests

- Chest x-ray

Management

Goals of Treatment

- Relieve pressure in the pleural space (tension pneumothorax)
- Improve oxygenation
- Re-expand the collapsed lung

Appropriate Consultation

Consult a physician as soon as possible.

Adjuvant Therapy

- Oxygen to keep saturation > 97%
- Ventilatory assistance as needed with Ambu bag or mask
- Start IV therapy with normal saline to keep the vein open; if there has been trauma, start 2 IVs. Volume replacement.

Nonpharmacologic Interventions

Tension Pneumothorax

This condition is life threatening. The pressure build-up must be released immediately by needle decompression of the affected side.

- Locate the puncture site. The second or third intercostal space in the midclavicular line on the same side as the pneumothorax is recommended as the site of approach. An alternate site is the fourth intercostal space midaxillary line.
- Prepare the area with an antiseptic such as povidone-iodine (Betadine)
- Make a one-way valve by inserting a 13- or 14-gauge angiocatheter through a condom
- Insert the catheter into the skin over the third rib and direct it over the top of the rib into the interspace (if using the alternate site go over the top of the fifth rib)
- Can use a Fisherman's Chest Seal® over the decompression needle, which provides an ongoing valve.

Open Pneumothorax

- Cover the hole in the chest with loose sterile gauze taped on three sides
- If a foreign body (e.g. a knife) is protruding from the chest wall, do not remove it; stabilize it and leave it in place

Monitoring and Follow-Up

- Place client on bed rest
- Monitor ABC (airway, breathing, circulation) and lung sounds frequently

Referral

Medevac as soon as possible in a pressurized aircraft.

Acute Foreign-Body Obstruction Of An Airway

Definition

Complete or partial blockage of the airway with a foreign body.

Causes

Aspiration (due to eating too quickly, eating and talking at the same time, neurological disorders, motility disorders of the esophagus, esophageal stricture).

History And Physical Findings

Partial Airway Obstruction

- Clear history of sudden aspiration
- Symptoms of respiratory distress
- Air entry variable, ranging from adequate to poor
- With poor air entry, client has limited ability to breathe, talk and cough; cough is weak and ineffective; severe respiratory distress is present
- With adequate air entry the client can cough forcefully, talk and breathe; frequently there is wheezing between coughs; severe respiratory distress is not present.

Complete Airway Obstruction

- Client unable to speak or breathe
- Severe respiratory distress
- The hands are usually put around the throat in a classic choking signal
- Loss of consciousness will occur if the obstruction is not quickly relieved
- The victim may be unconscious
- Cyanosis

Differential Diagnosis

- Anaphylaxis with laryngeal edema (acute allergy)
- Airway trauma
- Acute asthmatic attack
- Any condition that can cause sudden respiratory failure (e.g. stroke, epilepsy, myocardial infarction, drug overdose)

Complications

- Retention of fragment of foreign material
- Fracture of ribs or internal injury as a result of abdominal thrusts
- Decompensation of pre-existing medical conditions
- Death

Management

Goals of Treatment

- Dislodge and remove the foreign body
- Improve oxygenation

Nonpharmacologic Interventions

- Perform abdominal thrusts to dislodge foreign body (Basic CPR guidelines)
- Do not use abdominal thrusts when the person is able to cough forcefully, breathe and speak (which indicates partial obstruction with adequate air entry); allow the person to clear his or her own airway with spontaneous coughing and breathing

Adjuvant Therapy

- Assist ventilation as necessary with Ambu bag or mask once the obstruction has been removed
- Administer oxygen as necessary once the obstruction has been removed
- Start IV therapy with normal saline to keep vein open if client shows evidence of continuing respiratory distress

Monitoring and Follow-Up

Monitor the client for development of respiratory distress (which may indicate retention of fragment of the foreign body).

Appropriate Consultation

Consult a physician if the client shows evidence of continuing respiratory distress (which may indicate retention of fragment of the foreign body).

Referral

Medevac as required for further investigation and management of continuing respiratory distress.

Pulmonary Embolism

Definition

Sudden obstruction of pulmonary circulation.

Causes

- Blood clot embolizing from deep pelvic or leg veins
- Fat embolus (related to fractured femur or pelvis),
- Air embolus

Risk Factors

- Prolonged bed rest
- Advanced age
- Obesity
- Lower limb trauma
- Oral contraceptives
- Recent surgery
- Stroke
- Pregnancy
- Congestive heart failure
- Malignant disease

History

Symptoms vary greatly in severity. Pulmonary embolus may present as three different syndromes.

Acute cor pulmonale (right-sided heart failure) is due to massive embolus obstructing 60% to 75% of the pulmonary circulation.

Pulmonary infarction occurs in patients with massive embolism and complete obstruction of a distal branch of the pulmonary circulation.

Acute unexplained shortness of breath occurs in patients who do not have cor pulmonale or infarction.

- Sudden onset of shortness of breath (may be the only symptom)
- Pleuritic chest pain with infarction
- Cough (rare)
- Hemoptysis may be present in infarction
- Syncope (faintness) may be present in cor pulmonale
- Leg pain (infrequent)
- Anxiety

Older clients may present with increasing shortness of breath, confusion and restlessness (which indicate hypoxia).

Physical Findings

The physical findings, like the history, are variable. The results of the examination can be deceptively normal or obviously abnormal. Consider pulmonary embolism in any person with unexplained dyspnea.

- Heart rate elevated
- Respiratory rate elevated
- Blood pressure normal, elevated or low (cor pulmonale)
- Mild-to-severe respiratory distress, oxygen saturation decreased
- Anxiety
- Sweating, pallor and cyanosis may be present
- Distension of neck veins with cor pulmonale
- Swelling, redness of calf infrequently present
- Calf tenderness may be present
- Peripheral pitting edema may be present
- Dullness to percussion may be present (with infarction and if associated with pleural effusion)
- Air entry may be reduced in affected area
- Crackles and wheezes may be present (with infarction)
- S3 (gallop rhythm) may be present with cor pulmonale
- Loud second heart sound may be present where not expected

Differential Diagnosis

- Acute congestive heart failure
- Myocardial infarction
- Pneumonia
- Viral pleuritis
- Pericarditis

Complications

- Pulmonary infarction
- Cor pulmonale (right heart failure)
- Left heart failure with pulmonary edema
- Recurrent emboli
- Death

Diagnostic Tests

- Electrocardiography; results are often normal, except for tachycardia, but can help rule out myocardial ischemia
- Chest X-ray

Management

Goals of Treatment

- Prevent death
- Prevent recurrent embolization

Appropriate Consultation

Consult a physician as soon as possible.

Adjuvant Therapy

- Oxygen to keep saturation > 97%
- Start IV therapy with normal saline; adjust rate according to state of hydration

- If hypotension is present, resuscitate with appropriate fluid volumes (*see "Shock" in chapter 14, "General Emergencies and Major Trauma"*)

Nonpharmacologic Interventions

Bed rest.

Monitoring and Follow-Up

- Monitor ABC and vital signs frequently if abnormal
- Assess lung sounds periodically for signs of cardiac failure

Referral

Medevac as soon as possible.

Inhalation Of Toxic Materials

Definition

Inhalation of gases, fumes or particulate matter.

Causes

- Household or industrial fires
- Leaky vehicle muffler
- Suicide attempt
- Chemical exposure in the work place
- Agents: toxic gases, toxic byproducts from the burning of plastics

History

- Exposure to any of the agents listed above
- Cough and sputum (which may be black)
- Shortness of breath
- Sore throat, hoarseness
- Altered consciousness or confusion before admission

Physical Findings

- Heart rate elevated
- Respiratory rate increased
- Blood pressure may be elevated
- Oxygen saturation with pulse oximeter is not accurate for carbon monoxide poisoning
- Level of consciousness variable
- Degree of respiratory distress variable
- Facial burns, singed eyebrows and nasal hair
- Soot around or in the nose
- Mucosal irritation or thermal injury of the mouth with erythema and carbon deposits (soot)
- Other cutaneous burns
- Irritation of the mucous membranes (eyes)
- Air entry may be reduced
- Stridor or wheeze may be heard
- A flushed face and rosy red cheeks are characteristic of carbon monoxide poisoning

Differential Diagnosis

- Drug overdose
- Alcohol intoxication
- Asthma
- Bronchitis
- Acid reflux

Complications

- Bronchospasm
- Pulmonary edema
- Acute laryngeal edema
- Obstruction of the upper airway
- Deterioration of pre-existing heart or lung disease
- Death

Diagnostic Tests

- Chest x-ray
 - Baseline blood work (CBC, liver enzymes)
- NB: time and date on requisitions

Management

Goals of Treatment

- Improve oxygenation
- Identify associated injuries to underlying lung

Appropriate Consultation

Consult a physician.

Adjuvant Therapy

- Oxygen 10-12 L/min or more by mask
- Higher-flow oxygen is needed for carbon monoxide poisoning -- consult physician
- Start IV therapy with normal saline; adjust the rate according to the state of hydration

Pharmacologic Interventions

Bronchospasm is treated with inhaled salbutamol (See sections on management of asthma, above, this chapter, for details.)

Monitoring and Follow-Up

Monitor ABC and lung sounds closely.

Referral

Medevac as soon as possible, if indicated

Assessment Of The Cardiovascular System

History Of Present Illness And Review Of System

General

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

- Onset (sudden or gradual)
- Chronology
- Current situation (improving or deteriorating)
- Location
- Radiation
- Quality
- Timing (frequency, duration)
- Severity
- Precipitating and aggravating factors
- Relieving factors
- Associated symptoms
- Effects on daily activities
- Previous diagnosis or history of similar episodes
- Previous treatments
- Efficacy of previous treatments

Cardinal Symptoms

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

Chest Pain

- Associated symptoms (e.g. faintness, shortness of breath)
- Relation to effort, exercise, meals, bending over

Shortness of Breath

- Relation to exercise (level ground, uphill, stairs)
- Relation to posture
- Orthopnea (number of pillows used for sleeping)
- Paroxysmal nocturnal dyspnea
- Associated swelling of ankles or recent weight gain

Fainting or Syncope

- Weakness, lightheadedness, loss of consciousness

- Associated symptoms (e.g. pain, palpitations, shortness of breath, lightheadedness, nausea, sweating)
- Relation to postural changes, vertigo or neurologic symptoms

Palpitations

- Description: fast or slow, irregular or regular
- Relation to exercise

Sputum

- Colour (white/pink)
- Consistency (e.g. frothy)

Cyanosis

- Observation of blue colour of the lips or fingers (under what circumstances, when first noted, recent change in this characteristic)

Extremities

- Site of edema (e.g. in dependent body parts)
- Relation of edema to activity or time of day
- Intermittent claudication (exercise-induced leg pain)
- Distance client can walk before onset of pain related to claudication
- Time needed to rest to relieve claudication
- Temperature of affected tissue (warm, cool or cold)
- Tingling
- Leg cramps or pain at rest
- Presence of varicose veins

Other Associated Symptoms

- Sweating
- Nausea
- Vomiting

Medical History (Specific To Cardiovascular System)

- Age
- Increased cholesterol level
- Hypertension
- Coronary artery disease (angina)
- Myocardial infarction

- Cardiac murmurs
- Rheumatic fever
- Valvular heart disease
- Diabetes mellitus
- Thyroid disease
- Chronic renal disease
- Chronic obstructive pulmonary disease (COPD)
- Systemic lupus erythematosus
- Recent viral illness (e.g. viral cardiomyopathy)

Family History (Specific To Cardiovascular System)

- Diabetes mellitus
- Hypertension
- Coronary artery disease (ischemic)
- Heart disease

- Myocardial infarction (especially in family members < 50 years of age)
- Sudden death from cardiac disease
- Hypercholesterolemia
- Hypertrophic cardiomyopathy
- Rheumatic fever

Personal And Social History (Specific To Cardiovascular System)

- Smoking
- Exposure to secondhand smoke
- Obesity
- High stress levels (personal or occupational)
- Chronic abuse of cocaine, amphetamines, anabolic steroids
- Alcohol abuse
- Diet - caffeine intake

Examination Of The Cardiovascular System

An examination of the cardiovascular system involves more than just examining the heart. The examination generally covers two systems: the central cardiovascular system (head, neck and precordium [anterior chest]) and the peripheral vascular system (extremities). Examination of the cardiovascular system must also include a full assessment of the lungs and neuromental status (for signs of confusion, irritability or stupor).

Vital Signs

- Temperature
- Pulse
- Respiratory rate
- Oxygen saturation
- Blood pressure (lying and standing, in both arms)

Head And Neck

- Central cyanosis
- Colour of conjunctiva
- Jugular venous pressure
- Carotid bruits

Inspection Of Precordium (Anterior Chest)

- Look for visible pulsations of the chest wall

Palpation

- Location of apical beat (point of maximum impulse [PMI])
- Quality and intensity of apical beat (normal, diffuse, weak, forceful)
- Heave (abnormally forceful PMI)
- Thrill (a palpable murmur that feels like a purr)
- Identify and assess pulsations and thrills in aortic, pulmonic, mitral and tricuspid areas, along left and right sternal borders, in epigastrium and along left anterior axillary line

Auscultation

- Listen to normal heart sounds before trying to identify murmurs
- Use diaphragm of stethoscope first, then bell of stethoscope, when listening to the heart
- Listen at apex, in aortic and pulmonic areas, and along left sternal border

Heart Sounds

- Determine rate and rhythm
- Determine if there is an underlying rhythm or if rhythm is completely irregular
- Identify and describe intensity of first and second heart sounds
- Identify extra sounds (S3, S4, splitting of second sound, rubs)

Murmurs

- Timing (in relation to the cardiac cycle)
- Quality
- Intensity (loudness)
- Location where murmurs sound loudest
- Radiation
- Pitch

Bruits

- Carotid
- Abdominal
- Iliac
- Femoral

Extremities

Hands

- Colour of skin, nail beds
- Nicotine stains
- Clubbing of fingers
- Temperature
- Equality of pulses (brachial, radial)
- Synchrony of radial and femoral pulses
- Capillary refill time

Legs

- Colour (pigmentation, discoloration), distribution of hair
- Temperature, texture
- Capillary refill time
- Changes in foot colour with changes in leg position (e.g. blanching with elevation, rubor with dependency)
- Ulcers, varicose veins, edema (check sacrum if client is bedridden)
- Presence and equality of pulses (femoral, popliteal, posterior tibial, dorsalis pedis)

Other Assessments

For a client whose condition is not of an urgent nature, assess the following:

- Evidence of hypertensive or diabetic retinopathies (fundoscopic exam)
- Colour, temperature, rashes, lesions, xanthoma of skin
- Abdominal bruits, enlargement of liver, tenderness in right upper quadrant of abdomen

Differential Diagnosis Of Cardinal Cardiovascular Symptoms

Chest Pain

Table 1: Differential Diagnosis of Chest Pain

Characteristic of chest pain	Myocardial infarction or acute coronary insufficiency	Angina	Unstable Angina	Pneumonia
Onset	Sudden, patient at rest	With exertion	New onset, or changing pattern	Gradual or sudden
Location	Retrosternal, anterior chest	Retrosternal, anterior chest		Anterior, lateral and/or posterior lung field(s)
Radiation	Left arm, left shoulder, neck, jaw, back, upper abdomen	Left arm, left shoulder, neck, jaw, back, upper abdomen		Anterior chest, shoulder, neck
Duration	>20min	Usually 1-2 min	Increasing	Hours
Intensity	Severe	Mild to moderate	Increasing	Moderate
Quality	Sensation of squeezing, pressure	Sensation of tightness, pressure		Constant ache, with intermittent knife-like pain
Relief	None	Rapid relief with rest and/or sublingual nitroglycerin	Not relieved by rest or sublingual nitroglycerin	None
Precipitating or aggravating factors	None may be obvious	Exertion, heavy meal, walking uphill against a cold wind		Increased pain with coughing or deep inspiration; recently ill with a cold
Associated signs and symptoms	Nausea, sweating, shortness of breath, anxiety, palpitations	Typically none		Fever, cough, sputum, shortness of breath

Characteristic of Chest Pain	Pulmonary embolism*	Pericarditis	Musculo-skeletal disorder	Esophageal, gastric or duodenal disorder	Stress or emotional disorder
Onset	Sudden	Gradual or sudden	Gradual or sudden	Gradual or sudden	Gradual or sudden
Location	Retrosternal, anterior chest, lateral chest	Retrosternal, anterior chest	Anterior, lateral and/or posterior chest wall	Retrosternal, epigastric, left chest, left or right upper quadrant	Variable, anterior chest, left chest
Radiation	Variable	Variable; shoulder tip, neck	Arm, shoulder, neck, back, abdomen	May be felt in back or arm	Usually none
Duration	Variable	Hours to days	Minutes or hours	Minutes or hours	Minutes or hours
Intensity	Absent or mild to moderate	Usually moderate, but may be severe	Mild to moderate	Moderate	Mild to moderate
Quality	Dull ache; knife-like pain may also be present	Sharp	Dull ache; sharp pain may also be present	Burning (usually), tightness	Achy, stabbing
Relief	None	Sitting up and leaning forward often helps; other position may alter the pain	Rest, mild analgesics	Antacids, milk, sitting up or standing up	Rest, relaxation, distraction
Precipitating or aggravating factors	Immobilization; none may be obvious; pain may be worse with deep inspiration or coughing	Previous infection of upper respiratory tract; pain worse with deep inspiration or coughing	History of unaccustomed physical work; pain worse with arm action	Certain foods, a large meal, bending over; pain may awaken person from sleep and may occur when stomach is empty	Stressful situations, fatigue
Associated signs and symptoms	Shortness of breath, sweating, hemoptysis, leg pain (rare)	Symptoms of infection of upper respiratory tract may be present; malaise; usually occurs in younger adults	Localized chest-wall tenderness, tender costochondral area	Regurgitation of acid in mouth, belching, difficulty swallowing, sticking sensation when food swallowed, cough (rare); test of stool for occult blood may be positive	Tightness in neck and shoulder(s), headaches, reduced appetite, mild weight loss, fatigue, sleep disturbance, palpitations, dizziness, hyperventilation symptoms

*Chest pain may be absent in pulmonary embolism

Dyspnea

Cardiac Causes

- Congestive heart failure (right, left or biventricular)
- Coronary artery disease
- Myocardial infarction (recent or past history)
- Cardiomyopathy
- Valvular dysfunction
- Left ventricular hypertrophy
- Asymmetric septal hypertrophy
- Pericarditis
- Arrhythmias

Pulmonary Causes

- COPD
- Asthma
- Restrictive lung disorders
- Hereditary lung disorders
- Pneumothorax

Mixed Cardiac and Pulmonary Causes

- COPD with pulmonary hypertension and cor pulmonale
- Deconditioning
- Chronic pulmonary emboli
- Trauma

Noncardiac or Nonpulmonary Causes

- Metabolic conditions (e.g. acidosis)
- Pain
- Neuromuscular disorders
- Otorhinolaryngeal disorders

Functional Causes

- Anxiety
- Panic disorders
- Hyperventilation
- Exertion

Faintness And Syncope

Faintness is characterized by transient symptoms of lack of strength associated with an impending sense of loss of consciousness. Syncope is characterized by transient symptoms of generalized weakness associated with loss of consciousness and loss of muscle tone. Symptoms are due to a temporary impairment of cerebral

function and are usually precipitated by a reduction in cerebral perfusion.

Vascular Causes

- Vasovagal hypotension (common faint)
- Postural hypotension
- Cerebrovascular disease (transient ischemic attack, stroke, vertebral-basilar insufficiency, carotid insufficiency)

Neurological Causes

- Seizure
- Head trauma

Cardiac Causes

- Abnormally slow heart rate and rhythm
- Abnormally rapid heart rate and rhythm
- Reduced cardiac output
- Acute blood loss (gastrointestinal hemorrhage)
- Valvular heart disease (aortic or pulmonic stenosis)
- Pulmonary hypertension

Other Causes

- Hyperventilation (syncope rare, faintness common)
- Hypoxia

Palpitations

Primary Arrhythmic Causes

- Sinus tachycardia or arrhythmia
- Premature supraventricular or ventricular ectopic contractions
- Bradycardia-tachycardia syndrome ("sick sinus syndrome")
- Supraventricular tachycardia
- Multifocal atrial tachycardia
- Atrial fibrillation, flutter or tachycardia
- Atrioventricular nodal re-entrant tachycardia
- Atrioventricular reciprocating tachycardia (Wolff-Parkinson-White syndrome)
- Accelerated junctional rhythm
- Ventricular tachycardia
- Bradycardia due to advanced atrioventricular block or sinus node dysfunction

Extracardiac Causes

- Changes in contractility, heart rate or stroke volume
- Fever
- Hypovolemia
- Anemia
- Hypoglycemia
- Pulmonary disease
- Pheochromocytoma
- Thyrotoxicosis
- Vasovagal episodes

Drug-Related Causes

- Vasodilators
- Substance abuse (e.g. cocaine, alcohol, tobacco, caffeine)
- Digoxin
- Phenothiazine
- Theophylline

- β_2 -Agonists
- Antiarrhythmics

Psychiatric Causes

- Panic attack
- Hyperventilation

Other Cardiac Causes

- Changes in contractility or stroke volume
- Valvular disease such as aortic insufficiency or stenosis
- Atrial or ventricular septal defect
- Congestive heart failure
- Cardiomyopathy
- Congenital heart disease
- Pericarditis
- Pacemaker-mediated tachycardia
- Pacemaker syndrome

Leg Edema**Table 2: Differential Diagnosis of Leg Edema**

Mechanism	Disease or syndrome	Usual clinical features
Increased capillary pressure		
Obstruction of inferior vena cava	Thrombosis, malignancy	Bilateral, severe (may be mild if partial obstruction)
Deep venous obstruction in leg	Thrombosis, extrinsic compression	Unilateral, mild
Reduced venous channels or venous valve incompetence	Coronary bypass grafting, stroke, varicosities	Unilateral or bilateral, mild
Right atrial hypertension	Left ventricular dysfunction	Bilateral
	Pulmonary disease	Bilateral
	Valve disease	Bilateral
	Renal dysfunction	Bilateral, mild
Reduced lymphatic clearance (lymphatic obstruction)	Lymphadenopathy, filariasis	Unilateral or bilateral
Decreased capillary oncotic pressure (hypoalbuminemia)	Severe malnutrition; liver, renal, gastrointestinal disease	Bilateral, mild or severe, generalized, poor prognosis
Increased capillary permeability	Calcium-channel blockers	Bilateral, mild
	Idiopathic cyclic edema	Bilateral, mild, premenstrual female

Common Problems Of The Cardiovascular System

Congestive Heart Failure

Definition

A clinical syndrome caused by an accumulation of fluid peripherally (right ventricular failure) or in the lungs (left ventricular failure), or both, from inadequate functioning of the heart. Congestive heart failure is a complication of an underlying disease process.

Systolic heart failure (the more common form) is due to impaired systolic pumping action of the heart. Diastolic heart failure occurs when the systolic function is normal but the filling of the heart is impaired.

Causes (Precipitating Factors In Acute Heart Failure)

Increased Myocardial Demand

- Stress (physical, environmental or emotional)
- Infection or fever
- Anemia
- Hyperthyroidism
- Hypertension
- Pregnancy
- Renal disease

Compliance and Lifestyle

- Inadequate or improper medication intake (i.e. NSAIDs)
- Dietary indiscretion (e.g. excess consumption of salt or water)
- Heavy alcohol consumption

Decreased Pump Function of the Ventricles

- Negative inotropic medications: β -blockers, calcium-channel blockers, antiarrhythmics, chemotherapeutic agents
- Arrhythmias
- Ischemia or infarction
- Pulmonary embolism
- Radiation treatment

History

- Shortness of breath (initially induced by exercise)
- Later progression to orthopnea, paroxysmal nocturnal dyspnea and dyspnea at rest

- Chronic, nonproductive cough, worse at night or when lying down
- Ankle edema
- Recent weight gain
- Nocturia
- Chronic fatigue
- Palpitations
- Symptoms of intercurrent illness (e.g. pneumonia)
- Anxiety may aggravate condition
- Alterations of mental status in elderly clients may be present as chronic heart failure progresses
- Increased number of pillows to sleep (orthopnea)

Physical Findings

There is a broad range in severity of findings.

- Heart rate elevated
- Respiratory rate increased
- Blood pressure may be normal, elevated or low
- Weight increased (reflecting fluid retention)
- Minimal to extreme distress when client lies down
- Jugular venous distension may be present
- Jugular venous pressure elevated (> 3 cm)
- Edema may be present (pedal, ankle or tibial; sacral if bedridden)
- Hepatomegaly
- Hepatojugular reflux
- Ascites (rare)
- Lung bases may be dull (pleural effusion) bilaterally, but only rarely
- Fine crackles in the bases of lungs
- S3, S4 or gallop rhythm may be present; murmurs may be present if there is associated valvular dysfunction

Differential Diagnosis

- See "Causes," above.
- Acute bronchitis in COPD or asthma
- Other causes of edema (renal disease, liver disease, local venous stasis, lymphedema)
- Pulmonary embolism

Complications

- Arrhythmias
- Hepatomegaly (ascites)
- Acute pulmonary edema
- Hypokalemia from use of diuretics
- Angina
- Decreased renal function, decreased renal clearance of drugs (digoxin toxicity)
- Pulmonary embolism
- Side effects of medication

Diagnostic Tests

- Perform ECG and compare with any previous tracings
- Look for signs of ischemia (depression of ST segment, inversion of T wave), atrial fibrillation, bradycardia

Do the following diagnostic tests only if the person is not ill enough to require hospitalization:

- Complete blood count
- Blood glucose level
- Thyroid function
- Liver function
- Ferritin level
- Creatinine level
- Electrolyte levels
- Digoxin level (if applicable) and if not determined recently (within past 3 months)
- Chest x-ray (for cardiomegaly, pulmonary edema, pleural effusions), if available

Management Of Chronic Heart Failure

Goals of Treatment

- Control symptoms
- Identify and manage underlying cause
- Limit factors that precipitate or aggravate condition
- Prevent progression
- Improve quality of life and survival

Because there is a broad range of severity, assessment of severity will help guide management. Definitive and precise medical management depends on whether the failure is due to systolic or diastolic dysfunction and the

underlying or precipitating cause (e.g. atrial fibrillation).

Appropriate Consultation

Consult a physician as soon as possible.

Client Education

- Ensure client understands disease process and outcome (progressive, can be controlled but not cured)
- Recommend dietary modifications: reduce sodium, increase dietary potassium (if renal function has been adequate in the past), reduce fat and cholesterol
- Recommend limited fluid intake to 1.2-2.0 L/day
- Recommend restriction of alcohol use
- Recommend weight loss, if applicable
- Recommend that client monitor weight at home, and see the nurse if he or she gains more than 1.5 kg (3 lb) in a day
- Recommend rest after meals
- Encourage client to start an exercise program (walking) to improve exercise tolerance
- Stress the importance of long-term follow-up (every 3-6 months when stable)
- Counsel client about appropriate use of medications (dose, frequency, compliance, side effects)
- Teach clients taking digoxin, or family member, to monitor pulse

Adjuvant Therapy

- Pneumococcal vaccine
- Influenza vaccine annually

Pharmacologic Interventions

Four classes of drugs are currently recommended to manage congestive heart failure: angiotensin-converting enzyme (ACE) inhibitors, diuretics, cardiac glycosides, and nitrates or direct vasodilators, prescribed by physician.

Nitrates

A long-acting nitroglycerin preparation to reduce the workload of the heart is often recommended to reduce symptoms and improve exercise tolerance in clients who cannot tolerate ACE inhibitors or who remain symptomatic despite maximal therapy

with ACE inhibitors, diuretics and digoxin or if there is myocardial ischemia (i.e. systolic blood pressure > 100 mm Hg).

Vasodilators

Vasodilators such as hydralazine may also be used in combination with nitrates in clients with refractory symptoms despite use of ACE inhibitors, diuretics and digoxin or those who cannot tolerate ACE inhibitors.

β-Blockers

β-Blockers such as metoprolol can be used in clients with chronic congestive heart failure to preserve or improve ventricular function. They can be used to control symptoms of ischemia in clients with congestive heart failure and angina.

β-Blockers should be avoided in clients with low cardiac output and should be used only with extreme caution in clients with obstructive lung disease (e.g. asthma).

Calcium-Channel Blockers

Calcium-channel blockers may be used in clients with diastolic congestive heart failure to control arterial blood pressure and to help induce regression of myocardial hypertrophy. They are also useful in client with hypertrophic cardiomyopathy.

Calcium-channel blockers are generally contraindicated in systolic heart failure and in clients who have had myocardial infarction with left ventricular dysfunction.

Antiarrhythmic Drugs

Antiarrhythmic drugs are generally used for symptomatic clients with sustained ventricular arrhythmias or to help maintain sinus rhythm in atrial fibrillation.

Anticoagulation

Anticoagulation is strongly recommended for all clients with heart failure and associated atrial fibrillation.

Long-Term Monitoring and Follow-Up

- Review cardiac and respiratory systems for symptoms
- Weigh client and chart weight every visit (client weight chart)
- Review current medications for use, dosage, frequency, compliance, side effects, drugs with sodium-retaining effects (e.g. NSAIDs)
- Instruct client to return to clinic if symptoms worsen or chest pain develops
- Laboratory tests every 3-6 months: complete blood count, creatinine level, electrolyte levels, uric acid level (if taking a thiazide diuretic), urinalysis for proteinuria, digoxin level

Referral

Refer client to a physician for a thorough evaluation and tailoring of drug therapy regimen.

Management Of Acute Decompensated Heart Failure

Appropriate Consultation

Consult a physician as soon as possible.

Adjuvant Therapy

- Oxygen to keep saturation > 97%
- Start IV therapy with normal saline to keep vein open

Nonpharmacologic Interventions

Bed rest with head elevated.

Pharmacologic Interventions

Diuretics:

furosemide, 40-80 mg IV

The dose may have to be higher in a person who is already taking this drug on a maintenance basis for congestive heart failure; one guideline is to double the client's usual maintenance dose. Adjust the diuretic dose according to client's response. Look for improvement in respiratory status.

Nitrates (long-acting) to reduce the workload of the heart:

topical nitroglycerin, 1.25-2.5 cm q6-8h, provided systolic blood pressure > 100 mm Hg

Monitoring and Follow-Up

- Monitor vital signs, pulse oximetry
- Airway, breathing and circulation (ABC)
- Level of consciousness
- Listen to heart and lung sounds

- Record intake and urinary output
- Monitor response to therapy

Referral

Medevac as soon as possible.

Deep Vein Thrombosis

Definition

Acute formation of a blood clot or thrombus within a vein resulting in obstruction of venous return.

Causes

Unknown, but the triad of venous stasis, injury to vessel intima and altered blood coagulability are central to the process.

Risk Factors

- Prolonged bed rest/decreased activity for any reason
- Paralysis
- Malignant disease
- Childbirth
- Pregnancy
- Use of oral contraceptives
- Leg trauma
- Major surgery
- Infection after orthopedic surgery
- Acute myocardial infarction
- Stroke
- Old age (related to decreased activity)

History

- Symptoms may be subtle, variable or vague
- Usually occurs in leg or deep pelvic veins (popliteal, femoral, iliac)
- Presence of one or more risk factors (see above)
- Recent leg injury
- Leg pain may be mild or absent
- Pain described as a dull ache or tightness, rarely severe
- Leg discomfort worse when walking
- Swelling of lower leg
- Fever

Symptoms may be absent or minimal until shortness of breath and other pulmonary complaints appear because of embolism to the lungs. The risk of pulmonary emboli is low when only the calf veins are involved but increases to 40% when the thigh veins are involved.

Physical Findings

- Variable; depend on size and location of clot and severity of venous obstruction
- Heart rate may be elevated
- Minimal to moderate distress
- Difficulty walking
- Minimal to marked swelling of lower leg
- Redness of affected calf or leg may be present
- Superficial leg veins may be distended
- Mild to moderate calf tenderness: flexion of the ankle may increase pain
- Localized warmth may be present
- Peripheral pulses (compare sides for symmetry)

Differential Diagnosis

- Calf-muscle strain
- Trauma with hematoma
- Cellulitis
- Ruptured Baker's cyst (popliteal cyst)

Complications

- Pulmonary embolism
- Chronic venous insufficiency

Diagnostic Tests

None.

Management

Goals of Treatment

- Early detection
- Prevent complications

Appropriate Consultation

Consult a physician immediately if you have any suspicion of this disorder.

Nonpharmacologic Interventions for Acute Symptoms

- Bed rest
- Elevation of leg above level of the heart
- Anti-embolic stockings
- Monitor vital signs closely

Nonpharmacologic Interventions over the Long Term

Client Education

- Counsel client about appropriate use of medications (dose, frequency, side effects)
- Recommend use of anti-embolic stockings
- Recommend avoidance of restrictive clothing around knees (e.g. socks, garters)
- Ensure bedridden clients are turned and repositioned frequently (q2h)
- Recommend active or passive leg exercises while in bed

Pharmacologic Interventions

Heparin therapy may be instituted on advice of physician before transfer.

Monitoring and Follow-Up

Acute Symptoms

Observe client for shortness of breath or unexplained tachycardia (signs of pulmonary embolism).

Long Term

- Follow up every 3-6 months when stable
- Review prevention strategies, medication use, side effects

Referral

Medevac the acutely symptomatic client as soon as possible.

Hypertension

Definition

Persistently elevated blood pressure from increased peripheral arterial resistance related to salt or water retention or endogenous pressure activity.

Causes

Cause of essential hypertension (which accounts for 90% of cases of hypertension) is unknown.

Risk Factors for Primary (Essential) Hypertension

- Heredity
- Obesity
- High salt intake
- Smoking
- High alcohol consumption
- Chronic stress
- Age
- Hyperlipidemia

Risk Factors for Secondary Hypertension (10% of Cases)

- Renal disease
- Polycystic kidneys
- Renal vascular disease
- Estrogen use
- Pregnancy
- Hyperthyroidism (Cushing's syndrome)
- Primary hyperaldosteronism
- Pheochromocytoma
- Coarctation of aorta
- Use of oral contraceptives
- Chronic alcohol abuse

History

- Presence of one of the risk factors (*see above*)
- Client usually > 35 years of age
- Condition usually discovered on routine screening of blood pressure; the Canadian Task Force on Preventive Health Care (1994) suggests screening everyone between 21 and 64 years of age at every office visit (B recommendation; i.e., good evidence to include in the periodic health examination)

- Usually asymptomatic
- Headache on rising in the morning gradually subsiding during the day (rare)
- Fatigue
- Transient ischemic attack
- Nausea or vomiting
- Altered level of consciousness
- Palpitations
- Angina
- Symptoms of cardiac failure
- Epistaxis

Physical Findings

Diastolic Blood Pressure Readings

- High-normal diastolic pressure (85-89 mm Hg)
- Mild diastolic hypertension (90-99 mm Hg)
- Moderate diastolic hypertension (100-109 mm Hg)
- Severe diastolic hypertension (110-119 mm Hg)
- Very severe hypertension (≥ 120 mm Hg)

Systolic Blood Pressure Readings

- Normal systolic pressure (< 140 mm Hg)
- Mild systolic hypertension (140-159 mm Hg), if diastolic readings are within normal range
- Moderate systolic hypertension (160-179 mm Hg)
- Severe systolic hypertension (180-209 mm Hg)
- Very severe hypertension (≥ 210 mm Hg)
- Isolated systolic hypertension (> 160 mm Hg), if diastolic readings are within normal range

Other Findings

- Ocular funduscopic exam may reveal retinal changes
- Enlarged heart (left ventricular hypertrophy)
- Bruits (carotid, abdominal aortic, renal and femoral)

Differential Diagnosis

- Essential hypertension
- Secondary hypertension

General Clues to Secondary Hypertension

- Severity of high blood pressure: severe hypertension is more likely secondary to a specific underlying cause
- Speed of onset: if hypertension develops rapidly, it should be considered secondary until proven otherwise
- Age at onset: rapid onset in people younger than 25 years or older than 55 years should suggest secondary hypertension
- The presence of hypertension in an individual in whom an abdominal bruit is heard suggests stenosis of the renal arteries

Complications

- Congestive heart failure
- Angina
- Stroke or transient ischemic attacks
- Hypertensive crisis
- Kidney disease
- Retinal disease
- Peripheral disease
- Complications related to therapy (e.g. thiazide diuretics increase risk of gout, poor response)

Diagnostic Tests

- Urinalysis (routine and for microalbuminuria in diabetic clients)
- Complete blood count
- Blood glucose, cholesterol and triglyceride levels (while fasting)
- Creatinine and electrolyte levels
- Baseline ECG and chest x-ray if > 50 years of age

Management

Goals of Treatment

- Decrease morbidity and mortality associated with high blood pressure
- Control symptoms with an effective, well-tolerated treatment regimen

Appropriate Consultation

Consult a physician if there is a need to treat hypertension with medications.

Nonpharmacologic Interventions

Lifestyle modifications are first-line therapy for mild elevation of blood pressure.

Client Education

- Ensure that client understands disease process and prognosis
- Encourage client to lose weight if appropriate
- Recommend dietary modifications (e.g. reduce salt to < 150 mmol/day, reduce cholesterol, and reduce intake of stimulant substances and caffeine)
- Recommend smoking cessation (refer for treatment)
- Recommend restriction of alcohol consumption
- Recommend regular exercise
- Counsel client about appropriate use of medications (dose, frequency, side effects and importance of compliance)
- Ask client to return to clinic if any unusual symptoms occur or there is a change in status

Pharmacologic Interventions in Moderate to Severe Hypertension

Antihypertensive medications should be started. The physician will determine the therapy of choice (which depends on the person's age and the presence of other medical problems) and will include drugs from the classes described below.

β-Blockers

A β-blocker is the drug of first choice to lower blood pressure in patients with angina pectoris. Although evidence is lacking, it also seems reasonable to use a β-blocker as the drug of first choice in clients for whom the drug can be used to treat more than hypertension, e.g. those with frequent recurrent migraine, sympathetic hyperactivity, resting tachycardia or palpitations.

β-Blockers should not be used in clients with asthma or other forms of obstructive airways disease.

ACE Inhibitors

ACE inhibitors have been clearly shown to prolong survival in patients with congestive heart failure. Watch for patients with non-productive cough. They are therefore the obvious first choice for patients with hypertension and congestive heart

failure. It has not yet been established whether ACE inhibitors have a unique renal protective effect in diabetic nephropathy.

Calcium-Channel Blockers

Monitoring and Follow-Up

Follow up three or four times yearly if hypertension is well controlled or more frequently if client's condition warrants. Encourage self-monitoring and recording of blood pressure.

Routine Follow-up Assessment Related to Hypertension

Determine history related to the following:

- Headaches
- Dizziness
- Angina
- Congestive heart failure/non-productive cough
- Transient ischemic attack
- Stroke
- Nausea and vomiting
- Vision changes
- Medication compliance
- Drug side effects

The physical examination should include the following:

- Blood pressure (supine and standing)
- Neck examination (carotid artery for bruits, JVP [jugular venous pressure] for congestive heart failure)
- Cardiovascular examination
- Respiratory examination
- ECG (annually)
- Chest X-ray (annually)
- Ophthalmologic exam
- Blood work q3-6months: complete blood count, blood glucose level, creatinine level, electrolyte levels, uric acid level (if client is taking thiazide diuretics)
- Urinalysis (for protein)

Referral

Arrange follow-up with physician at least yearly if the client's hypertension is stable or as soon as possible if poorly controlled.

Repeat physician consultation is necessary for chronically hypertensive clients if any of the following situations apply:

- Client not responding to therapy
- Target organ damage caused by poorly controlled blood pressure
- Symptoms and signs of complications

Dysrhythmias

Definition

Abnormal heart rhythm. The most common types are as follows:

Sinus arrhythmia

A cyclic increase in heart rate associated with inspiration and decrease in heart rate with expiration. No clinical significance and is common in the elderly and children.

Sinus Bradycardia

Heart rate < 60 bpm; impulse originates in SA node, but is slowed through the AV node. Usually bradycardia is an accidental finding and can be normal for the young or for athletes. Severe bradycardia can be an indication of sinus node pathology, such as sick sinus syndrome or heart block, wherein the SA node does not generate or transmit a signal to the atria.

Sinus Tachycardia

Heart rate >100-160 bpm; is caused by rapid impulse formation from the SA node.

Narrow QRS Complex Tachycardias: Paroxysmal Supraventricular Tachycardia (PSVT)

The most commonly occurring paroxysmal tachycardia. Episodes may last from seconds to hours. Rate is usually 160-220 bpm and are regular even with exercise and position changes.

Supraventricular Tachycardia (SVT)

Accessory pathways between atria and ventricles allow an avoidance of the delay at the AV node, thus predisposing the heart to re-entry tachycardia. The QRS is usually narrow and the P wave occurs after the QRS (the PR interval is greater than the RP interval)

Atrial Fibrillation (A.Fib)

This is the commonest arrhythmia. There are three classifications of A.Fib.

- 1.Paroxysmal - which is self-terminating
- 2.Persistent - which can be converted to sinus rhythm
- 3.Chronic

Atrial Fib. is the only common arrhythmia in which the ventricular rate is rapid and the rhythm is highly irregular. The atrial rate can be > 350 bpm, most are not conducted through the AV node. The ventricular rate can be normal or > 150 bpm and there is usually a difference between the radial rate and the apical rate.

Atrial Flutter

This is less common than A.Fib and is most often associated with COPD. Atrial rates can be as high as 250-300 bpm with transmission of every second impulse through the AV node, which gives a ventricular rate of about 150 bpm. Ventricular rate is usually regular and the P waves have a distinct saw-tooth appearance, especially in leads II, III and AVF.

Wide QRS Complex Tachycardias: Premature Ventricular Contractions

These beats have a wide QRS complex, are not usually preceded by a P wave, usually there is a pause before the next normal beat. Bigeminy and trigeminy are rhythms in which every second or third beat is a PVC. Usually benign in patients without heart disease.

Ventricular Tachycardia (VT)

Three or more consecutive ventricular premature beats. The rate is > 100 bpm (usually 150-200) and is moderately regular. The complexes are wide and there is AV dissociation. There are also fusion beats. It is either sustained - lasting > 30 seconds, or unsustained - lasting < 30 seconds. VT may be asymptomatic or can be associated with syncope, dizziness, diaphoresis or nausea.

VT can quickly deteriorate into ventricular fibrillation.

Torsades de Pointes

This is a variant of VT. The complexes are wide and bizarre and look like the axis is changing (QRS from positive to negative and back).

Usually associated with drugs or conditions that increase the QT interval.

Ventricular fibrillation (VF)

VF is a pulseless arrhythmia that is irregular and chaotic. The heart can no longer pump blood around the body. VF is the primary cause of sudden cardiac death. VF is most commonly seen following an MI. VF can be coarse or fine. The heart rate is irregular, usually > 300 bpm, and a

waveform that resembles a squiggle that fades to a flat line.

Pulseless Electrical Activity (PEA)

A clinical condition "characterized by loss of palpable pulse (or ventricular contraction) in the presence of recordable cardiac electrical activity." ECG recording may show myocardial infarction, signs of hyperkalemia, prolonged QT interval related to tricyclic drug overdose. PEA is caused by an inability to generate a strong contraction in spite of adequate electrical impulse. "PEA is always caused by a profound global cardiac insult."

Predisposing Factors

Bradycardia - Increased vagal tone - Decreased sympathetic drive - Ischemia to sinoatrial node - Drug use: digoxin, beta blockers - Athletic activity (normal variant in athletes) - Injury or other insult - Acute myocardial infarction - Hypothermia - Electrolyte abnormality - Acidosis Tachycardia - Decreased vagal tone - Increased sympathetic tone - Myocardial infarction - Hypoxia - Hypovolemia - Fever - Anxiety - Pain - Hypothyroidism with elevated TSH - Exercise - Caffeine Supraventricular tachycardia - Digoxin toxicity - Catecholamines - Caffeine - Gender (more common in males 2:1)	PSVT - Gender (more common in females) - Rheumatic heart disease - Pericarditis - Myocardial infarction - Mitral valve prolapse - Preexcitation syndrome Atrial Fibrillation - Myocardia ischemia - Thyrotoxicosis - Alcohol - Sick sinus syndrome - PACs Atrial Flutter - Chronic hypertension - Valvular heart disease - Left ventricular hypertrophy - Coronary artery disease - Diabetes - CHF - Post-op revascularization - Digitalis toxicity - Pulmonary embolism Ventricular tachycardia - Coronary heart disease - Structural heart disease Torsades de Pointes - Congenital elongated QT intervals - Antiarrhythmic drugs - Electrolyte imbalances	Ventricular Fibrillation - Severe coronary artery disease - Acute myocardial infarction with shock - Myocardial reperfusion after thrombolysis Premature Ventricular Contractions - Stress Pulseless Electrical Activity - Respiratory failure with hypoxia - Massive pulmonary embolus - Cardiac tamponade - Cardiac rupture - Massive myocardial infarction - Pulmonary-respiratory arrest - Hemothorax - Tension pneumothorax - Prolonged acidosis - Decreased availability of calcium - Sepsis - Severe CHF - Hyperkalemia - Hypothermia - Drug ingestion (TCA, digoxin, calcium and beta blocker in overdosage) - Post defibrillation PEA
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History

- Not all symptoms may be present
- Client may note irregular heartbeat
- Palpitations
- Chest discomfort
- Shortness of breath
- Dizziness
- Diaphoresis
- Weakness
- Syncope
- Nausea

Physical Findings

Sinus bradycardia: ECG normal, heart rate < 60 bpm. A heart rate below 40 bpm is usually a junctional rhythm originating in the ventricle. Look for irregular PR intervals to determine heart block or sick sinus syndrome.

Sinus tachycardia: ECG normal, heart rate > 100 bpm, blood pressure constant

PSVT (Atrioventricular nodal re-entrant tachycardia): ECG abnormal - rhythm regular, fast, atrioventricular block usual as seen by a prolonged PR interval, systolic BP constant, electrical alternans rare

SVT (Orthodromic atrioventricular re-entrant tachycardia): ECG abnormal - rhythm regular, atrioventricular block not present, systolic BP constant, electrical alternans common especially at high heart rates

Atrial fibrillation: ECG abnormal, rhythm irregular, P waves not visible, systolic BP changing. At high rates there is risk of developing Wolfe-Parkinson-White syndrome in some individuals - look for delta waves on the Q wave (slurred QRS)

Atrial flutter: ECG abnormal, ventricular rhythm is usually regular, P waves have a well defined saw-tooth pattern. If rate is < 120 bpm, there may be no symptoms, if > 120 bpm, there may be hemodynamic instability

Premature ventricular contractions (PVC): ECG normal with occasional wide and bizarre QRS

complexes. Pulse volume is diminished or absent during PVC

Ventricular tachycardia: ECG abnormal, rhythm may be regular or irregular. There are no comprehensive ECG criteria for diagnosing VT, but the presence of a rate > 150 bpm, wide and bizarre QRS complexes, atrioventricular dissociation and presence of fusion beats, suggest ventricular tachycardia. Hypotension, dyspnea, diaphoresis may also be present.

Torsades de pointe: ECG abnormal, rhythm regular or irregular. QRS complexes appear to change appearance and size, looks like they are twisting. Hypotension, dyspnea, diaphoresis may also be present.

Ventricular fibrillation: ECG abnormal, unintelligible, no identifiable waves, complexes or rhythms. No heart rate detectable, hemodynamically very unstable.

Differential Diagnosis

- Multifocal atrial tachycardia
- Sinus tachycardia with multiple premature atrial contractions
- Sick sinus syndrome
- Wolfe-Parkinson-White syndrome
- Atrioventricular block

Complications

- Heart failure
- Myocardial infarction
- Cerebrovascular accident
- Thromboembolism
- Wolff-Parkinson-White syndrome
- Cardiac arrest

Diagnostic Tests

- 12 lead ECG
- Arrange for 24-hour Holter monitoring
- Bloodwork - TSH, CBC, INR, PTT CK, Troponin T

Management

Goals of Treatment

- Convert to sinus rhythm
- Relieve symptoms
- Prevent recurrence
- Prevent complications (e.g. CHF, MI, life-threatening dysrhythmias)

Appropriate Consultation

Consult a physician if client has abnormal ECG pattern, refractory atrial fibrillation, suspicion of Wolff-Parkinson-White or "sick sinus" syndrome.

Nonpharmacologic Interventions

Identify and remove any contributing factors.

Client Education

- Teach client and family members the signs of hemodynamic compromise, including rapid heart rate, unexplained weight gain, worsening dyspnea on exertion or in the night, decreased exercise tolerance
- Teach client about long-term medication and its side effects

Pharmacologic Interventions

Initial treatment prescribed only by a physician.

Selection of treatment modality should be based on underlying pathophysiology.

Chronic atrial fibrillation is also treated with anticoagulants such as warfarin.

Therapy is started as soon as possible if there is a history of underlying heart disease.

Monitoring and Follow-Up

- For clients taking antiarrhythmic agents, liver enzyme levels should be measured during first 4-8 weeks of therapy
- Clients with risk factors for cardiac complications of therapy should undergo ECG during first weeks of therapy and every 3-6 months thereafter
- Clients taking digoxin should be monitored carefully for toxic effects
- Evaluate INR on a regular basis to monitor therapeutic response to warfarin

Referral

Medevac clients with hemodynamic instability.

Atrial Fibrillation

Definition

Atrial fibrillation is a cardiac arrhythmia in which chaotic electrical activity replaces the orderly activation sequence of normal sinus rhythm.

Associated Conditions

- Hypertensive heart disease
- Valvular or rheumatic heart disease
- Coronary artery disease
- Acute myocardial infarction
- Pulmonary embolus
- Cardiomyopathy
- Congestive heart failure
- Pericarditis
- Increased thyroid hormone
- Misuse of street drugs, alcohol

History

- Palpitations
- Lightheadedness, poor capacity for exercise
- Fatigue
- Dyspnea
- Angina
- Syncope or near syncope
- Stroke
- Arterial embolization

Physical Findings

Do a complete cardiovascular and respiratory examination. Also assess the eyes for lid lag (hyperthyroid sign) and the neck for thyroid enlargement.

- Irregular pulse
- Tachycardia
- Possible heart failure (see page 16)
- Hypotension
- ECG shows rapid, irregular atrial rate and no P waves

Differential Diagnosis

- Multifocal atrial tachycardia
- Sinus tachycardia with frequent atrial premature beats
- Atrial flutter

Complications

- Angina
- CHF
- Embolic stroke
- Peripheral arterial embolization
- Bradycardiac arrhythmias due to pharmacologic therapy
- Inherent risk of bleeding with anticoagulation

Diagnostic Tests

For asymptomatic people:

- ECG
- TSH
- INR and PTT
- Chest x-ray

Management

Goals of Treatment

- Search for and treat all predisposing factors (*see "Associated Conditions," above*)
- Reduce symptoms
- Prevent complications

Appropriate Consultation

Consult a physician

Client Education

- Ensure that client understands disease process and prognosis
- Counsel client about appropriate medication use, including side effects
- Teach client signs and symptoms of complications that require immediate follow-up (rapid heart rate, palpitations, edema, shortness of breath on exertion, chest pain)
- Recommend avoidance of alcohol, caffeine
- Recommend referral to smoking cessation (if applicable)
- Counsel client to avoid sleep deprivation

Pharmacologic Interventions

- Drug therapy is directed at

1. Correcting the atrial arrhythmia: examples of antiarrhythmic agents are quinidine, procainamide and disopyramide.

2. Slowing the ventricular rate: β -Blockers, such as amiodarone, and calcium-channel blockers, such as diltiazem and verapamil, are used to control ventricular rate.
3. Effecting anticoagulation - warfarin therapy is recommended to prevent stroke and other embolic complications.

Monitoring and Follow-Up

- Clients with stable atrial fibrillation should be followed regularly to assess for symptoms and signs of recurrence, complications, compliance with therapy and side effects of medication
 - ECG should be done every 3-6 months
- Clients on anticoagulation must have INR levels monitored regularly, q1w x 1month, q2w x 3 months, then q1m if stable

Referral

Medevac clients who are hemodynamically unstable. Electrical cardioversion is sometimes necessary if symptoms are severe.

Refer stable symptomatic clients to a physician for thorough evaluation and initiation of therapy as soon as possible.

Acute Pericarditis

Definition

An inflammatory process of the pericardium with many causes, occurring with or without effusion. The most common cause is idiopathic or non-specific pericarditis.

Causes

- Idiopathic (unknown)
- Viral infection (*e.g. coxsackievirus, ECHOvirus, adenovirus, Epstein-Barr virus, mumps, HIV*)
- Bacterial infection: *Hemophilus influenzae* (especially children), *Meningococcus*, *Pneumococcus*, *Salmonella*, *Staphylococcus*, PCP related to AIDS
- Fungal infection: *Aspergillus*, *Candida*, *Histoplasmosis*, *Nocardia*
- Mycobacterial infection: *Mycobacterium tuberculosis*
- Neoplasm: breast, lung, lymphoma
- Drug-induced: procainamide, hydralazine, phenytoin and others
- Connective-tissue disease: systemic lupus erythematosus, rheumatoid arthritis, scleroderma, acute rheumatic fever
- Radiation therapy
- Post-myocardial infarction (Dressler's syndrome)
- Chest trauma
- Uremia
- Myxedema
- Aortic dissection
- Sarcoidosis
- Pancreatitis

History

- Chest pain, typically sharp; retrosternal with radiation to the trapezial ridge
- Pain frequently sudden in onset
- Pain reduced by leaning forward and sitting up
- Splinted breathing
- Pain on swallowing
- Fever

Physical Findings

- Low-grade fever
- Respiration fast and shallow

- Anxiety
- Mild distress
- Flushing
- Splinted breathing
- Shortness of breath (only in cases of pericardial tamponade or constrictive pericarditis)
- Pericardial friction rub
- Localized lung crackles (may be present due to shallow breathing)
- Pulsus paradoxus

Differential Diagnosis

- Acute myocardial infarction
- Pneumonia with pleurisy
- Pulmonary emboli
- Aortic dissection
- Pneumothorax
- Mediastinal emphysema

Complications

- Pericardial tamponade
- Recurrence of pericarditis
- Noncompressive effusion
- Chronic constrictive pericarditis

Diagnostic Tests

- ECG
- Chest x-ray (if available), to rule out complications such as pericardial effusion or enlarged heart

Management

Goals of Treatment

- Prevent complications
- Identify and treat underlying causes

Appropriate Consultation

Consult a physician if you suspect this diagnosis.

The otherwise healthy client is safely treated on an outpatient basis.

Client Education

- Ensure that client understands disease process and prognosis

- Counsel client about appropriate medication use and side effects
- Recommend avoidance of heavy physical labor
- Teach client about symptoms and signs of complications, and instruct client to report any that occur
- Stress the importance of follow up

Pharmacologic Interventions

Anti-inflammatory medication for at least two weeks:

ASA, 650 mg q4h or

ibuprofen, 200 mg, 2-3 tabs q6h

In some clients, the condition becomes refractory and corticosteroids or pericardiectomy may be required.

Monitoring and Follow-Up

- Follow up in 2 or 3 days, to make sure no complications develop, and then again in 2 weeks
- Repeat ECG and chest x-ray should be considered at about 4 weeks
- In most clients complete resolution occurs after 2 weeks of therapy

Aortic Aneurysm (Pulsatile Abdominal Mass)

Definition

Weakening of the wall of the abdominal aorta. A pulsatile abdominal mass is considered and treated as an abdominal aortic aneurysm until proven otherwise. It may be asymptomatic and discovered by accident.

History

If an aneurysm is leaking:

- Sudden onset of pain in mid-abdomen or back (or both)
- Sudden weakness and faintness

Physical Findings

- Pulse rapid and weak, pulsus paradoxus
- Blood pressure low-normal to low
- Blood pressure may drop with change in posture
- Pulsating mid or upper abdominal mass

If an aneurysm has ruptured:

- Shock (hypovolemia)
- In severe distress, client may be unconscious
- Pulse diminished or absent
- Blood pressure low or cannot be determined
- A pulsating abdominal or flank mass may be palpable
- Increased abdominal girth
- Subcutaneous bruising may be present
- Death usually occurs

Management Of Asymptomatic Client

Goals of Treatment

- Identify and monitor the asymptomatic abdominal aneurysm

Appropriate Consultation

Consult a physician when an asymptomatic aortic aneurysm is suspected or detected.

Monitoring and Follow-Up

- Annual follow-up by physician
- Annual abdominal ultrasonography to measure size

Referral

Referral to physician for vascular surgery

Management Of Symptomatic Client

Goals of Treatment

- Replace blood loss

Appropriate Consultation

Consult a physician immediately.

Adjuvant Therapy

- Oxygen to keep oxygen saturation > 97%
- Large bore IV (14- to 16-gauge) with normal saline (or lactated Ringer's solution) x2

Nonpharmacologic Interventions

- Bed rest
- Maintain "nothing-by-mouth" order
- Insert a nasogastric tube (paralytic ileus is common)
- Insert a urinary catheter

Monitoring and Follow-Up

- Monitor ABC and vital signs closely, including oxygen saturations
- Aim for pulse < 100 bpm and systolic blood pressure >100 mm Hg
- Monitor urinary output

Referral

Medevac as soon as possible.

Pulmonary Edema

Definition

Accumulation of fluid within the lungs that interferes with ventilation and oxygenation.

Causes

Acute left-heart failure, with or without right-heart failure (*see "Differential Diagnosis," below*)

History

- Severe shortness of breath
- Orthopnea, paroxysmal nocturnal dyspnea (left ventricular failure)
- Fluid retention peripherally and weight gain (right heart failure) may also be present
- Cough productive of frothy pink sputum

Physical Findings

- Pulse rapid and may be "thready" or weak
- Respiratory rate elevated
- Blood pressure normal, elevated or decreased
- Acute respiratory distress
- Diaphoresis
- Central cyanosis may be present
- Peripheral cyanosis with cool, mottled extremities
- Swelling of ankles may be present
- JVP may be elevated
- Hepatojugular reflux and hepatomegaly may be present
- Peripheral pitting edema may be present
- Crackles and wheezes in lower half of lung fields
- S3 gallop rhythm in the heart

Differential Diagnosis

- Chronic congestive heart failure
- Acute myocardial infarction
- Acute pulmonary embolism
- Atrial fibrillation
- Valvular heart disease
- Adult respiratory distress syndrome
- TB

Complications

- Dependent on underlying disease process
- Angina

- Hypotension, shock
- Respiratory failure

Diagnostic Tests

- Obtain ECG: look for signs of myocardial ischemia or infarction

Management

Goals of Treatment

- Improve oxygenation
- Promote diuresis of accumulated fluids
- Reduce venous return to the heart
- Treat any reversible precipitants (e.g. cardiac ischemia, hypertension, arrhythmia)

Appropriate Consultation

Consult a physician immediately.

Adjuvant Therapy

- Oxygen to keep oxygen saturation > 97%
- Start IV therapy with normal saline to keep vein open

Nonpharmacologic Interventions

- Bed rest with head elevated
- Insert an indwelling urinary catheter

Pharmacologic Interventions

IV diuretics:

furosemide, 40-80 mg IV push

For any client who receives this drug regularly, a much larger dose may be required (a quick guide is to double the usual PO daily total to determine the acute IV dose).

To reduce workload on the heart (discuss with physician, preferably before administering): *morphine, 2-5 mg IV* over several minutes; this can be repeated under the direction of a physician

To reduce venous return and workload on the heart, the physician may order topical nitrates: *nitroglycerin topical, 1.25-2.5 cm stat, then q4-6h*, but only if systolic blood pressure >100 mm Hg

Monitoring and Follow-Up

- Monitor vital signs (watch for hypotension) and ABCs frequently, including oxygen saturation
- Monitor urine output hourly (if not diuresing, the client requires more IV diuretics)

Referral

Medevac as soon as possible.

Acute Arterial Occlusion Of A Major Peripheral Artery

Definition

Sudden obstruction of a peripheral artery with acute ischemia of the distal limb.

Causes

- Acute thrombosis of an artery, trauma or arterial embolus
- Predisposing factors: peripheral vascular disease, atrial fibrillation, recent myocardial infarction, prosthetic heart valve

History

- Sudden onset of severe pain in distal part of a limb
- Paresthesia, coldness and pallor in distal limb follow later
- Previous symptoms of intermittent claudication
- History of cardiac disease

Physical Findings

- Heart rate elevated
- Pulse may be irregular
- Respiratory rate normal or increased
- Blood pressure normal or increased
- Anxious, in acute distress
- Signs of longstanding peripheral vascular disease in the opposite limb
- Colour of limb normal initially, becomes pale later
- Skin temperature may be normal initially, becomes cool or cold later
- Peripheral pulses are less palpable than in opposite limb or absent altogether
- Cutaneous sensation decreased or absent
- Tenderness in calf on dorsiflexion of foot
- Arterial bruits may be present (aortic, iliac, femoral, popliteal)

The 5 P's of acute arterial occlusion are pain, pallor, pulseless, paresthesia and paralysis.

Differential Diagnosis

- Compartment syndrome if trauma has been involved

Complications

- Ischemic muscular contracture
- Loss of limb
- Pulmonary embolism
- Sepsis

Management

Goals of Treatment

- Improve oxygenation of the limb
- Prevent injury to or loss of limb

Appropriate Consultation

Consult a physician immediately.

Nonpharmacologic Interventions

- Bed rest
- Prevent injury to limb: handle carefully, protect from pressure or injury
- Do not elevate ischemic limb (keep horizontal or slightly dependent)

Adjuvant Therapy

- Oxygen to keep saturation $\geq 97\%$
- Start IV therapy with normal saline to keep vein open

Pharmacologic Interventions

Analgesia for pain:

morphine, 2-5 mg IV

Give *dimenhydrinate (A class drug)* with morphine to prevent nausea and vomiting.

Monitoring and Follow-Up

Monitor vital signs, general condition, cardiac and respiratory status frequently.

Referral

Medevac as soon as possible. There is only a 4 to 6-hour window of opportunity to perform surgical intervention to save limb from irreparable damage.

Assessment Of The Gastrointestinal System

N.B. When assessing the GI system and there are symptoms of abdominal pain, it is important to remember that symptoms may be related to involvement of other systems.

History Of Present Illness And Review Of System

General

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

- Onset (sudden or gradual)
- Chronology
- Current situation (improving or deteriorating)
- Location
- Radiation
- Quality
- Timing (frequency, duration)
- Severity
- Precipitating and aggravating factors
- Relieving factors
- Associated symptoms
- Effects on daily activities
- Previous diagnosis of similar episodes
- Previous treatments
- Efficacy of previous treatments

Cardinal Symptoms

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

Abdominal Pain

Ask about all of the characteristics listed in the section above (see "General," above).

Nausea and Vomiting

- Frequency, severity
- Presence of blood and its colour (e.g. bright red, dark, colour of coffee grounds)
- Triggers

Bowel Habits

- Frequency, colour and consistency of stool
- Presence of blood or melenas
- Pain before, during or after defecation
- Use of laxatives/enemas
- Hemorrhoids
- Belching, bloating and flatulence

Jaundice

- History of hepatitis A, hepatitis B or hepatitis C, alcohol use
- Tea-coloured urine
- Clay-coloured bowel movements
- Itchy skin

Dysphagia

- Solids or liquids, is the pattern consistent
- Site where food gets stuck

Other Associated Symptoms

- Fever
- Malaise
- Headache
- Dry skin
- Dehydration
- Dry mouth
- Diet recall, appetite and foods avoided (including reasons for avoidance), food preferences (e.g. raw foods, wild meat), nutritional supplements
- Meal pattern (e.g. small, frequent meals)
- Anorexia, bulimia, fasting
- Recent weight loss or gain that is not deliberate

Medical History (Specific To Gastrointestinal System)

- Gallbladder disease
- Diabetes mellitus
- Liver disease (hepatitis A, hepatitis B, hepatitis C or cirrhosis)
- Esophageal cancer
- Inflammatory bowel disease
- Hiatus hernia
- Irritable bowel syndrome (IBS)
- Gastroesophageal reflux disease (GERD)
- Peptic ulcer disease (PUD)
- Pancreatitis
- Diverticulosis

- Abdominal surgery
- Presence of hernia, masses
- Blood transfusion
- Past and current use of medications: over-the-counter medications (e.g. acetylsalicylic acid [ASA], acetaminophen), estrogen, progesterone, calcium-channel blockers, anticholinergics, antacids, triple therapy for peptic ulcer disease, thiazide diuretics, steroids, digoxin
- Diagnosis of H. pylori, treated and untreated

Family History (Specific To Gastrointestinal System)

- Alcoholism
- Household contact with hepatitis A or hepatitis B
- Household contact with gastroenteritis
- Food poisoning
- GERD
- Peptic ulcer disease
- Gallbladder disease
- Gastric or colon cancer
- Polyps
- Pancreatitis
- Metabolic disease (e.g. diabetes mellitus, porphyria)
- Cardiac disease
- Renal disease

Personal And Social History (Specific To Gastrointestinal System)

- Alcohol use
- Smoking
- Caffeine use
- Use of street drugs, including injection drugs
- Use of anabolic steroids
- Travel to area where infectious gastrointestinal conditions are endemic
- Body piercing or tattoos
- Stress at work, home or school
- Dietary intake of nitrates (e.g. smoked foods)
- High-fat diet
- Obesity
- Exposure to untreated drinking water
- Sanitation at home or community
- Dieting
- Abdominal trauma

Occupational Or School Environment

- Healthcare occupation
- Institutional environment -- workers or residents (e.g. nursing home)
- Environmental exposure
- Chemical exposure

Examination Of The Abdomen

General

- Apparent state of health
- Appearance of comfort or distress
- Colour (e.g. flushed, pale, jaundiced)
- Nutritional status (obese or emaciated)
- State of hydration (skin turgor)
- Match between appearance and stated age

Vital Signs

- Temperature and pulse
- Respiratory rate
- Blood pressure
- Weight

Abdominal Inspection

- Abdominal contour, symmetry, scars, dilatation of veins
- Movement of abdominal wall with respiration
- Visible masses, hernias, pulsations, peristalsis
- Jaundice (scleral icterus, skin)
- Spider nevi on face, neck or upper trunk
- Palmar erythema, Dupuytren's contracture (associated with chronic liver disease)
- Clubbing of fingers (late sign associated with inflammatory bowel disease)

Auscultation

Auscultation should be performed before percussion and palpation so as not to alter bowel sounds.

- Presence, character and frequency of bowel sounds
- Presence of bruits (renal, iliac or abdominal aortic)

Percussion

- Percuss from resonant to dull areas
- Liver: define upper and lower borders, measure span

- Spleen: confirm presence of normal resonance over lowest rib interspace in anterior axillary line
- Bladder: identify distension and fullness
- Identify other areas of dullness, increased resonance or tenderness

Light Palpation

- Tenderness, muscle guarding, rigidity
- Superficial organs or masses

Deep Palpation

- Tender areas, rebound tenderness
- Liver: size, tenderness, whether edge is smooth or irregular, firm or hard
- Spleen: enlargement, tenderness, consistency
- Kidney: tenderness, enlargement, tenderness of costovertebral angle
- Masses: location, size, shape, mobility, tenderness, movement with respiration, pulsation, hernias (midline, incisional, groin)
- Inguinal lymph nodes: enlargement, tenderness
- Consider GU

Rectal Examination

- For occult blood (which would indicate gastrointestinal [GI] bleeding)
- For referred pain (which occurs in appendicitis)
- For masses, hemorrhoids, anal fissures, sphincter tone, etc.
- Prostate exam
- Cervical/uterine exam

Cardiovascular And Pulmonary Examination

A cardiovascular and pulmonary exam should also be performed.

- Tachycardia, lungs (crackles)
- Abdominal pain (may be referred from the lungs in pneumonia)
- ECG

Fig 1: Location of pain: Clues to diagnosis

The location of pain may provide clues to common causes of abdominal pain.

Diffuse pain or variable location:

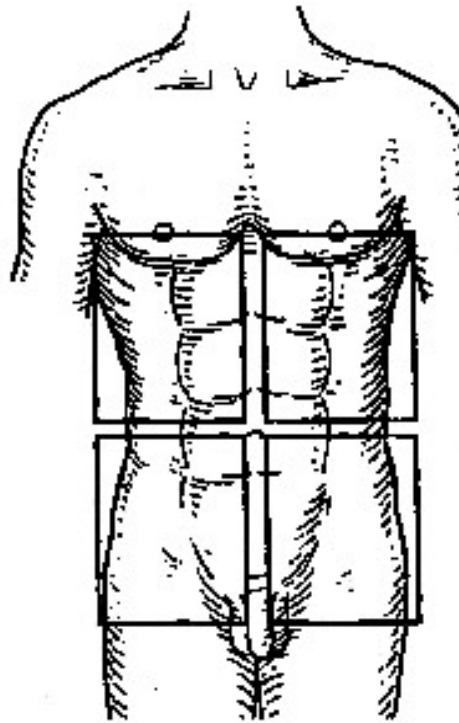
- gastroenteritis
- intestinal obstruction
- hemolytic crisis (sickle cell disease)
- peritonitis
- endocrinologic disorders (diabetic ketoacidosis, Addison's disease, hyperparathyroidism)

Right Upper Quadrant:

- cholecystitis
- cholelithiasis
- acute hepatitis
- hepatic abscess
- subphrenic abscess
- right lower lobe pneumonia

Right Lower Quadrant:

- appendicitis
- cecal diverticulitis
- ectopic pregnancy
- ovarian cyst/torsion
- pelvic inflammatory disease
- Mittelschmerz
- endometriosis

**Left Upper Quadrant:**

- gastritis
- acute pancreatitis
- splenic enlargement/
- hematoma
- myocardial ischemia
- left lower lobe pneumonia

Left Lower Quadrant:

- all GU conditions listed under right lower quadrant
- diverticulitis

Epigastric or Midline:

- abdominal aortic aneurysm (may also present as back, flank, or hip pain, or as diffuse pain)
- cardiac disease (may be confused with pain from reflux disease)
- peptic ulcer (gastric or duodenal)

Problems Of The Gastrointestinal System

Dehydration (Hypovolemia)

Definition

Decrease in volume of circulating plasma.

Causes

- Excessive urine production (e.g. use of diuretics, unexplained polyuria or polydipsia)
- Excessive GI losses (through vomiting, diarrhea, third spacing of fluid in the abdomen as a result of ascites or pancreatitis)
- Excessive losses through the skin (because of burns, fever, exfoliative dermatitis)

- Inadequate intake of food or fluids (because of immobility, loss of consciousness, cognitive impairment, medications that blunt the thirst response such as antipsychotics, heat, exercise)

Physical Examination

- Search for orthostatic hypotension if supine blood pressure appears normal
- Estimate volume deficit (see Table 1)

Table 1: Physical findings in association with degree of dehydration

Clinical sign	Mild dehydration	Moderate dehydration*	Severe dehydration*
Fluid loss (% of body weight)	< 6%	6% to 10%	> 10%
Radial pulse	Normal	Rapid, weak	Very rapid, feeble
Respiration	Normal	Deep	Deep, rapid
Systolic blood pressure	Normal	Low	Very low or undetectable
Skin turgor	Retracts rapidly	Retracts slowly	Retracts very slowly
Eyes	Normal	Sunken	Very sunken
Mentation	Alert	Restless	Drowsy, comatose
Urine output	Normal	Scant	Oliguria
Voice	Normal	Hoarse	Inaudible

* If dehydration is moderate to severe, there may be associated electrolyte disturbances.

Types

Hypotonic Dehydration

- Symptomatic earlier than isotonic or hypertonic dehydration (use estimated weight loss as a guide: 3% = mild dehydration, 6% = moderate dehydration, 9% = severe dehydration)
- Usually results from replacing losses (vomiting and diarrhea) with low-solute fluids, such as dilute juice, weak tea
- Lethargy and irritability are common, and vascular collapse can occur early

Isotonic Dehydration

Symptoms less dramatic than in hypotonic dehydration (use estimated weight loss as a guide: 5% = mild dehydration, 10% = moderate dehydration, 15% = severe dehydration)

Hypertonic Dehydration

- Usually occurs as a result of using inappropriately high solute load as replacement, or because of renal concentrating defect with large free-water losses or heat exposure with large insensible losses
- Typical symptoms include thick, doughy texture to skin (tenting is uncommon), tachypnea, intense thirst
- Shock is very late manifestation

Management

Goals of Treatment

- Restore normal state of hydration
- Identify and rectify cause of dehydration

General Principles of Treatment

- Fluid composition depends upon type of dehydration

- Be sure to add ongoing losses to maintenance + deficit fluids and electrolytes
- In hypotonic or isotonic dehydration, calculate total fluids and electrolytes (maintenance + deficit replacement) for the first 24 hours, and give half this amount over the first 8 hours, and the other half over the next 16 hours
- In hypertonic dehydration, correct the fluid and electrolyte deficits slowly (over about 48 hours)
- Do not add *potassium* to IV line until urine output established (diabetic ketoacidosis may be an exception, where correction of hyperglycemia and acidosis may lead to rapid development of hypokalemia)
- Increase maintenance fluids by 12% for each degree Celsius of fever
- If GI losses continue, replace with 10 mL/kg for each diarrheal stool and 2 mL/kg for each episode of vomiting (this should approximate losses)

The search for the underlying cause of the dehydration should be concurrent with rehydration therapy to prevent the re-emergence of dehydration from ongoing fluid losses.

Pharmacologic Interventions

Oral rehydration therapy is the initial method of treatment unless the volume of the deficit and the resulting severity of symptoms or the lack of feasibility of oral intake make IV therapy necessary.

Oral rehydration fluids are effective, and rehydration should be attempted in clients with adequate blood pressure who are able to take fluids orally.

Oral rehydration fluids should contain both sodium and sugar to maximize absorption of these two components.

An oral rehydration solution can be made at home with table salt and sugar: 1/2 tsp (2.5 mL) salt, 8 tsp (40 mL) sugar, 4 cups (1 L) water. Commercially prepared solutions (e.g. Gastrolyte®, Rehydralyte®) are also available.

Potassium

- For mild dehydration, potassium may not be required

- For moderate-to-severe dehydration caused by GI or renal losses, *potassium replacement is usually required*

Mild Dehydration

- Administer 50 mL/kg of oral rehydration solution over the first 4 hours of treatment; give frequently, in small amounts
- Re-evaluate at 4 hours for maintenance fluid requirements (general daily maintenance fluid requirement for an adult is 2000-2400 mL)
- Fluid intake in the first 24-48 hours should be enough to replace the initial deficit plus any ongoing loss of fluid through the GI and genitourinary tracts and the skin
- If condition unresolved consult with physician

Moderate Dehydration

- Consult with physician
- Administer 100 mL/kg of oral rehydration solution over the first 4 hours of treatment; give frequently, in small amounts
- Re-evaluate at 4 hours for maintenance fluid requirements (general daily maintenance fluid requirement for an adult is 2000-2400 mL)
- Fluid intake in the first 24-48 hours should be enough to replace the initial deficit plus any ongoing loss of fluid through the GI and genitourinary tracts and the skin

Severe Dehydration

- Consult with physician
- Start 2 large-bore IV lines (14- or 16-gauge) with normal saline
- Give 20 mL/kg IV rapidly as a bolus
- Assess for overload
- Reassess for signs of continuing hypovolemic shock
- If shock persists, continue to administer fluid in boluses and reassess
- Adjust IV rate according to clinical response (ongoing IV therapy is based on response to initial fluid resuscitation, continuing losses and underlying cause of dehydration)
- Aim for pulse rate < 100 bpm and systolic blood pressure > 90 mm Hg

Client Education, Monitoring and Follow-Up

Refer to section on diarrhea

Anal Fissure

Definition

Painful, linear tear in anal mucosa.

Causes

- Chronic constipation
- Trauma to anal canal

History

- Acute pain during and after defecation
- Spotting of bright red blood with defecation
- Bleeding tends to be minimal
- Constipation caused by fear of pain
- Tends to occur in young and middle-aged adults
- Most common cause of chronic perianal pain
- Recent childbirth

Physical Findings

- Firm retraction of buttocks is required for adequate visualization
- May be concealed by overlying anal mucosa
- Usually one fissure
- Usually in midline
- Digital rectal exam causes acute pain

Differential Diagnosis

- Thrombosed external hemorrhoids
- Perianal or perirectal abscess
- Crohn's disease or sexually transmitted infections (if fissures fail to heal)

Complications

- Constipation
- Chronic anal fissure

Diagnostic Tests

None.

Management

Goals of Treatment

- Relieve pain
- Relieve underlying constipation
- Prevent recurrence

Nonpharmacologic Interventions

- Most fissures are superficial and will heal spontaneously
- Sitz baths 3 or 4 times daily for 20 minutes with warm salt water

Client Education

- Instruct client about proper perianal hygiene and prevention of infection
- Counsel client about lifestyle and diet (e.g. dietary fiber, fluids, exercise)
- Condom use, if anal sex, also use lubricant

Pharmacologic Interventions

Local topical preparations without corticosteroids may be useful:

zinc sulfate 0.5% ointment, bid and after each bowel movement

An ointment is better than a suppository because it remains within the affected area.

Start stool-bulking agents and stool softeners if constipated (*see "Constipation," below, this chapter*).

Monitoring and Follow-Up

Follow up in 1-2 weeks.

Referral

Arrange consultation with a physician if fissure does not heal in 4-6 weeks.

Hemorrhoids

Definition

Blood vessels beneath the anal canal mucosa (internal) and perianal skin (external) that enlarge and protrude.

Causes

- Pregnancy and childbirth
- Chronic constipation with straining at bowel movements
- Prostatic enlargement with chronic straining to urinate
- Prolonged sitting
- Anal infection

History

Rule out bowel pathology such as inflammatory bowel disease, carcinoma.

Internal Hemorrhoid

- Sensation of something "sticking out" of rectum
- Bright red bleeding with bowel movements
- Blood on stool surface only, not mixed in with stool; often seen on toilet tissue
- Anal itching or discharge may be present
- Painless unless complications present

External Hemorrhoid (Perianal Lump)

- Soft skin tags may be present
- Discomfort or irritation frequently present
- Tendency to thrombose
- Sudden acute pain if thrombosed

Physical Findings

To examine anal area, have client lie on left side with the knees drawn up to the chest; retract the buttocks.

- Both internal and external hemorrhoids may be present
- Usually located in left lateral, right anterior and right posterior positions
- Internal hemorrhoids covered by thin, pink anal mucosa
- External hemorrhoids covered by skin (Note: a thrombosed external hemorrhoid is a bluish purple, globular, irreducible, tender lump at the edge of the anus)

- Typically 1 to 3 swellings around anal opening, the size of a finger tip; pink, purple or blue in colour
- Rectal examination may reveal concealed internal hemorrhoids
- Assess whether prolapsing hemorrhoids are easily reducible

Differential Diagnosis

- Rectal polyp or prolapse
- Skin tag
- Other causes of pruritus ani and perianal dermatitis
- Perianal or perirectal abscess
- Anal fissure
- Complicated hemorrhoid
- Tumor

Complications

- Thrombosed or strangulated internal hemorrhoid
- Thrombosed external hemorrhoid

Diagnostic Tests

- Stool may test positive for occult blood

Management

Goals of Treatment

- Relieve symptoms
- Keep anal region clean
- Promote easy passage of stool on a regular basis

Appropriate Consultation

If unable to reduce the prolapsed internal hemorrhoid, contact a physician.

Nonpharmacologic Interventions

- Gently try to reduce painful prolapsed internal hemorrhoid
- Apply a topical anesthetic (e.g. *lidocaine jelly* 2%, wait 15 minutes, then gently try to reduce it. Do not use force!)
- Instruct client to gently reduce (push back up) painless prolapsed internal hemorrhoid(s)
- Instruct client to cleanse the perianal area after each bowel movement with plain water, salt water or medicated witch-hazel cotton pads (Tucks)

- Instruct person to take Sitz baths 3 or 4 times daily for 15 to 20 minutes to cleanse the area, soothe local irritation and relax the anal sphincter
- Manage underlying constipation

Client Education

- Counsel client about appropriate use of medications (dose, frequency, dangers of overuse)
- Teach client proper perianal hygiene
- Instruct client to return to clinic for reassessment if severe pain or bleeding develops (incision drainage of thrombosed external hemorrhoid may be required)
- Instruct client to apply an ice pack (20 minutes on, 20 minutes off) to help reduce swelling and pain if a thrombosed hemorrhoid is suspected

Pharmacologic Interventions

For mildly sore and edematous "inflamed" external hemorrhoid, treat with hemorrhoidal ointments or suppositories without steroids (ointments are better):

zinc sulfate 0.5% ointment or suppository every morning and evening and after each bowel movement for 3-6 days

For perianal dermatitis, hemorrhoidal ointment with steroids (for anti-inflammatory properties) may be used to reduce itch and discharge (these preparations may cause local irritation if misused):
zinc sulfate 0.5% ointment every morning and evening and after each bowel movement for 3-6 days

Monitoring and Follow-Up

Follow up in 1 week to determine if symptoms have improved.

Referral

For acute pain of recent onset (1-2 days) that is increasing despite treatment, contact a physician for advice and to rule out an abscess.

Constipation

Definition

Condition in which diminished frequency or incomplete evacuation of stool is hard, dry, often small and round; difficult and painful to pass. Constipation is a symptom, not a diagnosis. A careful, accurate history and physical examination are mandatory to establish the underlying cause.

Causes

- Ignoring urge to defecate
- Insufficient fiber and fluid in diet
- Physical inactivity
- Pregnancy
- Side effect of medications
- Chronic abuse of laxatives
- Anal fissure
- Hemorrhoids
- Cancer of colon or rectum
- Other diseases of large bowel
- Endocrine problems
- Neurological diseases
- Recent change in pattern of defecation, consistency of stool or other features
- Any associated rectal blood, melena
- Diarrhea (overflow)
- Abdominal pain, cramping and bloating
- Difficulty or pain on defecation
- Ineffective or painful straining
- Time of most recent bowel movement
- Fluid intake
- Dietary intake
- Activity and exercise patterns
- Current medication, previous and current use of laxatives
- Stressors and psyche
- Depression
- Eating disorders
- Pregnancy (current)
- Endocrine disorders (e.g. diabetes mellitus, hypothyroidism)
- Neurological disease (e.g. Parkinson's disease, multiple sclerosis)
- Collagen vascular disease (e.g. systemic sclerosis)

Medications Associated with Constipation

- Aluminum antacids
- Tricyclic antidepressants
- Antipsychotics
- Anticholinergics
- Antiparkinsonian drugs
- Opiate narcotics
- Seizure medication (phenobarbital, phenytoin, carbamazepine)
- Antihypertensive medications (e.g. calcium-channel blockers)
- Iron preparations
- Sympathomimetics (e.g. pseudoephedrine)
- Terbutaline
- Bismuth products (e.g. Pepto-Bismol)

History

The consistency of the movement and the ease with which stool is passed are more important than the frequency of bowel movements.

- Duration of constipation (recent or chronic problem)

Physical Findings

- Usually no distress
- Client looks well
- Abdomen may be distended
- Bowel sounds normal but may be reduced in chronic constipation
- Bowel sounds may be normal to dull in lower quadrants
- Stool may be palpable in left or right lower quadrant
- Left and right lower quadrant may be tender
- Hard, pebbly stool in rectum, or rectum may be empty
- Hemorrhoids and anal fissures may be present

Differential Diagnosis

- Irritable bowel syndrome
- Diverticular disease
- Partial bowel obstruction
- Rectal fissure
- Anal fissure or hemorrhoids
- Physical inactivity

- Side effects of medications or laxative abuse
- Cancer of colon, rectum or other organ
- Diseases of the large bowel
- Endocrine problems (e.g. hypothyroidism)
- Neurological diseases (e.g. Parkinson's disease)

Complications

- Chronic abdominal pain
- Hemorrhoids
- Anal fissure
- Fecal impaction
- Fecal and urinary incontinence
- Urinary retention
- Inguinal hernia from straining
- Intestinal obstruction

Diagnostic Tests

Test stool for occult blood.

Management

Goals of Treatment

- Establish regular bowel function
- Eliminate contributing factors
- Identify and manage underlying disease
- Prevent and treat complications (e.g. fecal impaction, hemorrhoids, anal fissures, rectal prolapse, fecal incontinence, bowel obstruction)
- Eliminate need to strain and prevent adverse effects of straining (e.g. hernia, gastroesophageal reflux, coronary and cerebral dysfunction in the elderly, vasovagal)

Nonpharmacologic Interventions

- Client should increase dietary fluids to 1.5-2.0 L/day
- Client should increase dietary fiber to 20-30 g/day: bran, whole grains, fruits and vegetables should be encouraged; prune juice, stewed prunes and figs can be tried
- Encourage physical exercise if client is able
- Discontinue medications with constipating effects if possible
- Establish regular time for toileting to help develop a conditioned reflex for bowel action (e.g. immediately after breakfast)
- Encourage relaxation exercises for the pelvic floor and external anal sphincter muscles
- Advise client that bowel retraining may take months (patience and persistence are required)

and dietary changes must be maintained over the long term)

Pharmacologic Interventions

To relieve initial constipation, medications may be required. Avoid starting client on a long-term course of laxatives.

Acute Constipation

Step 1: Start a bulk-forming agent:

psyllium hydrophilic mucilloid, 1 tsp (5 mL) in 8 oz (250 mL) fluid bid or tid

Step 2: If bulk-forming agent not tolerated or ineffective, add or substitute osmotic saline laxative agents for a short period (3-4 days): *stimulant laxatives* such as *bisacodyl*, 5-15 mg hs

or

senna, 2-4 tabs hs to bid

Step 3: If no relief, consult a physician regarding orders for:

electrolytes or *polyethylene glycol*

or

Fleet® phosphosoda (oral *Fleet®*)

For clients with difficulty initiating evacuation, add:

glycerin suppository, 1 or 2 prn or

Fleet® enema prn

When fecal impaction is present, disimpact as necessary. Use enemas (e.g. *Fleet®*, saline, oil retention). Follow up closely until regular bowel function is achieved.

Docusate sodium, a stool softener, is better than a laxative for use in situations where straining needs to be avoided for a prescribed period.

Chronic Constipation

The following medications may be used in conjunction with nonpharmacologic approaches if these interventions are unsuccessful after a 1-month trial:

Step 1: Regular use of bulk-forming agent:

psyllium hydrophilic mucilloid, 1 tsp (5 mL) in 8 oz (250 mL) fluid bid or tid

Step 2: Intermittent use of osmotic saline laxatives for short periods (e.g. 3-4 days):

magnesium hydroxide (*Milk of Magnesia*), 1.2-3.2 g (15-40 mL) od

Monitoring and Follow-Up

Follow up regularly every 2-4 weeks until regular bowel function is achieved. Review and adjust dose of bulking agents to obtain a soft, formed stool.

Referral

Refer to a physician to arrange further investigation if

- Testing of stool for occult blood is positive
- Hemoglobin is low

- There is evidence of other organic disease
- This constipation represents a new change in bowel habit in a person > 50 years of age
- the constipation is not resolving with appropriate treatment.

Severe straining at stool or a continued sensation of rectal fullness even when rectum is empty warrants a more thorough evaluation.

Diarrhea

Definition

Change in bowel habits characterized by frequent loose or liquid stool (may be of large or small volume). Diarrhea is a symptom, not a diagnosis. A careful, accurate history and physical examination are mandatory to establish the underlying cause.

Causes

Acute Diarrhea

- Viral infection (most common cause): such as rotavirus, adenovirus or (less commonly) hepatitis A
- Bacterial infection: *Campylobacter*, *Clostridium difficile*, *Escherichia coli* (0157:H7), *Salmonella*, *Shigella*, *Yersinia*
- Inflammatory bowel disease (e.g. ulcerative colitis, Crohn's disease)
- Medications (e.g. antibiotics, antacids, laxatives)
- Parasitic infection (e.g. *Giardia*, hookworm, cryptosporidium, amebiasis)

During "spring break-up" and in late summer, community outbreaks of bacterial and parasitic origin diarrhea are common if water quality is poor. *E. coli* and parasites may be involved if there has been recent travel.

Chronic Diarrhea

- Poor nutrition
- Inflammatory bowel disease (e.g. ulcerative colitis, Crohn's disease)
- Malabsorption syndromes (e.g. lactase deficiency, post-abdominal surgery)
- Endocrine conditions (e.g. hyperthyroidism, diabetes mellitus)
- AIDS
- Irritable bowel syndrome
- Acute diverticulitis
- Fecal impaction (overflow)

History

- Sudden onset of frequent, loose, watery bowel movements
- Blood, pus or mucus may be present
- Melena
- Steatorrhea (fatty, greasy, bulky stool)

- Abdominal pain, possibly crampy
- Current or recently used medications
- Recent travel
- Dietary and fluid intake in past 24 hours
- Nausea or vomiting
- Fever
- Headache
- Thirst
- Decreased urine output (may be present if diarrhea is severe or prolonged)

If the client is passing bloody diarrhea, consider infection with *Shigella* or *Salmonella*, or inflammatory or ischemic bowel disease.

Physical Findings

- Temperature may be elevated (if cause is infectious)
- Heart rate may be increased (if dehydration, fever or metabolic derangement)
- Weight loss (if chronic)
- Blood pressure low if severely dehydrated
- Postural blood pressure drop if moderately dehydrated
- Client appears mildly to severely ill (depending on cause and severity)
- Mucous membranes may be dry
- Eyes may be sunken with dark circles underneath
- Sclera or skin may be jaundiced (in hepatitis)
- Skin may feel dry, turgor may be poor
- Abdomen may be slightly distended with gas
- Bowel sounds hyperactive
- Abdomen hyperresonant if excess gas is present
- Abdomen may be mildly tender in all areas
- Abdominal mass may be present (depending on underlying cause)
- Rectal exam reveals tenderness and mass

Differential Diagnosis

- Viral infection
- Bacterial infection
- Parasitic infection
- Excess consumption of alcohol or fruit
- Antibiotic use (current or recent)
- Laxative abuse

- Irritable bowel syndrome
- Inflammatory bowel disease
- Fecal impaction with overflow diarrhea
- AIDS
- Malabsorption syndrome (e.g. lactase deficiency)

Complications

- Dehydration
- Systemic infection (sepsis)

Diagnostic Tests

- Test stool for occult blood
- Test stool for culture and sensitivity, ova and parasites, and *C. difficile* (if recent antibiotic therapy)
- Test for HIV (in chronic diarrhea or if risk behaviors present)

Management

Goals of Treatment

- Establish normal bowel function
- Prevent complications (e.g. dehydration)
- Avoid complications of antidiarrheal medications (e.g. constipation, toxic megacolon)

Appropriate Consultation

Consult a physician if the client is moderately or severely dehydrated.

Nonpharmacologic Interventions

Dietary Adjustments

- Client should avoid coffee, alcohol, most fruits, vegetables, heavily seasoned foods
- Client should stop eating dairy products (except yogurt, aged cheese) for 7-10 days
- Client may need to stop solid foods for a brief period (6 hours) if stool is frequent and watery or if vomiting occurs in association with diarrhea
- There is evidence that early reinstitution of a lactose-free general diet will decrease the duration and severity of diarrhea
- Gradually reintroduce solid foods (e.g. salted crackers, dry toast or bread), and then move on to bland foods (e.g. baked potato, poultry, baked fish, noodles)
- A combination of clear broths, oral rehydration solutions and a modest amount of hypotonic

fluids (e.g. water, juices, soft drinks) may be the best strategy for managing acute diarrhea

Elderly and debilitated clients in particular are at risk for dehydration, and early use of oral rehydration fluids is recommended.

Water, juices and soft drinks do not replace electrolytes because they are low in sodium. Too much of these hypotonic fluids can lead to hyponatremia.

Client Education

- Teach client to recognize symptoms and signs of dehydration and advise client to return to clinic if they occur
- Witch-hazel cotton pads (Tucks) may provide relief to the raw perianal area
- Teach client that proper hand washing prevents the spread of infection
- Teach client how to prevent recurrent diarrhea (by boiling drinking water for at least 20 minutes)

Pharmacologic Intervention

Refer to Page 7, this section, Dehydration Management

Control nausea and vomiting if significant:
dimenhydrinate, 25-50 mg IM, single dose, then 50 mg PO q4-6h prn

Avoid antidiarrheals until diagnosis confirmed and infectious disease ruled out.

Antidiarrheals may help to relieve symptoms.
loperamide hydrochloride, 4 mg to start, then 2 mg after each loose bowel movement to a maximum of 16 mg/day, then 2-4 mg bid

Monitoring and Follow-Up

Monitor hydration, general condition and vital signs frequently until stable. Follow up in 24 hours (sooner if oral intake is not keeping up with losses).

Referral

Refer any client who

- is dehydrated by more than 6% to 10%, if he or she does not respond rapidly to rehydration therapy
- is elderly and has multiple medical problems
- is unable to tolerate fluids by mouth
- in whom bowel sounds are absent
- has abdominal tenderness or rebound tenderness
- has high fever and appears acutely ill.

Gastroesophageal Reflux Disease (GERD)

Definition

Reflux of gastric contents into the esophagus, which results in esophageal irritation or inflammation.

Causes

Presence of acidic stomach contents in the esophagus due to laxity of the lower esophageal sphincter.

Predisposing Factors

- Defective esophageal clearance, such as stricture, hiatal hernia, incompetent gastric sphincter
- Obesity
- Pregnancy
- Estrogen therapy
- Medications
- Tobacco use
- Alcohol use
- Genetic factors
- Hypersecretion of gastric acid
- Delayed gastric emptying

History

- Heartburn
- Retrosternal burning sensation radiating upward (may radiate as far up as the throat)
- Acidic stomach contents may be regurgitated
- Associated with large meals, lying down and bending over
- Often awakens client during the night
- May be associated with cough, sore throat, hoarseness, painful swallowing
- Hypersalivation (water brash)
- Aggravating factors identifiable
- Relief with antacids and sitting up
- Stress makes condition worse

Physical Findings

Mild epigastric tenderness may be present.

Differential Diagnosis

- Peptic ulcer disease
- Esophageal motility disorder
- Esophageal tumor
- Cardiac chest pain

Complications

- Esophagitis
- Esophageal ulcer
- Upper GI bleeding
- Esophageal stricture
- Nocturnal aspiration
- Barrett's esophagus
- Adenocarcinoma of esophagus

Barrett's Esophagus

People who have had regular or daily heartburn for more than 5 years may be at risk for Barrett's esophagus, a condition that develops in some people with chronic GERD or inflammation of the esophagus (esophagitis). In Barrett's esophagus, the normal cells that line the esophagus, called squamous cells, change into a type of cell not usually found in humans, called specialized columnar cells. Damage to the lining of the esophagus, by acid reflux, causes these abnormal changes.

Once the cells in the lining of the esophagus have become columnar cells, they will not revert to normal. The goal of treatment is to prevent further damage by stopping any acid reflux from the stomach.

An increase in cancer of the esophagus occurs. Because of the risk of cancer, people with Barrett's esophagus should be screened regularly for esophageal cancer.

Diagnostic Tests

- Stool for occult blood
- Hemoglobin level
- Refer to physician for test for *Helicobacter pylori* (by serology or breath test)

Management

Goals of Treatment

- Relieve symptoms
- Promote healing of the esophagus
- Prevent complications such as stricture, bleeding, Barrett's esophagus
- Prevent recurrence

Appropriate Consultation

Consult a physician if the following are detected:

- Weight loss due to severity or duration of symptoms
- Difficult or painful swallowing
- Sticking of solids or liquids
- Persistent vomiting
- Nocturnal cough or shortness of breath
- Anemia
- Stool positive for occult blood
- Client with new onset of symptoms

Nonpharmacologic Interventions

- Elevate the head of the bed using 4-6 inch (10-15 cm) wooden blocks
- Encourage weight loss (if appropriate)
- Eliminate (when possible) drugs that impair esophageal motility and lower esophageal sphincter tone (e.g. calcium-channel blockers, β -blockers, tricyclic antidepressants, anticholinergics, theophyllines)
- Offer smoking cessation

Client Education

- Counsel client about appropriate use of medications (dose, frequency)
- Recommend dietary modifications (decrease or eliminate coffee, tea, chocolate, alcohol, fatty foods, citrus fruits, mints)
- Recommend small, frequent meals to prevent overdistension of the stomach
- Recommend avoidance of eating for 2-3 hours before bedtime
- Recommend postural modifications (daytime and nocturnal) to prevent acid from entering the esophagus
- Recommend that client avoid bending at the waist or lying down immediately after a meal
- Recommend avoidance of tight-fitting clothing
- No tobacco

Pharmacologic Interventions

Antacids as needed to control symptoms:

aluminum hydroxide/magnesium hydroxide, 30 mL PO pc and hs, increase prn or

aluminum/magnesium/simethicone, 30 mL PO pc and hs, increase prn

H₂-receptor antagonists:

ranitidine, 150 mg PO bid for 6 weeks

In elderly clients and those with reduced renal function, the doses should be one-half to one-quarter the usual doses.

Refer to physician if symptoms not controlled with H₂-receptor antagonists for evaluation for proton pump inhibitors.

Proton Pump Inhibitors (by physician order)

Proton pump inhibitors (e.g. *rabeprazole*) are a class of drugs used to treat refractory symptoms of GERD. They are more effective for healing esophageal ulceration and maintain the remission of symptoms much better than

H₂-receptor antagonists. These drugs do not reverse Barrett's esophagus, but may prevent worsening of the disease.

Maintenance therapy for moderate to severe GERD is often needed, as the recurrence rate is high (75% to 90%). Cost and safety are concerns with long-term use of proton pump inhibitors. The lowest dose possible should be used.

Antireflux Surgery

Antireflux surgery is effective in controlling GERD in 90% of well-selected clients. Indications for surgery include intractable reflux esophagitis (in a young person) and major complications such as aspiration, recurrent stricture or major GI bleeding.

Monitoring and Follow-Up

Follow up in 2-3 weeks; if better, continue to treat for another 6-8 weeks.

Referral

Refer to a physician if symptoms are not controlled with therapy.

Peptic Ulcer Disease

Definition

An ulceration of the mucous membrane of the upper digestive tract. Usually refers to a duodenal or gastric ulcer.

Causes

Bacterial infection with *Helicobacter pylori*.
NSAID

Risk Factors

- Severe stress
- Chronic gastritis
- Smoking
- Genetic factors

History

- Symptoms may be vague or absent, classical or atypical (some people with a duodenal ulcer have no symptoms, whereas some with ulcer-like symptoms have no ulcer)
- Chronic benign disease with exacerbations and remissions
- Epigastric burning, gnawing, heartburn
- Discomfort varies, from mild to severe
- Discomfort located near midline between xiphoid and umbilicus or in right upper quadrant
- Symptoms begin 1-3 hours after meals, when stomach becomes empty
- May awaken person from sleep
- Quickly relieved by food, milk or antacids
- Nausea may be present
- Melena or hematemesis indicates complications
- Assess use of alcohol, ASA, anti-inflammatory drugs, tobacco (smoking and chewing)
- Dietary habits

The natural history of a benign ulcer is that two-thirds will recur in the first year after treatment.

Physical Findings

Epigastric tenderness.

Differential Diagnosis

- Gastritis
- GERD
- Irritable bowel syndrome
- Malignant gastric ulcer

- Diverticulitis
- Pancreatitis

Complications

- Chronic blood loss, anemia
- Severe pain
- Sudden hemorrhage, which can lead to hypotension
- Perforation
- Obstruction of the gastric outlet
- Malnutrition

Diagnostic Tests

- Stool for occult blood
- Hemoglobin level
- Refer to physician for diagnostic testing to confirm presence of *H. pylori*

Management

Goals of Treatment

- Relieve pain
- Reduce stomach acid
- Promote healing
- Prevent complications

Appropriate Consultation

If condition not resolved, consult.

Consult a physician if complications are identified or active bleeding is *present*

Nonpharmacologic Interventions

Client Education

- Explain the nature of the disease and the expected outcome
- Counsel client about appropriate use of medications (dose, frequency, purpose and importance of compliance)
- Recommend small, frequent meals that are lightly spiced or not spiced at all
- Recommend avoidance of all foods known to increase pain (e.g. large fatty meals, very sweet foods)
- Recommend avoidance of all caffeinated beverages (tea, coffee, colas)
- Recommend avoidance of alcohol

- Recommend avoidance of ASA and other anti-inflammatory drugs
- Recommend tobacco cessation
- Counsel client about reducing stress at home and at work
- Teach client the signs of complications that should be followed up immediately

Pharmacologic Interventions

Antacids as needed to control symptoms:
*aluminum hydroxide/magnesium hydroxide or
 aluminum/magnesium/simethicone, 30 mL PO
 1 and 3 h pc, hs and prn*

Reduce production of stomach acid:
ranitidine, 150 mg PO bid for 6 weeks

Triple Therapy for *H. pylori*

Anyone testing positive for *H. pylori* will need to undergo triple-drug therapy for eradication, as ordered by a physician.

Monitoring and Follow-Up

Follow up in 2 weeks to assess response to therapy. Follow up again in 4-6 weeks. Discontinue medications if symptoms have resolved.

Referral

Refer to a physician if there is no improvement with treatment or if complications develop.

Gallbladder Disease: Biliary Colic And Cholecystitis

Definition

The spectrum of gallbladder disease ranges from asymptomatic gallstones to biliary colic, cholecystitis, choledocholithiasis and cholangitis.

Cholecystitis is inflammation of the gallbladder caused by obstruction of the cystic duct, usually by a gallstone (calculous cholecystitis). The inflammation may be sterile or bacterial. The obstruction may be acalculous or caused by sludge.

Choledocholithiasis occurs when the stones become lodged in the common bile duct; from this, cholangitis and ascending infections can occur.

Causes

Biliary Colic

Gallstones temporarily obstruct the cystic duct or pass into the common bile duct.

Cholecystitis

The cystic duct or common bile duct becomes obstructed for hours, or gallstones irritate the gallbladder. Bacterial infection is thought to be a consequence, not a cause, of cholecystitis.

The most common organisms are *E. coli*, *Klebsiella* spp. and enterococci. Stones of the common bile duct (occurring in 10% of patients with gallbladder disease) are secondary (from the gallbladder) or primary (formed in the bile ducts).

Risk Factors

The phrase "fair, fat and fertile female" summarizes the major risk factors for gallstones. Although gallstones and cholecystitis are more common in women, men with gallstones are more likely to experience cholecystitis than women with gallstones. It is unknown if women who are pregnant or have multiple pregnancies are more likely to have gallstones or if they simply have more symptoms of the stones.

Some oral contraceptives and estrogen replacement therapy may increase the risk of gallstones.

Rates of gallstones, cholecystitis and stones of the common bile duct increase with age. Elderly clients are more likely to have asymptomatic gallstones that result in serious complications without gallbladder colic.

The causes of gallstones in teenagers are the same as for adults, and there is a higher prevalence among girls and during pregnancy.

History

Most gallstones (60% to 80%) are asymptomatic. Small stones are more likely to be symptomatic than large ones. Almost all patients experience symptoms before complications occur. Indigestion, belching, bloating and intolerance of fatty food are thought to be typical symptoms of gallstones; however, these symptoms are just as common in people without gallstones and frequently are not cured by cholecystectomy.

Biliary Colic

- 1-5 hours of constant pain, commonly in the epigastrium or right upper quadrant
- Pain may radiate to the right scapular region or back
- Client tends to move around to seek relief from pain
- Onset of pain occurs hours after a meal, frequently at night, waking the client from sleep
- Peritoneal irritation by direct contact with the gallbladder localizes the pain to the right upper quadrant
- Pain is severe, dull, or boring and constant (not colicky)
- Associated symptoms include nausea, vomiting, pleuritic pain and fever

Cholecystitis

- Persistence of the biliary obstruction leads to cholecystitis
- Persistent right upper quadrant pain
- The character of the pain is similar to the pain associated with gallbladder colic, except that it is prolonged and lasts for hours or days
- Nausea, vomiting and low-grade fever are more commonly associated with cholecystitis

Physical Findings

- Vitals signs parallel the degree of illness
- Clients with biliary colic have relatively normal vital signs
- Clients with cholangitis are more likely to have tachycardia or hypotension (or both) and fever
- Fever may be absent, especially in elderly clients
- Jaundice (in < 20% of patients)

Abdominal Examination in Gallbladder Colic and Cholecystitis

- Epigastric or right upper quadrant tenderness
- Murphy's sign (an inspiratory pause on palpation of the right upper quadrant; specific but not sensitive for gallbladder disease)
- Guarding on palpation
- Fullness in the right upper quadrant may be palpated

As in anyone with abdominal pain, a complete physical examination must be performed (including rectal and pelvic examinations in women). In elderly and diabetic clients, occult cholecystitis or cholangitis may be the source of fever, sepsis or changes in mental status.

Differential Diagnosis

- Appendicitis
- Acute bowel obstruction
- Ascending cholangitis
- Cholelithiasis
- Diverticular disease
- Gastroenteritis
- Hepatitis
- Inflammatory bowel disease
- Mesenteric ischemia
- Myocardial infarction
- Pancreatitis
- Bacterial pneumonia
- Eclampsia
- Hyperemesis gravidarum
- Urinary tract infection
- Renal calculi

Complications***Biliary Colic***

- Cholecystitis

Acute Cholecystitis

- Perforation
- Gangrene
- Peritonitis
- Cholangitis
- Abscess
- Fistula
- Pancreatitis
- Ileus

Diagnostic Tests

The choice of laboratory tests will depend on whether the client is well enough to be treated as an outpatient or requires admission to hospital. The results of lab tests should be completely normal if the client has cholelithiasis or gallbladder colic.

- White blood cell (WBC) count and liver function tests (LFTs) (AST, ALT, bilirubin and alkaline phosphate levels) may be helpful in the diagnosis of cholecystitis
- An elevated WBC count is expected; however, a normal value does not rule out cholecystitis
- Bilirubin >3.5 $\mu\text{mol/L}$ may indicate stone in the common bile duct or ascending cholangitis
- Mild elevation of amylase (up to 3 times normal level) may be present in cholecystitis, especially if there is gangrene
- Urinalysis
- Pregnancy test for women of childbearing age

Management Of Biliary Colic***Goals of Treatment***

- Relieve pain, nausea and vomiting
- Prevent complications

Appropriate Consultation

Consult physician if pain does not resolve, if fever develops or if significant vomiting continues, as these symptoms indicate that a complication may be developing.

Nonpharmacologic Interventions

- Bed rest
- Clear fluids if vomiting

Client Education

- Explain disease process and prognosis
- Counsel client about appropriate use of medications (dose, frequency)
- Recommend low-fat food as tolerated, once pain resolves

Pharmacologic Interventions**Analgesia**

Primary pain should be controlled with anticholinergic antispasmodics:

hyoscine butylbromide, 10 mg IM q6h

prn (max 100mg/day) hyoscine

butylbromide,

10mg, 1-2 tabs, PO q6h (max 6 tabs/day)

Secondary pain should be controlled with meperidine; **do not use morphine**, which may increase tone in the Oddi's sphincter:

meperidine, 50-100 mg IM q3-4h prn

Consult physician for IV order

Antiemetics to relieve vomiting and nausea:

dimenhydrinate, 25-50 mg IM q4- 6h prn

Monitoring and Follow-Up

Monitor for a few hours. When nausea and vomiting have resolved, push clear fluids.

Follow-up in 24 hours is recommended. If pain increases, fever develops, or the client is unable to tolerate intake by mouth because of vomiting, manage as for acute cholecystitis.

Management Of Cholecystitis**Goals of Treatment**

- Relieve pain, nausea and vomiting
- Prevent complications

Appropriate Consultation

Consult physician if pain does not resolve, if fever develops or if significant vomiting continues indicating that a complication may be developing.

Adjuvant Therapy

For clients with severe pain prehospital care should include the following:

- Oxygen, if client is unstable on presentation
- IV therapy with normal saline, rate adjusted according to age, state of hydration and pre-existing medical problems

Nonpharmacologic Interventions

- Bed rest
- Nothing by mouth

Pharmacologic Interventions**Analgesia**

Pain control should be given early, without waiting for the diagnosis or surgical consult.

Primary pain control should be with anticholinergic antispasmodics:

hyoscine butylbromide,

10 mg IM q6h prn (max 100mg/day)

Secondary pain control should be with meperidine; do not use morphine, which may increase tone in the Oddi's sphincter:

meperidine, 50-100 mg IM q3-4h prn

Antiemetics

dimenhydrinate, 25-50 mg IM q4-6h

Meperidine and dimenhydrinate can be mixed in the same syringe, but should be used immediately.

Antibiotics

For mild cholecystitis, where inflammation is the primary process, antibiotics are not usually used.

For acute cholecystitis (if client is febrile and acutely ill), draw a blood sample for culture and consult physician for IV antibiotics.

For clients with allergy to penicillin use only metronidazole.

Monitoring and Follow-Up

Monitor pulse oximetry, vital signs (frequent), blood glucose, intake and output.

Severe cholecystitis can evolve into sepsis or cholangitis, especially in diabetic or elderly clients in whom the diagnosis may be delayed.

Referral

Medevac as soon as possible; surgical consult is required.

Abdominal Hernia

Definition

Protrusion of part of the abdominal contents through a weakness in the abdominal wall.

Causes

- Weakness of abdominal wall muscles
- Predisposing factors: abdominal surgery, age, heavy lifting, chronic cough, chronic straining to pass stool or to urinate

History

- Presence of predisposing factor
- Soft, non-tender swelling on abdominal wall
- Pain absent
- Hernia usually appears when client is standing or when straining at bowel movements
- Hernia may disappear when client is lying down
- Pain indicates development of complications
- Inguinal (groin), abdominal (incisional) hernias common

Physical Findings

- Swelling may be seen in groin, may extend into scrotum
- Swelling may be seen on upper anterior thigh (femoral hernia) or abdomen
- Hernia disappears upon lying down, reappears upon standing up or bearing down
- Defect in abdominal wall may be palpable
- Hernia can be pushed back (reduced) through the opening into the abdomen

A painful or non-reducible inguinal mass should be considered a strangulated hernia until it is proven otherwise.

Differential Diagnosis

- Enlarged inguinal lymph node
- Hydrocele
- Testicular mass
- Dilated vein

Complications

- Strangulated hernia
- Bowel obstruction

Diagnostic Tests

None.

Management

Goals of Treatment

- Reduce swelling
- Support weak abdominal wall
- Relieve discomfort
- Prevent recurrence and further enlargement

Appropriate Consultation

Consult a physician immediately if the hernia is not reducible, if it is painful, or if it is associated with symptoms and signs of bowel obstruction. Consult a physician immediately if a painless femoral hernia is suspected.

Nonpharmacologic Interventions

With client lying down, attempt to reduce the inguinal or incisional hernia with gentle manual reduction.

- Do not use force
- Do not attempt to reduce a femoral hernia

Client Education

- Explain disease process, expected course and need for follow-up
- Demonstrate proper lifting techniques
- Teach client signs and symptoms of complications and advise him or her to return to the nursing station if these occur

Monitoring and Follow-Up

Follow as necessary until surgical consult takes place. Monitor for the development of bowel obstruction.

Referral

Arrange elective follow-up with physician for surgical consult. Medevac if there are symptoms of strangulation or bowel obstruction.

Irritable Bowel Syndrome

Definition

Functional disturbance of intestinal motility.

Cause

- Largely unknown
- Predisposing factors: insufficient dietary fiber, emotional stress, food sensitivity, laxative abuse

History

- Usually begins before age 40
- More common in women
- Symptoms vague and long term
- Chronic condition with remissions and exacerbations
- Altered stool frequency and/or consistency
- Diffuse lower-abdominal pain or discomfort
- Pain of variable intensity; may persist for hours or days
- Looser, more frequent bowel movements may occur with onset of pain
- Pain exacerbated by meals, bowel movements or stress
- Pain relieved by defecation
- Weight loss, malaise, may have a fever
- Interference with daily activities
- No rectal bleeding or blood in stool
- White mucus frequently present

Physical Findings

- Client may appear quite well or in mild distress
- Abdomen may be distended
- Bowel sounds present and may be increased or decreased
- Colon may be tender and "rope-like"
- Compression of colon may reproduce symptoms

Differential Diagnosis

- Constipation
- Gastroenteritis
- Lactose intolerance
- Inflammatory bowel disease
- Drug-induced diarrhea or constipation
- Biliary colic

Complications

- Chronic abdominal symptoms

Diagnostic Tests

- Stool for occult blood
- Stool for culture and sensitivity, ova and parasites
- Hemoglobin level

Management

Goals of Treatment

- Relieve symptoms
- Establish regular bowel habits
- Identify or modify precipitating stresses

Nonpharmacologic Interventions

Client Education

- Recommend dietary modifications (e.g. regular meals, gradual increase of fiber)
- Recommend increase in fiber content of diet (e.g. raw bran, brown bread, popcorn, All-Bran, Puffed Wheat or Shredded Wheat cereal); when raw (miller's) bran is used, start with a small amount and increase **gradually** to 1/4 to 1/2 cup daily to avoid bloating and flatulence
- Recommend avoidance of foods that are known to cause symptoms (these vary from person to person)
- Recommend that client consume an adequate amount of fluid when using bulking agents
- Recommend elimination of nicotine and codeine-containing drugs
- Teach relaxation techniques and emphasize the importance of exercise to help with stress-induced symptoms
- Assist client to identify specific stress factors that exacerbate symptoms
- Assist client to gain insight into identifiable emotional factors
- Offer understanding and support, as this is an incompletely and poorly understood syndrome

Pharmacologic Interventions

Start a stool-bulking agent:

psyllium hydrophilic mucilloid, 1-2 tsp (5-10 mL) bid or tid with 8 oz (250 mL) fluid

Monitoring and Follow-Up

- Follow up in 1-2 weeks
- Adjust the dose of fiber depending on response
- Use less fiber temporarily if gas and bloating are prominent
- Use more fiber if there has been little clinical response

Referral

Refer to a physician if symptoms or signs of organic disease are present or if symptoms do not improve with management.

Diverticulitis

Definition

Inflammation and infection in one or more diverticula.

History

- Abdominal pain may present acutely, but more often develops over hours to days, with left lower quadrant pain
- Fever and chills
- Tachycardia
- Anorexia
- Nausea and vomiting

Physical Findings

- Fever
- Tachycardia
- Abdominal tenderness to palpation with possible rebound tenderness
- Palpable mass may be present, representing an abscess or inflammatory phlegmon
- Bowel sounds may be active if there is partial obstruction, or hypoactive or absent if peritonitis has developed
- Rectal exam may help to identify the abscess or inflammatory mass

Differential Diagnosis

- Appendicitis
- Inflammatory bowel disease
- Ischemic colitis
- Colon cancer
- Other causes of bowel obstruction
- Urologic or gynecologic disorders

Complications

- Abscess
- Perforation
- Fistula
- Peritonitis
- Sepsis

Diagnostic Tests

- Stool for occult blood
- Urinalysis

Management

Goals of Treatment

- Rest the bowel
- Relieve symptoms
- Prevent complications

Appropriate Consultation

Consult a physician.

Nonpharmacologic Interventions

- Nothing by mouth
- Nasogastric tube

Adjuvant Therapy

Start IV therapy with normal saline to maintain hydration in client with moderate to severe symptoms.

Pharmacologic Interventions

- Broad-spectrum antibiotics such as ampicillin, gentamicin, clindamycin or cefoxitin are used; consult a physician before starting IV antibiotics
- Antibiotics should be continued for 7-10 days

Referral

Medevac. Surgery may be required if there is peritonitis, with or without evidence of perforation, unresolved obstruction or development of a fistula. Other indications for surgical intervention are failure to improve after several days of medical treatment and recurrence after successful treatment.

Emergencies Of The Gastrointestinal System

Abdominal Pain (Acute)

History

The area of the pain, including its origin and pattern of radiation, time of onset, nature and associated symptoms, will frequently help in making the diagnosis. A menstrual history should be obtained.

Associated Symptoms

- Weight loss may indicate malignancy or malabsorption
- Vomiting may be associated with small-bowel obstruction or volvulus
- Diarrhea and constipation may suggest inflammatory bowel disease, cancer, constipation, malabsorption
- Melena or blood per rectum indicates GI bleeding, which may be associated with peptic ulcer disease, esophageal varices or colon cancer, or may be drug induced
- Check stool by hemoculture; if negative, consider foods (e.g. Kool-Aid, beets) or medicines (iron) as cause
- Jaundice may suggest pancreatic cancer (painless), hepatitis, hemolysis, sickle cell anemia (G6PD [glucose-6-phosphate dehydrogenase] deficiency), alcoholic hepatitis, choledocholithiasis or primary biliary cirrhosis
- Urinary symptoms (dysuria, frequency, urgency, hematuria)
- Renal problems often present with abdominal pain; consider urolithiasis, urinary tract infection or testicular torsion
- Sexual activity, last period, birth control use, history of sexually transmitted infection, vaginal discharge, spotting or bleeding: consider pregnancy or ectopic pregnancy, pelvic inflammatory disease, ovarian torsion or ruptured ovarian cyst

Medical History

- Other major illnesses
- Prior surgery
- Prior studies performed for evaluation of abdominal problems
- Family history of similar complaints

- Medications, especially digoxin, theophylline, steroids and tetracycline (for esophageal ulcers), analgesics, antipyretics, antiemetics, barbiturates, diuretics, alendronate (for esophageal ulcers)

Physical Examination

Vital Signs

- Signs of shock, infection (elevated temperature)
- Signs of dehydration, with dry mucous membranes and decreased skin turgor

Abdominal Examination

Inspection

Scaphoid appearance or distension, point of most severe pain, hernia, scars.

Auscultation

- High-pitched bowel sounds suggest obstructive process
- Absent bowel sounds suggest ileus

Palpation and Percussion

- Muscle rigidity (voluntary or involuntary)
- Localized tenderness, masses, pulsation, hernias, peritoneal irritation (cough or jumping may also elicit "rebound")
- Involuntary guarding
- Murphy's sign (right upper quadrant pain when breathing in and pressing over the liver)
- Liver dimension and spleen dimension
- Tenderness of costovertebral angle
- Pelvic exam in women
- Rectal exam to rule out GI bleeding, prostatitis, etc.
- Absence of rectal tenderness does not preclude or confirm diagnosis of appendicitis

Diagnostic Tests (If Available)

- Stool for occult blood
- Hemoglobin
- WBC count
- Urinalysis
- Pregnancy test for all reproductive-age females, unless status is post-hysterectomy
- Chest x-ray (if available) to rule out pneumonia
- ECG

Table 2: Differential Diagnosis of Abdominal Pain

Diagnosis	Usual location of pain	Comments
Hepatitis, subphrenic abscess, hepatic abscess	RUQ may radiate to right shoulder	Elevated liver enzymes Jaundice
Cholecystitis, cholelithiasis, cholangitis	RUQ, mid-epigastric region; radiates to back and right scapula	Sudden onset associated with nausea
Pancreatitis	mid-epigastric region; radiates to back	May have signs of peritonitis
Duodenal ulcer or gastric ulcer	mid-epigastric region, LUQ; radiation to back if posterior ulcer; peritonitis with perforation	
Splenic hematoma or enlargement	LUQ	Hypotension and peritonitis if ruptured
Aortic aneurysm	Peri-umbilical, especially into back flanks; may present as epigastric or back pain, flank or hip pain	May be colicky; hypotension if ruptured
Appendicitis	Early; periumbilical; late: RLQ	May present with peritoneal signs, especially in elderly people
Crohn's disease or ulcerative colitis	RLQ, but may be LLQ	Diarrhea (bloody in ulcerative colitis), cramps, elevated sedimentation rate
Mesenteric adenitis	RLQ	Pain secondary to enlarged mesenteric nodes from streptococcal pharyngitis
Spontaneous bacterial peritonitis	Generalized, with peritoneal signs	Usually in alcoholic people, people with indwelling catheters and those on dialysis
Diverticulitis	Generally LLQ, very rarely RLQ; may be generalized	Clinical diagnosis (pain + diarrhea, vomiting, fever)
Meckel's diverticulum	Below or to left of umbilicus	May be recurrent; presents with rectal bleeding or intestinal obstruction
Urolithiasis or nephrolithiasis	Either flank; may radiate to labia or testicles	Colicky; may have blood in urine; need intravenous pyelogram
Cystitis	Suprapubic	Urinalysis may show blood and leucocytes
Gynecologic disease, including ovarian cyst, ovarian torsion, ectopic pregnancy, Mittelschmerz, PID	Pain in pelvis, either adnexal area; radiation to groin; may also radiate to right shoulder if free intraperitoneal bleeding	Pregnancy test, cervical cultures, ultrasonography to rule out ectopic pregnancy if this possibility exists
Metabolic disease such as diabetic ketoacidosis, Addison's disease	Pain may be diffuse; may have guarding	Associated with nausea and vomiting
Pneumonia	May mimic appendicitis	Cough and chest pain may also be present
Cardiac disease	May present as epigastric pain	ECG to rule out cardiac disease, especially if risk factors present; may be confused with esophageal reflux

Management***Initial Decision***

Decide whether to admit and observe, discharge, or refer for surgical opinion.

Appropriate Consultation

Consult a physician if the diagnosis is unclear and the presentation appears serious.

Nonpharmacologic Interventions

- Nothing by mouth until diagnosis is clear
- Consider nasogastric tube for vomiting, bleeding or suspected bowel obstruction
- Consider Foley catheter

Adjuvant Therapy

- Start IV therapy with normal saline and hydrate accordingly

Pharmacologic Interventions

Choice of medication will depend on the presentation and the severity of the pain as judged by the client.

Monitoring and Follow-Up

- Monitor pain, vital signs, management and any associated fluid losses closely with intake and output

Referral

Medevac for evaluation if diagnosis is uncertain and the client's condition warrants urgent evaluation.

Pancreatitis (Acute)

Definition

Inflammation of the pancreas.

Causes

- Excessive or chronic alcohol abuse
- Recent alcohol binge
- Acute cholecystitis
- Abdominal trauma
- Penetrating duodenal ulcer

History

- Steady, boring abdominal pain
- Pain located in epigastrium and periumbilical area
- Pain radiates through to back, flanks, lower abdomen and chest
- Pain is relieved by sitting up and leaning forward, aggravated by lying down
- Nausea, vomiting, abdominal distension present
- History of biliary disease or gallstones
- Past or current use of thiazide diuretics, estrogen, azathioprine steroids, sulfasalazine

Physical Findings

- Temperature elevated
- Heart rate elevated
- Blood pressure may be low
- Postural blood pressure drop may be present
- Client anxious, in acute distress
- Distress increased when lying down
- Abdomen may be distended
- Bowel sounds reduced to absent (paralytic ileus)
- Respiratory findings may be present: basal crackles, left-sided atelectasis, pleural effusion
- Acutely tender with muscle guarding and rigidity
- Rebound tenderness present

Differential Diagnosis

- Peptic ulcer disease
- Severe gastritis
- Acute cholecystitis
- Lower lobe pneumonia
- Intestinal obstruction

Complications

- Hypotension
- Shock
- Paralytic ileus
- Sepsis
- Hyperglycemia
- Adult respiratory distress syndrome
- Death

Diagnostic Tests

- Blood glucose level (may be elevated)
- Urinalysis
- WBC count (if possible)

Management

Goals of Treatment

- Relieve symptoms
- Maintain hydration
- Prevent complications

Appropriate Consultation

Consult a physician for help with diagnosis and treatment plan, for pre-hospital care.

Nonpharmacologic Interventions

- Bed rest
- Nothing by mouth
- Insert a nasogastric tube
- Insert a urinary catheter

Adjuvant Therapy

- Start a large-bore IV (14- or 16-gauge) with normal saline; replace volume deficits
- Adjust rate according to pulse, postural blood pressure drop, systolic blood pressure
- Aim for pulse < 100 bpm, systolic blood pressure > 100 mm Hg

Pharmacologic Interventions

Analgesia:

meperidine, IM or IV as per physician order

Antiemetics:

dimenhydrinate, 50 mg IM q6h prn

Monitoring and Follow-Up

- Measure hourly urinary output; adjust IV rate to maintain urine output
- Monitor blood glucose (hyperglycemia is common)
- Monitor pulse and blood pressure frequently until the client's condition stabilizes--watch for shock

- Observe for alcohol withdrawal if a recent binge is a known cause of pancreatitis

Referral

Medevac as soon as possible.

Appendicitis

Definition

Inflammation of appendix.

Cause

Obstruction of the opening of the appendix by stool. Infection may occur later.

History

The following outlines the classic pattern for acute appendicitis; however, the client may complain of various forms of abdominal, rectal and back pain depending on the location of the appendix.

- Vague, diffuse periumbilical or epigastric pain
- Pain shifts within hours to right lower quadrant
- Anorexia
- Nausea
- Vomiting usually occurs a few hours after onset of pain, but may not be present
- Low-grade fever may be present
- Urinary frequency, dysuria and diarrhea may develop if tip of appendix irritates the bladder or bowel
- In women, date of the last normal menstrual period and any history of recent menstrual irregularity should be noted

Physical Findings

Presentation is variable, depending on whether the client presents early or late in the evolution of the disease process.

- Temperature mildly elevated
- Heart rate elevated (may be normal in early stage)
- Variable level of distress
- Client holds abdomen, walks slowly and slightly bent over
- Bowel sounds variable: hyperactive to normal in early stages; reduced to absent in later stage
- Localized tenderness in right lower quadrant
- Muscle guarding in right lower quadrant
- Rebound tenderness may be present
- Rectal exam: tenderness in right lower quadrant if tip of appendix is near the rectum

Differential Diagnosis

Appendicitis is known as the "great mimic." The actual signs and symptoms depend on the location of the appendix within the abdomen.

- Gastroenteritis
- Crohn's disease
- Stone in ureter
- Mittelschmerz (ruptured follicular cyst)
- Ectopic pregnancy
- Pelvic inflammatory disease
- Twisted ovarian cyst
- Pyelonephritis
- Biliary colic
- Cholecystitis
- Peptic ulcer disease

Complications

- Abscess
- Localized peritonitis
- Perforation
- Generalized peritonitis
- Sepsis

Diagnostic Tests

- WBC count, if possible
- Urinalysis

Management

Goals of Treatment

- Maintain hydration
- Prevent complications

Appropriate Consultation

Consult a physician as soon as possible.

Nonpharmacologic Interventions

- Bed rest
- Nothing by mouth

Adjuvant Therapy

- Start IV therapy with normal saline
- Adjust IV rate according to age and state of hydration

Pharmacologic Interventions

Analgesia:

meperidine, IM or IV as per physician order

If transfer is delayed, discuss starting IV antibiotics as per physician order:

Monitoring and Follow-Up

Monitor vital signs and general condition frequently.

Referral

Medevac as soon as possible; surgical consult is required.

Obstruction Of The Small Or Large Bowel

Definition

Blockage of small or large bowel (partial or complete, mechanical or paralytic).

Causes

- Small bowel: strangulated hernia (40%), adhesions (30%), cancer, Crohn's disease
- Large bowel: cancer (70%), volvulus, diverticulitis, fecal impaction

History

- Pain
- Vomiting
- Inability to pass stool or gas
- Bloating
- Other symptoms, depending upon underlying disease process

The exact symptoms of obstruction depend on the location and severity of the obstruction. The higher the level of obstruction, the more acute and rapid the onset of symptoms.

Small-Bowel Obstruction

- Pain moderate to severe
- Intermittent waves of pain
- Relative comfort between waves of pain
- Vomiting frequent, violent, bilious when obstruction is high
- Vomiting feculent when obstruction is lower
- Abdominal bloating variable; prominent when obstruction is low
- Reduced rectal gas and stool
- Weakness

Large-Bowel Obstruction

- Pain moderately severe (generally less acute than in small-bowel obstruction)
- Colicky
- Distension present, occurs early, may be severe
- Vomiting usually late and infrequent, may be feculent
- Reduced or absent rectal gas and stool
- Sudden, severe pain characteristic of volvulus

Paralytic Ileus

- Obstruction of the bowel due to paralysis of the muscle of the bowel wall, caused by generalized peritonitis, any acute inflammation of the abdomen, severe chest injury or any acute illness
- Major symptom is distension, resulting in moderate discomfort
- Pain absent
- Frequent vomiting or regurgitation of gastric contents
- "Silent" distended abdomen on examination

Physical Findings

- Heart rate normal or increased
- Respiration normal or increased
- Blood pressure normal or low
- Postural blood pressure drop may be present
- Client appears mildly to severely ill
- Client doubles over with waves of pain in small-bowel obstruction
- Client pale, sweaty, anxious
- Various degrees of abdominal distension
- Hernia may be visible
- Contractions of bowel wall (peristalsis) may be seen
- Bowel sounds increased in early stages
- Peristaltic rushes, high-pitched tinkling sounds present
- Later, bowel sounds are diminished or absent
- Tenderness due to distension may be present
- Tender localized mass or hernia may be present
- Rebound tenderness and rigidity not present unless perforation, peritonitis or strangulation have occurred
- Rectal exam: blood or stool may be present, rectum may be empty
- Examine all hernial orifices, including both femoral rings

Differential Diagnosis

- Gastroenteritis
- Appendicitis
- Inflammatory bowel disease with distension
- Perforated ulcer
- Pancreatitis

Complications

- Perforation
- Peritonitis
- Strangulated segment of bowel
- Sepsis
- Hypotension, shock
- Death

Diagnostic Tests

- Stool for occult blood
- Urinalysis
- Hemoglobin (optional; may help with diagnosis and treatment)

Management***Goals of Treatment***

- Relieve distension
- Maintain hydration
- Prevent complications

Appropriate Consultation

Consult physician as soon as possible.

Nonpharmacologic Interventions

- Bed rest
- Nothing by mouth
- Insert a nasogastric tube, attach to low suction or to straight drainage
- Insert urinary catheter; measure hourly urinary output

Adjuvant Therapy

- Start a large-bore IV (14- or 16-gauge) with normal saline; replace volume deficits
- Adjust IV rate according to pulse, postural blood pressure drop, blood pressure, state of hydration, age, pre-existing medical problems
- Aim for pulse < 100 bpm, systolic blood pressure > 100 mm Hg

Pharmacologic Interventions

- If transfer is delayed, discuss starting IV antibiotics as per physician order.
- Analgesia may be necessary:
meperidine, IM or IV as per physician order

Monitoring and Follow-Up

Monitor ABC, vital signs, urinary output and general condition frequently.

Referral

Medevac as soon as possible.

Gastrointestinal Bleeding (Upper And Lower)

Definition

Sudden, rapid loss of blood from the gastrointestinal tract. GI bleeding is a complication of some other disease process.

Table 3: Causes of gastrointestinal bleeding

Category	Upper GI bleeding	Lower GI bleeding
Inflammatory	Peptic ulcer Severe gastritis Esophagitis Stress ulcer	Diverticulitis Crohn's disease Ulcerative colitis Enterocolitis
Mechanical	Mallory Weiss tear Hiatal hernia	Anal fissure Diverticulosis
Vascular	Esophageal varices	Hemorrhoids
Neoplastic	Carcinoma	Carcinoma and polyps
Systemic	Blood dyscrasias	Blood dyscrasias

History

- Usually a prior history of GI disease
- Hematemesis (vomiting of bright red blood or coffee-ground emesis)
- Melena (black, tarry stools)
- Hematochezia (passage of bright red blood from rectum)
- Sudden weakness or fainting
- Peptic ulcer disease: there may be a history of increasingly severe abdominal pain before onset of vomiting; vomiting will abruptly relieve pain

Physical Findings

- Signs of shock if bleeding is significant
- Pulse rapid and weak
- Respirations rapid
- Blood pressure low-normal or decreased
- Postural blood pressure drop
- Client pale and anxious
- Client weak and sweaty
- Bright red blood in vomitus or stool
- Bowel sounds initially hyperactive due to blood in bowel
- Bowel sounds may become reduced or absent
- Mild-to-severe tenderness may be present
- Signs of peritonitis may be present

Differential Diagnosis

Upper GI Bleeding

- Peptic ulcer
- Esophageal varices
- Severe gastritis

Lower GI Bleeding

- Diverticular disease
- Inflammatory bowel disease
- Cancer colon

Complications

- Hypotension
- Shock
- Peritonitis
- Death

Diagnostic Tests

- Measure hemoglobin
- Test stool for occult blood
- Check stool for gross blood

Management

Goals of Treatment

- Replace circulating blood volume

Appropriate Consultation

Consult a physician as soon as possible.

Nonpharmacologic Interventions

- Bed rest
- Nothing by mouth
- Insert nasogastric tube and empty the stomach for upper GI bleeding
- Insert urinary catheter; monitor hourly urinary output

Adjuvant Therapy

- Oxygen prn; to keep oxygen saturation > 97%
- Large-bore IV (14- to 16-gauge) with normal saline
- Start a second IV line for volume replacement if there are signs of hypovolemia

- Adjust IV rate according to estimated volume depletion, pulse rate, blood pressure, postural blood pressure drop and age

Monitoring and Follow-Up

Monitor ABC, vital signs and general condition closely, as active re-bleeding can occur.

Referral

Medevac as soon as possible.

Assessment Of The Urinary And Male Genital Systems

History Of Present Illness And Review Of System

General

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

- Onset (sudden or gradual)
- Chronology
- Current situation (improving or deteriorating)
- Location
- Radiation
- Quality
- Timing (frequency, duration)
- Severity
- Precipitating and aggravating factors
- Relieving factors
- Associated symptoms
- Interference with daily activities
- Previous diagnosis of similar episodes
- Previous treatments
- Efficacy of previous treatments

Cardinal Symptoms

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

Urinary System

- Frequency of urination
- Amount of urine (large or small)
- Urgency (client's sense that he or she must void now, cannot wait)
- Dysuria and its timing during voiding (at beginning or end, throughout, internal versus external dysuria)
- Nocturia (new onset or increase in usual pattern)
- Retention
- Incontinence
- Colour and odor of urine
- Hematuria
- Colicky pain
- Pain in costovertebral angle, flank or abdomen
- Suprapubic pain
- Perineal, genital, groin or low-back pain

Male Genital System

- Difficulty in starting or stopping urinary stream
- Voluntary bearing down (straining) to urinate
- Nature of stream (speed, strength, volume)
- Post-void dribbling or post-void fullness
- Discharge from penis, itching
- Lesions on the external genitalia
- Genital, groin, suprapubic or low-back pain
- Testicular pain or swelling
- Painful intercourse
- Sexual orientation
- Number of sexual partners
- Libido
- Erectile dysfunction
- Sexual practices, including risk behaviors (e.g. unprotected oral, anal or vaginal intercourse)
- Fertility (number of children)
- History of sexually transmitted infection (STI), including HIV and hepatitis B
- Testicular self-examination (frequency, regularity)
- History of hydrocele, epididymitis, prostatism, varicocele, hernia, undescended testis, spermatocele, recent vasectomy

Other Associated Symptoms

- Fever, chills, malaise
- Nausea, vomiting
- Diarrhea, constipation
- Decrease in appetite
- Change in sleep pattern

Medical History (Specific To Genitourinary System)

- Cystitis, pyelonephritis
- Renal disease
- Congenital structural abnormalities in the genitourinary (GU) tract
- Renal stones

- Recent onset of or increase in sexual activity
- Recent GU tract instrumentation (e.g. catheter, urethral dilatation, cystoscopy)
- Menopause (with no hormone replacement therapy)
- Use of tampons, douches
- Diabetes mellitus
- Immunocompromised
- STI (repeated)
- Sexual abuse
- Allergies
- Exposure to chemical irritants
- Medications (e.g. immunosuppressants, oral contraceptives, antihypertensives, antipsychotics)
- Risk behaviors (e.g. unprotected sex, alcohol or drug abuse, use of illicit injection drugs)

Family History (Specific To Genitourinary System)

- Urinary tract infections (e.g. due to environmental sensitivities or structural abnormalities)

- Renal disease (e.g. renal cancer, polycystic kidneys)
- Diabetes mellitus
- Kidney stones

Personal And Social History (Specific To Genitourinary System)

- Personal hygiene, toileting habits
- Sexual practices (risk behaviors, sexual orientation)
- Symptomatic sexual partner
- Use of contraceptive creams, foam, condoms, etc.
- Use of bubble bath, douches
- Tight-fitting underwear or other clothing
- Multiple sexual partners
- Disruption in sex life (from GU symptoms)
- Fear, embarrassment, anxiety
- Missing work, school or social functions because of GU symptoms (e.g. incontinence)

Physical Examination Of The System

General

- Apparent state of health
- Appearance of comfort or distress
- Colour (e.g. flushed, pale)
- Nutritional status (emaciated or obese)
- Match between appearance and stated age

Remember to also examine the following areas as part of your assessment:

- Head, eyes, ears, nose, throat: assess for pharyngitis and conjunctivitis (chlamydial infection, gonorrhea)
- Skin: assess for skin lesions, rashes, polyarthralgias of systemic gonorrhea and hydration status

Vital Signs

- Temperature
- Heart rate
- Respiratory rate
- Blood pressure

Urinary System (Abdominal Examination)

Inspection

- Previous abdominal or flank surgical scars
- Edema (facial, peripheral)

Palpation

- Suprapubic tenderness
- Bladder distension
- Abdominal tenderness or masses
- Costovertebral angle tenderness
- Enlargement of kidney (normal kidneys are usually not palpable unless client is thin)
- Inguinal nodes or swellings

Percussion

- Suprapubic or costovertebral angle tenderness
- Level of kidney
- Bladder distension

Male Genital Tract

Inspection

- Penis, scrotum and pubic area: inflammation, discharge, lesions, swelling, asymmetry, changes in hair distribution, nits, warts
- Rectum: lesions, discharge, swelling, hemorrhoids
- Inguinal and femoral areas (for hernia)

Palpation

- Penis: tenderness, induration, nodules, lesions
- Testes and scrotal contents: size, position, atrophy of testes, tenderness, swelling, warmth, masses, hydrocele
- Rectum: anal sphincter tone, rectal wall tumors, prostate gland
- Prostate: size, shape, contour, consistency, tenderness or nodules
- Superficial inguinal ring (for hernia)
- Inguinal and femoral areas (for hernia)

Laboratory Evaluation

- Urine: colour, cloudy or clear
- Dipstick testing: blood, protein, white blood cells (WBC), nitrites, pH
- Microscopic (spun urine): white and red blood cells, bacteria or casts, epithelial cells
- Culture and sensitivity of urethral discharge or prostatic secretions

Common Problems Of The Male Genitourinary System

Benign Prostatic Hyperplasia

Definition

Benign enlargement of prostate gland, which may result in obstruction of the bladder outlet.

Causes

- Unknown
- Predisposing factor: age > 55 years

History

Urinary symptoms occur when the prostate gland has enlarged to a size that produces partial obstruction of the bladder outlet.

- Continued sense of bladder fullness even after voiding
- Frequent urination in small amounts
- Sense of urgency
- Loss of stream force
- Hesitancy
- Straining to start flow
- Overflow incontinence
- Post-void dribbling
- Nocturia
- Hematuria may be an early symptom.
- Urinary tract infection or urinary retention may be the presenting complaint.

Table 1: American Urological Association symptom index for benign prostatic hyperplasia

Questions to be answered	Not at all	Less than one time in five	Less than half the time	About half the time	More than half the time	Almost always
1. Over the past month, how often have you had a sensation of not emptying your bladder completely after you finish urinating?	0	1	2	3	4	5
2. Over the past month, how often have you had to urinate again in less than 2 hours after you finished urinating?	0	1	2	3	4	5
3. Over the past month, how often have you found you stopped and started several times when you urinated?	0	1	2	3	4	5
4. Over the past month, how often have you found it difficult to postpone urination?	0	1	2	3	4	5
5. Over the past month, how often have you had a weak urinary stream?	0	1	2	3	4	5
6. Over the past month, how often have you had to push or strain to begin urination?	0	1	2	3	4	5
7. Over the past month, how many times did you most typically get up to urinate from the time you went to bed at night until the time you got up in the morning?	0 None	1 1 time	2 2 times	3 3 times	4 4 times	5 5 times

- sum of 7 circled numbers equals the symptom score

- Interpretation
- 0-7 = Mild - Candidate for watchful waiting with periodic evaluation
 - 8-19 = Moderate - Candidate for treatment options
 - 20-35 = Severe - Candidate for treatment options

Physical Findings

- Abdomen: bladder may be enlarged if acute urinary retention present; enlarged bladder may be palpable
- Rectal exam: prostate gland enlarged
- Prostate: normal consistency, top or margins may not be palpable, median sulcus may be indistinct

The clinical size of the prostate gland correlates poorly with the severity of symptoms. A client with mild clinical enlargement may present with very troublesome symptoms.

Differential Diagnosis

- Cystitis
- Cancer of the prostate
- Bladder tumor
- Calculi
- Prostatitis (chronic)
- Urethral stricture

Complications

- Recurrent urinary tract infections
- Acute urinary retention
- Hemorrhoids or hernias caused by straining with urination
- Renal damage secondary to chronic obstruction

Diagnostic Tests

- Obtain urine for urinalysis (routine and microscopy, culture and sensitivity)
- Rule out infection, hematuria and glycosuria
- Determine creatinine level
- Prostate surface antigen (PSA)

Management

Goals of Treatment

- Improve or eliminate symptoms
- Prevent the complications of long-term obstruction of bladder outlet (e.g. urinary tract infections, bladder stones, hydronephrosis)

Appropriate Consultation

Consult a physician if client's symptoms are severe and bothersome enough that he wants immediate treatment or if there is hematuria, nodularity of the prostate or unexpected back pain to rule out prostatic carcinoma.

Nonpharmacologic Interventions

- Instruct client to avoid fluids -- especially tea, coffee and alcohol -- before bedtime, as they tend to cause diuresis in the night
- Review any medications that the client is taking; discontinue if possible
- Cold remedies with decongestants, antihistamines, anticholinergics, antipsychotics, antidepressants and anxiolytics can cause poor bladder emptying and increase obstruction of the bladder outlet
- Advise client to report any sudden change in symptoms for re-evaluation

Pharmacologic Interventions

To improve symptoms, as ordered by physician

Monitoring and Follow-Up

If symptoms are mild, arrange elective follow-up with a physician. Client's symptoms should be monitored every 6 months, and a digital rectal exam performed annually. If symptoms are moderate to severe, refer for consultation (*see "Referral," below*).

Referral

Refer for urological consultation if symptoms are moderate to severe, causing inconvenience to the client, or if there are complications.

Epididymitis

Definition

Bacterial infection of epididymis.

Causes

- Client ≤ 35 years of age: usually an STI (*Neisseria gonorrhea*, *Chlamydia*)
- Client > 35 years of age: usually caused by urinary tract *pathogen* (*Escherichia coli*, *Klebsiella*, *Proteus*) or tuberculosis (TB)
- Risk factors in older age group: urinary tract infection, outflow obstruction, prostatic infection, instrumentation of the lower GU tract (e.g. catheterization), STI, prostatic surgery

History

- Unilateral scrotal pain and swelling
- Elevation of scrotum may provide relief of pain
- Fever, chills, malaise may be present
- Symptoms of cystitis or urethritis may be present (frequency, urgency, dysuria)

Physical Findings

- Temperature may be elevated
- Moderate distress
- Client walks slowly and carefully, sometimes holding scrotum
- Unilateral scrotal swelling and redness
- Urethral discharge may be present
- Scrotum acutely tender and warm to touch
- Epididymis enlarged, cord-like and acutely tender in early stages

Differential Diagnosis

- Testicular torsion - very important to rule out
- Infected sebaceous cyst, folliculitis
- Trauma
- Mumps orchitis
- Testicular tumor
- Spermatocoele
- Hydrocele
- Varicocele
- Tuberculosis

Complications

- Spread of infection to testis
- Abscess
- Sterility

Diagnostic Tests

- Urinalysis (routine and microscopy, culture and sensitivity)
- Urethral swabs for culture (*N. gonorrhea* and *Chlamydia*)
- HIV, Hepatitis B testing
- RPR testing

Management

In general, mild infections are treated on an outpatient basis; more severe infections, which are associated with fever and chills, require inpatient care.

Goals of Treatment

- Relieve symptoms
- Prevent complications of infection
- Prevent recurrence

Mild Infection

Appropriate Consultation

Consult a physician if there is concern about underlying non-infectious pathology, especially in a client > 35 years of age, or if symptoms are moderate to severe.

Nonpharmacologic Interventions

- Bed rest during acute phase (1-2 days)
- Elevation of scrotum to relieve pain
- Client should use a scrotal support when ambulatory
- Ice should be applied to scrotum for 20 minutes q2-3h to relieve pain
- Client should avoid heavy lifting, straining with stool and sexual intercourse during acute phase
- Advise client to return to the clinic for reassessment if symptoms worsen

Client Education

- Explain disease process and expected course
- Counsel client about appropriate use of medication (dose, frequency, side effects, completion of entire course prescribed)
- Counsel client about preventing spread of STIs to sexual partners

Pharmacologic Interventions

Analgesia and antipyretics for fever and pain:
acetaminophen, 500 mg, 1-2 tabs PO q4-6h prn

Antibiotics for young client with sexually transmitted infection (direct observed therapy by nurse): (Canadian STD Guidelines 1998 edition)
cefixime, 400 mg, 2 tabs PO stat and one of the following:

azithromycin, 1 g PO (single dose) tetracycline 500mg PO qid for 10 days
doxycycline 100mg PO bid for 10 days

For clients with allergy to cephalosporins or tetracycline:

erythromycin, 500 mg PO qid for 10 days

May also give:

ceftriaxone 250mg IM (single dose)

Antibiotics for client with nonsexually transmitted infection:

cotrimoxazole, 800/160 mg PO bid for 14 days
or
cephalexin, 250 mg PO qid for 14 days

Monitoring, Follow-Up and Referral

- Follow up in 48 hours and note response to therapy
- Follow up again in one week or when the course of antibiotics is completed

Severe Infection**Appropriate Consultation**

Consult a physician regarding choice of IV antibiotics.

Non pharmacologic Interventions

- Bed rest
- Ice packs should be applied to scrotum

Pharmacologic Interventions

Start IV therapy with normal saline to keep vein open.

Analgesia and antipyretics for fever and pain:

acetaminophen, 500 mg, 1-2 tabs PO q4-6h prn

For relief of moderate to severe pain:

acetaminophen with codeine 30mg, 1-2 tabs PO q4h prn

Antibiotics as per physician order.

Monitoring, Follow-up and Referral

Medevac as soon as possible.

Prostatitis (Acute)

Definition

Acute infection of the prostate gland.

Causes

The same organisms that cause cystitis (*E. coli*, *Proteus*, *Klebsiella*).

Risk Factors

- Urinary tract infection
- Prostatic calculi
- Age > 50 years

History

- Abrupt onset of fever and chills
- Genital pain (midline and achy)
- Pain in sacrum and low back may be present
- Dysuria, frequency, urgency (all symptoms of cystitis), nocturia
- Symptoms of bladder-neck obstruction may be present
- Flow and stream may be abnormal
- Pain with bowel movements
- Post-ejaculation pain
- Loss of libido

Physical Findings

- Temperature may be elevated
- Heart rate may be elevated
- Client in moderate-to-severe distress, may appear acutely ill
- Client walks slowly, with legs apart
- Bladder may be visibly distended on abdominal inspection
- Prostate gland enlarged, acutely tender, warm, with boggy consistency
- Small amounts of pus may be expressed from urethra
- Urine may be cloudy or clear
- Dipstick test: blood and protein may be present
- Microscopic examination of urine: bacteria, WBC and a few red blood cells (RBC) may be present

Differential Diagnosis

- Benign prostatic hyperplasia with urinary tract infection
- Epididymitis
- Urethritis
- Cystitis
- Pyelonephritis
- Malignancy

Complications

- Epididymitis
- Pyelonephritis
- Acute urinary retention
- Sepsis
- Abscess
- Chronic prostatitis

Diagnostic Tests

- Urinalysis (routine and microscopy, culture and sensitivity)
- Urethral swabs for culture (*N. gonorrhea* and *Chlamydia*) if an STI is suspected (because of history) or a urethral discharge is detected
- HIV testing
- RPR testing

Management

If the symptoms are mild to moderate, treat on an outpatient basis. If the symptoms are severe and the client appears acutely ill, inpatient care is required.

Goals of Treatment

- Relieve symptoms
- Prevent complications

Appropriate Consultation

Consult a physician, especially if the symptoms are severe or the client appears systemically unwell.

Nonpharmacologic Interventions

- Bed rest.
- Increase fluid for adequate hydration

Pharmacologic Interventions

Mild to Moderate Symptoms

Antibiotics:

Cotrimoxazole, 800/160 mg bid for 21 days
or

ciprofloxacin, 500mg bid x 21 days.

If recurrent prostatitis may need 6 weeks.

Severe Symptoms

IV therapy as per physician order

Manage fever and pain:

acetaminophen, 500 mg, 1-2 tabs PO q4h prn

Monitoring and Follow-Up

- Watch for distended bladder
- If the client is unable to void and has a distended bladder, have him sit in a tub filled with warm water and attempt to void into the water
- Do not catheterize See "*Acute Urinary Retention*," *this chapter*, if treatment as described here is not successful.

Referral

Medevac as soon as possible if symptoms are severe.

Common Problems Of The Urinary System

Asymptomatic Bacteriuria

Definition

Presence of bacteria in urine without symptoms.

Causes

- Anatomic structure (more common in women because the urethra is short and located close to the vagina)
- Hormonal changes (e.g. pregnancy, oral contraceptives)
- Relaxation of pelvic muscles (in elderly clients)
- Chronic prostatitis
- Contamination of specimen
- Indwelling catheters

History

- No urinary complaints
- Usually discovered on routine examination of urine
- Common in women 20-50 years of age
- Chronic low-grade prostatitis often present in men > 50 years of age
- Common in elderly clients and those with an indwelling urinary catheter

Physical Findings

Normal.

Laboratory Findings

- Urine: clear
- Dipstick test: normal
- Microscopic examination: bacteria evident
- Culture: positive in 24-48 hours

Ensure that the specimen is a properly collected sample of midstream urine.

Management

Goals of Treatment

- Recognize the significance of asymptomatic bacteriuria in the various subgroups (prenatal, immunocompromised, elderly)
- Eradicate bacteria from GU tract in pregnant women

Client Education

- Recommend adequate fluid intake to flush bacteria from the bladder and prevent stasis of urine (6-8 glasses of fluid per day)
- Instruct client about proper hygiene (wiping from front to back)
- Teach client the signs and symptoms of acute infection and advise client to return to the clinic if these occur

Pharmacologic Interventions

Pregnant Women

Treat all pregnant women with this condition to ensure resolution of the bacteriuria:

amoxicillin, 250-500 mg PO tid for 7 days

If not sensitive to amoxicillin, consult physician for alternate drug treatment.

For clients with allergy to penicillin: *nitrofurantoin, 100 mg PO bid for 7 days*

Other Groups: Older Men with Benign Prostatic Hyperplasia

Ask if there has been any change in symptoms, however small. If symptoms have increased, treat as for cystitis (see below); otherwise repeat urinalysis (routine and microscopy, culture and sensitivity).

Clients with Urinary Catheter

Consult with a physician, who may decide that condition may be left untreated. Antibiotic therapy would only encourage the growth of resistant strains of bacteria.

Elderly Clients

Antibiotic treatment is not needed. Simple measures such as increasing fluid intake, proper wiping, regular toileting and use of a commode help to reduce the bacterial numbers.

Healthy Non-Pregnant Women

If there have been no GU problems in the past and there are currently no symptoms, the problem is probably only contamination. Repeat the urinalysis (routine and microscopy, culture and sensitivity). Client education as above for nonpharmacologic interventions.

Cystitis

Definition

Bacterial infection of the bladder.

Causes

- *E. coli* (most common organism, in 80% to 90% of cases)
- Also *Klebsiella*, *Pseudomonas*, group B *Streptococcus* and *Proteus mirabilis*, *Chlamydia*

Risk Factors

- Female
- Poor perineal hygiene
- Diabetes mellitus
- Urinary instrumentation (e.g. catheter)
- Neurogenic bladder (because of stroke or multiple sclerosis)
- Congenital abnormality of GU tract
- Renal calculi
- Tumor
- Urethral stricture
- Pregnancy
- Increased sexual activity (in women)
- Use of spermicides, diaphragm
- Prostatic hypertrophy
- Immunocompromise (e.g. HIV infection)

History

- Dysuria
- Frequent urination, small amounts
- Urgency
- Suprapubic discomfort
- Rapid onset

In women, note presence of vaginal discharge, menstrual flow and use of a diaphragm.
In men, note presence of urethral discharge or symptoms suggestive of benign prostatic hyperplasia.

Physical Findings

- Temperature may be elevated
- Mild-to-moderate suprapubic tenderness
- Prostate may be enlarged

Laboratory Findings

- Urine: cloudy, concentrated

- Dipstick test: blood, protein and leucocytes in urine, nitrite positive
- Microscopic (spun urine): WBC, RBC and bacteria may be present

Differential Diagnosis

- Urethritis
- Vulvovaginitis
- Urinary calculi
- Renal TB
- STI
- Benign prostatic hyperplasia
- Diabetes mellitus
- Chronic prostatitis

Complications

- Ascending infection (pyelonephritis)
- Chronic cystitis

Diagnostic Tests

- Urinalysis (routine and microscopy, culture and sensitivity) only if the client is known to have an abnormality of the GU tract, if there is diagnostic uncertainty or if the client is pregnant. Otherwise, empiric antibiotic therapy is appropriate.
- Urine for culture and sensitivity if there is failure to respond to empiric therapy or a relapse occurs less than a month after therapy.
- Vaginal swab for analysis (routine and microscopy, culture and sensitivity) prn.
- Swabs for *N. gonorrhoea* and *Chlamydia* if an STI is suspected.
- Blood glucose level if symptoms suggest diabetes mellitus.

Management

Goals of Treatment

- Relieve symptoms
- Eradicate bacteria from the bladder

Client Education

- Counsel client about appropriate use of medications (dose, frequency, side effects, need to complete entire course of medications)
- Recommend increasing fluid intake (to 8-10 glasses per day)

- Instruct client in proper perineal hygiene (wiping from front to back) to prevent recurrence
- Recommend triple voiding (i.e. voiding before and immediately after intercourse, then drinking a large glass of water and voiding again within 1 hour) if client is a sexually active woman with recurrent cystitis. This process flushes out any organisms that may enter the urethra during intercourse.

Pharmacologic Interventions

Uncomplicated cystitis should be treated with a 10-day course of antibiotics:

cotrimoxazole 800/160 mg PO bid or

nitrofurantoin, 50 mg PO qid (or 100mg bid)

or

amoxicillin, 250-500 mg PO tid

Cystitis in pregnancy should be treated with a 7-day course of antibiotics:

amoxicillin, 250-500 mg PO tid If not sensitive to amoxicillin, consult with physician for alternate treatment.

Nitrofurantoin is contraindicated near term and during labor. Contact a physician for help in choosing an antibiotic if the client is allergic to penicillin or is near term.

Monitoring and Follow-Up

- If symptoms do not begin to resolve in 72 hours or if symptoms progress despite treatment, client should return to the clinic for reassessment
- Arrange follow-up after the completion of therapy and repeat the urinalysis and culture to ensure resolution of cystitis

Referral

Clients with chronic or recurrent cystitis should be referred to a physician. Men ≥ 50 years of age who present with a true (culture-positive) urinary tract infection for the first time should also be referred to a physician for further evaluation.

Pyelonephritis

Definition

Bacterial infection of the collection system of the kidney.

Causes

- *E. coli* (most common)
- Also *Enterobacter*, *Klebsiella*, *Pseudomonas* and *Proteus* (among others)
- In unresolving pyelonephritis, suspect TB of the kidney

History

- Flank pain
- Fever, shaking chills
- Nausea and vomiting
- Dysuria, frequency, urgency
- Abdominal pain

Physical Findings

- Temperature elevated
- Heart rate may be elevated
- Blood pressure may be mildly elevated
- Client appears moderately-to-acutely ill
- Mild, generalized abdominal discomfort
- Marked or severe pain with deep abdominal palpation of kidney
- Marked or severe costovertebral angle tenderness with percussion over kidney

Laboratory Findings

- Urine: cloudy, dark or bloody
- Dipstick test: positive for WBC, blood and nitrates, possibly protein
- Microscopic examination (spun urine): WBC, RBC, bacteria

Differential Diagnosis

- Pneumonia
- Acute cholecystitis with fever
- Appendicitis
- Acute pancreatitis

Diagnostic Tests

- Obtain urine for urinalysis (routine and microscopy, culture and sensitivity)

Management

Early or mild infections may be treated on an outpatient basis. **Moderate or severe** infections usually require inpatient treatment.

Goals of Treatment

- Eradicate bacterial infection
- Prevent complications

Appropriate Consultation

Moderate or Severe Infection

- Consult a physician regarding IV antibiotics
- If unable to consult, start empiric IV antibiotic therapy

Adjuvant Therapy

Moderate or Severe Infection

- Start IV therapy with normal saline
- Adjust IV rate according to age and other medical problems (e.g. diabetes mellitus, heart disease)

Nonpharmacologic Interventions

Mild Infection

- Increase fluid intake (to 8-10 glasses of fluid per day)
- Bed rest until symptoms improve

Client Education

- Counsel client about appropriate use of medications (dose, frequency, completion of entire course of antibiotics)
- Instruct client about proper hygiene to prevent recurrence of infection

Pharmacologic Interventions

Mild Infection

Early or mild infections may be treated on an outpatient basis.

Oral antibiotics--use one of the following for 10-14 days:

cotrimoxazole 800/160 mg PO bid or ciprofloxacin 500mg PO bid for 14 days

or

amoxicillin, 1g PO stat then 500 mg PO tid

Empiric therapy with amoxicillin will be 20% less effective than with cotrimoxazole because of resistant strains of *E. coli*, but this is the best choice if there is an allergy to sulfa drugs.

Analgesia and antipyretics:

acetaminophen, 500 mg, 1-2 tabs PO q4-6h

Moderate to Severe Infection

Analgesia and antipyretics for fever and pain:

acetaminophen, 325 or 500 mg, 1 or 2 tabs PO q4-6h prn

Antiemetics to control severe nausea and vomiting:

dimenhydrinate, 50-75 mg IM

Antibiotics:

As ordered by physician.

Extra consideration is required in choosing drugs for a pregnant woman. Consult a physician.

Monitoring and Follow-Up

Mild Infection

- Follow up in 2-3 days to determine clinical response to therapy
- In 14 days, repeat the urinalysis and culture to ensure resolution of the infection

Moderate to Severe Infection

- Monitor response to therapy, vital signs and urinary output

Referral

Moderate to Severe Infection

Medevac to hospital as soon as possible.

Young men who present with pyelonephritis for the first time and clients with recurrent pyelonephritis should be referred to physician for further investigation.

Renal Colic (Calculi)

Definition

Pain produced by the presence and movement of a stone within the ureter or renal pelvis.

Causes

- Familial predisposition to formation of calcium stones
- Increased dietary intake of calcium
- Dehydration
- Hyperuricemia (may be associated with gout)
- Recurrent urinary tract infections
- Bone resorption
- Prolonged immobilization
- Other genetic disorders (e.g. cystine stones, an inborn error of amino acid metabolism)

Risk Factors

- Family history
- Low fluid intake
- Thiazide diuretics
- Bowel or kidney disease
- Malignant disease

History

- Sudden onset of severe colicky pain in the flank
- Pain may radiate to lower abdomen, groin, labia or testicle
- Exact location of pain depends on location of stone, level of obstruction
- Hematuria may be present
- Dysuria, urgency, frequency may develop
- Nausea and vomiting are often present

Physical Findings

- Temperature elevated (if infection is also present)
- Heart rate may be elevated
- Blood pressure may be elevated
- Appears in acute distress
- Pale and sweaty
- Restless, tossing about, unable to find a comfortable position
- Abdomen may be distended
- Costovertebral angle and abdominal tenderness
- Bowel sounds may be decreased (because of reactive ileus)

Laboratory Findings

- Urine: may be normal or blood may be present

Differential Diagnosis

- Acute pyelonephritis
- Acute cholecystitis
- Acute abdomen (cholecystitis, appendicitis, gastroenteritis, diverticulitis)
- Peptic ulcer disease
- Salpingitis
- Gastroenteritis
- Peritonitis
- Pancreatitis
- Ectopic pregnancy

Complications

- Recurrent infection of the lower urinary tract
- Hydronephrosis
- Pyelonephritis
- Sepsis

Diagnostic Tests

- Urinalysis (routine and microscopic).

Management

If symptoms are **mild**, client is afebrile and diagnosis is clear, treat on outpatient basis. If symptoms are **severe** or the diagnosis is questionable, consult with a physician and inpatient treatment will be needed.

Goals of treatment

- Relieve symptoms
- Identify complications
- Collect stone or stone fragments

Appropriate Consultation

Severe Condition or Questionable Diagnosis
Consult a physician as soon as possible.

Nonpharmacologic Interventions

Mild Condition

- Encourage increase in fluid intake
- Strain urine to collect stones

Severe Condition or Questionable Diagnosis

- Bed rest
- Nothing by mouth if vomiting

Adjuvant Therapy**Severe Condition or Questionable Diagnosis**

- Start IV therapy with normal saline
- Adjust rate according to severity of vomiting and dehydration, client's age and underlying medical problems
- Generally, it is desirable to push the fluids to help the stone pass, i.e. administer enough fluid to produce urine output of 100-200 mL/h

Pharmacologic Interventions**Mild Condition**

To control pain:

*acetaminophen with codeine 30mg,
1-2 tabs PO q4h prn (maximum 15 tabs)*

Severe Condition or Questionable Diagnosis

Analgesia:

meperidine, as ordered Antiemetics for nausea and vomiting: *dimenhydrinate, 50-75 mg IM q4-6 hr prn*

Monitoring and Follow-Up**Severe Condition or Questionable Diagnosis**

- Monitor urine output
- Strain all urine for stones
- Send any stones for laboratory analysis
- Client may be discharged home once pain and nausea are controlled
- Instruct client to collect and strain all urine for stones and save any stones that are passed
- Follow up 12-24 hours after discharge

Referral

If questionable diagnosis or if condition is severe, if pain or fever persist, medevac to hospital.

Urinary Incontinence

Definition

Involuntary loss of urine.

Causes

Overflow Incontinence

Leakage of urine due to overdistension of the bladder, commonly caused by obstruction of the bladder outlet (e.g. prostatic enlargement, fecal impaction) or neurologic disease (e.g. multiple sclerosis).

Stress Incontinence

Leakage of urine due to an increase in intra-abdominal pressure (e.g. with cough, exercise). This form is more common in women. Poor pelvic support (for example, because of multiple vaginal deliveries or postmenopausal estrogen deficiency) is the primary cause.

Urge Incontinence

Leakage of urine due to inability to delay voiding when an urge is perceived. Causes include hyperactivity or instability of the bladder wall, disorders of the central nervous system (e.g. Parkinson's disease), and bladder irritability from infection, stones, diverticula or tumor.

Functional Incontinence

Leakage of urine due to inability to get to the toilet. Causes include age-related problems (e.g. decreased mobility, cognitive disability), alcohol intoxication, medications (e.g. diuretics, sedatives) and diabetes mellitus (neurogenic bladder).

History

- Loss of bladder control
- Amount of leakage varies with each person and with specific cause
- Qualify degree of difficulty in maintaining continence
- Determine when and how the urinary leakage occurs
- Assess bowel habits, number of pregnancies and vaginal deliveries, postmenopausal symptoms, neurologic deficits
- Review medications
- If infection is present, there will be related symptoms of cystitis

In women, incontinence is often associated with coughing, sneezing, laughing, climbing stairs, exercising (stress incontinence).

In men, dribbling and weak stream is usually associated with other symptoms of bladder-outlet obstruction

Previously "dry" elderly clients who suddenly become incontinent may have an early urinary tract infection or an intercurrent illness or infection elsewhere.

If diabetes is suspected, ask about polyuria, polydipsia, polyphagia, weight loss, recurrent cystitis or vaginitis.

Physical Findings

The findings will depend upon the specific cause. A careful examination of the urinary and genital systems, the abdomen and rectum, and the neurologic system is required.

- Distension of the bladder may be present
- Assess prostate, anal-sphincter tone, rectal wall, amount of stool present in rectum
- Note atrophic urethral and vaginal changes, relaxation of pelvic floor, pelvic masses
- Assess deep tendon reflexes and perineal sensation

Differential Diagnosis

See "Causes," above.

Complications

- Breakdown and ulceration of skin in the genital area
- Social embarrassment
- Social and psychological problems

Diagnostic Tests

- Urinalysis (routine and microscopy, culture and sensitivity) to identify cystitis
- Complete blood count, BUN, creatinine, electrolytes and calcium to check renal function
- Blood sugar to rule out diabetes

Management

Management is based on identifying and treating the underlying cause.

Goals of Treatment

- Achieve relief of urinary symptoms
- Increase functional capacity of the bladder

Nonpharmacologic Interventions

The following simple measures should be tried.

Stress Incontinence

- Demonstrate Kegel exercises to strengthen pelvic floor and perineal muscles; advise client to do 10-15 repetitions of each exercise, three or four times a day
- Encourage weight loss, if appropriate, to reduce symptoms
- Encourage frequent toileting q3-4h, complete emptying, voiding before strenuous activities and use of sanitary napkins to maintain dryness
- Encourage client to establish a good bowel routine to reduce straining at stool
- Urinary stress incontinence of some small degree may be physiological and may not be abnormal.

Nighttime Incontinence

- Advise client to reduce fluid intake in the evening 2 hours prior to bedtime
- Advise client to take diuretic drugs earlier in the evening

- Suggest a bedside commode, if available, or a condom catheter

Chronic Day and Nighttime Incontinence

- Advise client to toilet regularly at a bedside commode
- Suggest adult diapers or a condom catheter to help maintain dryness.
- Instruct client and family members about good skin care to prevent skin breakdown and infection

Medications are sometimes ordered by physician as an adjuvant therapeutic intervention to these nonpharmacologic measures.

In the elderly client, assess life situation and any recent life changes, mental status (to detect recent changes or confusion), general medical status (to identify concurrent illness and whether client has physical difficulty getting to the toilet).

If client has a distended bladder, *see "Acute Urinary Retention," below, this chapter.*

Relieve fecal impaction with gentle disimpaction or water *enemas* (*see "Constipation, Gastrointestinal System"*).

Referral

Refer electively to a physician for evaluation if conservative measures fail to improve symptoms.

Emergencies Of The Urinary And Male Genital Systems

Testicular Torsion

Definition

Twisting of spermatic cord and testis, which compromises blood supply to these structures and results in ischemic pain.

Causes

- Torsion usually spontaneous and idiopathic
- Predisposing structural (genetic) defect
- Occasionally caused by trauma to the groin

History

- Sudden onset of severe, constant, unilateral pain in scrotum, groin or lower abdomen
- Pain may be made worse by elevation of scrotum
- Pain not relieved by lying down
- Nausea and vomiting may be present
- Usually occurs in adolescents and young men

Physical Findings

- Temperature usually normal
- Heart rate elevated
- Blood pressure mildly elevated (because of pain)
- Client in acute distress
- Client bent over or unable to walk
- Unilateral scrotal swelling and redness
- Testis acutely tender, may be warm
- Testis swollen and found higher up (retracted) in the scrotal sac than expected
- Absence of cremasteric reflex

Differential Diagnosis

- Epididymitis
- Orchitis
- Trauma
- Incarcerated or strangulated inguinal hernia
- Torsion appendix testis

- Acute varicocele
- Testicular tumor
- Scrotal abscess

Complications

- Testicular infarction
- Testicular atrophy
- Abnormal spermatogenesis
- Infertility

Diagnostic Tests

None.

Management

Goals of Treatment

- Relieve pain
- Prevent complications

Appropriate Consultation

Consult a physician immediately. This is a surgical emergency.

Nonpharmacologic Interventions

- Nothing by mouth
- Bed rest

Adjuvant Therapy

- Start IV therapy with normal saline
- Adjust IV rate according to age and state of hydration

Pharmacologic Interventions

Analgesia, as per physician order

Referral

Medevac as soon as possible.

Acute Urinary Retention

Definition

Accumulation of urine in the bladder due to an inability to empty the bladder.

Causes

- Any process that causes increased bladder-outlet resistance or decreases bladder contractility
- Benign prostatic hyperplasia
- Side effects of drugs
- Fecal impaction
- Prostatic cancer
- Acute prostatitis
- Neurogenic bladder
- Urethral stricture or stone
- Impingement on sacral nerves by protruding intervertebral disk
- Spinal cord injury

History

- Strong urge to void but inability to do so
- Suprapubic fullness and pain
- Voiding habits before retention (hesitancy, dribbling, daytime frequency, nocturia)
- Bowel habits, last bowel movement and its consistency

Review medications, noting any drugs that might predispose to acute urinary retention (excessive alcohol intake, sedatives, decongestants in over-the-counter cold remedies, anticholinergics, antipsychotics and antidepressants).

With a neurogenic bladder, symptoms of pain, fullness and urgency may be absent. However, dribbling of small amounts of urine (overflow dribbling) may be present.

Physical Findings

- Pulse may be elevated
- Client may appear in moderate-to-acute distress (but there may be no evidence of distress with a neurogenic bladder)
- Client may be restless and sweaty
- Bladder distension may be noted on abdominal inspection

- Tender, distended bladder may be felt above symphysis, often reaching umbilicus (neurogenic bladder is distended but non tender)
- Rectal examination: fecal impaction, enlargement of prostate, nodular or rocky hard prostate, decreased anal tone or absent perineal sensation may be present

Differential Diagnosis

See "Causes," above.

Complications

- Decreased renal function
- Post-obstructive diuresis
- Renal failure
- Infection of stagnant urine

Diagnostic Tests

None.

Management

Goals of Treatment

- Identify underlying cause
- Relieve bladder distension

Appropriate Consultation

Consult a physician.

Nonpharmacologic Interventions

- Encourage client to sit in a tub full of warm water and to try voiding into the water. If the client is able to do so, reassess the bladder for residual distension.

If the bladder is still distended, catheterization is required (unless there are contraindications). Use the following technique:

- Use a Foley catheter (18 French in a male, 16 French in a female)
- If the client is known to have benign prostatic hyperplasia, a 16 French catheter may be tried if catheterization is unsuccessful with the larger size of catheter
- Insert catheter and decompress the bladder slowly
- Remove 200 mL of urine, then clamp the catheter for 30 minutes

- Continue to remove 50-75 mL of urine slowly every 20 minutes until the bladder is empty
- Leave catheter in place after decompression
- Do not insert catheter if retention is due to acute prostatitis
- Do not insert catheter if the pelvis is fractured
- Do not attempt catheterization more than three consecutive times

Monitoring and Follow-Up

Monitor hourly urine output carefully for the development of post-obstruction diuresis, a complication that occurs after the release of the obstruction, because of temporary impairment of renal function.

Diuresis is generally self-limiting and can be managed with oral fluid intake based on thirst, but client may require IV fluid therapy to prevent dehydration.

Referral

Medevac to hospital.

Assessment Of The Musculoskeletal System

History Of Present Illness And Review Of System

General

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

- Onset (sudden or gradual)
- Chronology
- Current situation (improving or deteriorating)
- Location
- Radiation
- Quality
- Timing (frequency, duration)
- Severity
- Precipitating and aggravating factors
- Relieving factors
- Associated symptoms
- Effects on daily activities
- Previous diagnosis of similar episodes
- Previous treatments
- Efficacy of previous treatments

Cardinal Symptoms

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

Bones and Joints

- Pain, swelling, redness, heat, stiffness
- Time of day when these symptoms are most bothersome
- Relation of symptoms to movement
- Limitation of movement
- Deformity
- Extra-articular findings: urethritis, pustular rash, tophi, nodules
- Trauma: obtain accurate description of exact mechanism of injury

Muscles

- Pain
- Weakness
- Twitching
- Wasting
- History of previous injuries and treatment received

Neurovascular Structures

- Paresthesia
- Paresis
- Paralysis

Functional Assessment

Any self-care deficits in bathing, dressing, toileting, grooming, mobility, use of mobility aids.

Medical History (Specific To Musculoskeletal System)

- Previous trauma (e.g. to bones, joints, ligaments)
- Arthritis (rheumatoid or osteoarthritis)
- Diabetes mellitus (associated with greater risk of carpal tunnel syndrome)
- Hypothyroidism (associated with greater risk of carpal tunnel syndrome)
- Recent immobilization of an extremity
- Medications (e.g. steroids)
- Allergies
- Obesity
- Osteoporosis
- Cancer
- Menopause
- Immune deficiency (recent infection)

Family History (Specific To Musculoskeletal System)

- Rheumatoid arthritis
- Diabetes mellitus
- Hypothyroidism (associated with greater risk of carpal tunnel syndrome)
- Osteoporosis
- Cancer (bone)

Personal And Social History (Specific To Musculoskeletal System)

- Absenteeism from work or school (multiple days)
- Occupational hazards (activity involving repetitive joint motion, e.g. kneeling, reaching overhead, computer use)
- Sports activities (especially contact sports)

- Risk behaviors for injuries (e.g. snowmobiling, skateboarding, injection drug use, alcohol abuse [specifically drinking and driving])
- Calcium intake
- Smoking

- Exercise habits
- Caffeine intake (decreases bone density)

Examination Of The Musculoskeletal System

The purpose of examining the musculoskeletal system is to assess function and performance of activities of daily living, as well as to check for abnormalities. A screening exam is appropriate for most people.

General

- Apparent state of health
- Appearance of comfort or distress
- Colour (e.g. flushed, pale)
- Nutritional status (obese or emaciated)
- Match between appearance and stated age

Musculoskeletal Screening Exam

Observe client walking into examination room; assess gait, posture and use of aids. Determine ability to perform activities of daily living (e.g. sitting, standing, walking, dressing).

Examine specific joints in the following order.

Compare corresponding paired joints.

- Temporomandibular joint
- Cervical spine
- Shoulders
- Elbows
- Wrists, hands and fingers
- Hips
- Knees
- Ankles, feet and toes
- Lumbar spine

Inspection of Joints

- Symmetry of structure and function
- Note alignment, size (muscle bulk, bone enlargement) and contour of the joint
- Inspect skin and tissues over joints for colour, swelling, rash, masses or deformity

Palpation of Joints

Palpate each joint, including skin, muscles, bony articulations and area of joint capsule, for the following features:

- Heat
- Swelling
- Tenderness
- Nodules, masses
- Crepitus
- Ligament instability

Range of Motion

Ask client to demonstrate range of active motion while stabilizing the body area proximal to the joint being moved. If you see a limitation, gently attempt passive motion.

The normal ranges of active and passive motion should be the same.

Muscle Testing

- Test strength of prime muscle groups (i.e. flexors and extensors) for each joint
- Muscle strength should be equal bilaterally and should fully resist your opposing force
- There is wide variability in normal muscle strength among different people

Ligament Stability Around Joints

- Determine stability of collateral ligaments of ankle
- Determine stability of collateral and cruciate ligaments of knee

Neurovascular Status

Assess limbs for the following aspects and conditions:

- Sensation
- Pulses
- Paresis
- Paralysis

This part of the examination is particularly important if the client has experienced trauma.

Table 1 presents the symptoms associated with various types of musculoskeletal injury.

Table 1: Symptoms of Musculoskeletal Injury

Symptom	Fracture	Dislocation	Sprain	Strain
Pain	Severe	Moderate to severe	Mild to moderate	Mild to moderate
Swelling	Moderate to severe	Mild	Mild to severe	Mild to moderate
Bruising	Mild to severe	Mild to severe	Mild to severe	Mild to severe
Deformity	Variable	Marked	None	None
Function	Loss of function	Loss of function	Limited	Limited
Tenderness	Severe	Moderate to severe	Moderate	Moderate
Crepitus	Present	Absent	Absent	Absent

Differential Diagnosis Of Musculoskeletal Cardinal Symptoms

Table 2: Causes of joint pain

Inflammatory

- Tenosynovitis
- Rheumatoid arthritis
- Viral polyarthritis (e.g. hepatitis B, Epstein-Barr virus)
- Septic arthritis (e.g. *Staphylococcus aureus*, streptococcal species)
- Autoimmune disease (e.g. polymyalgia rheumatica)
- Rheumatic fever
- Immune complex arthritis (e.g. HIV)
- Polyarthritis associated with systemic diseases (e.g. systemic lupus erythematosus, Lyme disease, syphilis, bacterial endocarditis)
- Gouty arthritis

Non-inflammatory

- Osteoarthritis
- Tendinitis
- Systemic lupus erythematosus
- Metabolic arthropathy
- Tumors
- Mechanical abnormalities (e.g. erosion of cartilage and bone)
- Blood dyscrasias
- Sickle cell anemia
- Neuroarthropathy

Table 3: Causes of neck pain and cervical spine disorders

Biomechanical

Neck strain
Herniated disk
Spondylosis
Myelopathy

Infectious

Osteomyelitis
Diskitis
Meningitis
Herpes zoster
Lyme disease

Referred

Thoracic outlet syndrome
Pancoast's tumour
Esophagitis
Angina
Vascular dissection

Neurologic

Brachial plexitis
Peripheral entrapment
Neuropathies
Reflex sympathetic dystrophy

Rheumatologic

Rheumatoid arthritis
Ankylosing spondylitis
Psoriatic arthritis
Reiter's syndrome
Myelopathy
Enteropathic arthritis
Polymyalgia rheumatica
Fibromyalgia
Myofascial pain
Diffuse idiopathic skeletal hypertrophy
Microcrystalline disease

Neoplastic

Osteoblastoma
Osteochondroma
Giant cell tumour
Hemangioma
Metastases
Multiple myeloma
Chondrosarcoma
Chordoma
Gliomas
Syringomyelia
Neurofibroma

Miscellaneous

Paget's disease
Sarcoidosis

Table 4: Causes of shoulder pain**Intrinsic Disorders**

- Glenohumeral osteoarthritis
- Acromioclavicular arthritis
- Septic arthritis
- Rheumatoid arthritis
- Gout
- Rotator cuff impingement
- Rotator cuff tear
- Biceps tendinitis
- Biceps tendon rupture
- Calcific tendinitis
- Adhesive capsulitis
- Trauma to bony structures (e.g. clavicle, acromioclavicular joint, glenohumeral joint)

Extrinsic Disorders (Referred Pain)

- Cervical spine disorders
- Brachial plexus neuropathy
- Myofascial pain
- Thoracic outlet syndrome
- Diaphragmatic irritation
- Neoplastic disease
- Myocardial ischemia

Shoulder pain can arise from the bony structures of the shoulder or from the muscles, ligaments and tendons that support the shoulder. Most shoulder problems are attributable to overuse and trauma.

Table 5: Causes of low-back pain**Mechanical Low-Back Disorders**

- Lumbar sacral strain
- Degenerative disk disease
- Facet joint syndrome
- Spondylolisthesis
- Herniated disk
- Spinal stenosis
- Osteoporosis
- Fracture
- Spondylolysis
- Severe kyphosis
- Severe scoliosis

Non-mechanical Spine Disease

- Neoplasia (e.g. multiple myeloma, lymphoma, spinal cord tumor, metastatic carcinoma)
- Infection (e.g. osteomyelitis, septic disk, epidural abscess)
- Inflammatory arthritis
- Ankylosing spondylitis
- Psoriatic spondylitis
- Paget's disease (tuberculosis of spine)

Referred Pain of Visceral Disease

- Prostatitis
- Endometriosis
- Chronic pelvic inflammatory disease
- Kidney stones
- Pyelonephritis
- Aortic aneurysm
- Pancreatitis
- Cholecystitis
- Penetrating peptic ulcer

Common Problems Of The Musculoskeletal System

Neck Pain

Definition

Neck pain, acute and chronic, is commonly seen in the primary care setting. Many disorders are implicated in neck pain, but mechanical problems of the cervical spine are the most common cause. Most patients improve with non-operative therapy within 3 months; only about 10% of patients require surgical intervention.

Types

Myofascial Pain

Myofascial pain is the most common type of acute and chronic neck pain. The upper trapezius and levator scapulae are the muscles most frequently involved in myofascial pain of the neck, head and upper back. The pain is often described as dull, aching or burning and is referred from active myofascial trigger points. A myofascial trigger point is a hyper-irritable spot within a taut band of skeletal muscle or muscle fascia that is painful to compression and gives rise to a characteristic pattern of referred pain and tenderness and autonomic phenomena such as tingling, dizziness and gooseflesh. Each muscle with active trigger points gives rise to its own characteristic, predictable and reproducible pattern of referred pain and autonomic symptoms.

Neuropathic Pain

Disease and injury of the neck commonly involve nerves or nerve roots lying along the transverse processes or the paravertebral region of the spinal cord. This produces neuropathic pain felt in the occipital region, the back, the posterior ear and ear lobe, and the anterior neck.

A history of significant trauma, cervical arthritis, prior herniated disk or herpes zoster infection, along with typical neuralgic pain and sensory disturbances, should suggest a neuropathic process.

Neuropathic pain is usually described as sharp, burning or aching and often follows the distribution of the affected nerve segment. The pain is worsened by movements that stretch the involved nerve or nerve roots. It is frequently accompanied by sensory and motor disturbances such as hyperesthesia, paresthesia, hypalgesia and a decrease in muscle strength. Disk herniation with radicular pain is one example of neuropathic disease.

Causes

Mechanical Disorders

Mechanical disorders that occur secondary to overuse, trauma or deformity constitute the most common cause of neck pain. Typically, these disorders are characterized by correlating exacerbation or alleviation of symptoms with certain physical activities.

Most mechanical disorders of the cervical spine have a natural history of improvement. In 50% of patients, the pain will decrease in 2-4 weeks, and 80% of patients will be asymptomatic in 2-3 months.

The causes of mechanical disorders include neck strain, herniated disk, spondylosis and myelopathy.

Mechanical Neck Problems Without Nerve Compression

Clients with pain only in the cervical area, trapezii and shoulders may have one of many disorders, of which neck strain and cervical hyperextension (whiplash) are the most common

Table 6: History and physical examination for mechanical neck problems without nerve compression

Condition	History	Physical Examination
Neck strain	Pain in middle or lower portion of the posterior neck Pain may be diffuse or localized to both sides of the spine	Local tenderness in paracervical muscles, decreased range of motion, loss of cervical lordosis No abnormalities found on neurologic or shoulder examination Spinal x-rays may be normal or reveal loss of lordosis
Cervical hyperextension (whiplash)	Acceleration-deceleration injury to soft-tissue structures Common causes: rear-impact motor vehicle crashes, falls, diving accidents, other sports injuries Paracervical muscles stretched or torn, and sympathetic ganglia may be damaged, resulting in Horner's syndrome, nausea, hoarseness or dizziness Intervertebral disk injuries occur with severe trauma First symptoms occur 12-24 hours after trauma Clients experience stiffness and pain with motion; may also have difficulty swallowing or chewing	Soreness, paracervical muscle contraction and decreased range of motion Neurologic examination often unremarkable, but x-rays may reveal loss of cervical lordosis In severely injured clients, structural damage identified on x-rays mandates immediate stabilization

Mechanical Neck Problems with Spinal Compression

The main type of mechanical neck problem with spinal compression is cervical myelopathy. This condition occurs secondary to compression of the spinal cord or nerve roots in the spinal canal (see Table 7). Only one-third of affected patients report neck pain. Although cervical myelopathy is rare, one form, spondylitic myelopathy, is the most common cause of spinal cord dysfunction in people over the age of 55 years.

The location, duration and size of lesions influence the severity and distribution of symptoms.

Compression usually results from a combination of osteophyte growth and degenerative disk disease. Symptoms may involve all limbs and may include difficulty in walking and urinary or fecal incontinence.

The most frequent presentation is arm pain and leg dysfunction. Older clients may describe leg stiffness, foot shuffling and a fear of falling. Common findings include weakness of the limbs, spasticity, fasciculations, hyperreflexia, clonus and Babinski's reflex in the lower extremities.

Table 7: Characteristics of radicular pain caused by compression of cervical nerve root

Nerve root	Area of pain	Location of sensory loss	Location of motor loss	Location of reflex loss
C5	Neck to outer shoulder, arm	Shoulder	Deltoid	Biceps, supinator
C6	Outer arm to thumb, index finger	Index finger and thumb	Biceps	Biceps, supinator
C7	Outer arm to middle finger	Index and middle fingers	Triceps	Triceps
C8	Inner arm to ring and little fingers	Ring and little fingers	Hand muscles	None

Differential Diagnosis Of Neck Pain

See Table 3 in "Differential Diagnosis of Musculoskeletal Cardinal Symptoms," above, this chapter.

Complications

- Permanent nerve damage with compression of nerve root
- Chronic neck pain
- Absenteeism from work
- Disability (long term)

Diagnostic Tests

Discuss with a physician before ordering any tests.

Management

Goals of Treatment

- Relieve symptoms
- Regain or maintain full range of motion
- Prevent complications

Appropriate Consultation

Consult immediately if there is concern of serious injury (e.g. trauma of significant force) or if there is associated neuropathic pain and neurological changes. Treat all other injuries conservatively and follow up closely.

Nonpharmacologic Interventions

- Clients without systemic disorders should be treated with non-operative therapy for 3-6 weeks
- Ice massage for 20 minutes qid provides additional analgesia in some cases
- Heat may decrease muscle tightness and improve range of motion in others
- Cervical collar and limiting motion are suggested; short-term immobilization is useful, particularly at night, when movement during sleep can cause pain
- A soft collar that supports but does not extend the neck is an appropriate treatment; however, its use should be decreased as neck pain diminishes

The use of a collar in clients with cervical hyperextension should be severely limited except in cases of disk herniation, which requires full-time collar immobilization to limit radicular pain for longer periods.

Pharmacologic Interventions

Anti-inflammatory analgesics such as nonsteroidal anti-inflammatory drugs (NSAIDs) can decrease the pain and inflammation associated with localized disease

ibuprofen, 200 mg, 1-2 tabs PO tid-qid

or

naproxen, 250 mg PO bid-tid for 2 weeks or longer prn

Do not use if there are contraindications to the use of NSAIDs (such as a history of peptic ulcer disease). Instead, use:

acetaminophen, 500 mg, 1-2 tabs PO tid-qid prn

Monitoring and Follow-Up

- Arrange follow-up at 1-2 days, at 7 days and then every 2 weeks to assess response to treatment
- Start range-of-motion exercises within pain-free range in 2-3 days (in cases of minor injury)
- Advise client to begin stretching and strengthening program when range of motion is regained

Referral

Most clients, including those with cervical radiculopathy, improve and return to normal activity within 2 months. Clients who are still symptomatic after 6 weeks of non-operative treatment should be referred to a physician for further evaluation.

Phone consultation or referral to physiotherapy.

Adhesive Capsulitis (Frozen Shoulder), Tendinitis And Bursitis

Definition

Adhesive capsulitis: Chronically stiff and painful shoulder, which begins without any significant injury.

Tendinitis and bursitis: Inflammation of a tendon or a bursa within the shoulder. The supraspinatus and long end of the biceps are especially susceptible.

Causes

Adhesive capsulitis: Prolonged immobilization from either protracted use of a sling or disuse because of pain in the arm.

Tendinitis and bursitis: Overuse, repetitive strain from repeated motion.

History And Physical Findings

Adhesive capsulitis: Shoulder pain and limitation of movement in one or more directions, with pain occurring at the limits of motion. Other findings relatively unremarkable.

Tendinitis and bursitis: Non-specific pain and aching of the shoulder. With supraspinatus tendinitis, the pain is aggravated when the shoulder is abducted and externally rotated against resistance. With bicipital tendinitis, the pain is aggravated when the patient flexes forward against resistance.

Management

Goals of Treatment

- Relieve pain and inflammation
- Maintain function of shoulder
- Prevent complications

Most of the soft-tissue conditions about the shoulder can be relieved by application of ice and rest for 5-7 days (with short-term use of sling for 2-3 days).

Physical therapy and rehabilitation are extremely important in regaining and maintaining range of motion, flexibility and strength for optimal shoulder functioning.

Nonpharmacologic Interventions

Rest Injured Limb

- Avoid aggravating positions and activities
- Type and period of rest varies according to severity of symptoms and type of injury or disorder
- For upper limb: use sling in acute stage for brief period (2-3 days), then discontinue

Ice or Cold Pack Locally to Reduce Pain and Swelling

- Apply to area for 20 minutes qid
- If soft-tissue injury is severe, apply q2h
- Use ice as long as swelling and pain are present
- Heat is contraindicated in acute soft-tissue injury
- Never use heat in acute or subacute phases of recovery
- Heat may be used for chronic stiffness and swelling

Pharmacologic Interventions

Anti-inflammatory analgesics to reduce pain and swelling:

ibuprofen, 200 mg, 1-2 tabs PO tid- qid

or

naproxen, 250 mg PO bid-tid for 2 weeks or longer prn

Do not use if there are contraindications to the use of NSAIDs (such as a history of peptic ulcer disease). Instead, use:

acetaminophen, 500 mg, 1-2 tabs PO tid-qid prn

Monitoring and Follow-Up

- Arrange follow-up at 1-2 days and at 14 days
- Start range-of-motion exercises within pain-free range in 2-3 days (in cases of minor injury)
- Advise client to begin stretching and strengthening program when range of motion is regained
- Exercise progression: passive range of motion, active assisted range of motion, isometrics, active stretching, and late stretching and strengthening exercises
- Exercises are best done in multiple short sessions, not long ones

- Exercise should be preceded by application of moist heat for 10-15 minutes and should be followed by icing for 20 minutes
- Any exercise that causes pain should be temporarily omitted
- As range of motion, flexibility and strength improve, so will shoulder function

Referral

Refer to a physician if there is no improvement with conservative therapy in 4-6 weeks.

A physiotherapy consultation (if available) is especially important for adhesive capsulitis because optimal treatment of this condition involves extended, aggressive physical therapy.

Rotator Cuff Syndrome

Definition

Pain and diminished function of the shoulder secondary to inflammation and weakness of the muscles of the rotator cuff. There are three stages, as outlined below.

The rotator cuff muscles are the supraspinatus, infraspinatus, teres minor and subscapularis, all of which envelop the scapula.

Causes

Stages 1 and 2: A rotator cuff tendinitis caused by forceful or repetitive motion

Stage 3: A complete traumatic tear of the supraspinatus tendon

History And Physical Findings

Stage 1: Occurs in people ≥ 25 years of age; pain is noted over the anterior aspect of the shoulder and is maximal when the arm is raised from 60° to 120° elevation.

Stage 2: Usually occurs in people 25-40 years of age who have had multiple previous episodes; in addition to pain from tendinitis inflammation of the rotator cuff, some permanent fibrosis, thickening or scarring is present; x-rays may reveal calcific deposits within the rotator cuff.

Stage 3: Client usually > 40 years of age; may feel a sudden pop in the shoulder and then suffer severe pain; client notes increasing weakness when trying to abduct and externally rotate the affected arm.

Management

Goals of Treatment

- Relieve pain and inflammation
- Maintain function of shoulder
- Prevent complications

Appropriate Consultation

Consult a physician immediately about all stage 3 injuries. Consult a physician if a stage 1 or 2 injury remains symptomatic for $> 4-6$ weeks.

Nonpharmacologic Interventions

Rest Injured Limb

Type and period of rest varies according to type and severity of injury.

Stages 1 and 2: Aggravating positions and activities should be avoided; a sling should be used in acute injury stage for a brief period (2-3 days)

Stage 3: Place injured limb in sling for comfort

Ice or Cold Pack Locally to Reduce Pain and Swelling

Apply ice or cold pack as follows:

- Apply to area for 20 minutes qid
- If soft-tissue injury is severe, apply q2h
- Use ice as long as swelling and pain are present
- Heat is contraindicated in acute soft-tissue injury
- Never use heat in acute or subacute phases of recovery
- Heat may be used for chronic swelling

Pharmacologic Interventions

Stages 1 and 2: Anti-inflammatory analgesics to reduce pain and swelling:

ibuprofen, 200 mg, 1-2 tabs PO tid- qid
or
naproxen, 250 mg, PO q6h prn

Do not use if there are contraindications to the use of NSAIDs (such as a history of peptic ulcer disease). Instead, use:

acetaminophen, 500 mg, 1-2 tabs PO tid-qid prn
or
acetaminophen with codeine 30mg,
1-2 tabs q4h prn (maximum 15 tabs)

Stage 2: In addition to the drugs given above, *corticosteroids* may be injected into the subacromial bursa.

Stage 3: Analgesics for pain:
ibuprofen, 200 mg, 1-2 tabs PO tid- qid
or
naproxen, 250 mg, PO q6h prn or
acetaminophen with codeine 30mg,
1-2 tabs q4h prn (maximum 15 tabs)

Monitoring and Follow-Up

Stages 1 and 2: Clients with this type of injury should be monitored as follows:

- Arrange follow-up at 1-2 days and at 10 days
- Start range-of-motion exercises within pain-free range in 2-3 days (in cases of minor injury)
- Advise client to begin stretching and strengthening program when range of motion is regained
- Exercise progression: passive range of motion, active assisted range of motion, isometrics, active stretching exercises, and late stretching and strengthening exercises
- Exercises are best done in multiple short sessions, not long ones

- Exercise should be preceded by application of moist heat for 10-15 minutes and should be followed by icing for 20 minutes
- Any exercise that causes pain should be temporarily omitted
- As range of motion, flexibility and strength improve, so will shoulder function

Referral

Physiotherapy consultation or referral should be considered if readily available.

Stage 2: If symptoms persist after 4-6 weeks of conservative therapy, consider referral to an orthopedist for surgery consult.

Stage 3: Medevac urgently. Treatment is usually surgical repair, depending on whether there is significant loss of function. Repair is more likely in young clients than in elderly clients. Many elderly clients have progressive loss of the rotator cuff as a result of aging.

Acromioclavicular Injuries

Definition

Grade 1 (sprain): Partial tear of the joint capsule. Mild pain without joint deformity and minimal ligamentous disruption and instability.

Grade 2 (subluxation): Complete tear of the acromioclavicular ligaments. The acromioclavicular joint is locally tender and painful with motion. The distal end of the clavicle may protrude slightly upward.

Grade 3 (dislocation): Complete tear of the acromioclavicular and coracoclavicular ligaments. Significant pain, especially on any attempt at abduction; there is an obvious "step-off" deformity on physical examination.

Causes

Usually results from a direct blow to or fall on the tip of the shoulder.

History

- The history often involves a fall onto the apex of the shoulder, usually with the arm in adduction. Severe forces resulting from significant falls are often associated with grade 3 injuries.
- Pain over injured area
- Inability to use shoulder

Physical Findings

- Pain at rest or elicited with movement
- Pain increases with severity of injury
- Tenderness on palpation of the acromioclavicular joint
- There may be a "step-off" deformity of the acromioclavicular joint
- Note the position of the clavicle

Perform a careful neurovascular assessment of brachial-plexus motor and sensory function, because associated injuries, though rare, can occur.

Complications

- Instability of the shoulder
- Loss of mobility

Diagnostic Tests

- X-ray may be advisable to determine extent of injury, especially in younger people with significant symptoms
- *Grade 1:* Acromioclavicular joint films (with and without weights) yield normal findings
- *Grade 2:* Stress x-ray of the acromioclavicular joint with the client holding a 4.5-kg (10-lb) weight in both hands reveals widening of the joint
- *Grade 3:* X-rays obtained with the client holding weights show superior displacement of the clavicle and complete dislocation of the joint

Management

Appropriate Consultation

Consult a physician for all grade 2 and 3 injuries as soon as possible.

Nonpharmacologic Interventions

Rest Injured Limb

Type and period of rest varies according to severity of injury.

- Avoid aggravating positions and activities
- *Grade 1:* Sling in acute injury stage for very brief period (5-7 days), then discontinue
- *Grade 2:* Subluxation requires a longer period of immobilization (7-14 days)

Ice or Cold Pack Locally to Reduce Pain and Swelling

For all grades of acromioclavicular injuries, ice or cold packs may be used:

- Apply to area for 20 minutes qid
- If soft-tissue injury is severe, apply q2h
- Use ice as long as swelling and pain are present
- Heat is contraindicated in acute soft-tissue injury
- Never use heat in acute or subacute phases of recovery
- Heat may be used for chronic stiffness and swelling

Pharmacologic Interventions

Anti-inflammatory analgesics to reduce pain and swelling:

ibuprofen, 200 mg, 1-2 tabs PO tid- qid

or

naproxen, 250 mg, PO q6h prn

Do not use if there are contraindications to the use of NSAIDs (such as a history of peptic ulcer disease). Instead, use:

acetaminophen, 500 mg, 1-2 tabs PO tid-qid prn

or

*acetaminophen with codeine 30mg,
1-2 tabs q4h prn (maximum 15 tabs)*

Monitoring and Follow-Up

- Arrange follow-up at 1-2 days and at 14 days
- Start range-of-motion exercises within pain-free range in 2-3 days (in cases of minor injury)

- Advise client to begin stretching and strengthening program when range of motion is regained
- Exercise progression: passive range of motion, active assisted range of motion, isometrics, active stretching exercises, and late stretching and strengthening exercises
- Exercises are best done in multiple short sessions, not long ones
- Exercise should be preceded by application of moist heat for 10-15 minutes and should be followed by icing for 20 minutes
- Any exercise that causes pain should be temporarily omitted
- As range of motion, flexibility and strength improve, so will shoulder function

Referral

Medevac urgently all clients with grade 3 injuries, as orthopedic consultation is required.

Glenohumeral Dislocations

Definition

Dislocation of the humeral head from the glenohumeral joint socket.

Causes

Trauma; usual mechanism is forced abduction and external rotation (95% are anterior dislocations).

History

- Severe pain
- Client usually holds the arm tightly against the body

Physical Findings

- Shoulder appears flattened laterally and prominent anteriorly
- The acromion process is prominent
- Shoulder appears to be "squared off"

Check for associated injuries:

- Proximal humeral fracture
- Avulsion of the rotator cuff
- Injuries to the adjacent neurovascular structures; axillary nerve injury is most common and is associated with decreased active contraction of the deltoid muscle

Differential Diagnosis

- Soft-tissue injury
- Clavicle fracture
- Acromioclavicular joint separation

Complications

- Neurovascular compromise

Diagnostic Tests

X-ray (if available) is necessary before reduction; obtain images in two planes (anteroposterior [AP] and lateral scapula) to confirm the dislocation and to rule out fracture, where possible, if mechanism is suggestive.

Management

Goals of Treatment

- Relieve pain
- Reduce dislocation
- Prevent complications

Appropriate Consultation

Consult a physician. The dislocation should be reduced as soon as possible.

Nonpharmacologic Interventions

Immobilize the client's arm in a sling-and-swathe dressing.

Pharmacologic Interventions

Analgesia is needed:

meperidine (D class drug), 75-100 mg IM and use of muscle relaxant

Monitoring and Follow-Up

Monitor pain and neurovascular status frequently until transfer.

Referral

Medevac to hospital if unable to perform reduction on site. Recurrent dislocation or subluxation is common and may require surgical repair, referral to a physician may be necessary.

Lateral Epicondylitis (Tennis Elbow)

Definition

An inflammatory process occurring at the extensor origin of the lateral epicondyle.

Causes

- Usually secondary to overuse or repetitive use
- Populations at risk: athletes and manual laborers

History

- Pain at the lateral epicondyle
- Referred pain to the extensor surface of the forearm
- Pain exacerbated by resisted extension of the wrist or fingers

Physical Findings

- Swelling (mild)
- Warmth
- Redness (mild)
- Tenderness over lateral elbow

Differential Diagnosis

- Avulsion injury of the tendon
- Bursitis
- Septic tenosynovitis
- Arthritis

Complications

- Recurrent episodes
- Tendon rupture

Diagnostic Tests

None.

Management

Goals of Treatment

- Relieve pain
- Reduce inflammation
- Strengthen the muscle
- Prevent complications

Nonpharmacologic Interventions

Rest the Limb

- Client should avoid exacerbating activities

- A constrictive band should be placed on the elbow (commercial "tennis elbow" bands are available)
- The joint should be rested (using a sling) for 2-3 days

Ice or Cold Pack Locally to Reduce Pain and Swelling

- Apply to elbow for 20 minutes qid
- Use ice as long as swelling and pain present
- Heat may be used for chronic stiffness and swelling after the acute phase

Pharmacologic Interventions

Anti-inflammatory analgesics to reduce pain and swelling:

ibuprofen, 200 mg, 1-2 tabs PO tid- qid
or
naproxen, 250 mg, PO q6h prn

Do not use if there are contraindications to the use of NSAIDs (such as a history of peptic ulcer disease). Instead, use:

acetaminophen, 500 mg, 1-2 tabs PO tid-qid prn
or
acetaminophen with codeine 30mg, 1-2 tabs q4h prn (maximum 15 tabs)

Monitoring and Follow-Up

- Arrange follow-up at 1-2 days and at 14 days
- Start gentle range-of-motion exercises within pain-free range in 2-3 days
- Advise client to begin stretching and strengthening program when range of motion is regained
- Exercise progression: passive range of motion, active assisted range of motion, isometrics, active stretching exercises, and late stretching and strengthening exercises
- Exercises are best done in multiple short sessions, not long ones
- Exercise should be preceded by application of moist heat for 10-15 minutes and should be followed by icing for 20 minutes

Referral

In most clients, the problem subsides with conservative treatment. Refer to a physician if there is failure to respond to treatment.

Carpal Tunnel Syndrome

Definition

The symptoms are a result of median nerve dysfunction because of compression within the carpal tunnel. Tends to affect the dominant hand but may be bilateral.

Causes

- Overuse
- Ganglion cyst
- Trauma: Colles' fracture
- Predisposing factors: pregnancy, diabetes mellitus, rheumatoid arthritis, hypothyroidism, systemic lupus erythematosus, hypoparathyroidism, hypocalcemia
- Risk factors: jobs that involve repetitive flexion and extension of the wrist

History

Symptoms usually affect the thumb, index and middle finger.

- Tingling or pricking sensation in the fingers
- Burning pain in the fingers, especially at night
- Relief of symptoms afforded by shaking or rubbing the hand
- Arm pain

Physical Findings

- Sensory loss in the thumb, index and middle fingers
- Tinel's sign: painful sensation of the fingers induced by percussion of the median nerve at the level of the palmar wrist
- Phalen's sign: keeping both wrists in a palmar-flexed position may reproduce symptoms
- Weakness of the hand while performing tasks (e.g. opening jars)
- Muscle wasting of the thenar eminence (late sign)

Differential Diagnosis

- Cervical spine spondylosis

- Peripheral neuropathy
- Brachial plexus lesion

Complications

Without treatment, permanent injury to the nerve

Management

Goals of Treatment

- Relieve symptoms
- Prevent complications

Appropriate Consultation

Consult a physician if there is evidence of muscle weakness and wasting of the thenar eminence on the initial visit. Otherwise, treat conservatively and follow closely.

Nonpharmacologic Interventions

- Avoid aggravating activities, especially repetitive motion activity
- Splint with the wrist in neutral position of extension

Pharmacologic Interventions

Anti-inflammatory analgesics:
ibuprofen, 200 mg, 1-2 tabs PO tid or
naproxen, 250 mg, PO bid-tid

Monitoring and Follow-Up

- Follow up in 2 weeks to see if there is response to treatment
- If improving, continue to see every 2 weeks until resolved or until 6 weeks has passed

Referral

Refer to a physician if the carpal tunnel symptoms do not improve in 6 weeks. If there is evidence of thenar muscle weakness or atrophy, surgical intervention is indicated.

Knee Injury

Most knee injuries in adults involve the ligaments.

Ligament Injuries

Collateral Ligament Injury

Grade 1 sprain: Microtear of the ligament; increase in joint opening < 5 mm (0.2 inch); no instability.

Grade 2 sprain: Partial macrotear of the ligament accompanied by significant increase in joint opening (with an end point) and instability.

Grade 3 sprain: Complete tear of the ligament, with no end point distinguishable on examination.

Collateral ligament injuries are usually caused by direct trauma to the contralateral side of the knee or excessive indirect force to the knee in a varus or valgus manner.

Pain and a sensation of tearing may have been noted by the client at the time of injury. In case of medial collateral ligament injury, there may be tenderness along the distal femur extending to the joint line.

Medial collateral ligament injuries may be associated with meniscal tears.

Valgus and varus tests allow assessment of the collateral ligaments. With the knee in 30° of flexion, the collateral ligaments can be isolated. Increased laxity may be seen (in grade 2 or 3 sprain).

Anterior Cruciate Ligament Injury

- History of a twisting injury accompanied by a pop or a tearing feeling and subsequent effusion
- Hemarthrosis found in 75% of cases
- Frequently associated with injury to a medial collateral ligament

Posterior Cruciate Ligament Injury

- Most injuries result from direct trauma to proximal tibia when the flexed knee is decelerated rapidly, as in a dashboard injury

- Posterior drawer test is used: knee is flexed 90°, and posterior displacement of the tibia on the femur is attempted

Meniscal Tears

- Medial meniscal injury is one of the most common causes of knee-joint pain; medial meniscus is much more susceptible to tears than lateral meniscus
- More than one-third of meniscal injuries are associated with anterior cruciate ligament tear and possibly medial collateral ligament injuries
- Client reports pain at time of injury; pain persists and interferes with weight-bearing activity
- Client often reports that the knee "locks," which may be attributable to pain or a physical inability to extend the knee because the torn meniscus prevents extension
- Most consistent physical finding is tenderness to palpation along the joint line
- Clinical tests help identify meniscal injury (e.g. McMurray's test and Apley's test)

Management

Goals of Treatment

- Relieve symptoms
- Restore or maintain knee function
- Prevent complications

Most knee injuries will respond well to conservative management.

Appropriate Consultation

If there are any diagnostic doubts, consult a physician as soon as possible.

Nonpharmacologic Interventions

Conservative treatment of isolated grade 1 and 2 collateral ligament and minor meniscal injuries involves nonpharmacologic interventions.

- Client should rest with an immobilizer splint or bandage for 7-14 days
- Client should start using crutches with weight bearing as tolerated as soon as ambulation causes only minor pain
- Ice should be applied for 20 minutes qid

- Client should elevate knee for first 24-72 hours
- Initiation of gentle range-of-motion exercises within the pain-free zone should begin as soon as pain and swelling subside enough to allow. Start with quadriceps extension.

Pharmacologic Interventions

Anti-inflammatory analgesics:

*ibuprofen, 200 mg, 1-2 tabs PO tid or
naproxen, 250 mg, PO bid-tid*

Do not use if there are contraindications to the use of NSAIDs (such as a history of peptic ulcer disease). Instead, use:

acetaminophen, 500 mg, 1-2 tabs PO q4h prn

If pain moderate to severe initially, use:

*acetaminophen with codeine 30mg, 1-2 tabs PO
q4h prn to maximum of 15 tabs, then switch to
plain acetaminophen*

Monitoring and Follow-Up

Follow up in 1-2 days to reassess injury. If swelling and pain are reduced, you may be able to examine knee more thoroughly.

Referral

Collateral Ligament Injury

Grade 3 collateral ligament injuries can be treated non-operatively, but physician referral may be recommended to assess the need for surgical intervention.

Anterior Cruciate Ligament Injury

Treatment should be supervised by an orthopedist. Treatment of acute injuries depends on the severity. Clients without associated meniscal, collateral ligament or posterior cruciate ligament injury should be treated by immobilizing the knee for comfort; crutches should be used.

Clients with associated ligament injury or meniscal injury should be referred immediately to an orthopedist, because surgery may be necessary.

Posterior Cruciate Ligament Injury

Isolated tears should be managed conservatively, but some posterior cruciate ligament injuries may require surgical fixation.

Meniscal Tears

If the knee remains locked or if symptoms of pain, giving way (a sense that the knee is going to collapse) and swelling persist, client should be referred to a physician to assess for the need for surgical intervention.

Ankle Sprain

Definition

Inversion or eversion injury causing a tear of ligaments supporting the ankle, usually involving lateral ligaments.

First-degree sprain: Ligament is stretched and joint is stable.

Second-degree sprain: More severe; significant partial tearing of the ligament, joint is stable.

Third-degree sprain: Complete tear of ligament(s), joint is unstable.

Causes

- Trauma
- Predisposing laxity of ligaments

History

- Sudden twisting motion of foot and lateral ankle
- Most commonly results in forced inversion of foot and ankle with injury to the lateral collateral ligament
- Eversion-type injury to the deltoid ligament is second most common type of sprain
- Depending upon extent of injury and degree of ligament injury, symptoms vary in severity
- Degree of pain depends on severity of injury
- Swelling
- Bruising
- Inability to walk (depending on degree of sprain)

Physical Findings

- Affected limb may be unable to bear weight
- Swelling evident (extent depends on severity of sprain)
- Bruising present in moderate and severe sprains
- Anterolateral aspect of ankle joint tender
- Posterolateral aspect of ankle joint may be tender
- In severe sprains, anterior aspect of ankle also tender
- Lateral ligament may show laxity
- Tenderness over either malleolus
- Range of motion (dorsiflexion, plantar flexion, inversion) may be limited because of pain

Differential Diagnosis

- Fracture
- Avulsion fracture
- Tendon rupture (e.g. Achilles', peroneal, posterior tibial)

Complications

- Chronic laxity of ligaments and recurrent injury to ankle
- Neurovascular compromise

Diagnostic Tests

X-ray of ankle (according to Ottawa Ankle Rules, below) to rule out a fracture if indicated.

Ottawa Ankle Rules

Perform radiography if there is pain near the malleoli and inability to bear weight immediately at the time of injury and at the time of your examination of the client or if there is point tenderness over the bone at the posterior tip of either malleoli.

Perform radiography if there is pain at the mid-foot and inability to bear weight both immediately and at the time of your examination or there is bone tenderness at the navicular or at the base of the fifth metatarsal.

Management

Goals of Treatment

- Reduce pain and swelling
- Rehabilitate ankle strength
- Prevent further injury

Appropriate Consultation

Consult a physician if joint instability is present at initial examination. Also, consult a physician if there is no improvement after 2 weeks of conservative therapy.

Nonpharmacologic Interventions

Rest the Joint

Type and period of rest varies according to severity of injury.

- No weight bearing or partial weight bearing with crutches, limited weight-bearing activities

- For first- and second-degree sprains, a gradual increase in weight-bearing is recommended, beginning as soon as pain and stability allow; this promotes healing and proprioception

Ice or Cold Pack to Reduce Swelling and Pain

- Apply to lateral aspect of ankle for 20 minutes qid for 48 hours (longer if swelling continues)
- If sprain is severe, apply ice q2h
- Use ice as long as swelling and pain are present
- Heat is contraindicated for the acutely injured ankle
- Never use heat in acute or subacute phases of recovery
- Heat may be used for chronic swelling

Compression and Elevation to Reduce Swelling and Pain

- Tensor bandage should be worn during daytime and removed at bedtime
- Ankle should not be wrapped too tightly
- When possible, ankle should be elevated above level of hip

Exercises

- Start gentle range-of-motion exercises for dorsiflexion within 24 hours
- Encourage calf stretching as tolerated
- Instruct client to draw letters of alphabet with ankle

Plantar flexion, inversion and eversion should be avoided in the very early stages of rehabilitation.

Muscle-strengthening exercises should be started when range of motion is regained. Instruct client about the following exercises:

- Toe and heel raises on inclined surface, holding end position for 4-6 seconds (10-20 repetitions)
- Toe raises on flat surface, holding end position for 4-6 seconds (10-20 repetitions)
- Heel and toe walking

- Balancing on one foot

Client Education

- Counsel about the importance of rest, ice and elevation
- Teach to use crutches to prevent weight bearing
- Teach the proper application of tensor bandage
- Counsel about appropriate use of medications (dose, frequency, side effects)
- Counsel about strategies to prevent further injuries to ankle (e.g. doing warm-up exercises before physical activities such as sports; wearing high-top, lace-up shoes for walking and running)

Pharmacologic Interventions

Anti-inflammatory analgesics to reduce pain and swelling:

ibuprofen, 200 mg, 1-2 tabs PO tid- qid prn

If there are contraindications to acetylsalicylic acid (ASA) or NSAIDs, use:

acetaminophen, 500 mg, 1-2 tabs PO q4h prn

For moderate to severe pain, stronger analgesics may be needed in addition to anti-inflammatory drugs in the first 24-48 hours; use:

acetaminophen with codeine 30mg, 1-2 tabs PO q4-6h prn (maximum 15 tabs)

Monitoring and Follow-Up

Follow up in clinic at 48 hours and again in 2 weeks, or sooner if pain and swelling persist

Referral

Arrange physiotherapy (if readily available) if symptoms persist for more than 2-3 weeks.

Refer all grade 3 sprains to a physician. Consider consult with orthopedist for eversion-type injuries.

Low-Back Pain

Acute low-back pain is one of the most common health problems. Almost everyone experiences it in his or her lifetime to some degree.

Back structures that can be a source of pain are ligaments, vertebral bones, facet joints, intervertebral disks, nerve roots and muscles. Pain usually results from strain or degeneration of these

structures, but serious inflammatory, infectious and neoplastic disorders also occur.

Back pain can also result from disorders of the visceral structures immediately anterior to the spine: aorta, kidneys, intestines, pancreas, stomach, gallbladder, prostate, uterus and ovaries.

Lumbosacral Strain And Sciatica

Definition

Stretching or tearing of muscles, tendons, ligaments or fascia of the lower back secondary to trauma or chronic mechanical stress. May be accompanied by sciatica (pain in buttocks or legs, or both, along path of sciatic nerve, due to nerve root irritation).

Causes

- Contusions
- Ligamentous strain
- Muscular strain
- Muscular tension related to mechanical stress
- Osteoarthritis of spine
- Protruding intervertebral disk
- Other disease process

Risk Factors

- Aging
- Prolonged periods of standing or sitting
- Poor posture
- Pregnancy
- Obesity
- Improper lifting techniques
- Family history
- Osteoporosis
- Past trauma
- Recent bacterial drug use
- IV drug use
- Immunosuppressed

History

Obtain a detailed history, with a precise description of the pain and events surrounding its onset (e.g. activity at the time).

- Pain localized in low lumbar area
- Pain may radiate into buttock or leg (e.g. sciatica)
- Aching pain may be accompanied by intense, sharp muscle spasm
- Sitting increases pain
- Supine posture decreases pain
- Rest decreases pain
- Motion increases pain
- Interference with daily activities

- Interference with performance of job-related activities
- Occupation involving bending or heavy lifting
- History of recent or previous trauma
- Other underlying spinal disk, bone or joint disease (e.g. spinal stenosis, osteoarthritis)
- Fever, chills
- Weight loss
- Cancer

Physical Findings

- Client appears in mild-to-severe distress
- Abnormal posture (tilting to one side)
- Difficulty with walking (ataxic gait)
- May be unable to stand or sit up straight
- Spinal deformities may be present
- Bruising or soft-tissue swelling may be present
- Spasm of para-spinal muscles may be present
- Intervertebral disk space may be tender in lumbar area and along paravertebral muscles
- Range-of-motion maneuver may be limited (especially forward flexion)
- Straight leg raising may be limited because of muscle tightness, muscle spasm or nerve root irritation (sciatica)
- Reflexes normal in cases of soft-tissue injury, but may be abnormal in cases of impingement on nerve root
- Weakness with heel or toe walking may be present (in cases of impingement on nerve root)
- Sensory deficits may be present (in cases of impingement on nerve root)
- Bowstring test may be positive (in cases of impingement on nerve root)
- Evaluate for "red flag" indicators for potentially serious conditions

Red Flag Indicators For Potentially Serious Conditions

Possible Fracture

- Major trauma
- Minor trauma in older clients or clients who may have osteoporosis

Possible Cauda Equina Syndrome (Surgical Emergency)

- Saddle-block anesthesia
- Bladder dysfunction
- Severe or progressive neurologic dysfunction in the legs
- Laxity of anal sphincter
- Major motor weakness in quadriceps (knee extensors), ankle plantar flexors, evertors and dorsiflexors (foot drop)

Possible Tumor or Infection

- Client age < 20 or > 50 years
- History of cancer
- Constitutional symptoms such as fever, chills and weight loss
- Risk factors for spinal infection, recent bacterial infection, injection drug use or immunosuppression
- Pain that is worse in the supine position or severe nighttime pain

Differential Diagnosis

See "Causes of Low-Back Pain," in "Differential Diagnosis of Musculoskeletal Cardinal Symptoms," above, this chapter.

Complications

- Chronic or recurrent back pain
- Absenteeism from work
- Dependency on or abuse of analgesics
- Occupational disability

Diagnostic Tests

In the absence of any red flag indicators, no investigations are needed within the first 4 weeks of acute mechanical low-back pain from lumbar strain.

Management

Goals of Treatment

- Relieve pain
- Prevent further injury
- Educate and reassure the client
- Maintain/improve activity level

Appropriate Consultation

Consult physician for moderate-to-severe back pain, especially if the client is > 50 years of age or has neurologic abnormalities, or if you suspect an underlying organic cause for the back pain.

Nonpharmacologic Interventions

- Clients with sciatica may have a longer expected recovery time than clients with non-specific back symptoms
- Bed rest is useful if pain and spasm preclude motion, but should not exceed 3 days; any longer may actually increase pain and disability
- Heavy physical activity should be reduced for 1-2 weeks; otherwise activity as tolerated
- No heavy lifting (> 11 kg [25 lb])
- Client should sleep on a firm mattress support with pillow under knees when lying on back or between knees when lying on side
- Ice packs can be used to reduce muscle spasm (20 minutes q2-4h for 24-48 hours)
- Use a heating pad or hot water bottle to reduce muscle stiffness (if pain and spasm absent) after the first 48 hours (20 minutes qid prn)
- Provide advice about nutrition and weight loss if client is overweight
- Time off should be brief; goal is to keep client active

Client Education

To Be Avoided

- Prolonged standing
- Prolonged sitting
- Lifting > 11 kg (25 lb)
- Lifting and twisting motion
- Slumping posture

To Be Encouraged

- Lumbar support
- Frequent positional changes
- Maintenance of normal spine alignment when sitting or standing
- Proper lifting techniques
- Counsel client about appropriate use of medications (dose, frequency, abuse, overuse)
- Teach the client back-strengthening and conditioning exercises that can be done at home

- Advise client not to start exercises until acute symptoms have subsided

Pharmacologic Interventions

Anti-inflammatory analgesics to reduce pain:

ibuprofen, 400 mg, PO tid-qid prn or

naproxen, 250 mg, PO bid or

acetaminophen, 500 mg, 1-2 tabs PO tid-qid prn

If pain is moderate to severe, or first-line agents fail to control discomfort:

acetaminophen with codeine 30mg, 1-2 tabs PO q4h prn (maximum 15 tabs) -- may be used in addition to the anti-inflammatory drugs

For muscle spasm

cyclobenzaprine 10mg PO tid for 3 days and reassess

Monitoring and Follow-Up

Arrange follow-up at 1-2 days, and then as needed

Referral

- Refer to a physician if symptoms persist after 4 weeks, or sooner if symptoms are worsening despite conservative treatment
- Arrange referral to a physiotherapist

Gout

Definition

Inflammatory disease of peripheral joints related to high concentrations of uric acid in the joints and bones.

Causes

- Primary gout: High levels of uric acid from either increased production or decreased excretion of uric acid
- Secondary gout: Hyperuricemia from primary acquired diseases such as hypertension, renal failure, hemolytic anemia, glycogen storage disease, psoriasis, renal insufficiency, sarcoidosis, enzyme deficiencies

Risk Factors

- Obesity
- Lead intoxication
- Medications such as salicylates, thiazide diuretics, corticosteroids, cytotoxic drugs, diazepam, ethambutol, nicotinic acid
- Alcohol abuse (especially binge drinking)
- Other risk factors: family history, diabetes mellitus, hypertension, renal failure, hypothyroidism, hyper- or hypo-parathyroidism, pernicious anemia

History

- Sudden onset of pain in a joint
- Great toe most commonly affected initially
- Instep, ankle, knee, wrist and elbow may be affected
- Almost all attacks are monoarticular (involving only one joint)
- Widespread joint involvement occurs rarely, accompanied by fever, chills and general malaise
- Pain usually occurs spontaneously, is severe, throbbing and continuous
- First attack begins during the night or early morning
- May be precipitated by trauma, alcohol binging, recent infection, emotional stress or administration of medications (diuretics, penicillin, insulin)
- Attacks are recurrent
- Familial tendency

- Male or postmenopausal female

Physical Findings

Acute Attack

- Temperature usually normal
- Heart rate may be elevated
- Client appears in acute distress
- Difficulty walking or unable to bear weight on affected limb
- Metatarsophalangeal or interphalangeal joint of great toe shows the following characteristics: redness and swelling; overlying skin tense and shiny; range of motion reduced and accompanied by pain; joint acutely tender and feels warm or hot

Chronic Disease

- Joint deformity may be present
- Tophi (chalky deposits) may be present in pinnae of ear, olecranon bursa, dorsum of hands, ulnar surface of forearms, Achilles' tendon and joints of hands and feet

Differential Diagnosis

- Septic arthritis
- Pseudogout
- Bursitis
- Cellulitis
- Osteomyelitis
- Degenerative arthritis with acute inflammation
- Rheumatoid arthritis
- Bunion

Complications

- Recurrent attacks
- Joint deformity and reduced mobility
- Chronic pain
- Renal calculi
- Nephropathy (may take 10 years to develop)
- Tophi (deposition of uric acid crystals in soft tissues)

Diagnostic Tests

- Serum uric acid (normal < 0.45 mmol/L [7.5 mg/dL])

- White blood cell (WBC) count (elevated in acute phase)
- Erythrocyte sedimentation rate (ESR) (elevated in acute phase)
- 24-hour urinary uric acid excretion (> 900 mg suggests overproduction)

Management

Goals of Treatment

- Relieve symptoms
- Prevent recurrence
- Prevent complications

Appropriate Consultation

Consult a physician if the client is acutely ill or febrile on initial presentation. Consult a physician if no response to therapy in 24-48 hours.

Nonpharmacologic Interventions

- No weight bearing
- Immobilize the joint until hyperacute symptoms are controlled
- Client should increase fluid intake during attack (8 glasses daily)
- Client should discontinue alcohol consumption
- Low-fat diet (to reduce dietary purine, if excessive)
- Weight reduction will help an obese client in the long term

Client Education

- Explain chronic nature and course of the disease
- Counsel client about appropriate use of medications (dose, frequency, side effects, adherence to regimen between attacks to prevent future attacks)

- Advise client to avoid known precipitating factors
- Explain how to prevent irritation (e.g. proper-fitting footwear, not going barefoot in the house)
- Advise client to return to clinic at first sign of recurrence
- Advise client to begin anti-inflammatory medications at the first sign of an acute attack

Pharmacologic Interventions

For acute gout, relieve pain and inflammation with NSAIDs:

ibuprofen, 400 mg, PO tid until acute symptoms subside, then taper drug to discontinue in another 72 hours

or

naproxen, 250 mg PO bid for 7 days

ASA (Aspirin) is contraindicated for gout.

If pain is severe, additional analgesia may be required until anti-inflammatory drugs start to work:

acetaminophen with codeine 30mg, 1-2 tabs PO q4h prn (maximum 15 tabs)

Monitoring and Follow-Up

- Follow up in 24 hours to ensure response to therapy
- Follow up in 1 month to evaluate status
- For client with chronic gout, measure uric acid levels annually and assess adherence to prophylaxis

Referral

Refer to a physician regarding prophylactic therapy for clients with recurrent episodes.

Osteoarthritis (Degenerative Joint Disease)

Definition

Degenerative disease of the articular cartilage of movable joints. Variable amounts of synovial inflammation result, new bone forms at joint surfaces (osteophytes).

Causes

- Unknown.
- Factors associated with osteoarthritis: aging, previous joint trauma, chronic overuse of joint, altered biomechanics, obesity, metabolic disorders (e.g. Wilson's disease), previous infection in a joint, endocrine disorders (e.g. diabetes mellitus), crystalline deposit disease

History

- Family history
- Client usually > 50 years of age
- Joint pain (joints most affected are DIP [distal interphalangeal], PIP [proximal interphalangeal], MCP [metacarpophalangeal], knees, hips, cervical spine, lumbar spine)
- Pain is aching in character
- Pain often worsens with changes in weather
- Pain increases with activity
- Pain relieved by rest
- Localized joint stiffness may be present in the morning or after periods of inactivity
- Stiffness quickly relieved with movement (in less than 30 minutes)
- Generalized joint stiffness absent
- Crepitus (a noisy joint) may be present
- Joint enlargement with limited range of motion may be present
- Flare-ups of pain may occur after unaccustomed exercise

Physical Findings

Extent and pattern of physical findings are variable.

- Difficulty with mobility may be present if spine, hips or knees are affected
- Joints may appear enlarged and deformed
- Range of motion limited according to extent of joint involvement

- Muscle strength and joint stability (ligament) may be affected
- Osteophyte formation (bony enlargement)
- DIP joints may have osteophyte formation dorsally and marginally (Heberden's nodes)
- Redness or swelling not evident unless there has been an episode of secondary reactive synovitis
- Tenderness may be present in late disease
- Crepitations may be felt or heard with movement of joint

Differential Diagnosis

- Other forms of arthritis and articular disease
- Trochanteric bursitis (in clients with hip problems)
- Ligamentous or meniscal problems, local bursitis, loose bodies (in clients with knee problems)

Complications

- Chronic pain
- Progressive joint destruction with increasing loss of function and pain
- Impingement of spinal nerves

Diagnostic Tests

None.

Management

Goals of Treatment

- Relieve or modify symptoms
- Preserve joint function
- Prevent complications

Appropriate Consultation

Consult a physician if client is < 50 years of age, joint involvement is atypical, or nerve dysfunction is suspected.

Nonpharmacologic Interventions

- Weight-reduction strategies if client is obese
- Daily exercise program (walking is best)
- Range-of-motion exercises and muscle-strengthening exercises
- Alternating application of heat and cold to reduce joint pain

Client Education

- Discourage bed rest or inactivity, as this will cause further loss of function and increase immobility
- Explain prognosis, process and expected course of the disease
- Counsel client about appropriate use of medications (dose, frequency, side effects)

Pharmacologic Interventions

acetaminophen, 500 mg, 1-2 tabs PO q4h prn

If there is insufficient pain control, add low-dose NSAID, if not contraindicated (e.g. heart failure, hypertension, renal failure, peptic ulcer):

ibuprofen, 200 mg, 1-2 tabs PO qid prn

or

naproxen, 250 mg bid prn

Monitoring and Follow-Up

Follow up every 6-12 months. Clients receiving daily doses of acetaminophen, ASA or other NSAIDs should undergo regular monitoring as follows: complete blood count, creatinine level, electrolyte level, liver function tests (LFTs) and stool examination (for occult blood).

Referral

Refer to a physician if symptoms are not controlled with conservative treatment. Arrange for physiotherapy (if readily available).

Rheumatoid Arthritis

Definition

A chronic systemic inflammatory disease that affects primarily the peripheral joints. Certain extra-articular manifestations are common, including rheumatoid nodules, arteritis, peripheral neuropathy, keratoconjunctivitis, pericarditis and splenomegaly.

Causes

- Largely unknown
- Autoimmune disorder
- Viral infection

Risk Factors

- Usually occurs in women 30-60 years of age
- Family history
- Native ancestry

History

- Recent systemic illness or trauma may have occurred
- Onset of symptoms generally insidious
- Hands, wrists, elbows, shoulders, ankles and feet are the joints most commonly affected; joints exhibit pain, swelling, stiffness, warmth, redness
- Pain and stiffness exacerbated by prolonged rest or strenuous activity
- Joint stiffness for at least 1 hour upon rising in morning, over a period of more than 6 weeks
- Fatigue, general malaise, anorexia and weight loss present during acute exacerbations
- Iritis

As disease progresses:

- Morning and resting stiffness lasts for longer periods of time (this increase over time is a good indicator of disease progression)
- Disease progresses to involve multiple other joints
- Progressive joint destruction, deformity

Physical Findings

Acute Exacerbation

- Client in moderate distress
- Temperature may be elevated
- Heart rate may be elevated

- Affected joints swollen (bilateral symmetric joint involvement common)
- Affected joints may be reddened
- Affected joints are warm and tender
- Range of motion reduced

Chronic Progressive Disease

- Affected joints are enlarged
- Joints become deformed: PIP joints take on fusiform shape; flexion contractures may occur (e.g. Swan neck deformity); ulnar deviation of MCP joints; deviation of wrists
- Subcutaneous rheumatoid nodules may be present
- Progressive weight loss may occur

Differential Diagnosis

- Degenerative osteoarthritis with inflammation
- Septic arthritis
- Polymyalgia rheumatica
- Systemic lupus erythematosus
- Gout
- Psoriatic arthritis
- Gonococcal arthritis
- Reiter's syndrome (in men)
- Lyme disease
- Polymyositis
- Inflammatory bowel disease (e.g. Crohn's disease, ulcerative colitis)

Complications

- Chronic pain
- Progressive joint destruction
- Loss of mobility
- Anemia of chronic disease
- Pulmonary and renal involvement
- Dermatitis
- Pericarditis

Diagnostic Tests

Before medications are started, clients should undergo some basic laboratory tests: complete blood count, ESR, rheumatoid factor, anti-nuclear antibody (ANA), creatinine and electrolyte levels, LFTs. Urinalysis should also be performed before drug treatment starts.

Management

Goals of Treatment

- Control pain
- Reduce inflammation
- Preserve joint function
- Prevent long-term disability

Appropriate Consultation

Consult physician for:

- Previously undiagnosed clients
- Clients whose disease is not controlled by current therapy
- Clients whose disease is progressive
- Clients in whom a complication is developing

Client Education

- Adequate rest and nutrition
- Rest for affected joints
- Splint affected joint during acute phase prn
- Ice packs prn to reduce pain and swelling of affected joints
- Adequate, balanced, nutritious diet
- Exercise program to maintain joint mobility and muscle strength
- Maintenance of ideal body weight
- Explain process, course and prognosis of the disease
- Counsel client about appropriate use of medications (dose, frequency, side effects, compliance)
- Instruct client to take medications with meals to reduce gastrointestinal upset
- Stress importance of daily exercise in maintaining function and mobility of joints

- Assess family support systems and encourage family members to become active in client's treatment program
- Advise client to return to clinic if acute episode occurs

Pharmacologic Interventions

Anti-inflammatory analgesics:

ibuprofen, 400 mg, PO tid or

naproxen, 250 mg, PO bid

Monitoring and Follow-Up

Acute Episode

- Follow up in 48-72 hours to assess response to therapy

Long-Term Surveillance

- Follow up regularly as dictated by stage of disease
- Assess weight, appetite, energy level, sense of well-being
- Monitor symptoms for progression of disease
- Determine efficacy of therapy
- Encourage joint mobility through exercise program
- Identify acute exacerbations

Referral

Refer clients with persistent joint inflammation (> 3 months) and any who present with severe disease as soon as possible. Arrange physiotherapy consult (if readily available).

Emergencies Of The Musculoskeletal System

Note: For spine and pelvic fractures see Chapter 14: General Emergencies and Major Trauma

Limb Fractures

Definition

A break in the continuity of the bone.

Causes

- Trauma
- Pathological fracture secondary to underlying disease (e.g. osteoporosis)

Types of Fractures

- *Closed (simple) fracture*: fracture that does not communicate with the external environment
- *Open (compound) fracture*: fracture that communicates with the external environment (through laceration of skin)
- *Comminuted fracture*: fracture involving three or more fragments
- *Avulsion fracture*: fracture in which fragment of bone is pulled from its normal position by muscular contraction or resistance of a ligament
- *Greenstick fracture*: incomplete angulated fracture of a long bone, seen most often in children
- *Undisplaced fracture*: fractured bone stays in alignment
- *Displaced fracture*: fractured bone goes out of alignment

History

- Determine exact mechanism of injury
- Pain
- Swelling
- Loss of function
- Numbness distal to fracture site (possible)

Commonly Seen Fractures

- *Fracture of the clavicle*: See "Clavicle Fracture," below, this chapter.
- *Fracture of radial head (elbow)*: Usually caused by a fall onto an outstretched hand. Client is reluctant to pronate the hand or flex the elbow beyond 90°.

- *Radial fracture (wrist)*: In adults, the most common radial fracture is the Colles' fracture, which is extra-articular and occurs 2.5-3 cm (1-1.2 inch) proximal to the articular surface of the distal radius. This fracture occurs with the hand in dorsiflexion; the distal fracture segment is angulated dorsally and causes a "dinner fork" deformity.
- *Metacarpal fracture*: Also known as "boxer's fracture," this is a fracture of the distal neck of the fifth metacarpal and is generally the result of punching something with a closed fist (generally a wall or refrigerator). Tenderness is localized to the injured metacarpal bone.
- *Finger fracture*: There are three types of finger fractures. (1) Distal tip fractures are usually crush injuries to the tip of the finger. (2) Middle and proximal phalangeal fractures should be examined for evidence of angulation (by x-ray) or rotation (by clinical examination), each of which requires reduction. (3) Small (< 25%) avulsion fractures of the middle phalangeal base occur with a hyperextension injury.
- *Pelvic fracture*: Often associated with major trauma and can lead to significant blood loss.
- *Hip fracture*: Common in elderly clients. May not be very painful.
- *Femur fracture*: Often associated with major trauma and can lead to significant blood loss.
- *Tibia and fibula fracture*
- *Ankle fracture*

Physical Findings

- Skin lacerations with protruding bones may be present if fracture is compound
- Bruising and swelling
- Range of motion decreased
- Affected part may be pale if blood flow to the area is compromised

- Limb cool, pulses absent and sensation decreased if blood supply has been compromised
- Check temperature of area and presence of pulses distal to site of injury
- Test sensory function (to sharp and dull stimuli) distal to site of injury
- Affected area extremely tender
- If bones are displaced, crepitations may be felt

Table 8: Volumes of blood loss associated with some common fractures

# tibia	350 - 650 mL
# femur	800 - 1200 mL
# humerus	200 - 500 mL
# ribs	100 - 150 mL
# pelvis	1500 - 2000 ⁺ mL

Differential Diagnosis

- Severe sprain
- Severe contusion
- Dislocation

Complications

- Hemorrhage
- Damage to arteries, neurovascular bundle and surrounding soft tissues
- Wound infection
- Fat embolism
- Adult respiratory distress syndrome
- Chest infection
- Disseminated intravascular coagulopathy
- Exacerbation of general illness
- Compartment syndrome may result from casting
- Deformity
- Osteoarthritis of adjacent or distant joints
- Aseptic necrosis
- Traumatic chondromalacia
- Reflex sympathetic dystrophy

Diagnostic Tests

X-ray

Management

Most bones join in 6-8 weeks; lower-limb bones may take longer and fractures in children may take less time.

Goals of Treatment

- Stabilize fracture
- Relieve pain
- Prevent or manage complications
- Identify and treat associated injuries

Appropriate Consultation

Consult physician for all suspected or confirmed fractures.

Nonpharmacologic Interventions

Do not attempt to reduce a displaced fracture.

- Immobilize and support involved area using splints, a back slab cast or sling (for upper extremities) as appropriate
- For client with displaced fracture, give nothing by mouth because surgery may be needed

Client Education

- Counsel client about appropriate use of medications (dose and frequency)
- Advise client to keep limb elevated as much as possible during the first several days to reduce swelling
- Instruct the client about cast care: keep cast dry, avoid poking objects down the cast, as this may result in damage to the skin
- Advise client to return to the clinic if pain increases, if numbness or tingling develops, if the limb becomes cool or if colour changes are noted in the distal limb
- Teach client how to care for limb after removal of cast: skin should be kept clean and well hydrated with oil or petroleum jelly to prevent drying, cracking and infection; range-of-motion exercises should be done to regain joint mobility

Adjuvant Therapy

If hypotension is present in a client with a major fracture (e.g. femur, pelvis, hip), treat for shock:

- Oxygen to keep oxygen saturation > 97%
- Start two large-bore IVs with normal saline or Ringer's lactate

Pharmacologic Interventions

Analgesia for pain as ordered by physician

Referral

Medevac to hospital.

Management Of Specific Fractures Of The Upper Extremity***Fracture of Radial Head***

Management of undisplaced fracture includes a sling and posterior elbow splint for 1-2 weeks with range-of-motion exercises initiated after 1 week. Continue in sling for another week and do follow-up x-ray to document that no displacement has occurred with mobilization.

Displaced fractures of the radial head should be referred to an orthopedist for operative repair.

Radial Fracture

Reduction by traction and manipulation is performed. After the fracture is reduced, a plaster short-arm cast is applied for 5-8 weeks. If the fracture is undisplaced, casting for 6 weeks without reduction is indicated.

Metacarpal Fracture

Undisplaced fractures of the base of the metacarpals are treated by immobilization in a short-arm cast. Displaced fractures are reduced by

traction, with local pressure over the prominent proximal end of the distal metacarpal fracture. Follow-up x-ray within 7 days is necessary. If any instability is noted after reduction or the fracture is comminuted, the client should be referred to an orthopedist for open reduction and internal fixation.

Distal Tip Fracture

Protective splinting of the tip for several weeks is usually satisfactory.

Middle and Proximal Phalangeal Fracture

Nondisplaced extra-articular fractures can be managed by 1-2 weeks of immobilization followed by dynamic splinting with "buddy taping" to the adjacent finger.

Large intra-articular or displaced fractures are usually unstable and require orthopedic referral.

Small (< 25%) Avulsion Fracture of Middle Phalangeal Base

These injuries are managed by 2-3 weeks of immobilization with up to 15° of flexion at the PIP joint, followed by "buddy taping" for 3-6 weeks.

Monitoring and Follow-Up

- Monitor vital signs, and watch for tachycardia and hypotension; shock may occur with major fractures of the pelvis and femur
- Monitor neurovascular status of area distal to the fracture site

Clavicular Fracture

Definition

Break in the continuity of the clavicle.

Eighty percent of clavicle fractures occur in the middle third of the bone (class A), 15% involve the distal or lateral third (class B), and 5% involve the proximal or medial third (class C).

Class B fractures are further classified as:

- *Type 1 (non-displaced)*: the supporting ligaments remain intact and there is no significant displacement of the fracture fragments
- *Type 2 (displaced)*: the coracoclavicular ligament ruptures, with resultant upward displacement of the proximal segment because of the sternocleidomastoid muscle
- *Type 3 (articular surface)*: fracture involves the acromioclavicular joint

Causes

- Fall onto shoulder or outstretched upper extremity
- Direct trauma to clavicle area

History

- Fall onto outstretched upper extremity, fall onto the shoulder or direct clavicular trauma
- Pain (moderate to severe), especially with movement of the upper extremity

Physical Findings

- Tenderness
- Swelling over fracture site
- Deformity
- Ecchymosis, especially when severe displacement causes tenting of skin
- Bleeding due to open fracture (rare)
- Non-use of arm on affected side

Distal neurovascular examination and lung auscultation (to clinically exclude pneumothorax) must be performed.

Differential Diagnosis

- Dislocation
- Shoulder fracture

- Rib pneumothorax (tension and traumatic)
- Rotator cuff injury
- Sternoclavicular joint injury

Complications

- Brachial plexus compression may result from hypertrophic callus formation and may cause peripheral neuropathy
- Delayed union or non-union (especially with distal-third fractures)
- Poor cosmetic appearance
- Post-traumatic arthritis
- Intrathoracic injury (as with fracture of the first rib, great force is necessary to cause proximal-third clavicle fractures, and it is imperative to rule out underlying injuries)
- Pneumothorax
- Subclavian artery and vein injury
- Internal jugular vein injury
- Axillary artery injury

Diagnostic Tests

- Routine clavicle x-ray (the fracture is usually seen with an AP view)
- Chest x-ray, if pneumothorax suspected

Management

Goals of Treatment

- Identify and treat associated life threatening injuries
- Stabilize fracture site
- Relieve pain
- Identify and manage complications

Nonpharmacologic Interventions

- Employ the ABC approach (airway, breathing and circulation) to evaluation and stabilization
- Perform a careful secondary survey
- Apply a cold pack to site of injury
- Immobilize the upper extremity with a sling

Class A (Middle-Third Fractures)

- Treat with sling immobilization (some prefer a figure-of-eight clavicular splint, especially for displaced fractures)

Class B (Distal-Third Fractures)

- Type 1 (non-displaced) and type 3 (articular surface) fractures of the distal clavicle are treated with sling immobilization
- Type 2 (displaced) fractures should be immobilized in a sling and swath and may require orthopedic surgical fixation

Class C (Proximal-Third Fractures)

- Treat non-displaced fractures with sling immobilization
- Displaced fractures may require orthopedic referral for surgical reduction

Client Education

- Client should use a sling or shoulder immobilizer
- Alternatively, client may use a figure-of-eight bandage (clavicle strap); educate clients as to proper placement and adjustment techniques; paresthesias or edema in the hands or fingers indicate that the strap is too tight and should be removed; purpose of this bandage is to reduce pain by decreasing movement of the fracture fragments, not necessarily to maintain perfect

alignment; may be combined with a sling for added comfort

- Counsel client about injury prevention: adequate protective gear for participation in certain sports, use of seatbelts, drug and alcohol counseling (as needed), early physical therapy (e.g. range-of-motion exercises) if indicated

Pharmacologic Interventions

Control discomfort with NSAIDs. If pain continues, add a narcotic analgesic:
ibuprofen, 400 mg PO tid, prn for 1-2 weeks

If pain is not controlled, add:
*acetaminophen with codeine 30mg,
1-2 tabs PO q4h prn (maximum 15 tabs)*

Monitoring and Follow-Up

- Reassess injuries in 48 hours, then follow up weekly until full shoulder mobility has returned

Referral

- Medevac clients with open fractures
- Refer other clients if not improving

Septic Arthritis

Definition

Bacterial infection of a joint.

Causes

Common pathogens include *Neisseria gonorrhoeae*, *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Mycobacterium tuberculosis*, gram-negative bacilli and occasionally *Haemophilus*; infection with viral and fungal agents is rare but may occur in immunocompromised clients.

Risk Factors

- Trauma
- Recent joint surgery
- Prosthetic joint
- Contiguous spread from osteomyelitis
- Extension of cellulitis
- Hematogenous spread of bacteria
- Pre-existing joint disease (e.g. rheumatoid arthritis)
- Injection drug use
- Prior use of antibiotics, corticosteroids or immunosuppressants
- Serious chronic illness (e.g. diabetes mellitus, liver disease, malignant disease)
- Primary immunodeficiency (e.g. HIV)

History

- Presence of one of the above risk factors
- Fever and chills
- Sudden onset of acute monoarticular joint pain
- Heat
- Redness
- Swelling
- Large joint usually involved
- Client unable to bear weight on affected limb, unable to move joint
- Recent history of urethritis, salpingitis or hemorrhagic skin lesions (indicating gonococcal infection) may be present

Physical Findings

The classic signs of acute inflammation may be absent in elderly clients, chronically debilitated people or clients receiving steroid therapy.

- Temperature elevated

- Heart rate elevated
- Client appears ill and in acute distress
- Joint red
- Joint swelling may be present
- Range of motion severely limited
- Client actively resists any movement of joint
- Hemorrhagic skin lesions may be present
- Joint warmth may be present
- Joint tender
- Regional lymphatic nodes enlarged and tender

Differential Diagnosis

- Localized synovitis due to trauma
- Bursitis
- Cellulitis
- Rheumatic fever arthritis
- Active rheumatoid arthritis
- Active gout or pseudogout
- Reiter's syndrome
- Psoriatic arthritis
- Lyme disease arthritis

Complications

- Sepsis
- Septic shock
- Osteomyelitis
- Joint destruction
- Loss of limb

Diagnostic Tests

None.

Management

Goals of Treatment

- Relieve pain and inflammation
- Prevent complications

Appropriate Consultation

Consult a physician immediately.

Nonpharmacologic Interventions

- Bed rest
- Splint limb, using pillows or a back slab, to protect involved area from injury

Adjuvant Therapy

Start IV therapy to keep vein open.

Pharmacologic Interventions

Analgesic or antipyretics for pain and fever:
acetaminophen, 500 mg, 1-2 tabs PO q4h prn

Consider starting IV antibiotics in consultation with physician if transfer to hospital will be delayed more than an hour or two.

Monitoring and Follow-Up

Monitor vital signs frequently.

Referral

Medevac as soon as possible.

Osteomyelitis

Definition

Infection of the bone.

Causes

Bacterial infection (common pathogens are *Staphylococcus aureus*, *Streptococcus*).

Risk Factors

- Extension of existing soft-tissue infection
- Trauma
- Direct introduction of organism into the bone
- Hematogenous spread of pre-existing infection

People with diabetes, peripheral vascular disease with chronic skin breakdown, and chronic skin infection are particularly prone to osteomyelitis.

History

- Presence of one of the above risk factors
- Mild-to-moderate fever may be present
- Infection of overlying skin and subcutaneous tissues may be present
- Localized pain, increased by weight bearing or movement
- Heat, redness and swelling of affected area
- Sinus may be draining

Blood-Borne Osteomyelitis

- Original site of infection frequently not apparent
- Most commonly occurs in vertebrae
- Presents as persistent back pain with minimal or absent fever
- May present as acute back pain with high fever, paravertebral muscle spasm and guarding of movements (mimicking pyelonephritis)

Physical Findings

- Temperature may be elevated
- Heart rate moderately elevated
- Client in moderate distress
- Distress with weight-bearing
- Involved area swollen, overlying skin red
- Range of motion reduced if adjacent joint is involved
- Purulent drainage from sinus may be present
- Area warm and tender to touch

Differential Diagnosis

- Infectious arthritis
- Active rheumatoid arthritis
- Cellulitis

Complications

- Chronic osteomyelitis
- Chronic bone pain
- Loss of limb
- Subcutaneous abscess

Diagnostic Tests

None.

Management

Goals of Treatment

- Relieve infection
- Prevent complications

Appropriate Consultation

Consult a physician immediately.

Nonpharmacologic Interventions

- Bed rest
- Elevate and splint affected area

Adjuvant Therapy

Start IV therapy with normal saline to keep vein open.

Pharmacologic Interventions

Antipyretic or analgesic for pain and fever:
acetaminophen, 500 mg, 1-2 tabs PO q4h prn

Consult physician for choice of IV antibiotics

Referral

Medevac as soon as possible.

Assessment Of The Central Nervous System

History Of Present Illness And Review Of System

General

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

- Onset (sudden or gradual)
- Chronology
- Current situation (improving or deteriorating)
- Location
- Radiation
- Quality
- Timing (frequency, duration)
- Severity
- Precipitating and aggravating factors
- Relieving factors
- Associated symptoms
- Effects on daily activities
- Previous diagnosis of similar episodes
- Previous treatments
- Efficacy of previous treatments

Cardinal Symptoms

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

General Cerebral Function

- Changes in memory, especially recent
- Changes in concentration
- Changes in mood

Cranial Nerve Function

- Changes in vision, drooping eyelids
- Facial weakness
- Disturbance of speech production
- Hearing loss, unusual noise in ears, difficulties with balance
- Impairment of sense of smell or taste

Headaches

- Onset, age at onset
- Pattern, any changes in pattern, how it progresses
- Location, description, whether pulsating, degree of pain
- Time of day, duration, frequency

- Precipitating factors, aggravating factors
- Associated symptoms: nausea, vomiting, visual or sensory disturbances
- Interference with daily activities

Changes in Level of Consciousness

- Dizziness
- Fainting
- Convulsions
- History of head injury that produced any loss of consciousness

Motor Function

- Muscle weakness, paralysis, stiffness, spasm
- Clumsiness, ataxia
- Staggering gait with wide-base stance
- Tremor

Sensory Function

- Loss of or decrease in sensation
- Sensation of "pins and needles," tingling
- Burning sensation

Other Associated Symptoms

- Bowel or bladder dysfunction
- Impotence
- Pain

Medical History (Specific To Central Nervous System)

- Seizures
- Head trauma
- Metabolic disorders (e.g. diabetes mellitus, thyroid problems)
- Cardiac disorders (e.g. hypertension, heart block)
- Transient ischemic attack
- Demyelinating disorders (e.g. multiple sclerosis, Parkinson's disease)
- Alcoholism
- Migraine headaches
- Psychiatric disorders (e.g. depression, bipolar disorder)
- Bell's palsy

Family History (Specific To Central Nervous System)

- Seizures
- Metabolic disorders (e.g. diabetes mellitus)
- Cardiac disorders (e.g. hypertension, myocardial infarction, stroke)
- Demyelinating disorders (e.g. multiple sclerosis, Parkinson's disease)
- Headaches (including types)
- Psychiatric disorders

Personal And Social History (Specific To Central Nervous System)

- Alcoholism and/or drug abuse
- Occupational exposure to neurotoxins

Examination Of The Central Nervous System

General Appearance

- Apparent state of health
- Appearance of comfort or distress
- Colour (e.g. flushed, pale, cyanotic)
- Nutritional status (emaciated or obese)
- Match between appearance and stated age

To Be Assessed During History-Taking

- Level of consciousness
- Mental status
- Speech (clarity, content, volume, rate)

Screening Examination

The following screening examination will reveal areas of difficulties. If deficits are discovered, a more in-depth examination is required.

Cranial Nerves

See Table 1.

Table 1: Screening tests for cranial nerves

	Cranial Nerve	Test
I	Olfactory	Smell (test only if there is a specific complaint)
II	Optic	Visual acuity, visual fields, funduscopic examination
III	Oculomotor	Pupillary response (direct or consensual)
IV	Trochlear	Extraocular eye movements
VI	Abducent	
V	Trigeminal	Motor function: clench teeth, open jaw. Sensory function: pain (sharp stimulus); light touch (cotton wisp); sensation on forehead, cheek, chin. Corneal reflex (omit if client is conscious)
VII	Facial	Facial symmetry; raise eyebrows, frown, close eyes tightly against resistance, show teeth, puff cheeks, smile
VIII	Acoustic (Vestibulocochlear)	Hearing (watch ticking, whisper), Rinne and Weber tests
IX	Glossopharyngeal	Movement of palate, uvula, pharyngeal wall. Gag reflex and swallowing.
X	Vagus	Hoarseness
XI	Spinal accessory	Shoulder shrug against resistance. Head turn against resistance
XII	Hypoglossal	Stick out tongue, push tongue against each cheek

Motor Function, Sensory Function and Reflexes

Assess motor function, sensory function and reflexes together, as follows.

Table 2: Glasgow Coma Score

Glasgow Coma Score		
Eye Opening (E)	Verbal Response (V)	Motor Response (M)
4=Spontaneous 3=To voice 2=To pain 1=None	5=Normal conversation 4=Disoriented conversation 3=Words, but not coherent 2=No words...only sounds 1=None	6=Normal 5=Localizes to pain 4=Withdraws to pain 3=Decorticate posture 2=Decerebrate 1=None
		Total = E+V+M

Note that the phrase 'GCS of 11' is essentially meaningless, and it is important to break the figure down into its components, such as E3V3M5 = GCS 11.

A Coma Score of 13 or higher correlates with a mild brain injury, 9 to 12 is a moderate injury and 8 or less a severe brain injury.

Arms and Hands

- Grip strength
- Raise both arms and hold (assess for palmar drift)
- Finger-nose test (assess for eye-hand coordination)
- Blunt and sharp pin prick
- Reflexes (biceps, triceps, brachioradialis [supinator])

Legs

- Straight-leg raising
- Bowstring test
- Quadriceps test
- Heel-to-toe walk
- Heel-shin test
- Romberg test
- Blunt and sharp pin prick
- Reflexes (Achilles' tendon, patellar, plantar)

Meningeal Irritation

Test for meningeal irritation if indicated:

- Neck stiffness
- Brudzinski's sign
- Kernig's sign

Common Problems Of The Central Nervous System

Bell's Palsy

Definition

Sudden, painless, unilateral paralysis of facial muscles due to inflammation and swelling of the seventh cranial nerve (the facial nerve). The condition usually resolves spontaneously.

Causes

- Largely unknown
- Possibly viral infection of facial nerve
- May be related to Lyme disease and HIV infection
- Hereditary and vascular factors may be contributory

Risk Factors

- Pregnancy (third trimester)
- Positive family history
- Hypertension
- Diabetes mellitus

History

- Sudden onset of unilateral facial weakness
- Progression to complete paralysis within a few hours
- Inability to close eye on affected side
- Excessive tearing of affected eye may be present
- Taste sensation may be altered
- Hypersensitivity to sound
- Pain in or behind ear may occur on affected side just before onset of facial weakness

Physical Findings

- Client appears anxious
- Flat nasolabial fold
- Client unable to close eye, raise eyebrow or smile on affected side
- Widened palpebral fissure
- Eyeball rolls upward when client attempts to close eyelid
- Drooling may be present
- Sensation to light touch and pin prick may be reduced
- Loss of forehead wrinkles

Differential Diagnosis

- Stroke (brain stem)
- Cerebral tumor
- Parotid gland tumor
- Middle ear or mastoid infection
- Meningitis
- Head or facial trauma with fracture
- Lyme disease
- Herpes zoster oticus
- Guillain-Barré syndrome
- Multiple sclerosis

Complications

- Corneal abrasion
- Corneal ulceration
- Keratitis
- Chronic facial weakness
- Facial muscle contracture

Diagnostic Tests

None.

Management

Goals of Treatment

- Protect the eye from injury
- Prevent complications

Management is directed toward the symptoms and depends on the time and severity of presentation.

Appropriate Consultation

Consult a physician immediately. If within 72 hours of onset and the client is at high risk for denervation (e.g. full unilateral facial paralysis, > 50 years of age, diabetic)

Nonpharmacologic Interventions

Reassure client that full recovery can be expected in 6-8 weeks.

Client Education

- Counsel client about appropriate use of medications (dose, frequency, side effects)
- Recommend adequate nutritional intake and suggest that client direct food and liquids to unaffected side of mouth to prevent drooling and to promote proper mastication
- Recommend adequate oral hygiene after meals to prevent collection of food and liquids within affected cheek
- Suggest protection of affected eye to prevent corneal abrasions (e.g. wearing sunglasses during the day to prevent dust particles from entering eye, taping the eye closed at night)
- Recommend facial exercises and massage, to be performed 2 or 3 times daily to prevent muscle atrophy (wrinkle forehead, blow out cheeks, purse lips, close eyes)

Pharmacologic Interventions

Antiviral or anti-inflammatory drugs as prescribed by the physician.

Prevention of drying of eye: eye drops
hydroxypropyl ethyl cellulose (Isopto Tears®),
q1-2h during the day;
lubricant ophthalmic eye ointment (Lacri-Lube®)
and eye patch hs

Monitoring and Follow-Up

- Arrange daily follow-up for several days
- Assess progression of palsy
- Monitor for symptoms of corneal abrasion: stain corneal surface with fluorescein prn and examine to identify development of corneal abrasion; if corneal abrasion suspected or detected, *see "Corneal Abrasion" in chapter 1, "The Eyes"*

Referral

Refer to a physician for initial management if complications are suspected or detected or if condition does not resolve.

Headaches

General

Most headaches (90%) are benign.

There is a wide variety of causes of headaches, ranging from abnormalities of the head and neck to systemic illness. Other causes include use or abuse of drugs, alcohol or chemicals.

Differential Diagnosis Of Headache

Primary

- Migraine
- Tension (muscle contracture)
- Cluster
- Other
 - Cold stimulus (e.g. ice cream)
 - Benign
 - Post-traumatic

Secondary

Disorders of the Cerebral Parenchyma

- Brain tumor
- Brain abscess
- Intracranial hemorrhage
- Cerebral trauma
- Hydrocephalus
- Hypertension

Disorders Involving the Meninges

- Meningitis
- Subarachnoid bleeding

Disorders Involving the Extracranial Structures

- Dental abscess
- Paranasal sinusitis

- Temporomandibular joint syndrome
- Closed-angle glaucoma
- Trigeminal neuralgia
- Herpes zoster infection
- Retro-orbital disease process

Metabolic Causes

- Food additives or toxins (e.g. nitrites, monosodium glutamate, alcohol)
- Side effect of medication (e.g. nitrates, oral contraceptives, calcium-channel blockers)
- Related to fever
- Related to hypercapnia (increased carbon dioxide levels)

Vascular Causes

- Hypertension
- Vasculitis
- Embolic or thrombotic events

Features Suggestive Of A Serious Cause Of Headache

- Advanced age
- Worst headache ever experienced
- Onset with exertion
- Decreased alertness or cognition
- Radiation of pain between the shoulder blades (which suggests spinal arachnoid irritation)
- Association with nuchal rigidity
- Any history or physical finding suggestive of infection (e.g. fever)
- Headache worsening under observation

Muscle Tension Headache

Definition

Diffuse pain in the head.

- *Episodic*: usually associated with some stressful event, of moderate intensity, self-limited and responds to nonprescription preparations
- *Chronic*: often occurs daily (must be present for at least 15 days per month for 6 months to be considered chronic); pain often bilateral, usually occipito-frontal and associated with contraction of muscles of the neck and scalp

Causes

- Stress or anxiety
- Poor posture
- Cervical osteoarthritis
- Intramuscular vasoconstriction of scalp muscles
- Depression (found in 70% of those with daily headache)
- Life-time prevalence: 88% in females, 69% in males, common in children 8-12 years of age

Risk Factors

- Excess caffeine intake
- Medications (e.g. long-term use of acetaminophen)
- Obstructive sleep apnea
- Family history

History

- History vague
- No obvious relieving or precipitating factors identified
- Document medication use: type, frequency, amount, effect
- Often associated with abuse or overuse of medications, especially analgesics
- 40% of patients have positive family history
- 60% of patients > 20 years of age at onset
- Pain becomes more constant and severe over time
- Stressful events aggravate symptoms

Features Of Headaches

- Generalized
- Constant

- Dull, tight sensation
- Occasionally throbbing
- Present on rising in the morning
- Wax and wane during the day
- Prevent client from falling asleep, but never awaken client from sleep
- Medication affords only minimal or no relief

Associated Symptoms

- Nausea
- Anorexia
- Fatigue
- Concentration impaired

Physical Findings

- Client in no distress, although may complain of headache at time of presentation
- Results of neurologic examination completely normal
- Muscular tightness in the neck, upper trapezius, occipital and frontal scalp muscles

Differential Diagnosis

Although most chronic headaches are benign, it is important to rule out other more serious problems:

- Caffeine dependency
- Nonprescription drug dependency (e.g. acetaminophen with or without codeine)
- Dental disease including temporomandibular joint dysfunction
- Post-traumatic headache
- Depression
- Chronic sinusitis
- Temporal arteritis
- Migraine headache
- Eye problem
- Middle ear disease
- Hypertension
- Intracranial infection (meningitis)

Complications

- Dependence on analgesic medication
- Depression

Diagnostic Tests

None.

Management

Goals of Treatment

- Identify symptoms suggestive of serious pathology
- Relieve symptoms

Appropriate Consultation

Consult physician if symptoms suggest serious pathology (e.g. neurologic deficit). Otherwise, treat conservatively and follow.

Nonpharmacologic Interventions

- Provide supportive environment
- It is important for success of therapy that caregiver be nonjudgmental
- Explore current life situation: encourage client to talk about worries, concerns, fears
- Discover areas of difficulty that could contribute to headaches
- Evaluate stress level
- Ice packs may help
- Massage therapy may help
- Rest in dark, quiet room may help
- Recommend decrease in use of caffeinated products

Client Education

- Counsel client about appropriate use of medications (dose, frequency, avoidance of overuse)
- Suggest stress-management strategies (e.g. relaxation techniques)

Pharmacologic Interventions

Analgesics:

acetaminophen, 500 mg, 1-2 tabs PO q4h prn

or

ibuprofen, 200 mg, 1-2 tabs PO q4h prn

Monitoring and Follow-Up

Follow up in 1-2 weeks to assess response to interventions.

Referral

Refer to a physician if there is failure to respond to therapy or if there is concern about an underlying disorder, or if recurrent.

Cluster Headache

Definition

Recurrent attacks of severe unilateral headaches around the eye and temple. Attacks last approximately 30-120 minutes and occur one to three times per day, at the same time of day, for up to 12 weeks; this pattern is typically followed by 1-24 months without an attack.

Causes

Unknown.

Risk factors

- Male > 30 years of age
- Possible relationship to previous head injury
- May be triggered by alcohol, nitroglycerine, disturbance in sleep cycle, emotion (anger), excessive physical activity

History

- Client usually male, older than mid-20s
- Cyclic or seasonal pattern to attacks
- Sudden onset of unilateral pain
- Headache usually begins without warning, often during sleep
- Begins as dull ache, which quickly increases to severe pain
- Peaks in 15 minutes
- Pain steady, boring, piercing and centered about one eye (retro-orbital)
- No aggravating or relieving factors
- Pain extends into adjacent cheek, temple, forehead
- Usually resolves within 30-120 minutes, leaving client fatigued
- Pain recurs later the same day or at same time next day
- Cycle repeats itself until "cluster" ends

Associated Symptoms during Attack

- Nausea

Physical Findings

- Heart rate elevated during attack
- Bradycardia may be present in 43% of cases

During Attacks

- Acute distress
- Pale
- Diaphoretic
- Restless
- Ipsilateral nasal rhinorrhea
- Ptosis of affected eyelid
- Conjunctival redness and excessive tearing of affected eye
- Occasionally vomiting

Between Attacks

- Client feels well (i.e. completely asymptomatic)
- Results of neurologic examination normal

Differential Diagnosis

- Temporal arteritis
- Subarachnoid hemorrhage (initial presentation)
- Episodic, long-lasting tension headaches
- Trigeminal neuralgia
- Acute glaucoma
- Sinusitis
- Pheochromocytoma

Complications

- Inadequate nutrition during "cluster"
- Depression
- Potential for drug abuse (e.g. analgesics)

Diagnostic Tests

None.

Management

Goals of Treatment

- Relieve pain
- Prevent recurrence

Appropriate Consultation

Consult a physician for acute attack. If symptoms are significant during an initial attack, serious pathology must be ruled out.

Client Education

- Explain expected course of disease and prognosis and how to avoid precipitants

- Counsel client about appropriate use of medications (dose, frequency, compliance, avoidance of overuse or abuse of analgesics)
- Counsel client about appropriate use of prophylactic medication
- Recommend avoidance of alcohol, bright light, anger, stressful activity or undue excitement during a cluster
- Recommend that client decrease smoking during a cluster, as smoking reduces response to drug treatment
- Counsel client about smoking cessation

Pharmacologic Interventions

Do not give analgesics in a previously undiagnosed client until you have consulted a physician, as these drugs may mask the progression of neurologic symptoms.

A physician may prescribe a trial of *dihydroergotamine* or similar drug.

Monitoring and Follow-Up

- Monitor medication compliance
- Assess effectiveness of prophylaxis
- Assess for depression
- Assess for analgesic abuse or dependence

Referral

- Refer all previously undiagnosed clients as soon as possible to a physician during an acute attack
- Clients with chronic recurrence of cluster headaches should be evaluated by a physician if symptoms are not controlled by prophylaxis

Migraine Headaches

Definition

Recurrent headaches due to vascular disturbances.

Causes

- Unknown
- Individual attacks may be triggered by specific foods (e.g. chocolate, cheese, smoked meats, alcohol, caffeine, other food additives and preservatives), missing meals, menstrual cycle, oral contraceptives, fatigue, excessive sleep, stress or relief of stress, excessive or flickering light

Risk Factors

- Female
- Young age (10-30 years)
- Family history of migraine

History

- Regular or near regular perimenstrual or periovulatory timing
- Abatement of headache with sleep
- Prodrome may be present: irritability, mood swings, changes in energy level, food cravings, fluid retention
- Aura (including visual defects and sensory losses) may be present: precedes headache, lasts approximately 5-30 minutes, recedes with onset of headache (although sometimes aura and headache may overlap)

Pain of Headache

- Unilateral or diffuse
- Moderate to severe intensity
- Peaks within 1 hour
- Pulsating in nature (at onset or any time during attack)
- Rest in dark, quiet room helps
- Bending forward or moving head increases pain

Associated Symptoms

- Photophobia (aversion to light)
- Phonophobia (aversion to noise)
- Osmophobia (aversion to odors)
- Nausea and vomiting
- Diarrhea, constipation
- Chills, tremor, sweating

Physical Findings

During Attack

- Moderate distress
- Pale
- Diaphoretic
- Scalp arteries may be distended
- Photophobia
- Scalp tenderness
- Results of neurologic exam usually normal during and between attacks

Criteria for Diagnosing Migraine without Aura

1. At least 5 attacks fulfilling criteria 2, 3, 4 and 5
2. Each attack, untreated or treated unsuccessfully, lasts 72 hours
3. Each attack has at least 2 of the following characteristics:
 - Unilateral most often, but 30% to 40% have bilateral pain
 - Pulsating quality (occurring at any time during the attack); 50% of those with migraines report non-throbbing pain; headache quality may vary over the course of the attack
 - Moderate or severe intensity, enough to interfere with daily activities
 - Pain aggravated by physical activity such as walking up or down stairs
4. During an attack at least one of the following symptoms is present:
 - Nausea and vomiting
 - Photophobia, phonophobia and osmophobia
5. There is no evidence from the client's history or physical examination of any other disease that might cause headaches

Criteria for Diagnosing Migraine with Aura

The criteria are the same as for migraine without aura, but also include symptoms of neurologic dysfunction (including visual disturbances) before or during attack.

Differential Diagnosis

- Disorders or infections of head and neck
- Systemic illness
- Toxic effects of drugs, alcohol, chemicals
- Intracranial lesion
- Stroke
- Drug-seeking behavior
- Attention-seeking behaviour

Complications

- Family and marital dysfunction if headaches frequent
- Depression
- Drug addiction (e.g. to prescription analgesics)

Diagnostic Tests

None.

Management***Goals of Treatment***

- Identify and modify trigger factors
- Relieve symptoms
- Prevent recurrences

Appropriate Consultation

Consult physician if an acute attack is moderate to severe and is unresponsive to first-line drug therapy, or if attacks recur and are not controlled with current prophylactic regimen.

Severe Attack

Consult physician for medication orders.

Nonpharmacologic Interventions**Mild or Moderate Attack**

- Rest in dark, quiet room
- Ice packs
- Pressure massage of the scalp
- Relaxation therapy
- Cognitive-behavioral therapy (e.g. stress management training)

Severe Attack

- Bed rest in dark, quiet room
- Nothing by mouth temporarily if vomiting is significant

Client Education

- Explain expected disease course and prognosis
- Counsel client about appropriate use of medications (dose, frequency, avoidance of overuse or abuse)
- Recommend regular rest and activities, appropriate diet
- Help client to identify trigger factors and then to attempt to reduce or eliminate them (e.g. caffeine, alcohol, certain foods, oral contraceptives, nuts, cheese)
- Prophylactic medications are ineffective if the person is concurrently taking analgesics on a regular basis. Instruct client not to take headache medications other than those prescribed.
- The client should be prepared to experience some side effects, to take the medication daily and to recognize that the drug therapy will need to be adjusted or changed until efficacious drug(s) and doses are identified.
- The client should also expect to have some migraine attacks, although these will probably be less severe or less frequent than before.
- Explain that prophylaxis is designed to be used for a number of months and then weaned. Some clients may need long-term therapy.
- Instruct any female client to report if she becomes pregnant or is contemplating pregnancy, as some prophylactic drug therapies will have to be stopped.

Adjuvant Therapy**Severe Attack**

For severe attack only, start IV therapy with normal saline; adjust rate according to state of hydration.

Pharmacologic Interventions**Symptomatic Therapy, Mild or Moderate Attack**

Analgesia:

enteric-coated acetylsalicylic acid (ASA), 325 mg, 1-2 tabs PO q4h prn or

ibuprofen, 200 mg, 1-2 tabs PO q4h prn

or

**acetaminophen with codeine 30mg, 1-2 tabs PO q4h prn*

*Combination medications can be used if clients do not respond to initial therapy with non-steroidal anti-inflammatory drugs (NSAIDs). They are to be used for short periods only. Overuse of such combination medications is one of the most prominent causes of rebound headache (a leading form of chronic daily headaches).

Antiemetics for vomiting if necessary:
dimenhydrinate, 50 mg PO q4-6h prn

If headache does not resolve refer to physician for prescription for pain control.

Avoid use of meperidine, if at all possible. This drug should be used as a last resort only.

Prophylactic Therapy
As ordered by physician

Monitoring and Follow-Up

Mild or Moderate Attack

Encourage regular follow-up until headaches are effectively controlled; frequency of follow-up should be individualized to each person's unique circumstances.

Severe Attack

Monitor response to therapy and vital signs.

Referral

Mild or Moderate Attack

- Arrange follow-up with physician to discuss prophylactic therapy if headaches are frequent or severe enough to interfere with daily activities
- Referral for a neurologic examination may be needed if optimum first-line therapy and prophylaxis fail to control attacks

Severe Attack

Medevac may be required if attack is prolonged and unresponsive to therapy (a condition known as status migrainous).

Temporal Arteritis (Giant Cell)

Definition

Inflammation of temporal arteries.

Causes

- Largely unknown
- Possibly autoimmune reaction

History

- Age > 50 years
- Client may initially complain of flu-like symptoms
- Headache unilateral or bilateral
- Headache located in temporal or periorbital area
- Onset gradual or sudden
- Pain slight and transient initially
- Pain becomes more severe (throbbing or boring) and constant over several days
- Not relieved by over-the-counter medications

Associated Symptoms

- Malaise
- Night sweats
- Fever
- Shoulder and back pain
- Reduced vision of eye on affected side

Physical Findings

- Temperature may be mildly elevated
- Client appears mildly-to-moderately ill
- Visual acuity may be reduced on affected side
- Problem with visual acuity may progress to other eye
- Range of motion of shoulder(s) may be reduced; shoulder movement may be painful
- Shoulder joint may be tender

- Temporal artery may be firm, nodular, non-compressible, tender
- Temporal artery may be pulseless

Differential Diagnosis

- Other disorders of head and neck
- Systemic illness

Complications

- Blindness on affected side
- Progression to blindness of other eye
- Stroke
- Coronary occlusion
- Arterial insufficiency of upper extremities

Diagnostic Tests

- Determine erythrocyte sedimentation rate (if test available) (will be elevated)

Management

Goals of Treatment

- Diagnose the problem
- Prevent complications

Appropriate Consultation

Consult a physician immediately if this diagnosis is suspected.

Pharmacologic Interventions

Oral prednisone may be initiated by the physician if transfer to hospital will be delayed.

Referral

Arrange transfer to hospital for further investigation (e.g. CT scan) and treatment as soon as possible (biopsy of temporal artery is needed to confirm diagnosis).

Transient Ischemic Attack (TIA)

Definition

Acute episode of temporary, focal loss of cerebral function that is vascular in origin. Onset is rapid, and symptoms are of variable duration, typically lasting 2-15 minutes but rarely as long as 24 hours. Most TIAs last less than 1 hour.

TIA is an important omen of impending stroke; one-third of all patients with TIA have a stroke within 5 years of the first event.

Causes

- Temporary reduction or cessation of cerebral blood flow
- Underlying problem: atherosclerosis of carotid or vertebrobasilar arteries

Risk Factors

- Advancing age
- Hypertension
- Diabetes mellitus
- Heart disease
- Cardiac arrhythmias (atrial fibrillation)
- Smoking
- Family history

History

- Usually one of above risk factors is present
- Attacks may occur several times a day or once or twice a year
- Symptoms generally similar for repeat attacks
- Identify previous symptoms of peripheral vascular disease, coronary artery disease
- Symptoms acute at onset
- Symptoms resolve completely in 24 hours
- Client remains conscious throughout attack
- Symptoms depend on affected blood vessel
- Carotid artery: unilateral symptoms, ipsilateral blindness, contralateral weakness or paresthesia, aphasia, headache (may follow attack)
- Vertebrobasilar arteries: confusion, vertigo, binocular blindness or diplopia, weakness or paresthesia of extremities, drop attacks in which client remains conscious but suddenly collapses
- Slurred speech may be present

Physical Findings

Because TIA may be brief, the results of a physical examination may be entirely normal. Careful examination of the neurologic and cardiovascular systems is required. Look for evidence of atherosclerosis (e.g. peripheral vascular disease, heart disease).

- Blood pressure and heart rate often normal
- Pulse may be irregular (because of underlying atrial fibrillation)
- Hypertension may be present
- Client usually looks well
- Muscular weakness of affected side may be obvious or subtle
- Visual acuity may be reduced
- Balance may be slightly affected
- Confusion may be evident
- Look for old surgical scars from previous heart surgery
- Carotid artery thrill may be present
- Focal sensory deficits
- Focal motor deficits
- Deep tendon reflexes may be increased or decreased for first 24 hours after attack
- Carotid bruit(s) may be present
- Other peripheral arterial bruits may be present (e.g. aortic, iliac)
- Heart murmur may be present

Differential Diagnosis

Differential diagnosis includes anything that can cause decreased cerebral blood flow with cerebral ischemia or transient impairment of cerebral function.

- Hypotensive episode
- Bell's palsy
- Dissecting aortic aneurysm
- Heart disease
- Focal seizure
- Cerebrovascular accident
- Hypoglycemia
- Anemia

Complications

- Future cerebrovascular accident or myocardial infarction.
- Injury

Diagnostic Tests

- Electrocardiography may be helpful
- Look for evidence of atrial fibrillation
- Bloodwork (CBC, electrolytes)

Management***Goals of Treatment***

- Modify risk factors
- Prevent future TIA or stroke

Appropriate Consultation

Consult a physician as soon as possible.

Client Education

- Explain disease course and expected outcome
- Counsel client about appropriate use of medications (dose, frequency, total amount, long-term use, side effects, precautions if also receiving anticoagulant therapy)

- Recommend that clients receiving anticoagulant therapy avoid foods high in vitamin K (e.g. yellow and green vegetables)
- For clients receiving anticoagulant therapy, stress importance of avoiding injury
- Offer lifestyle counseling on ways to reduce risk factors such as control of hypertension, smoking cessation, weight reduction, reduction of dietary fat, regular exercise

Pharmacologic Interventions

ASA therapy (for antiplatelet effects) as per physician order.

Monitoring and Follow-Up

Follow up regularly to monitor symptoms and track progress in reducing risk factors; frequency of follow-up will depend on severity of symptoms and number of risk factors.

Referral

- Manage as a stroke in progress
- Medevac to hospital as soon as possible
- For investigation of underlying pathology

Emergency Problems Of The Central Nervous System

Differential Diagnosis Of Acute Unconsciousness

Metabolic disturbances (mnemonic "AEIOU and sometimes S")

A for anoxia
E for ethanol intoxication
I for insulin excess (hypoglycemia)
O for overdoses (drugs)
U for uremia
S for seizure

Hypoperfusion of the brain

- Stroke
- Hypotension
- Hypovolemia
- Arrhythmias
- Head trauma
- Coma

Meningitis

Definition

Infection of meninges.

Causes

- Viral or bacterial infection
- Most common bacterial causes in adults:
Hemophilus influenzae, *Neisseria meningitidis*,
Streptococcus pneumoniae

Risk factors

- Alcoholism
- Chronic otitis media
- Sinusitis
- Mastoiditis
- Closed head injury
- Pneumococcal pneumonia
- Recurrent meningitis
- Immunocompromised

History

- Usually preceded by infection of upper respiratory tract
- High fever
- Headache, which becomes increasingly severe
- Headache made worse with movement, especially bending forward
- Sudden vomiting, often without preceding nausea
- Photophobia
- Changes in level of consciousness that progress from irritability, through confusion, drowsiness and stupor to coma
- Seizures may develop
- Stiff neck and/or neck pain

Physical Findings

Perform a full head and neck examination to identify a possible source of infection.

- Temperature elevated
- Heart rate elevated or bradycardia with raised intracranial and intraocular pressure
- Blood pressure normal (low if client is in septic shock)
- Client in moderate-to-acute distress
- Client flushed
- Altered level of consciousness

- Focal neurologic signs
- Photophobia
- Petechiae may be present
- Cervical nodes may be enlarged
- Brudzinski's sign
- Kernig's sign

Differential Diagnosis

- Bacteremia
- Sepsis
- Brain abscess
- Seizure

Complications

- Seizure
- Coma
- Blindness
- Deafness
- Palsies of cranial nerves III, VI, VII, VIII
- Death

Diagnostic Tests

- Complete blood count
- Blood cultures
- Urinalysis (routine and microscopy, culture and sensitivity)
- Throat swab for culture and sensitivity
- WBC
- Consider ECG and chest X-ray

Management

Goals of Treatment

- Control infection
- Prevent complications

Appropriate Consultation

Consult a physician immediately.

Nonpharmacologic Interventions

- Bed rest
- Nothing by mouth
- Insert indwelling urinary catheter (optional if client is conscious)

Assessment Of The Integumentary System

History Of Present Illness And Review Of System

General

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

- Onset (sudden or gradual)
- Chronology
- Current situation (improving or deteriorating)
- Location
- Quality
- Timing (frequency, duration)
- Severity
- Precipitating and aggravating factors
- Relieving factors
- Associated symptoms
- Effects on daily activities
- Previous diagnosis of similar episodes
- Previous treatments
- Efficacy of previous treatments

- Date(s) and site(s) of recurrence(s)
- Intermittent or continuous

Cardinal Symptoms

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

Skin

- Changes in texture or colour
- Unusual dryness or moisture
- Itching
- Rash
- Bruises, petechiae
- Changes in pigmentation
- Lesions
- Changes in moles or birthmarks

Hair

- Changes in amount, texture, distribution

Nails

- Changes in texture, structure

Other Associated Symptoms

- Site of onset

- Influence of environmental or occupational factors

Medical History (Specific To Integumentary System)

- Allergic manifestation (e.g. asthma, hay fever, urticaria)
- Recent or current viral illness
- Recent or current bacterial illness
- Fever
- Allergies to drugs, foods, other chemical substances
- Medications (e.g. steroids, OCPs [oral contraceptive pills], antibiotics, OTCs [over-the-counter drugs])
- Immunosuppression (e.g. HIV/AIDS)
- Seborrheic dermatitis
- Psoriasis
- Diabetes mellitus

Family History (Specific To Integumentary System)

- Allergies (e.g. seasonal, to food)
- Seborrheic dermatitis
- Others at home with similar symptoms (e.g. rash)
- Psoriasis

Personal And Social History (Specific To Integumentary System)

- Obesity
- Poor hygiene
- Hot or humid environment, poor environmental sanitation
- Stress (may precipitate flares of chronic skin problem such as psoriasis)
- Exposure to new chemicals (e.g. soaps), foods, pets, plants
- Emotional disturbance
- History of sensitive skin
- Others at home, work or school with similar symptoms
- Recent travel

Physical Examination

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

Inspection And Palpation Of The Skin

- Colour
- Temperature, texture, turgor
- Dryness or moisture
- Scaling
- Pigmentation
- Vascularity (erythema, abnormal veins)
- Bruises, petechiae
- Edema (dependent, facial)
- Induration
- Individual lesions (colour, type, texture, general pattern of distribution, character of edge, whether raised or flat)
- Hair (amount, texture, distribution)
- Nails (shape, texture, discoloration, grooving)
- Mucous membranes
- Flexural folds or skin creases
- Examine lymph nodes
- Examine area distal to enlarged lymph nodes

Table 1: Major Types of Skin Lesions

Type of Lesion	Characteristics
Atrophy	Skin thin and wrinkled
Crust (scab)	Dried serum, blood or pus
Erosion	Loss of part or all of the epidermis
Excoriation	Linear or hollowed-out crusted area, caused by scratching, rubbing or picking
Lichenification	Skin thickened, skin markings accentuated (e.g. atopic dermatitis)
Macule	Flat, circumscribed, discoloured spot; size and shape variable (e.g. freckle, mole, port-wine stain)
Nodule	Palpable, solid lesion that may or may not be elevated (keratinous cyst, small lipoma, fibroma)
Papule	Solid elevated lesion (e.g. wart, psoriasis, syphilitic lesion, pigmented mole)
Pustule	Superficial elevated lesion containing pus (impetigo, acne, furuncle, carbuncle)
Scales	Heaping-up of the horny epithelium (e.g. psoriasis, seborrheic dermatitis, fungal infection, chronic dermatitis)
Telangiectasia	Fine, often irregular red line produced by dilatation of a normally invisible capillary
Vesicle	Circumscribed, elevated lesion <5 mm in diameter containing clear fluid; larger vesicles are classified as bullae or blisters (e.g. insect bite, allergic contact dermatitis, sunburn)
Ulcer	Loss of epidermis and at least part of the dermis
Wheal	Transient, irregularly shaped, elevated, indurated, changeable lesion caused by local edema (e.g. allergic reaction to a drug, a bite, sunlight)

Common Problems Of The Skin

Abscess (Subcutaneous)

Definition

A collection of pus in subcutaneous tissues.

Causes

- Infection with bacteria, e.g. *Staphylococcus aureus*, anaerobes, other microorganisms
- Predisposing factors: folliculitis, cellulitis, trauma, incision

History

- Pain, swelling, redness at infected site
- Fever may be present
- Injury or trauma

Physical Findings

- Temperature may be elevated
- Heart rate may be elevated
- Client may look ill
- Localized redness, swelling
- Lesion may be draining
- Localized induration
- Tenderness
- Fluctuance (may be difficult to palpate if abscess is deep)
- Regional lymph nodes may be enlarged and tender
- Size of abscess often difficult to estimate; abscess usually larger than suspected

Differential Diagnosis

Cellulitis.

Complications

Sepsis.

Diagnostic Tests

Swab discharge for culture and sensitivity.

Management

Goals of Treatment

- Control infection
- Prevent complications

Appropriate Consultation

Consult a physician if client is febrile or appears acutely ill; if extensive cellulitis, lymphangitis or adenopathy is present; or if an abscess is suspected or detected in a critical region (e.g. head or neck, hands, feet, perirectal area) or in an immunocompromised client (e.g. diabetic person).

Nonpharmacologic Interventions

- Soak abscess with warm saline compresses four times a day
- Cover any open areas with a sterile, non-adherent dressing (e.g. Telfa®)
- Rest, elevate and gently splint infected limb

Client Education

- Medication instruction
- Dressing changes as directed
- Cleansing of wound

Adjuvant Therapy

As per physician consultation if indicated

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

Pharmacologic Interventions

Small, Uncomplicated Abscess

Antibiotics:

cloxacillin, 250-500 mg PO qid for 10 days

or

cephalexin, 250 mg PO qid for 10 days

For clients with allergy to penicillin:

erythromycin, 250-500 mg PO qid

Antipyretics and analgesia:

acetaminophen, 325 or 500 mg, 1-2 tabs PO q4-6h prn

IV antibiotics may be started before transfer if ordered by a physician:

Monitoring and Follow-Up

Refer if not resolving or if complications occur.

Cellulitis

Definition

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

Causes

- Bacteria: most commonly *Staphylococcus* or *Streptococcus*
- Predisposing factors: local trauma, furuncle, underlying skin ulcer, type 2 diabetes, poor circulation

If a bite was the original trauma, different organisms are involved. See "*Skin Wounds*," in "*Dermatological Emergencies*," below, this chapter.

History

- Localized pain
- Redness
- Swelling
- Area increasingly red, warm to touch, painful
- Area around skin lesion also tender
- Mild fever and headache may be present

Physical Findings

- Temperature may be elevated
- Heart rate may be elevated
- Redness, swelling
- Advancing edge of lesion diffuse, not sharply demarcated
- Small amount of purulent discharge may be present
- Skin surrounding lesion red and swollen, may be tense
- Edema
- Tenderness
- Induration (firm to touch)
- Regional lymph nodes may be enlarged, tender

Differential Diagnosis

- Folliculitis
- Foreign body
- Abscess
- Necrotizing fasciitis

Complications

- Extension of infection
- Abscess
- Sepsis

Diagnostic Tests

- Swab any wound discharge for culture and sensitivity.
- WBC

Management

Goals of Treatment

- Control infection
- Identify formation of abscess
- Prevent complications

Appropriate Consultation

Consult physician if any of the following conditions pertain:

- cellulitis is moderate to severe (e.g. large area is involved)
- cellulitis is progressing rapidly, which may indicate an invasive streptococcal infection
- cellulitis involves hands, feet, face or a joint
- client is immunocompromised (e.g. has diabetes mellitus)
- client is febrile, appears acutely ill or shows signs of sepsis

Nonpharmacologic Interventions

- Apply warm saline compresses to affected areas qid
- Elevate, rest and gently splint the affected limb

Client Education

- Counsel client about appropriate use of medications (dose, frequency, compliance)
- Encourage proper hygiene of all skin wounds to prevent future infection
- Stress importance of close follow-up

Adjuvant Therapy

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

- Start IV therapy with normal saline to keep vein open; adjust rate according to state of hydration and age

Pharmacologic Interventions

Oral antibiotics:

cloxacillin, 250-500 mg PO qid for 10 days

or

erythromycin, 250 mg PO qid for 10 days

or

cephalexin (Keflex), 250-500 mg PO qid for 10 days

Antipyretics and analgesia:

acetaminophen, 500 mg, 1-2 tabs PO q4-6h prn

Administer IV antibiotics only as directed by a physician.

Monitoring and Follow-Up

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

Monitor affected area frequently for progression.

Referral

Refer to physician if no improvement.

Furuncle And Carbuncle

Definition

Furuncle or boil: an acute, tender perifollicular inflammatory nodule

Carbuncle: a cluster of furuncles, generally larger and deeper

Causes

- Staphylococcal infection of several hair follicles
- Predisposing factors: obesity, diabetes mellitus, poor hygiene, excessive friction or perspiration, seborrhea, local trauma (e.g. from plucking hairs), use of systemic steroids

History

- Usually found on the neck, axilla, breasts, face and buttocks
- Local redness, swelling, pain, tenderness
- Begins as a small nodule, quickly becomes a large pustule
- If poked, purulent, sanguineous material drains
- May occur singly or in groups
- May be recurrent
- Fever absent

Physical Findings

- Nodule or pustule 5-30 mm in diameter
- Deep red in colour
- Central area may spontaneously drain pus
- Carbuncle may present as red mass with multiple draining sinuses in area of thick, inelastic tissue (e.g. posterior neck, back, thigh)
- Lesion(s) warm, tender to touch
- May be fluctuant
- Regional lymph nodes usually not enlarged or tender

Differential Diagnosis

- Cellulitis
- Abscess
- Impetigo
- Insect bites

Complications

- Scarring
- Spread of infection (e.g. lymphangitis, lymphadenitis)
- Abscess
- Recurrence

Diagnostic Tests

- Swab discharge for culture and sensitivity
- Determine blood glucose level if infection is recurrent or if symptoms suggestive of diabetes mellitus are present

Management

Goals of Treatment

- Control infection
- Prevent recurrence
- Identify predisposing underlying conditions (e.g. diabetes mellitus)

Appropriate Consultation

Consult physician if a large furuncle or carbuncle is present, as surgical drainage may be needed.

Nonpharmacologic Interventions

- Apply warm saline compresses to area at least qid. This may lead to resolution or spontaneous drainage if the lesion or lesions are mild.
- Cover area with a sterile, non-adherent dressing
- If area is fluctuant and pointing, incise lesion with a single stab wound and allow pus to drain.

Client Education

- Counsel client about appropriate use of medications (dose, frequency)
- Encourage proper hygiene of the area
- Stress importance of regular skin cleansing to prevent future infection
- Recommend that client avoid picking or squeezing the lesions
- Instruct clients with recurrent disease to bathe area bid with a mild antiseptic soap to help prevent recurrences

Pharmacologic Interventions

Antibiotics if infection is moderate or severe:
cloxacillin, 250 mg PO qid for 7-10 days

For clients with allergy to penicillin:
erythromycin, 250 mg PO qid for 7-10 days

Monitoring and Follow-Up

- Follow up in 2 days and at 7-10 days
- Instruct client to return immediately for reassessment if lesion becomes fluctuant, if pain increases or if fever develops

Referral

Arrange elective follow-up with physician if infections recur.

Impetigo

Definition

Highly contagious superficial bacterial infection of skin.

Causes

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

History

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

Physical Findings

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

Differential Diagnosis

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

Complications

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

Diagnostic Tests

None.

Management

Goals of Treatment

- Control infection
- Prevent auto-innoculation
- Prevent spread to other household members

Appropriate Consultation

Consult a physician if there is failure to respond to therapy.

Nonpharmacologic Interventions

- Apply warm saline compresses to soften and soak away crusts qid and prn
- Cleanse with antiseptic antimicrobial agent to decrease bacterial growth

Client Education

- Counsel client about appropriate use of medications (dose, frequency, compliance)
- Recommend proper hygiene (i.e. daily washing with prescribed soap)
- Counsel client about prevention of future episodes
- Suggest strategies to prevent spread to other household members (e.g. proper hand-washing, use of separate towels)

Pharmacologic Interventions

Apply topical antibiotic preparation after each soaking:

mupirocin ointment, qid

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

cloxacillin, 500 mg PO qid for 10 days

or

erythromycin, 250 mg PO qid for 10 days

or

cephalexin, 500 mg PO qid for 10 days

Monitoring and Follow-Up

- Follow up in 2-3 days to assess response to treatment

- Instruct client to return for reassessment if fever develops or infection spreads despite therapy

Referral

Not usually necessary unless complications develop.

Eczema (Atopic Dermatitis)

Definition

Chronic, itchy, inflammatory condition of the skin

Causes

- Largely unknown
- Inherited skin sensitivity
- Allergy

History

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

Physical Findings

- Skin scaly, dry, thickened (lichenified)
- Fissures may be present
- Excoriations
- Mild redness and edema often present
- Vesicles may be present in some areas
- Lesions may be weeping
- Pustular or crusted lesions may be present
- Some areas of skin usually show chronic changes (thin skin, scarring, lichenification)

Differential Diagnosis

- Seborrheic dermatitis
- Dry skin (winter itch)
- Allergic contact dermatitis
- Psoriasis
- Scabies

Complications

- Secondary bacterial infection
- Chronic irritation of skin
- Side effects of medication (e.g. steroid preparations)

Diagnostic Tests

None.

Management

Goals of Treatment

- Relieve symptoms
- Prevent secondary infection

Appropriate Consultation

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

Nonpharmacologic Interventions

- Offer support to client, as it can be difficult to live with this irritating and cosmetically unattractive condition
- Advise client to stop using steroid preparations once acute lesions have healed, since steroids do not have any preventive benefit and may further irritate and damage skin
- Assist client to identify precipitating and aggravating factors, and encourage avoidance
- If lesions are dry, promote lubrication with Glaxal® base, Nivea® cream or petroleum jelly (Vaseline® bid, after bathing and prn)

Client Education

- Counsel client about appropriate use of medications (dose, frequency, application)
- Encourage proper hygiene to prevent secondary bacterial infection
- Recommend loose-fitting cotton clothing
- Recommend avoidance of coarse materials and wool
- Recommend avoidance of overheating
- Recommend avoidance of irritants at work and at home
- Recommend use of a soap substitute (e.g. Aveeno® and avoidance of soaps)
- Suggest that cotton gloves be worn inside rubber gloves when client works with liquids

- Suggest that greasy lubricants be applied within minutes of leaving shower or bath to "lock in" moisture

Pharmacologic Interventions

Reduce inflammation if itch moderate or severe:
hydrocortisone 0.5% cream or ointment,
tid for 1-2 weeks

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

Relieve itch with oral antihistamines:
diphenhydramine 25-50mg PO tid-qid
or
hydroxyzine, 10-25 mg PO hs and bid prn

Start with 10 mg if client is small, elderly or taking anxiolytics. Sedative effect of hydroxyzine is useful to break the itch-scratch cycle.

Monitoring and Follow-up

Follow up in 1-2 weeks to assess response. Advise client to return sooner if there are signs of infection developing.

Referral

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

Pediculosis (Lice Infestation)

Definition

Infestation with lice.

Causes

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

Risk Factors

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

History

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

Physical Findings

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

Differential Diagnosis

- Dandruff

Complications

- Recurrent infestation
- Skin infection

Diagnostic Tests

None.

Management

Goals of Treatment

- Eradicate infestation
- Prevent recurrences
- Prevent spread to close contacts

Nonpharmacologic Interventions

- Remove dead lice and nits with tweezers or nit comb. Soaking the head with white vinegar and waiting 10 mins before combing may loosen nits
- Avoid irritation of eyes and mucous membranes
- Remove nits on eyelashes with petroleum jelly (nits become coated, and ova die from suffocation)
- Instruct client to place small amount of petroleum jelly on tips of fingers, then close eyes and rub petroleum jelly into lids and brows; repeat bid or tid for 4 or 5 days
- Examine all family members and close personal contacts, including schoolmates and daycare contacts, and treat if infested
- Recommend that combs, brushes, hats, coats, bedding and clothing of all household members be washed in warm soapy water

Client Education

- Counsel client about proper use of medication and side effects
- Recommend avoidance of sharing of combs, brushes, hats, etc.
- Suggest that mattresses (which can harbor lice) be taken outside for the day
- Things that cannot be washed should be dry-cleaned or put in clothes dryer
- May return to school post-treatment

Pharmacologic Interventions

Antiparasitic shampoo agent for head lice (apply topically and massage in thoroughly for 10 minutes, then rinse):
permethrin cream rinse

Monitoring and Follow-Up

Follow up in 7 days. Shampoo treatment may be repeated 7-10 days after original application.

Referral

Usually not necessary.

Scabies

Definition

Infestation of the skin with a mite parasite.

Cause

Sarcoptes scabiei.

Risk Factors

- Failure to recognize an infestation
- Faulty application of treatment regimens
- Failure to treat close contacts
- Failure to eradicate mites from clothing and bed linen
- Crowded housing, shared beds, crowded schools and daycare centers
- High pediatric population
- Lack of running water, which may predispose to poor hygiene and secondary skin infection

History

- Severe itching
- Itching generally worse at night
- Rash of hands, feet, flexural folds
- Transmitted by intimate contact with infected person
- Transmitted by clothes
- Symptoms may take 2-3 weeks to develop after contact with mite
- Symptoms are due to hypersensitivity to mite and its products

Physical Findings

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

Differential Diagnosis

- Pediculosis
- Impetigo
- Eczema
- Contact and irritant dermatitis

Complications

- Secondary bacterial infection

Diagnostic Tests

None.

Management

Goals of Treatment

- Eradicate infestation
- Control secondary infection
- Relieve symptoms

Appropriate Consultation

Consult physician if unsure of diagnosis.

Nonpharmacologic Interventions

- Prophylactic therapy essential for all household members, since signs of scabies may not appear for 1-2 months after the infection is acquired
- Treat all household members at the same time to prevent re-infection
- All bed linen (sheets, pillowslips) 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
- If hot water is not available, place all bed linen and clothing into plastic bags and store away from family for 5-7 days, as the parasite cannot survive beyond 4 days without skin contact
- Placing bedding outside in the cold or in ultraviolet light will also help
- Children may return to daycare or school the day after treatment is completed
- Healthcare workers who have had close contact with clients with scabies may require treatment
- Community education, aimed at early recognition and awareness of scabies, is important
- In widespread scabies epidemics, prophylactic treatment of a whole community may be optimal management

- Vacuum upholstered furniture

Client Education

- Counsel client about proper use and side effects of medication.
- Hygiene

Pharmacologic Interventions

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

*permethrin 5% dermal cream,
(drug of choice)*

Use as per product monograph. Treatment may be repeated in one week if necessary.

The safety of permethrin in pregnant and lactating women has not been established.

Topical antiparasitic agents can cause dermatitis if used incorrectly (i.e. if overused).

Pruritus may be a problem particularly at night. Instruct client that itch will persist for up to 2 weeks. To manage itching:

*diphenhydramine 25-50mg PO tid- qid
or
hydroxyzine, 10-25 mg PO bid and hs prn*

Monitoring and Follow-Up

- Follow up in 1 week to assess response to treatment
- Advise client to return immediately if signs of secondary infection develop

Referral

Refer if no response to treatment.

Ringworm (Tinea)

Definition

Superficial infection of skin.

- On feet: tinea pedis (athlete's foot)
- In groin: tinea cruris (jock itch)
- On body: tinea corporis

Causes

Fungi that invade dead tissues such as the stratum corneum, nails and hair (dermatophytes). More common in diabetics.

History And Physical Findings

See Table 2 below

Table 2: History and physical findings for various forms of tinea

Type	History	Physical findings
Tinea pedis	Affects feet. Itch severe. Scaling and redness, mainly between toes. Foul odour may be present. Area may be moist, whitened, macerated, cracked. Skin peels off easily, with red, tender area underneath. One or several small vesicles may be present. Vesicles rupture leaving a “collarette” of scales. May involve sole of foot with marked scaling (itch minimal)	Scaling of lateral interdigital areas. Moist, whitened, macerated, cracked skin may be present. Skin peels off easily with red, raw, tender area underneath. One or several small blisters may be present. Sole of foot may be involved, with marked scaling. Fissures may become secondarily infected (cellulitis)
Tinea cruris	Affects groin. Common in men. Itch mild to severe. Begins as erythema of crural fold. Spreads outward. May spread on to thighs or buttocks. Scrotum and penis not usually affected. Often spread by infected towel. Often associated with tinea pedis. Predisposing factors: excessive sweating, diabetes mellitus, friction	Involves crural areas and upper inner thigh. Scaly reddish brown lesion. Sharply defined margin. Central clearing absent. Groin, thigh, buttock may be involved. May be bilateral or unilateral. Scrotum and penis not usually affected.
Tinea corporis	Affects any smooth, non-hairy part of body. Scaly, circular or oval skin lesions. Frequently itchy. May be asymptomatic.	Lesions variable in size. Typically a well-circumscribed circular or oval patch. Reddish pink and scaly. Central clearing. Accentuation of redness at outer border. Margins scaly, vesicular or pustular.

Differential Diagnosis

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

Complications

Secondary bacterial infection (particularly with tinea pedis).

Diagnostic Tests

Take skin scrapings for mycologic investigation (fungal culture).

Management

Goals of Treatment

- Relieve symptoms
- Eradicate infection

Appropriate Consultation

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

Nonpharmacologic Interventions

Client Education

- Recommend elimination of moisture and heat

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

Pharmacologic Interventions

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

*miconazole skin cream, bid or tid or
clotrimazole skin cream, bid or tid or*

tolnaftate cream or powder, bid or tid

Tolnaftate powder has additional drying benefits.

For tinea corporis, apply one of these topical antifungal agents for 2-4 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.

Stasis Dermatitis

Definition

Inflammation of skin caused by pooling of venous blood in lower limb.

Causes

- Improper venous drainage
- Predisposing factors: varicose veins, previous deep vein thrombosis, arterial disease, smoking, CHF, diabetes

History

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

Physical Findings

- Usually begins on medial ankle, may spread to lower third of leg
- Localized swelling
- Tiny petechiae
- Excoriations, redness, scales
- Diffuse red-brown pigmentation develops
- Entire circumference of lower leg may become involved

Differential Diagnosis

- Contact dermatitis
- Cellulitis

Complications

- Skin breakdown, ulceration
- Infection
- Deep venous thrombosis

Diagnostic Tests

None.

Management

Goals of Treatment

- Control edema
- Prevent formation of ulcers
- Prevent infection

Appropriate Consultation

Consult physician if no resolution or if condition progresses.

Nonpharmacologic Interventions

- Encourage client to elevate legs
- Application of compression with support hose or tensor bandages when ambulatory
- Application of cool normal-saline soaks or wet normal-saline dressings in acute phase
- Lubrication of area twice daily with emollient cream
- Avoidance of irritants (soap, hot water, rough clothes, rubbing)

Pharmacologic Interventions

Antibiotics as ordered by physician if superinfection apparent.

Monitoring and Follow-Up

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

Referral

Arrange follow-up with physician if condition deteriorates.

Urticaria (Hives)

Definition

Local wheal and erythema of skin

Causes

- Often unknown
- Chronic idiopathic
- Hypersensitivity to foods, drugs, inhaled allergens, insect bite or sting
- Emotional upset
- Physical agents (e.g. heat, cold, sun)
- Systemic disease (e.g. systemic lupus erythematosus)
- Infection (e.g. hepatitis, mononucleosis or other viral illness)

History

- Recent exposure to one of above causes possible
- 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

Differential Diagnosis

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

Complications

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

Diagnostic Tests

None.

Management

Goals of Treatment

- Relieve symptoms
- Identify precipitating factor
- Prevent recurrence

Appropriate Consultation

Contact physician if any of the following pertain:

- Symptoms are severe
- Complications are present
- If shortness of breath, wheezing or swelling of tongue or mouth occurs
- Client is pregnant or lactating

Nonpharmacologic Interventions

- Application of cool compresses to reduce itching
- Avoidance of overheating
- Temporary avoidance of hot, spicy food
- Colloidal oatmeal baths

Client Education

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

Pharmacologic Interventions

Apply topical antipruritic agents:
calamine lotion qid prn

Oral antihistamine to relieve itch and suppress formation of new lesions:

*cetirizine 10mg PO od for 2-7 days or
diphenhydramine, 25-50 mg PO q6-8h for 2-7 days
or*

hydroxyzine, 25-50 mg PO q6-8h for 2-7 days

Monitoring and Follow-up

- Follow up in 2-7 days
- Instruct client to return for reassessment if lesions progress despite therapy
- Instruct client to return to clinic immediately if shortness of breath, wheezing or swelling of

tongue or mouth occurs; in this situation, *Refer to the AMS BLS/ALS Field Medical Protocols.*

Referral

Refer to a physician for evaluation if lesions are recurrent or persistent.

Warts (Verrucae)

Definition

Common, contagious, benign epithelial hyperkeratotic tumors

Causes

Human papillomavirus

History

- Occur most commonly in children
- May persist for many years and disappear spontaneously
- Single or multiple lesions

Physical Findings

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

Differential Diagnosis

- Corns
- Molluscum contagiosum
- Melanoma

Complications

- Unacceptable cosmetic appearance
- Enlargement or spread of warts

Diagnostic Tests

None.

Management

Goals of Treatment

- Eradication of lesion
- Control of spread

Appropriate Consultation

Arrange consultation with physician if warts are on face or genitals, or if client is pregnant.

Nonpharmacologic Interventions

- Give the client lots of support and encouragement to persevere, as the treatment is long and tedious
- *Before each application of medication:* soak affected area in warm water to soften wart; use a pumice stone to remove dead tissue, or pare away dead skin with scalpel

Client Education

- Counsel client about appropriate use of medications - dose, frequency, application
- Protect normal surrounding skin with Vaseline® petroleum jelly
- Suggest strategies to avoid spread to other areas of body and to other persons

Pharmacologic Interventions

Apply topical treatment to warts:
salicylic and lactic acid liquid (A class drug), od for up to 3 months

Monitoring and Follow-Up

Follow up every week to assess response and adherence to treatment regime.

Referral

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

Dermatological Emergencies

Skin Wounds

Definition

Breach in the integrity of the skin (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

History

- Mechanism of injury
- Contaminants: wound contact with manure, rust, dirt, etc. will increase risk of infection
- 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: 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
- Status of rabies 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 (e.g. artery)
- Injury to tendon

Diagnostic Tests

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

Management

Goals of Treatment

- Restore function

- Minimize risk of infection
- Repair injured tissue with a minimum of cosmetic deformity

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

Wound Repair: General Principles

- Most wounds may be closed with sutures up to 12 hours after the injury; clean well and use clinical judgment when choosing which wounds to close.
- *Do not* suture wounds that are infected or inflamed, dirty wounds, human or animal bites, puncture wounds, neglected wounds or severe crush wounds.
- 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.

Nonpharmacologic Interventions

Homeostasis

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

Skin Preparation

- *Debridement*: Using aseptic technique, remove devitalized tissue; avoid taking healthy tissue.

- High-pressure irrigation is the most effective means of cleansing a wound. Use normal saline in a 60-mL syringe with a 19-gauge needle.

Scrubbing does not cleanse the wound as well, and using any disinfectant in the wound damages healthy cells needed for healing.

- *Skin disinfection*: Can be performed with povidone-iodine solution. Avoid getting the solution in the wound, because it will impede healing.
- Hair can be clipped in the area if necessary. Shaving hair is not recommended.
- Never shave eyebrows. They are needed for alignment of the wound and may not grow back.
- Flush well with normal saline after disinfection.

Open Wound Care

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

Wound Closure

- *Steri-Strips*: If the wound is small and shallow and falls together naturally along lines of 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.
- *Suturing*: Larger wounds need suturing (Table 3). Close in layers as necessary using simple interrupted sutures.

Table 3: Types of suture material for particular sites

	Type of suture	Size	Body area
Nonabsorbable	Silk or Nylon coated with polypropylene glycol (Prolene®)	#3-0, 4-0 #5-0, 6-0 #5-0	Scalp Face Forehead
Absorbable	Chromic (catgut) Monofilament (Monocryl®)	#3-0, 4-0, 5-0	Subcutaneous tissue Muscle

Local Anesthetic for Suturing

Lidocaine (1% to 2%) is the most frequently used local anesthetic (onset 2-5 minutes, duration 60 minutes):

lidocaine 1% with or without epinephrine (maximum 30 mL)

or

lidocaine 2% with or without epinephrine (maximum 10 mL)

Nurses should use 1% lidocaine without epinephrine as first choice when suturing a wound.

For adults, the maximum dose of 1% lidocaine (without epinephrine) is 4.5 mg/kg (maximum 30 mL).

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

- Use a 22- or 25-gauge needle
- 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 on to the wound before infiltration to provide some initial anesthesia
- Give anesthetic at least 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 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, clients with hip prostheses or lymphedema, diabetic clients

with a contaminated foot wound, or other clients with peripheral vascular disease:

cloxacillin, 250-500 mg PO qid for 10 days

For clients with allergy to penicillin:

erythromycin, 250 mg PO qid or 500 mg bid for 10 days

Topical Antibiotics

Consider topical antibiotic ointment for wounds on face and torso:

bacitracin ointment, qid for 5 days

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, 20-40 mg/kg daily, divided tid, PO for 7 days

Cefixime is an acceptable alternative.

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

Cat Bites

Antibiotics are routinely given for cat bites.

The drug of choice is:

amoxicillin/clavulanate, 20-40 mg/kg daily, divided tid, PO for 7 days

Vibramycin is an alternative.

Dog Bites

Only 5% of dog bites become infected, and routine prophylaxis is not recommended. If there is a need to treat, *amoxicillin/clavulanate* is the drug of choice (as for other types of bites).

Client Education

- Keep wound covered for 24 hours

Monitoring and Follow-up

- 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 4

Increase time before removal of sutures in diabetic or steroid-dependent clients in whom healing may take several weeks.

Table 4: Timing of removal of sutures

Site of wound	Timing of suture removal
Face	3-5 days; steri-strip reinforcement after suture removal
Scalp	7-10 days
Trunk	7-10 days
Arms	7-10 days
Legs	10-14 days
Joints (dorsal surface)	14-21 days (splint recommended)

Referral

- Consider surgical consult if there is suspicion of injury to major structures
- Open fracture is an indication for surgical debridement and repair (except in the case of fracture of a distal phalanx, where copious irrigation and oral antibiotics are acceptable treatment if the injury can be monitored carefully for infection)

Burns

Definition

Tissue injury caused by thermal contact.

Types of Burns

First-Degree

Affects epidermis only; painful and erythematous.

Second-Degree

- *Superficial*: Affects epidermis and outer half of dermis; hairs are spared
- *Deep*: Affects epidermis, with destruction of reticular dermis; can easily convert to full-thickness burn if secondary infection, mechanical trauma or progressive thrombosis occurs

Third-Degree

Tissue is dry, pearly white, charred, leathery. Heals by epithelial migration from the periphery and by contracture. May involve adipose, fascia, muscle or bone.

Causes

Thermal

- Due to external heat source

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

Electrical

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

Chemical

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

Radiation

- Initially appear hyperemic; may later resemble third-degree burns
- Changes can extend deep into the tissue
- Sunburns are of this type and involve moderate superficial pain

Table 5: Assessing depth of a burn

Characteristic	First degree	Second degree	Third degree
Blisters	None	Present	None
Colour	Red	Red	White, charred
Moisture	Dry	Wet	Dry
Sensation	Present	Present	Absent
Pain	Moderate	Severe	Absent

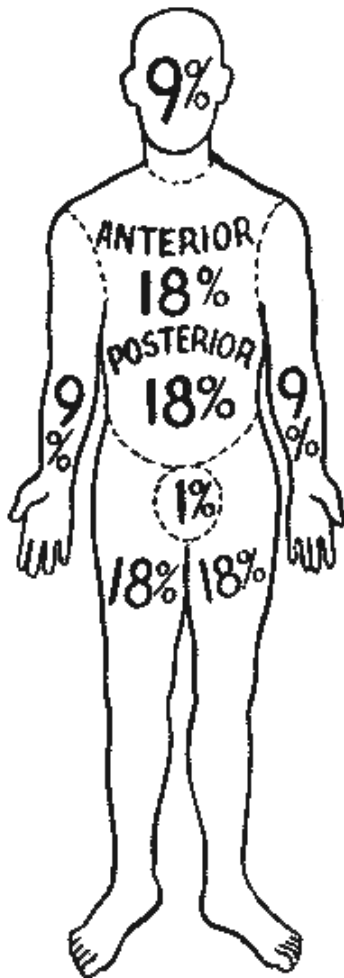
History

- Obtain accurate description of exact mechanism of injury
- Inquire about any treatment given at home (e.g. cooling, application of oils)
- Medical history (but only when time permits)
- Medications currently being taken (but only when time permits)
- Allergies (but only when time permits)
- Tetanus vaccination status (but only when time permits)

Physical Findings

- Assess ABC
- Temperature may be elevated if wounds infected
- Heart rate may be elevated because of pain
- Blood pressure may be low if client is in shock
- Determine depth (Table 5) and extent (Figure 1) of the burn

Figure 1: Assessing extent of a burn (Wallace's Rule of Nines)



Assessing The Severity Of The Burn

The severity of a burn depends on the:

- depth of the burn
- amount of surface area involved
- location of the burn
- accompanying complications
- age of the patient

Differential Diagnosis

- Scalded skin syndrome
- Systemic reaction (e.g. drug reaction)
- Yeast infection

Complications

- Increasing depth of burn
- Shock

- Secondary infection
- Renal failure
- Carbon monoxide poisoning

Diagnostic Tests

None.

Management

Table 6: Criteria for transfer of burn patient

- | |
|---|
| <ul style="list-style-type: none"> • Burns covering 10% or more of body surface (if age >50 years) • Second and third degree burns covering 20% or more of body surface (any age) • Burns of face, hands, feet, perianal or genital area, over major joints • Smoke inhalation, electrical burns, chemical burns • Burns associated with major injuries or fractures • Circumferential chest or extremity burns • Lesser burns in a client with underlying disease (e.g. diabetes mellitus) |
|---|

Goals of Treatment

- Promote healing and restoration of tissue
- Prevent complications

Nonpharmacologic Interventions

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

- *Thermal burn:* Cool if area is still warm to touch. Burns caused by liquid should be cooled rapidly, and any clothing in contact with the area should be removed rapidly to decrease contact time. Immerse in cool water to reduce heat and prevent extension of burn. *Do not immerse or apply cold water if burns involve > 10% of body.*

- *Chemical burn:* Irrigate. If dry powder is still visible on the skin, brush it away before irrigating the skin with water. Irrigate with copious amounts of water for at least 15 (preferably 30) minutes after powders have been removed. This process should be started at the accident scene if possible. Alkali burns should be irrigated for 1-2 hours after injury. Call poison control center for specific instructions.
- *Tar burn:* Cool, clean gently, and apply a petrolatum-based antibacterial ointment (e.g. Polysporin®) or other petroleum-based product. Do not attempt to scrape tar off the skin surface, as this can cause further damage. Avoid chemical solvents, which may cause additional burns. After 24 hours the tar can be washed away and the injury treated as a thermal burn.
- *Electrical burn:* Be cautious and observe the client closely. Watch for cardiac arrhythmias. Cardiac monitoring for 24 hours is essential if there was significant exposure to electrical current. Apply a cervical collar. Look for long-bone fractures secondary to muscle contraction. An electrical burn may cause thrombosis of any vessel in the body. Clean and dress as for a thermal burn (see below).

Treatment Of Minor Burns

Nonpharmacologic Interventions

First degree burns

- Cleanse with normal saline or sterile water
- *Dressings:* Cover area lightly with sterile, dry gauze dressing

Second degree burns

- Remove any attached clothing and debris
- Cleanse with normal saline or sterile water
- Gently debride using sterile technique
- Small blisters may be left intact
- Debride open blisters
- *Dressings:* Small, less severe second-degree burns do not require antimicrobial ointment or impregnated dressings; instead, apply non-adherent porous mesh gauze dressing (e.g. Jelenet®)

Client Education

- Counsel client about appropriate use of medications (dose, frequency)

- Suggest that analgesics be taken 1 hour before dressing changes
- Recommend that dressing be kept clean and dry until area healed

Adjuvant Therapy

Give tetanus vaccination if needed

Pharmacologic Interventions

Analgesia:

ibuprofen, 200 mg, 1-2 tabs PO q6h prn

or

acetaminophen, 500 mg, 1-2 tabs, q4h prn

or

*acetaminophen with codeine 30mg,
1-2 tabs q4-6h prn (maximum 15 tabs)*

Consult a physician if additional analgesia needed for debridement, etc.

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

Apply:

silver sulfadiazine, od or

bacitracin ointment, od or

chlorhexidine dressing, 0.5%, od

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

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

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

Discuss choice with a physician.

Monitoring and Follow-Up

- Follow up in 24 hours and daily until the burn is healed

- Re-evaluate depth and extent of injury
- Monitor for healing and development of infection
- Cleanse and debride prn; tub soaks can help loosen coagulum and speed separation of necrotic debris
- Reapply bacitracin or silver sulfadiazine and dry sterile dressing
- Absolute sterility is not mandatory during dressing changes; however, cleanliness and thorough cleaning of hands, sinks, tubs and any instruments used is emphasized. Acetic acid (0.25%) can be applied for pseudomonal prophylaxis.

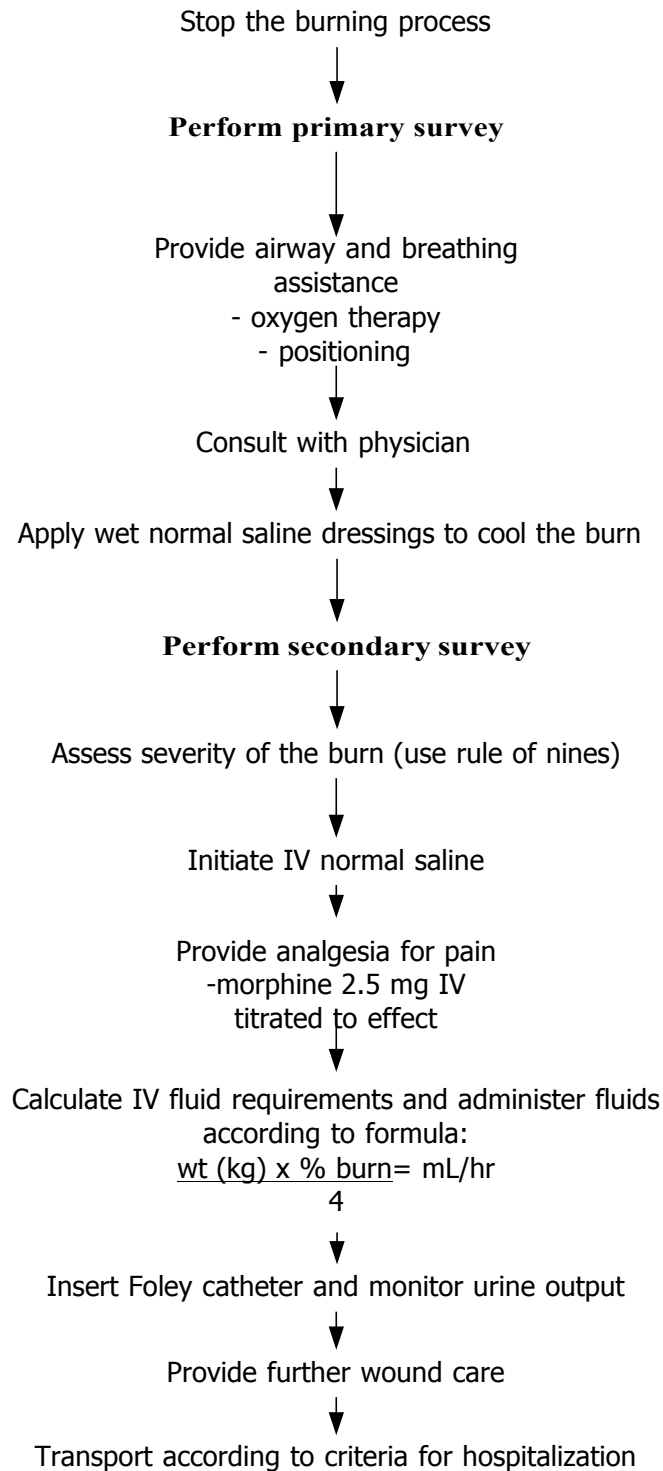
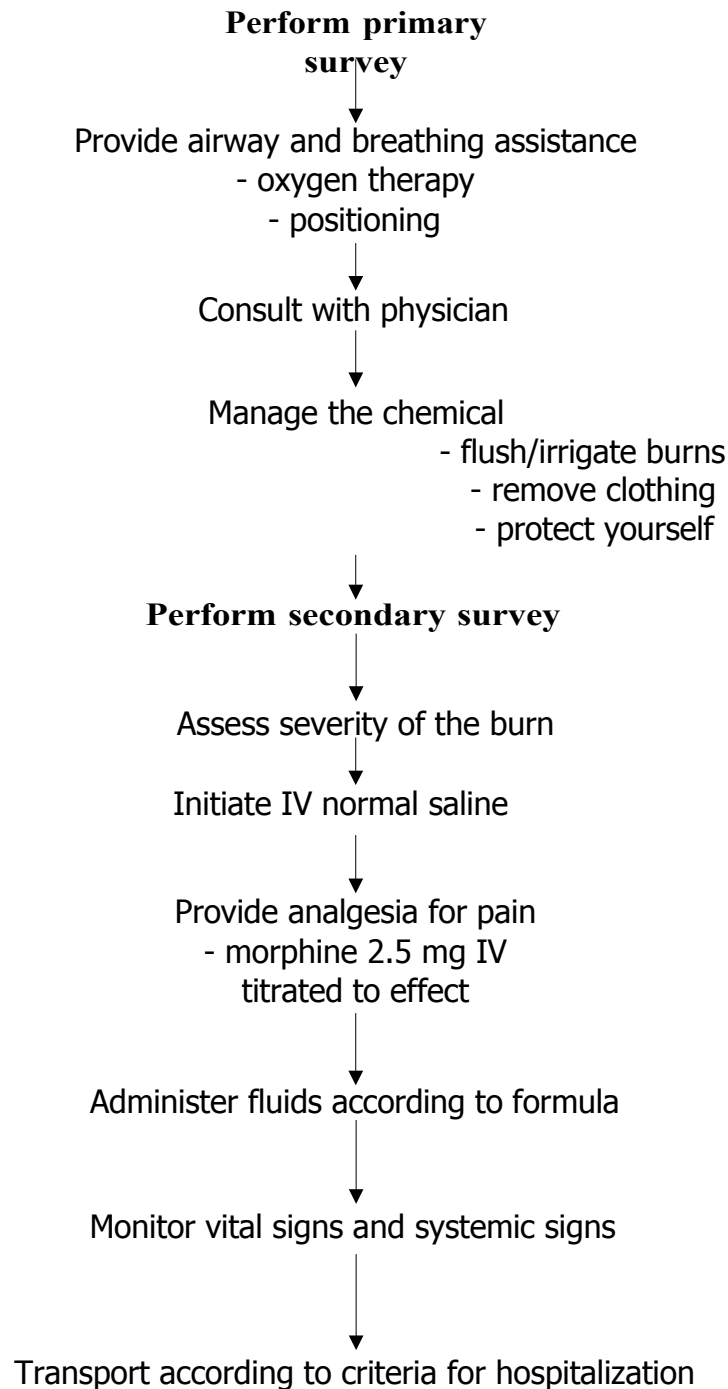
Figure 2: Treatment of Major Burns

Figure 3: Treatment of Chemical burns

Frostbite

Definition

Thermal injury to tissue caused by cold. Injury may occur without (Table 7) or with (Table 8) freezing of the tissue. Freezing of the tissue is defined by the formation of ice crystals.

Cause

Exposure to cold.

History

Most commonly affects hands and feet.

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

Physical Findings (See also Tables 7 and 8)

- 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 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 (feels like a piece of wood)
- If rewarming has occurred, area will be warm and tender

Differential Diagnosis

- Superficial versus deep frostbite

Complications

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

Management

Goals of Treatment

- Identify associated hypothermia
- Rewarm parts
- Control pain
- Prevent infection

Nonpharmacologic Interventions

- Rapidly rewarm affected part by immersion in 42°C water for 20-30 minutes; **slow rewarming is not good.**
- Do not rub and do not use hot water bottles
- Rest affected limb; avoid irritation to skin
- Continue rewarming once process has started until skin is warm, soft, pliable and flushed red
- Prevent refreezing; if in the field, do not thaw extremity until assured it will not refreeze
- Elevate limb once it is rewarmed; leave exposed if possible
- Do not break blisters
- Separate toes and fingers with dry cotton wool
- Wrap client loosely in bulky soft material and protect from injury and exposure during transport
- Give warm fluids to drink
- Forbid smoking

Client Education

- Dress in layers with appropriate cold-weather gear
- Cover all exposed skin areas
- Prepare properly for trips in cold climates
- Avoidance of smoking, as nicotine constricts small vessels

Table 7: Types of cold injury without frostbite

Type of injury	Cause	Clinical observations	Treatment
Chilblain (peripheral cold injury without freezing of tissue)	Prolonged dry exposure at temperatures above freezing	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	Rewarm as for frostbite (see text); pain medication should be provided
Trench foot and immersion injury	Prolonged wet exposure at temperatures above freezing	May have tissue destruction resembling second degree burns, including blisters, pain, hypersensitivity to cold; temperature sensitivity may be permanent	Rewarm as for frostbite (see text)

Pharmacologic Interventions**Mild Frostbite**

Analgesia for pain:

acetaminophen, 325 or 500 mg, 1-2 tabs PO q4h prn

or

ibuprofen, 400 mg, 1-2 tabs PO q4h prn

Moderate to Severe Frostbite

Analgesia for pain, which may be severe during rewarming:

meperidine, 50-100 mg IM q3-4h

Monitoring and Follow-up**Mild Frostbite**

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

Appropriate Consultation

Consult a physician for all but mild frostnip.

Referral

Moderate-to-Severe Frostbite

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

Table 8: Classification of frostbite

Frostnip	Superficial frostbite	Deep frostbite
Superficial, skin changes reversible	Tissue below skin pliable, soft	Tissue feels woody under skin; affects muscles, tendons, etc.
Skin blanched, numb; loss of sensation	Blisters appear in 24-48 hours; fluid reabsorbs; hard, blackened eschar develops; generally superficial, remains sensitive to heat and cold	Extremity cool, deep purple or red, with dark, hemorrhagic blisters and loss of distal function; may take several months to determine extent of injury
Comparable to first degree hot thermal burn	Treat conservatively; generally resolves without surgical intervention in 3-4 weeks	Frozen tissue will eventually slough

Common Endocrine And Metabolic Problems

Diabetes Mellitus

Definition

Diabetes mellitus is a metabolic disorder characterized by hyperglycemia, which is due to reduced insulin secretion, increased tissue resistance to insulin action or both.

Classification

Type 1

Type 1 diabetes mellitus is primarily the result of pancreatic β -cell destruction, which leads to absolute insulin deficiency and tendency to ketoacidosis. Onset is usually at younger age (<30 years).

Type 2

Type 2 diabetes mellitus occurs as a result of some degree of defect in insulin secretion and an increase in resistance to insulin in the tissues. Age at onset is usually middle age or older. People with type 2 diabetes are much less prone to ketoacidosis.

The prevalence of type 2 diabetes is reaching epidemic proportions among First Nations people. Age-adjusted prevalence rates are 19% to 26%, among the highest in the world. The condition is also occurring atypically in children and young adults in this population.

Gestational Diabetes

Gestational diabetes is a transient disorder, starting in pregnancy and ending with delivery. Women with gestational diabetes often go on to have type 2 diabetes later in life. Gestational diabetes is defined as fasting blood glucose ≥ 5.3 mmol/L and 1-hour pc blood glucose ≥ 10.6 mmol/L or 2-hour pc blood glucose ≥ 8.9 mmol/L. These pc glucose levels are based on a 75-g glucose load.

Impaired Glucose Tolerance (Pre-Diabetes)

Impaired Fasting Glucose Tolerance

People with a fasting blood glucose level between 6.1 and 7.0 mmol/L, which is below the diagnostic threshold for diabetes, are considered to have impaired fasting glucose tolerance.

Impaired Glucose Tolerance

People with a fasting blood glucose level $> 6.1 - 7.0$ mmol/L and a 2-hour pc blood glucose level between 7.8 and 11.1 mmol/L are considered to have impaired glucose tolerance.

Both of these groups have a higher risk of diabetes mellitus and cardiovascular disease than the general population. Preventive interventions involving lifestyle changes and more frequent screening for diabetes should be a priority for these people.

Causes

- Genetic
- Autoimmune
- Related to pancreatitis

Risk Factors

- Family history
- Hypertension
- Hyperlipidemia
- Central obesity
- Smoking
- High-fat diet
- Previous gestational diabetes

History

- Polyuria, polydipsia, polyphagia
- Nocturia
- Weight history (especially any weight loss)
- Fatigue, irritability
- Obesity (particularly in the central trunk)
- Blurred vision, changes in vision, frequent changes in optical prescription
- Nausea and vomiting
- Unresolving "flu-like" illness (ketoacidosis)
- Reversible paresthesia of fingers or toes

Past History

- Obstetric: gestational diabetes, large babies (>4.5 kg at delivery)
- Endocrine disorders
- Cardiovascular disease

- Hypertension
- Hyperlipidemia
- Recurrent or unresolving vaginal infections (yeast), urinary tract infections, skin infections (especially of feet)
- Surgery (e.g. on pancreas)

Family History

- Diabetes mellitus
- Hyperlipidemia
- Hypertension
- Renal disease
- Infertility
- Hirsutism
- Autoimmune diseases
- Pancreatitis
- Blindness

Current Health

- Eating habits (food choices, meal patterns, cultural influences concerning food)
- Physical activity level, factors limiting physical activity
- Medications (e.g. thiazides, sugar-containing medications, corticosteroids)
- Allergies
- Smoking habits
- Alcohol use
- Social factors: family dynamics, education, employment, lifestyle, coping skills

Physical Findings

A complete review and examination of all body systems must be done to detect the presence of any damage secondary to the diabetes.

- Client appears ill if diabetes is of acute onset
- Client appears wasted if there has been weight loss
- Vital signs: changes depend on initial presenting complaint and presence of underlying damage to target organs
- Blood pressure may be elevated
- Eyes: fundoscopic signs of retinopathy
- Oral cavity: poor dental health (client at risk for infection)
- Neck: thyroid assessment
- Chest: routine respiratory exam

- Cardiac system: signs of heart failure, bruits, peripheral pulses
- Abdomen: enlargement of organs
- Genitourinary system: signs of nephropathy (e.g. proteinuria)
- Musculoskeletal system: signs of limited joint mobility, arthropathy of hands
- Skin: infection (e.g. feet or nails), colour, temperature, poor healing
- Signs of neuropathy: neurological effects; changes in vibrational sense (e.g. in feet), proprioception, response to light touch (with monofilament), reflexes

Differential Diagnosis

- Impaired fasting glucose tolerance (fasting blood glucose 6.1-7.0 mmol/L)
- Impaired glucose tolerance (2-hour pc blood glucose level with 75-g glucose tolerance test [GTT] 7.8-11.1 mmol/L)
- Nondiabetic glycosuria
- Drug side effects (e.g. oral contraceptives, corticosteroids, thiazide diuretics)
- Diabetes insipidus
- Pheochromocytoma
- Cushing's syndrome

Complications

- Ketoacidosis (type 1);
- Hyperosmolar nonketotic coma
- Coronary artery disease, peripheral vascular disease
- Nephropathy, urinary infections
- Retinopathy, cataracts (early onset), blindness
- Peripheral neuropathy
- Recurrent skin (yeast) infections
- Premature death from complications

Diagnostic Tests

Diagnostic Blood Glucose Levels

Random blood glucose level ≥ 11.1 mmol/L in presence of symptoms (if random result < 11.1 mmol/L, have client return within a day or two for a fasting glucose test to ascertain definitive diagnosis)

or

Fasting blood glucose level ≥ 7.0 mmol/L on two or more occasions
or

Blood glucose level 2 hours after oral GTT (with 75-g load) = 11.1 mmol/L

Other Tests

- Lipid levels, complete blood count, creatinine level and TSH
- Urinalysis (routine and microscopy)
- Urine dipstick test for glucose, ketones and protein, microalbuminuria

Management

Goals of Treatment

- Attain optimum glycemic control
- Educate the client for self-care
- Prevent complications
- Attain optimum control of concomitant hypertension and hyperlipidemia and other cardiovascular risk factors
- Prioritize for alcohol and drug rehabilitation

Appropriate Consultation

Consult a physician immediately if diabetes mellitus is suspected. **All drug therapy for clients with diabetes is initiated by a physician.**

Nonpharmacologic Interventions

Lifestyle Modifications

- Nutrition therapy: consultation with dietician is recommended
- Nutritional recommendations: choose well-balanced diet from the four food groups; decrease saturated fats to $< 10\%$ of total calories; ensure adequate intake of carbohydrates, protein, vitamins and minerals
- Useful starting point is to plan meals with 55% carbohydrates and 30% fat content
- Exercise program: regular activity (e.g. walking for 20 minutes three times weekly)
- Weight control to maintain healthy body weight
- Smoking and alcohol cessation
- Education in diabetes self-care

Client Education

- Explain nature, course and prognosis of disease, as well as possible complications: condition can be controlled, but it cannot be cured

- Counsel client about appropriate use of medications (dose, frequency, route of administration, side effects)
- If client is taking insulin, monitor ability to self-administer
- Provide dietary counseling
- Have client maintain a dietary intake journal, and review the journal regularly
- Home glucose monitoring is essential; have client demonstrate ability to perform these tests accurately, provide instruction as necessary, and encourage maintenance of daily diary of results
- Discuss with client the procedure to follow in the event of an illness
- Educate client about signs and symptoms of hyperglycemia and hypoglycemia, and tell client what to do if these conditions develop
- Discuss foot care with client: keep feet clean; avoid dry skin (apply moisturizer daily); wear appropriate shoes or boots (not tight); avoid going barefoot; avoid open-toe shoes; do not cut nails too short; give prompt attention to cuts and sores
- Exercise will help with weight control and will reduce blood glucose levels

Involve the entire family in diabetic teaching to give them an understanding of diabetes and to enlist their support and assistance in the client's management of the condition.

Pharmacologic Interventions

Type 1

Insulin therapy as ordered by physician (Table 2).

Type 2

Physician-initiated drug therapy:

Monitoring and Follow-Up

Follow up every 4-6 weeks initially or more often as needed. Once stabilized, follow up three or four times a year. Monitoring should involve the following components.

At each visit:

1. Assess compliance with medications, diet and exercise
2. Review dietary journal with client and tailor diet plan to client's preferences and food availability

3. Measure blood pressure and weight each visit
4. Perform foot examination at least twice yearly
5. Encourage weight loss if appropriate: aim to reduce excess body weight by about 0.5 kg/week (in most cases this can be achieved by reducing caloric intake by about 500 calories/day)
6. Encourage client to exercise regularly (a daily walk is the best form of exercise for the general population)
7. Measure fasting blood glucose; measure Hb_{A1C} every 3-4 months if client is not stable and every 6 months if client is stable
8. Urinalysis for gross protein (q 6-12 months)
9. If nephropathy is diagnosed, refer to physician. Follow-up monitoring as directed by physician

Annually:

10. Electrocardiography (ECG) (if > 35 years of age)

11. Fasting lipid profile

12. Eye (dilated funduscopy) exam by eye team

(see Flow Sheet)

Referral

- Refer all newly diagnosed clients to a physician as soon as possible for complete evaluation and referral to diabetic clinic.
- Arrange follow-up with a physician twice yearly if stable or more frequently as necessary

Table 2: Types of insulin

Type	Time to onset of action	Peak action	Duration of action
Lispro	5-10 minutes	45 minutes	3-4 hours
Regular	30-45 minutes	2-5 hours	5-8 hours
NPH	1-3 hours	4-12 hours	18-24 hours
70/30	30-45 minutes	2-12 hours	18-24 hours
50/50	30-45 minutes	2-12 hours	18-24 hours
Lente	2-5 hours	7-15 hours	18-22 hours
Ultra-Lente	4-6 hours	8-20 hours	24-28 hours

Prevention Strategies

Primary Prevention, Type 1 Diabetes Mellitus

There are no known proven strategies to prevent type 1 diabetes mellitus.

Primary Prevention, Type 2 Diabetes Mellitus

- The major focus of any diabetes strategy should be primary prevention
- Primary prevention is aimed at weight control through a program of diet and exercise

Screening Strategies

Screening for Diabetes Mellitus

High-risk groups require aggressive screening for diabetes.

People > 45 years of age should be screened every 3 years. Screening should be annual for anyone with any of the following risk factors:

- Obesity (body mass index > 27 kg/m²)
- First-degree relative with diabetes mellitus
- Member of a high-risk population

- Low level of high-density lipoprotein (HDL)(<0.90 mmol/L) or elevated fasting level of triglyceride (>2.8 mmol/L)
- History of gestational diabetes
- History of impaired fasting glucose tolerance (fasting blood glucose 6.1-6.9 mmol/L)
- History of impaired glucose tolerance (fasting blood glucose < 7.0 mmol/L, 2-hour pc blood glucose level [2 hours after oral GTT] 7.8-11.0 mmol/L)
- Hypertension
- Coronary artery disease
- Presence of complications associated with diabetes

Metabolic Emergencies

Diabetic Ketoacidosis

Definition

A condition due to insulin deficiency that is characterized by hyperglycemia, ketonemia, ketonuria, acidosis and dehydration.

Causes

- Type 1 diabetes mellitus.
- Noncompliance with diet
- Failure to take insulin properly
- Concurrent illness or infection or failure to adjust diabetic regimen when ill
- Inadequate insulin (dose, type)

History

- Insidious onset
- Malaise, weakness, marked fatigue
- Thirst
- Polyuria, polydipsia, polyphagia
- Anorexia
- Nausea and vomiting
- Abdominal pain
- Muscle aches
- Headache
- Blurred vision
- Reversible paresthesia in fingertips

Physical Findings

- Client appears ill
- Temperature normal
- Heart rate rapid
- Respirations deep and rapid (Kussmaul respiration)
- Blood pressure usually normal
- Postural blood pressure drop
- Reduced level of consciousness may be present
- Fruity odor on breath
- Mucous membranes dry
- Skin warm and dry, loss of turgor

Differential Diagnosis

- Hypoglycemia
- Other causes of stupor or coma (e.g. stroke, head injury, alcohol or drug overdose)

Complications

- Severe dehydration
- Electrolyte imbalance (e.g. hyponatremia, hypokalemia, hyperkalemia, decreased serum bicarbonate)
- Cerebral edema related to overaggressive rehydration
- Hypoglycemia related to overcorrection of hyperglycemia
- Gastric dilatation
- Paralytic ileus

Diagnostic Tests

- Concentration of ketones in urine
- Random blood glucose level with glucometer
- Blood for baseline creatinine and electrolyte levels and complete blood count
- ECG may be helpful: look for the tall T-wave of hyperkalemia and watch for signs of silent myocardial infarction in the older diabetic client

Management

The reversal of diabetic ketoacidosis should be gradual to prevent overcorrection.

Goals of Treatment

- Assess and stabilize airway, breathing and circulation (ABC)
- Rehydrate
- Identify precipitating factors
- Treat any underlying cause (e.g. infection)
- Reduce blood glucose to about 13.8 mmol/L

Appropriate Consultation

Consult a physician immediately

Adjuvant Therapy

Oxygen as needed; keep oxygen saturation > 97%

Intravenous Therapy

Reversing the dehydration will assist in reducing the blood glucose level.

- Start IV therapy with 0.9% normal saline

- Run at 500-1000 mL/h (10-20 mL/kg per hour) as per physician orders
- After this, adjust IV infusion rate according to clinical response, state of hydration and ongoing urinary losses

Nonpharmacologic Interventions

- Insert indwelling urinary catheter
- Insert nasogastric tube if client is comatose

Pharmacologic Interventions

Consult a physician to start insulin therapy.

Monitoring and Follow-Up

- Check blood glucose hourly and before insulin administration: avoid falls in glucose > 5.5 mmol per hour
- Monitor heart rate, blood pressure, postural blood pressure changes and mental status frequently
- Cardiac monitoring
- Measure intake and output hourly; test urine for ketones hourly (hyperglycemia will resolve before ketonuria) and report results to physician
- Clients may take fluids orally when they can be tolerated

Referral

Medevac as soon as possible.

Hypoglycemia

Definition

Subnormal blood glucose level.

Causes

- Delayed meal
- Inadequate total caloric intake
- Unusual physical exertion
- Insulin measurement error
- Insulin overdose
- "Brittle" diabetic

History

- Sudden onset
- Hunger
- Sweating
- Shakiness, tremor
- Anxiety, restlessness
- Faintness, weakness
- Nausea
- Palpitations
- Progression to mental confusion, bizarre behavior, personality changes, reduced consciousness or loss of consciousness, seizures

Physical Findings

- Heart rate rapid
- Blood pressure elevated
- Pale
- Diaphoretic
- Anxious, restless
- Tremor
- Confusion
- Bizarre or aggressive behavior
- Staggering gait, may appear intoxicated
- Unconscious or experiencing seizure
- Cold, clammy skin

Differential Diagnosis

- Alcohol intoxication
- Alcohol-induced hypoglycemia
- Drug-induced hypoglycemia (e.g. overdose)

Complications

- Injury due to a fall
- Hypoxia of brain
- Seizures
- Death

Diagnostic Tests

Blood glucose level with glucometer (< 3.3 mmol/L is the autonomic warning level; if 2.8 mmol/L, client will have symptoms of neuroglycemia).

Management

Goals of Treatment

- Increase blood glucose level quickly
- Identify concurrent illness or associated injury

Nonpharmacologic Interventions

- Assess and stabilize ABC
- Give the conscious client 12 oz (360 mL) sweetened orange juice or some other form of rapidly absorbed sugar

Adjuvant Therapy

Adjuvant therapy should be undertaken if client is nauseated, stuporous or unconscious or is unable to take oral therapy.

- Oxygen to keep oxygen saturations >97%
- Start IV therapy with 5% dextrose in water (D5W) at 100-150 mL/h

Pharmacologic Interventions

dextrose, 50% solution, preloaded syringe, 25-50 mL IV stat over 1-3 minutes

or

glucagon, 0.5-1.0 mg SC, IM or IV

Monitoring and Follow-Up

- Observe response to treatment
- Recheck serum glucose level immediately
- When client regains consciousness or recovers, obtain an accurate history and do a thorough examination
- Identify any associated illness, previous episodes of hypoglycemia, head trauma or other injuries
- Give client a balanced meal
- Monitor glucose hourly with glucometer for recurring hypoglycemia

Appropriate Consultation

Consult a physician as soon as possible.

Referral

Medevac client if you are unable to stabilize blood glucose or if underlying cause is not clear.

Appendix A – Patient Care Documentation

Patient care documentation includes patient history, physical assessment of all anatomical systems, treatments, laboratory, and ongoing system and treatment reviews.

Initial Assessment:

1. Document name, age, weight, sex, destination, sending/receiving physician, presenting problem, current vital signs, mechanism of injury/history of presenting problem, medical history, special requirements, allergies, medications
2. Document time of patient assessment
3. Document initial vital signs and GCS
4. Document treatments, labs and medications
5. Document complete initial assessment including full primary and secondary survey as well as focused assessment regarding patient complaint (see below)
6. Document on trauma diagram location of injury/burn as appropriate
7. Document PR, QRS, and QTc intervals as well as ST/T wave changes and overall interpretation on all ECGs

Continuation of Care:

1. Document that an initial assessment was completed.
2. Document infection prevention/control methods implemented
3. Document time of patient transport to aircraft, how transported, patient condition enroute (if escorting)
4. Document time patient loaded in to aircraft, how patient secured in aircraft, patient condition (if escorting)
5. Document a complete set of vital signs including GCS every 30 minutes or every 15 minutes if patient unstable
6. Document in narrative form every 30 minutes including descriptor of patient status, treatments, and pertinent changes from initial assessment (not just vital signs)
7. Document medications given including time, drug, route, and dosage
8. Document any arrhythmias and obtains rhythm strip

Physical Examination

CVS:

- Level of consciousness, dizziness, lightheaded, headache, fatigue
- Skin color
- Elevated/depressed JVP
- Heart sounds, clear, muffled, extra sounds, murmur, location
- Cardiac rhythm and rate, apical equal to radial, correlates with rhythm strip, ectopy
- Chest pain OPQRST, associated with shortness of breath, diaphoresis, nausea
- Palpitations
- EKG, PR, QRS, QTc intervals, ST/T wave changes, axis deviation, MI localization
- Pulses, central vs peripheral, quality, equal bilaterally
- Temperature, diaphoresis
- Capillary refill time, central vs peripheral
- Edema
- Intake, Output
- Blood pressure, NIBP correlates with IBP
- Pacemaker settings
- IV location, size, patency

RESP:

- Level of consciousness, anxiety, fatigue
- Color of skin, mucous membranes, nail beds
- Patients position of comfort, tripod
- MOANS, RODS, LEMON
- Airway and oxygen adjuncts in place OPA, NPA, NRB, BVM, NC

- ETT/LMA size, position, cuff pressure, suction
- Rate, SpO₂, O₂ administration, EtCO₂, ABG/VBG
- Pattern of respirations, Cheyne-Stokes, agonal, Kussmaul
- Audible wheezes, stridor, grunting
- Nasal flaring, gasping
- Ability to manage own secretions, dysphagia
- Tracheal deviation, JVD
- Work of breathing, accessory muscle use and location, in drawing/retractions location, paradoxical respirations
- Bilateral chest expansion, flail segment, splinting
- DCAP-BLS TIC, subcutaneous emphysema
- Forced/prolonged expiratory time, pursed lip breathing, barrel chest
- Breath sounds and adventitia on auscultation, inspiratory vs expiratory
- Cough, URTI symptoms
- Clubbing

CNS:

- GCS and breakdown of E, V, M
- DCAP-BLS TIC
- Pupil size and response, extraocular movements
- Raccoon eyes, battle signs, otorrhea, rhinorrhea
- Speech changes, visual changes, facial asymmetry
- Cranial nerve assessment (As appropriate)
- Presence of headache, neck stiffness, photophobia, fever
- Spinal immobilization, posterior spinal inspection/palpation
- Equality of movement, sensation, motor strength
- Posturing, position
- Description of seizure activity and length of seizure
- Reflexes (corneal, gag, cough, babinski)
- BGL
- Tremors, CIWA
- Pain onset, provocation, quality, radiation, source
- Ambulation description

GI/GU:

- Intake, appetite, NPO start time
- Nausea, vomiting, hematemesis
- Pain description, intensity, quality, location, circumstances
- Shoulder blade pain, flank pain
- Abdominal visualization, flat, obese, distended, cachexic
- Bowel sounds, bruits, tympanic
- Abdominal palpation, soft, hard, tenderness, mass, rebound, radiation, guarding
- Bladder/liver/spleen palpable
- Urine output, pain on voiding, urgency, frequency
- Vaginal discharge, bleeding, amount, presence of clots, number of pad changes
- Diarrhea, constipation, melena, flatus
- Foley catheter time of insertion, size, output consistency, amount
- Wounds, dressings, location, condition
- NG, Ostomy, drains, output, amount, consistency, suction

EENT:

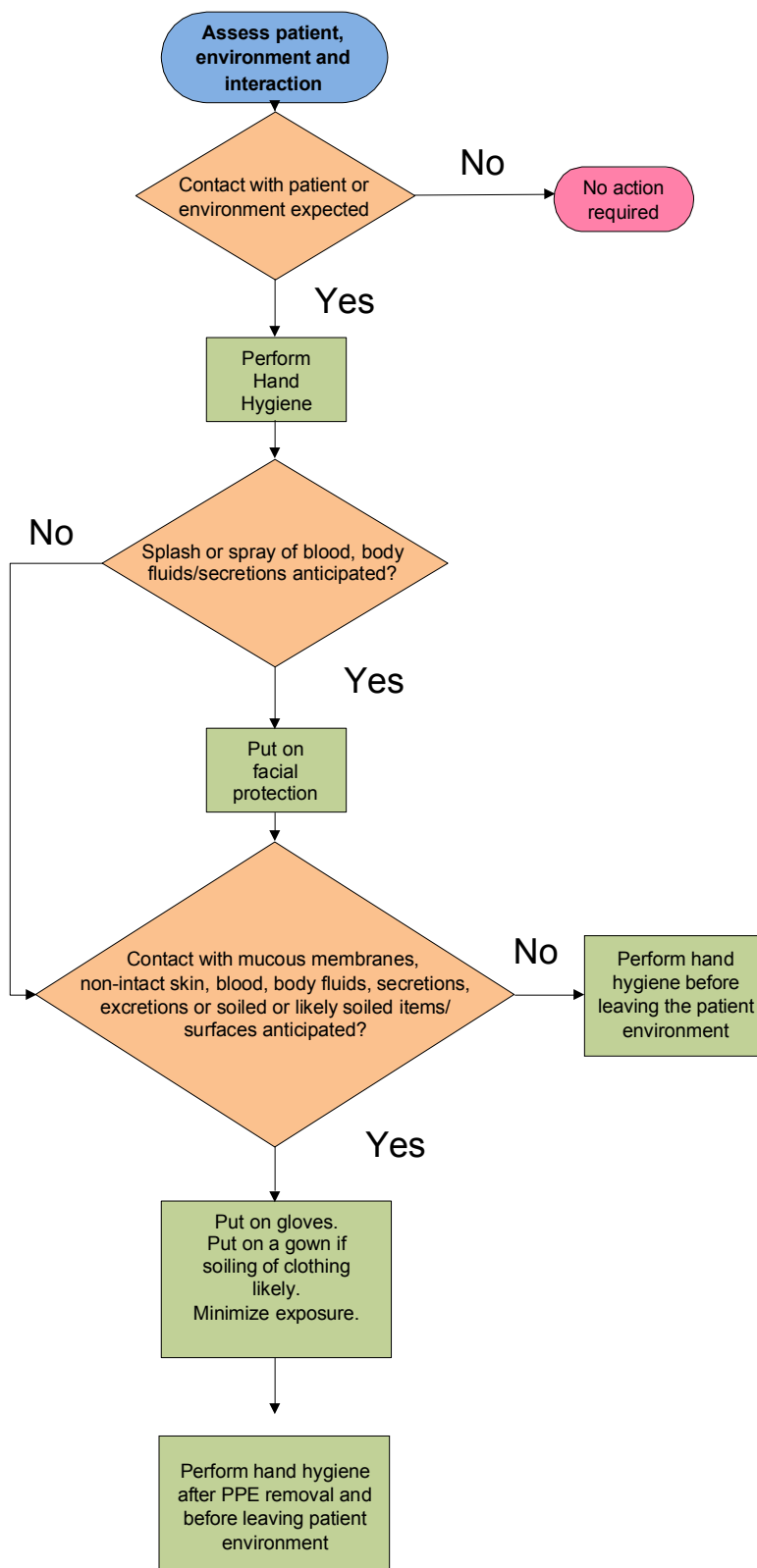
- Visual acuity, blurring, tunnelling, changes
- Hearing changes, ringing, discharge, TM intact
- Nasal congestion, fractures
- Oral swelling, mandibular/maxillary malalignment
- Tonsillar swelling, exudate

MSK/INTEG:

- DCAP-BLS TIC
- Rash, petechial/blanchable, pattern, vesicular, infection prevention
- Burn description, degree, % BSA

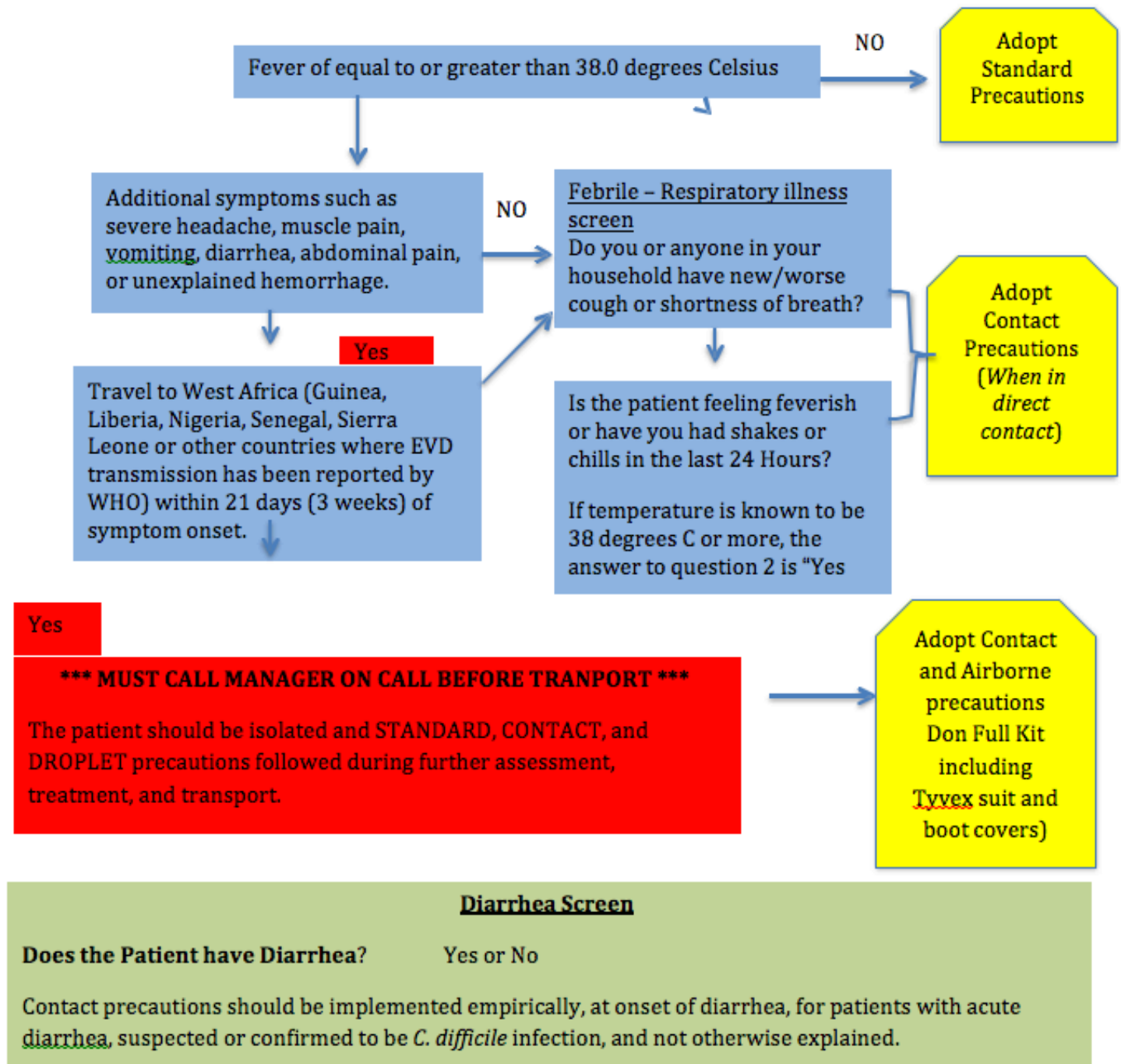
Appendix B – Routine Practices Point of Care Risk Assessment Algorithm
Appropriate Use of Personal Protective Equipment (PPE)

Adapted from PHAC Routine Practices and Additional Precautions Assessment and Educational Tools 2012



Appendix C – Infectious Disease Screening Tool

If any part of the patient history indicates infectious disease process please ask the following questions:





AMS INDUSTRIAL BLS/ALS MEDICATION LIST

Note: Advanced Medical Solutions Medical Director reserves the right to delegate the administration of OTC medications by an EMR with prior consultation and/or standing protocols as identified for a specific remote workplace.

Generic Name	Trade Name	Concentration	Preparation	Classification	EMR	EMT	EMT-P	PA
Acetaminophen	Acephen, Tylenol	500-mg	Tablet	Anti-Pyretic/Non-Opioid Analgesic	-	■	■	■
Acetaminophen / Codeine	Tylenol #3	325-mg/30-mg	Tablet	Anti-Pyretic/Opioid Analgesic	-	■	■	■
Acetaminophen / Phenylephrine / Pheniramine	NeoCitran Extra Strength Cold & Flu	650-mg/10-mg/20-mg	Powder	Allergy, Cold, and Cough Remedies	-	■	■	■
Acetylsalicylic Acid	Aspirin®, Asaphen®	81-mg	Tablet	Anti-Pyretic/Non-Opioid Analgesic	■	■	■	■
Acetylsalicylic Acid	Aspirin®, Asaphen®	325-mg	Tablet	Anti-Pyretic/Non-Opioid Analgesic	-	■	■	■
Activated Charcoal	Charac-50, Charcodote	50-mg	Solution	Antidotes	-	-	■	■
Adenosine	Adenocard	6-mg/2-mL	Injectable	Anti-Arrhythmic	-	-	■	■
Albuterol	Ventolin HFA	90-mcg/spray; 18-gm	HFA	Bronchodilators	-	■	■	■
Albuterol	Salbutamol, Ventolin Nebules	2.5-mg/3-mL	Solution	Bronchodilators	■	■	■	■
Aluminum Hydroxide / Magnesium Carbonate	Gaviscon Extra Strength	160-mg/105-mg	Tablet	Anti-Ulcer/Hypophosphatemic	-	■	■	■
Aluminum Hydroxide / Magnesium Carbonate	Gaviscon Extra Strength Liquid	254-mg/237.5-mg	Solution	Anti-Ulcer/Hypophosphatemic	-	■	■	■
Amiodarone	-	50-mg/mL	Injectable	Anti-Arrhythmic	-	-	■	■
Amoxicillin	Novamoxin®	500-mg	Tablet	Anti-Infective	-	-	-	■
Artificial Tears	-	15-mL	Solution	Ophthalmic	-	■	■	■
Atropine	-	0.1-mg/mL	Injectable	Anti-Arrhythmic	-	-	■	■
Azithromycin	Zithromax®	250-mg	Tablet	Anti-Infective	-	-	-	■
Benzocaine	Orajel® Severe Toothache & Gum	10%	Ointment	-	-	■	■	■
Benztropine	Apo-Benzotropine®, Cogentin®	1-mg/mL	Injectable	Anti-Parkinson	-	-	-	■
Calcium Chloride 10%	-	1.36-mEq/mL	Injectable	Mineral and Electrolyte Replacement	-	-	■	■
Camphor / Dimethicone / Menthol / Phenol	Blistex Medicated Lip Balm	0.5%/1.1%/0.6%/0.5%	Ointment	Non-Opioid Analgesics	-	■	■	■
Camphor / Eucalyptus / Menthol / Methyl Salicylate	Rub A535®	1%/0.5%/0.75%/12.5%	Cream	Non-Opioid Analgesics	-	■	■	■
Cefazolin	Ancef®	1-gm	Injectable	Anti-Infective	-	-	-	■
Cefixime	Suprax®	400-mg	Tablet	Anti-Infective	-	-	-	■
Ceftriaxone	Rocephin®	1-gm	Injectable	Anti-Infective	-	-	-	■
Celox	Celox Rapid Gauze, Z-Fold	9-gm	Towelette	Anti-Hemostatic Agent	-	■	■	■
Cephalexin	Keflex®	500-mg	Tablet	Anti-Infective	-	-	-	■
Chlorhexidine Gluconate	Chlorhexidine Wash Cloths	2%	Towelette	Anti-Septic	-	■	■	■
Chlorhexidine Gluconate	Apo-Chlorhexidine Oral Rinse	0.12%	Solution	Anti-Septic	-	■	■	■
Ciprofloxacin	Cipro®, Cipro® XR	500-mg	Tablet	Anti-Infective	-	-	-	■

Generic Name	Trade Name	Concentration	Preparation	Classification	EMR	EMT	EMT-P	PA
Clopidogrel	Plavix®	300-mg	Tablet	Anti-Platelet	-	-	■	■
Clotrimazole	Canesten Anti-Fungal Cream	1%	Ointment	Anti-Fungal	-	■	■	■
DEET	OFF! Deep Woods Sportsmen Insect Repellent	98.25%	Towelette	Insect Repellent	■	■	■	■
Dexamethasone	Decadron	10-mg/mL	Injectable	Anti-Asthmatics	-	-	■	■
Dextromethorphan/Benzocaine	Cepacol Extra Strength Sore Throat & Cough	5-mg/7.5-mg	Lozenge	Allergy, Cold, and Cough Remedies	-	■	■	■
Dextromethorphan / Pseudoephedrine / Guaifenesin / Acetaminophen	Benylin® All-In-One Cold and Flu	15-mg/30-mg/100-mg/500-mg	Tablet	Allergy, Cold, and Cough Remedies	-	■	■	■
Dextromethorphan / Pseudoephedrine / Guaifenesin / Acetaminophen	Benylin® All-In-One Cold and Flu	15-mg/30-mg/100-mg/500-mg	Liquid	Allergy, Cold, and Cough Remedies	-	■	■	■
Dextrose	Insta-Glucose	24-gm	Gel	Nutrient Replenisher	■	■	■	■
Dextrose D5W	-	250-mL	Injectable	Nutrient Replenisher	-	-	-	■
Dextrose D50W	-	0.5-gm/mL	Injectable	Nutrient Replenisher	-	■	■	■
Diazepam	Valium	5-mg/mL	Injectable	Anti-Anxiety/Anti-Convulsants	-	-	■	■
Diltiazem	Cardizem	5-mg/mL	Injectable	Anti-Arrhythmic	-	-	-	■
Dimenhydrinate	Apo-Dimenhydrinate, Gravol	50-mg/mL	Injectable	Anti-Emetics/Anti-Histamines	-	-	■	■
Dimenhydrinate	Gravol	50-mg	Tablet	Anti-Emetics/Anti-Histamines	-	■	■	■
Diphenhydramine	Benadryl®	50-mg/mL	Injectable	Anti-Histamine	-	-	■	■
Diphenhydramine	Benadryl®	50-mg	Tablet	Anti-Histamine	-	■	■	■
Dopamine	Intropin	400-mg/250-mL	Injectable	Inotropic/Vasopressors	-	-	■	■
Docusate Sodium	Colace®	100-mg	Tablet	Laxative	-	■	■	■
Enoxaparin	Lovenox	30-mg/0.3-mL	Injectable	Anti-Thrombotic	-	-	■	■
Epinephrine 1:1,000	Adrenalin, Anapen, EpiPen	0.3-mg/0.3-mL	Injectable	Anti-Asthmatics/Bronchodilators	■	■	■	■
Epinephrine 1:1,000	Adrenalin®	1-mg/mL	Injectable	Anti-Asthmatics/Bronchodilators	-	■	■	■
Epinephrine 1:10,000	Adrenalin®	0.1-mg/mL	Injectable	Vasopressors	-	-	■	■
Eugenol	Oil of Cloves - Emergency Dental Kit	85%	Solution	Anti-Septic/Non-Opioid Analgesic	-	■	■	■
Fentanyl	Sublimaze®	0.05-mg/mL	Injectable	Opioid Analgesic	-	-	■	■
Fluorescein Sodium	Bio-Glo	1.0-mg	Strip	Ophthalmic	-	■	■	■
Fomepizole	Antizol	1-mg/mL	Injectable	Antidote	-	-	■	■
Furosemide	Lasix®	10-mg/mL	Injectable	Diuretics	-	-	■	■
Glucagon	GlucaGen®	1-mg	Injectable	Hormones	-	■	■	■
Haloperidol	Haldol®	5-mg/mL	Injectable	Anti-Psychotics	-	-	■	■
Hepatitis A/Hepatitis B	Twinrix	1-mL	Injectable	Immunizations	-	-	-	■
Hydrocortisone	Anusol-HC	0.5%	Ointment	Anti-Hemorrhoids	-	■	■	■
Ibuprofen	Advil®, Motrin®	200-mg	Tablet	Anti-Pyretic/Non-Opioid Analgesic	-	■	■	■

Generic Name	Trade Name	Concentration	Preparation	Classification	EMR	EMT	EMT-P	PA
Indomethacin	Apo-Indomethacin®, Indocin®	50-mg	Tablet	Anti-Pyretic/Non-Opioid Analgesic	-	-	-	■
Ipratropium Bromide	Atrovent® HFA	7-mcg/spray; 12.9-gm	HFA	Bronchodilators	-	■	■	■
Ipratropium Bromide	Atrovent®	500-mcg	Solution	Bronchodilators	■	■	■	■
Isopropyl Alcohol	Alcohol Swabsticks	70%	Swabstick	Anti-Septic	■	■	■	■
Isopropyl Alcohol	Rubbing Alcohol	70%	Solution	Anti-Septic	■	■	■	■
Ketamine	Ketalar	10-mg/mL	Injectable	Anesthetics	-	-	■	■
Ketorolac	Toradol®	30-mg/mL	Injectable	Non-Opioid Analgesics	-	-	■	■
Labetalol	-	5-mg/mL	Injectable	Anti-Hypertensive	-	-	-	■
Lamivudine / Zidovudine	Combivir	150-mg/300-mg	Tablet	Anti-HIV	-	■	■	■
Levonorgestrel	Plan-B	0.75-mg	Tablet	Emergency Contraceptive	-	■	■	■
Lidocaine 0.5%	Solarcaine Burn Relief Spray	0.5%	Spray	Anesthetics	-	■	■	■
Lidocaine 2%	Xylocaine	20-mL	Injectable	Anesthetics	-	-	■	■
Lidocaine 2% / Epinephrine 1:100,000	Xylocaine	20-mL	Injectable	Anesthetics	-	-	■	■
Lidocaine 10%	Xylocaine Spray	10%	Aerosol	Anesthetics	-	-	■	■
Loperamide	Imodium®	2-mg	Tablet	Anti-Diarrheal	-	■	■	■
Loratadine	Claritin®	10-mg	Tablet	Anti-Histamine	-	■	■	■
Lorazepam	Ativan®	1-mg	Tablet	Anti-Anxiety/Anti-Convulsants	-	-	■	■
Lorazepam	Ativan®	4-mg/mL	Injectable	Anti-Anxiety/Anti-Convulsants	-	-	■	■
Magnesium Sulfate	-	500-mg/mL	Injectable	Mineral and Electrolyte Replacement	-	-	■	■
Mannitol	Osmitrol	20%/500-mL	Injectable	Diuretics	-	-	-	■
Metoclopramide	Reglan®	5-mg/mL	Injectable	Anti-Emetics	-	-	■	■
Metoprolol	Betaloc IV®, Lopressor®	1-mg/mL	Injectable	Anti-Anginal/Anti-Hypertensive	-	-	■	■
Midazolam	Versed®	5-mg/mL	Injectable	Anti-Anxiety/Sedative/Hypnotics	-	-	■	■
Morphine	Morphine H.P., MS Contin	10-mg/mL	Injectable	Opioid Analgesic	-	-	■	■
Naloxone	Narcan	0.4-mg/mL	Injectable	Antidotes	-	-	■	■
Nitroglycerin	Nitrolingual, Nitromist	400-mch/spray; 4.9-gm	Spray	Anti-Anginal	-	■	■	■
Nitroglycerin	Nitro-Dur	0.2-mg	Patch	Anti-Anginal	-	■	■	■
Nitrous Oxide	Entonox, Nitronox	Self Administered	Gas	Inhaled Agent	-	■	■	■
Norepinephrine	Lovephed	1-mg/mL	Injectable	Vasopresor	-	-	■	■
Ondansetron	Zofran	2-mg/mL	Injectable	Anti-Emetics	-	-	■	■
Oxygen	-	0.5 – 15 LPM	Gas	Inhaled Agent	■	■	■	■
Oxytocin	Pitocin	10-units/mL	Injectable	Hormones	-	-	■	■
Permethrin	Nix Lice Treatment	1%	Lotion	Pediculicide	-	■	■	■
Permethrin	Nix Dermal Cream	5%	Cream	Pediculicide	-	■	■	■
Phenytoin	Dilantin	50-mg/mL	Injectable	Anti-Convulsants	-	-	-	■

Generic Name	Trade Name	Concentration	Preparation	Classification	EMR	EMT	EMT-P	PA
Phenytoin	Dilantin	50-mg	Tablet	Anti-Convulsants	-	-	-	■
Polymyxin B / Bacitracin	Polysporin Topical Ointment	10,000-units/500-units	Ointment	Anti-Infective	-	■	■	■
Polymyxin B / Trimethoprim	Polytrim Ophthalmic Solution	10,000-units/1-mg	Solution	Anti-Infective	-	■	■	■
Povidone Iodine	Betadine Solution	10%	Solution	Anti-Septic	■	■	■	■
Povidone Iodine	Povidone Iodine Swabsticks	10%	Swabstick	Anti-Septic	■	■	■	■
Pramoxine / Phenylephrine / Glycerin / Petrolatum	Preparation H Cream	1%/0.25%/14.4%/15%	Cream	Anti-Hemorrhoids	-	■	■	■
Pramoxine/Zinc Acetate	Polysporin Itch Relief	1%/0.1%	Ointment	Anti-Histamine	■	■	■	■
Prednisone	Winipred	50-mg	Tablet	Anti-Asthmatics	-	-	■	■
Pseudoephedrine	Sudafed	30-mg	Tablet	Allergy, Cold, and Cough Remedies	-	■	■	■
Ranitidine	Zantac	25-mg/mL	Injectable	Anti-Ulcer	-	-	-	■
Ranitidine	Zantac	150-mg	Tablet	Anti-Ulcer	-	■	■	■
Rocuronium	Zemuron	10-mg/mL	Injectable	Paralytic Agent	-	-	■	■
Silver Sulfadiazine	Flamazine	1%	Cream	Anti-Infective	-	■	■	■
Sodium Bicarbonate 8.4%	-	1-mEq/mL	Injectable	Anti-Ulcer	-	-	■	■
Sodium Biphosphate	Fleet Enema	19-g/7-g	Liquid	Laxative	-	-	■	■
Sodium Chloride	Normal Saline 0.9%	10-mL	Injectable	Mineral and Electrolyte Replacement	-	■	■	■
Sodium Chloride	Normal Saline 0.9%	50-mL	Injectable	Mineral and Electrolyte Replacement	-	■	■	■
Sodium Chloride	Normal Saline 0.9%	500-mL	Injectable	Mineral and Electrolyte Replacement	-	■	■	■
Sodium Chloride	Normal Saline 0.9%	1,000-mL	Injectable	Mineral and Electrolyte Replacement	-	■	■	■
Sterile Water	-	10-mL	Solution	-	-	-	-	■
Sterile Water	-	1,000-mL	Solution	-	-	-	-	■
Succinylcholine	Anectine	20-mg/mL	Injectable	Paralytic Agent	-	-	■	■
Tetanus + Diphtheria Toxoids (Td) Vaccine	-	0.5-mL	Injectable	Immunizations	-	-	-	■
Tetracaine	Altracaine, Tetcaine	0.5%	Solution	Ophthalmic	-	■	■	■
Tobramycin	Tobrex	0.3%	Solution	Ophthalmic	-	-	■	■
Tolnaftate	Tinactin Super Absorbent Powder	1%	Powder	Anti-Fungal	-	■	■	■
Tranexamic Acid	-	100-mg/mL	Injectable	Anti-Fibrotic Agent	-	-	■	■
Tuberculin	Mantoux	5-units	Injectable	Diagnostic Agent	-	-	-	■
Valacyclovir	Valtrex	500-mg	Tablet	Anti-Viral	-	-	-	■
Vasopressin	Pressyn	20-units/mL	Injectable	Hormones	-	-	■	■
Vitamin B1	Thiamine, Betaxin	100-mg/mL	Injectable	Vitamins	-	-	■	■
Witch Hazel 50%	Preparation H Totables	50%	Towelette	Anti-Hemorrhoids	-	■	■	■
Xylometazoline	Otrivin Complete Nasal Care	0.1%	Spray	Allergy, Cold, and Cough Remedies	-	■	■	■