Chapter # 7

ISOLATION – PRACTICAL ISSUES AND SOLUTIONS

Isolation

"Isolation is the separation of a person or a group of persons infected or believed to be infected with a contagious disease to prevent the spread of infection". These persons are usually isolated in a hospital, but they may also be isolated at home or in a designated community-based facility, depending on their medical needs."

Quarantine

"Quarantine is the separation and restriction of movements or activities of persons who are not ill but who are believed to have been exposed to infection, for the purpose of preventing transmission of diseases". Persons are usually quarantined in their homes, but they may also be quarantined in community-based facilities and airports/seeports.

Principles of Isolation

- Transmission of infections usually occur through direct contact with patient or their contacts.
- Infections transmitted by droplets (e.g., rubella, measles etc usually require close contact. These droplets generally do not travel beyond a distance of 6 feet.
- While organisms transmitted through airborne route (e.g.: Anthrax, SARS, Avian Influenza) can travel long distances as their particles remain suspended in air for longer period.
- Fomite transmission (e.g. MRSA) is reported from inanimate objects e.g.: clothing, eating utensils

Goals of Isolation

Isolation is necessary to:

- Protect the Community
  * Remove infected patients
- Protect Healthcare Workers
- Protect Other Patients
- Response personnel (Ambulance, Police, Fire and Rescue)

Emergency Management Agencies and health department officials Isolation strategy is to be based on modes of the transmission of the pathogen:

Transmission-based Isolation

- Airborne (TB, Chicken pox, Measles)
- Droplet (Diphtheria, Pertussis, Meningococcus)
- Contact (Enteric infections, Respiratory infections, Skin infections)

Isolate suspected or confirmed infectious patient

- Prevent sharing of airspace (respiratory isolation)
- Prevent direct contact (protective clothing/masks)
- Prevent contact with infectious materials (decontamination-chlorine/bleach solution/proper disposal of biowaste)

Administrative Controls

Many of the strategies of infection control reduce worker risk for exposure to any infectious agent:

- Work practices that limit number of workers potentially exposed:
Assign only prophylaxis vaccinated workers to jobs with exposure. Putting possibly infectious patients in isolation.
- Work practices that limit exposure to the hazard:
Procedures for handling waste, laundry, specimens (incineration).

Standard Precautions

Constant use of gloves and hand washing (plus face-shields, masks, or gowns if splashes are anticipated) for any contact with blood, moist body substances (except sweat if not Ebola or Marburg virus), intact mucous membranes and intact skin will protect individuals from different diseases.

Prevent Infection from Patients or Materials

- Standard Precautions:
  * Prevents direct contact during care.
  * Prevents transmission of other infections.
- Contact Precautions:
  * Prevents dispersal of potentially infectious material by health care-providers.
- Airborne Precautions:
  * Prevents transmission via airborne route to other parts of hospital.
  * Provides respiratory protection for workers who must share airspace with infectious patient

Prevent sharing of airspace with potentially infectious patients

- Negative pressure isolation rooms.
- Separate facilities for larger groups.
- Respirators for health care-providers in direct charge of patients

Isolation Strategies

Three groups to consider:

- Confirmed or suspected cases
  * Infectious
- Febrile or symptomatic contacts
  * May be infectious
- Asymptomatic contacts under surveillance
  * May not be infectious but still follow standard precautions (assume infectious)

Hospital Treatment Issues in a Highly Infectious Agent "Event"

- Existing services and isolation capabilities could be overwhelmed
  * Ill will present in hospitals unannounced
  * In-hospital spread to others may occur if infection control measures not followed Immediately
- Plans need to include medical treatment capabilities for cases possibly in non-hospital settings (outside-like Mass Prophylaxis Treatment Sites) eg, schools/city halls/civic centers
- Mobile Field Hospital (inflatable)

Decontamination of Surfaces/Floors/ Bathrooms

- Surfaces: doorknobs, tables, chairs, toilets
  * Diluted bleach solution (Fresh every day)
  * Hospital disinfectants
- Blood, pus and other body fluids:
  * Bio-Hazard Waste Disposal after disinfecting with bleach solution or hospital disinfectants

Decontamination

- Laundry:
  * Contain in large containers with plastic lining
  * Disposable laundry bags if available
  * Don't sort first, wash, then sort (wear gloves)
- Household:

* Basic cleaning, wipe down surfaces
* Wash all contaminated clothing in hot water (bleach if possible).
* Public health review of homes

Infection Control in Places without Infrastructure

- Waste disposal – incineration
- More durable virus:
  * Surface cleaning with bleach solution
- Contain soiled items on site
  * Decontaminate or incinerate
  * e.g., Ebola, Congo, Crimean and Marburg outbreaks.

Burial Issues/Religion

- Do not bath deceased (e.g.: Ebola and Marburg)
- Contain and seal remains
- If bathing is necessary it should be given by trained person, using bleach.
- No open funeral
- Cremate, if possible e.g.: Ebola / Marburg / Tularemia
  * If not, bury, but no embalming
  * Bury deep in ground, not "on surface" if mass burial (like Tsunami victims)

Notification of Communicable Diseases to Executive District Officer (Health)

Medical practitioners attending patients known to be suffering from or suspected of suffering from a notifiable communicable disease, have an obligation to inform the Executive District officer health (at the district health office). It is also important that all such cases are reported to a member of the Infection Control Team. This should be done as soon as possible. Notification should occur on clinical suspicion of the disease and not dependent on laboratory confirmation.

- Common vehicle

Transmission can be through contaminated food, water, medications, blood products, devices, and equipment.

- Vector-borne

Transmission of microorganisms via mosquitoes, flies, ticks, etc.

Neither common vehicle nor vector-borne transmission play a significant role in typical hospital-associated infections (HAI) and will not be discussed here.

Practical Guidance for Decision Makers on Isolation

At any one time hospitals might have more patients with potentially transmissible infections needing isolation rooms than they have rooms available. Consistent and evidence-based decisions should therefore be made on prioritization for the use of such isolation.

Limited resources available and competing priorities might make the decision difficult to make. In the absence of widely used accepted guidelines, these decisions may not be consistent. When faced with the need to prioritize the use of isolation facilities, the following factors, which influence transmission and its impact, should be considered, e.g., a risk assessment should be performed:

1. Advisory Committee of Dangerous Pathogens (ACDP) Classification of Pathogens: The ACDP classification provides an acknowledged system of classifying organisms based on their transmissibility, pathogenicity, and on our ability to protect against or treat individual infections.
This is widely used all over the world.

2. The probable route of transmission: Air-borne infections are those most likely to spread readily

Table-4: Summary of components of standard infection control precautions and of transmission based precautions in isolation procedures

	Standard	Contact	Droplet	Airborne
Hand Hygiene	a	a	a	a
Gloves	When likely to touch blood, body fluids and contaminated items	On entering room, during care	As per "Standard"	As per "Standard"
Mask	During procedures likely to generate contamination with blood and body fluids	As per "Standard"	As per "Standard" and if present within 1 meter of patient	On entering the room. Non-essential susceptible people should be excluded. For TB wear high-efficiency mask
Eye protection /face shield	During procedures likely to generate contamination with blood and body fluids	As per "Standard"	As per "Standard"	As per "Standard"
Apron/gown	During procedures likely to generate contamination with blood and body fluids	On entering if contact with patient or environment anticipated	As per "Standard"	As per "Standard"
Equipment	a	a	a	a
Environment (Cleaning, etc.)	a	a	a	a
Linen	a	a	a	a
Isolation room	Single room not required	Single room and minimize time outside	Single room, minimize time outside to when patient may wear mask	Single room with negative pressure ventilation, minimize time outside to when patient may wear mask. Exclude non-essential susceptible people

a = According to description in text

if not isolated; blood-borne infections are least likely to do so.

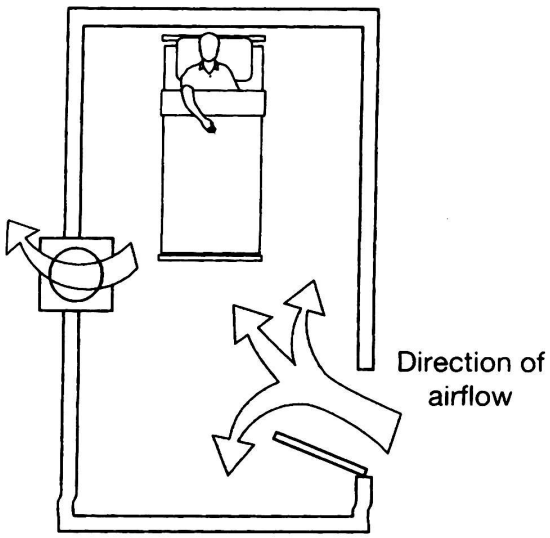
3. Evidence for transmission: Although 1) and 2) may suggest transmission, the emphasis placed on evidence-based medicine now supports a requirement to demonstrate that transmission of specific infections has indeed occurred in hospitals.

4. Occurrence of infection in the hospital: The incidence or prevalence of an infection/colonization in a hospital is frequently a consideration when deciding whether or not to isolate a patient. In a sporadic infection, isolation of a patient will have a higher priority than in endemic or epidemic situation.

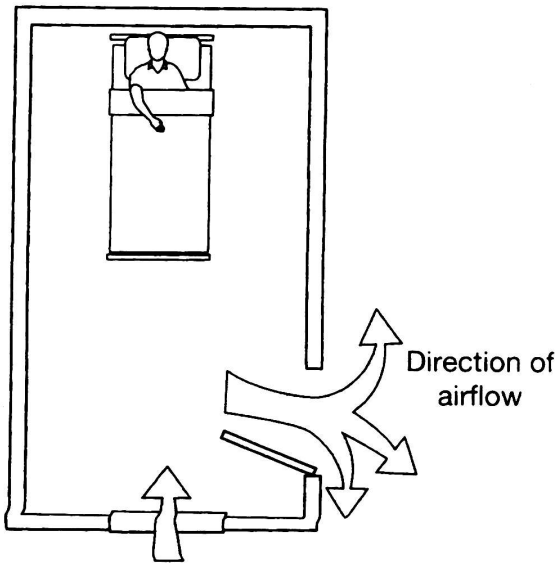
5. Antibiotic resistance: Emergence of antibiotic resistant bacteria is one of the principal causes of the increased demand on isolation facilities.

6. Susceptibility of other patients: When deciding whether or not to isolate a case, the presence of a susceptible patient population promotes the isolation of the potential source of sepsis.

7. Dispersal characteristics of patient: While transmissibility of various infections has been addressed in 1, 2, and 3, it is well recognized that for a given infection certain patients present greater transmission hazards than others.



Picture-15: Positive Pressure Isolation



Picture-16: Negative Pressure Isolation

Table 5: Summary of infection control precautions for various categories.

Activity	Standard precautions	Additional precautions		
		Airborne transmission	Droplet transmission	Contact transmission
Single room	No[a]	Yes-door closed	Yes	Yes - if possible, (cohort with patient with the same infection)
Negative pressure ventilation	No	Yes[b]	No	No
Handwashing	Yes	Yes	Yes	Yes
Gloves	For body substances	For Body substances	For Body substances	Yes
Gown	If soiling likely	If soiling likely	If soiling likely	If HCW's clothing will have substantial contact with the patient, environmental surfaces or items in the patient's room
Mask	Protect face if splash Likely	Particulate mask for tuberculosis only. All others, regular mask.	No[c]	Protect face if splash likely
Goggles/face-shields	Protect face if splash Likely	Protect face if splash likely	Protect face if splash likely	Protect face if splash likely
Miscellaneous	Avoid contaminating environmental surfaces with gloves	Teach patient to cover nose and mouth when coughing or sneezing	Provide 1 m of separation between patients in cohort	Remove gloves and gown, wash hands before leaving patient's room

Table 6: Type and duration of isolation precautions.

Disease	Category of isolation and precautions	Duration of infection control precautions	Comments
AIDS	Standard		
Actinomycosis	Standard		
Amoebiasis	Standard	As long as cysis appear in faeces	
Anthrax	Standard	Duration of hospitalization; until off antibiotics and cultures are negative	Laboratory must be informed if the specimens are sent for examination
Ascariasis	Standard		
Aspergillosis	Standard		No person-to-person transmission
Botulism	Standard		
Brucellosis	Contact	Precautions only if draining lesions(s)	Person-to-person transmission rate
Campylobacter gastroenteritis	Standard	Duration of diarrhoea	Person-to-person transmission rate
Candidiasis	Standard		Spread rare, except in high dependency units, i.e. SICU, etc
Chickenpox (Varicella)	Airborne and contact	Exclusion should continue until lesions are encrusted. Patient is infectious until 5 days after rash appears.	Duration patient home of clinical condition permits. HCWs should have a clear history of chicken pox or should know that they are immune. Visitors who have not had the disease to be warned of the risk.
Chlamydia trachomatis infection	Standard	Duration of symptoms	
Cholera	Standard	Duration of illness	Until three cultures of stools are negative

Table 6: Continued

Disease	Category of isolation and precautions	Duration of infection control precautions	Comments
Clostridium perfringens Food poisoning	Standard		
Gas gangrene	Standard	Duration of illness	Usually autogenous infection. Not transmitted from person-to-person. Isolation of patient not necessary.
Clostridium difficile	Contact	Duration of diarrhoea	
Conjunctivitis Acute bacterial and chlamydial	Standard		
Gonococcal	Standard	Until 24 h after starting antibiotic therapy	
Acute viral haemorrhagic	Contact		
Cryptococcus	Standard	Duration of illness	
Cryptosporidiosis	Standard	Duration of diarrhoea	
Creutzfeldt-jacob disease	Standard		No person-to-person transmission
Cytomegalovirus infection (neonates & immunocompromised)	Standard		Pregnant staff should avoid contact, particularly with patient's urine
Diarrhoea	Standard		
Diphtheria Cutaneous	Contact	Until off antibiotics and three swabs are culture negative from skin lesions taken at least 24 h apart after antibiotic therapy	Throat and nasal swabs should be taken from all close contacts. Notify laboratory before swabbing contact.

Table 6: Continued

Disease	Category of isolation and precautions	Duration of infection control precautions	Comments
Pharyngeal	Droplet	Until off antibiotics and three consecutive swabs from nose and throat culture are negative	Culture positive carriers of toxigenic C. diphtheria should receive chemoprophlaxis with erythromycin and swabs repeated after treatment No admission of Patients until contacts are bacteriologically clear.
Dysentery	Standard		
Amoebic	Standard	As long as crsis appear in faeces	
Bacillary	Contact	Duration of diarrhoea	Discharge patient home if clinical condition permits
Echinococcosis (Hydatidosis)	Standard		
Ebola virus	Contact	Duraing hospitalization	
Encephalitis or encephalomyeli tis	Contact	Until off antibiotic and cultures are negative	
Enteric fever Typhoid	Standard	Duration of diarrhoea	
Paratyphoid	Standard	Duration of diarrhoea	
Epiglotitis (H. Influenzae type b)	Droplet		Close contact should be given rifampicin as chemoprophylaxis
Gas gangrene	Contact		Usually autogenous infection. Not transmitted from person-to-person Isolation of pattent not necessary.

Table 6 Continued

Disease	Category of isolation and precautions	Duration of infection control precautions	Comments
Gastroenteritis	Standard		
Glandular fever	Standard	Until acute phase is over	Isolation of patient not necessary
German measles (Rubella)	Droplet	From 7 days before up to 10 days from onset of rash	Discharge patients home if Clinical condition permits. Exclude non-immune women (staff or visitor) of child bearing age. circumstances.
Gonococcal Ophthalmia neonatorum	Contact	For 24h after the start of effective antibiotic therapy	
Gonorrhoea	Contact	For 24h after the start of effective antibiotic therapy	
Hepatitis viral Type A	Standard and Contact	7 days before to 7 days after onset of jaundice	Hepatitis A is most contagious before jaundice and is infections in the early febrile phase of illness. Close contacts may be given gamma globulin with in14 day to abort or attenuate clinical illness
Type B & C	standard		
Type E	standard		
Herpes simplex	Contact	Until vesicles healed	protect immunologically compromised patients. Wear gloves when hands are in contact with oral or genital secretions, staff with cold sores

Table 6 Continued

Disease	Category of isolation and precautions	Duration of infection control precautions	Comments
			compromised patients, neonates or burns patients
Herpes zoster (shingles)	Contact	Lenght of acute illness i.e. until vesicles dry	As Herpes zoster may lead to cases of chicken pox, susceptible individuals and staff who have not had chickenpox should be excluded from contact with the patient. Visitors who have not had be warned of the risks.
HIV infection	standard		Isolation required only in special
Hookworn disease	Standard		
Impetigo	Contact	For 24 h after start of effective antibiotic therapy	
Infectious mononucleosis (Glandular fever)	Standard	Until acute phase is over	Oral secretions precautions
Influenza	Droplets	In prodromal phase and for 5 days after onset	Immunization can be offered to a selected group
Lassa fever	Contact	Duration of hospitalization	
Legionnaire's disease	Standard		Not transmitted from person-to-person; isolation of patient not necessary
Leprosy	Standard		
Leptospirosis (Weil's disease)	Standard	Duration of hospitalization	Contact precautions for urine only. Not transmitted from person-to-person;

Table 6 Continued

Disease	Category of isolation and precautions	Duration of infection control precautions	Comments
			isolation of patient not necessary.
Listeriosis	Contact	Duration of hospitalization	{Person-to-person spread rare
Lyme diease	Standard		
Malaria	Standard		
Marburg virus disease	Contact	Duration of hospitalization	
Measles	Droplet	For 5 days start of rash, except in immunocompromiz ed patients with whorm precautions should be maintained for duration of illness	Discharge patient home if clinical condition permits. Immunoglobin for exposed immunocompromis ed patient. If outbreak in a paediatric ward, do not admit Children who are not immunosuppressed until 14 days after the last contact has gone home.
Meningitis 'Coliforms'	None		
Listeria monocytogen es	None		See under Listeriosis.
Neisseria meningitidis (Meningococc al)	Droplet	For 48 h after start of effective antibiotic therapy and patient has received Chemoprophylaxis	Visiting by all children Should be discontinued.
Haemophilus influenzae (type b)	Droplet	Duration of illness	Close contacts should be given rifampicin as prophylaxis.
Pneumococcal meningitis	Standard		
Tuberculosis			Isolate if patient has

Table 6 Continued

Disease	Category of isolation and precautions	Duration of infection control precautions	Comments
	if pulmonary TB		respiratory open pulmonary TB.
Meningitis	Droplet		
Viral	Standard	Until virus no longer present in stool	Seek advice from a member of infection control team (ICT)
Meningoccal septicaemia	Droplet	For 48 hours after start of effective antibiotic therapy and patient has received Chemoprophylaxis	
MRSA	Contact	Until three swabs are negative	
Multi-resistant Gram-negative organisms	Contact		
Mumps	Droplet	7 days before to 9 days after onset of parotid swelling	Exclude non-immune staff. inform visitors who are not immune. Persons with subclinical infections may be infectious.
Mycoplasma	Standard		
Norcadis	Standard		
Oraf	Standard		Contact precautions for exudates. isolation of patients not necessary.
Pertussis (see Whooping cough)	Droplet		
Pinworm infection	Standard		
Plague Bubonic	Standard	Duration of hospitalization until culture negative	

Table 6 Continued

Disease	Category of isolation and precautions	Duration of infection control precautions	Comments
Pneumonic	Droplet	Duration of hospitalization until culture negative	
Pneumaonia	Usually None (see Comments)		Isolation required with respiratory precautions for Strep. Pneumonia resistent to penicillin MRSA, plague and psittacosis.
Poliomyelitis	Contact	Until stools negative for polio virus or 7 days from onset	Droplet spread is possible during its earliest phase first week; masks should be worn. Subsequently. faecal excretion is more important. Visitors and staff should be immunized. Gamma globulin for non-immuno contracts booster for immunized contacts. no elective surgery on non-immunized contacts. virus shedding may follow vaccination with a live oral polio vaccine for several weeks.
Psittacosisi (Q fever)	Standard	For 7 days after onset	
Rabies	Standard	Duration of hospitalization	immunize staff in close contact
Ringworm	Standard		Isolation in a cubicle is advisable especially in paediatric ward.
Rubella	Droplet	For 7 days before up to 10 days from	Discharge patient home if clinical

Table 6 Continued

Disease	Category of isolation and precautions	Duration of infection control precautions	Comments
		onset of rash	condition permits. Exclude non-immune women (staff or visitor) of child bearing age.
Salmonellosis	Standard	Duration of diarrhoea Until completion of appropriate treatment	Staff (exceptin catering or food handler) may return to work when free of symptoms (i.e. formed stool).
Scabies	Contact	Treat patients and near by for disease	
Schistosomi-asis (Biliharziasis)	Standard		
Shigellosis	Standard	Until off antibiotics and cultures are negative	
Streptococcal infection Group A (Strep. pyogenes)	Standard Contact		
Group B	Standard		Cross-infection can occur in SCBU.
Group C	Standard		
GroupG	Standard		
Staphylococcal (food poisoning)	None		
Syphilis Congenital, primary and secondary	Contact	For 48 h after start of effective therapy	Skin lesions of primary and secondary syphilis may be highly infectious.
Latent (tertiary) and seopositive without lesions	Standard		

Table 6 Continued

Disease	Category of isolation and precautions	Duration of infection control precautions	Comments
Tetanus	Standard		
Thread worm	Standard		
Toxocara	Standard		
Toxoplasmosis	Standard		
Trichomoniasis	Standard		
Trichuriasis (Whipworm)	Standard		
Tuberculosis Pulmonary (open)	Airborne	Two weeks after start of effective anti-TB Treatment and sputum is negative for AAFB. Four weeks in neonatal and paediatric wards or if immunosuppressed patients are present.	Staff and visitors who are not immune should be warned of the risk. Face mask should be given.
Closed	Standard	Duration of hospitalization	Isolation of patient not necessary
Typhoid/Paratyphoid fever	Standard and contact		
Vincent's angina (Trench mouth)	Standard		
Viral Haemorrhagic Fevers	Contact		
VRE (Vancomycin resistant enterococci)	Contact		
Whooping cough (Pertussis)	Droplet	Until 3 weeks after onset of paroxysmal	Discharge patient home if clinical condition permits.

Table 6 Continued

Disease	Category of isolation and precautions	Duration of infection control precautions	Comments
		start of effective antibiotic therapy	Visiting by children Should be restricted to those who are immune. Prophylactic erythromycin to close contacts.
Yellow fever	Standard		

Reproduced with permission from Damani NN. In Manual of Infection Control Procedure 2nd ed. London (GMM)Greenwich Medical Media 2003