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Prevention Of Infection In Surgery

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Abstract: This article presents the potential use of precautionary measures and good hygiene as the basis for protection against infection. In infection prevention courses at tertiary health care institutions. Additional precautions include wearing masks, gloves and aprons, especially where contact transmission is possible. These simple but important principles will help protect your health and the health of those around you from various diseases.
Keywords: infections, microorganisms, precautions, hand washing, hand hygiene, micro flora, mask, gloves, apron, shoes, and precautionary measures."

Patients receiving medical care in hospitals or clinics are at risk of infection if proper preventive measures are not taken. Nosocomial (hospital-acquired) infections are a significant global issue, with their rates ranging from 1% to 40%. Most of these infections are preventable through the use of accessible, relatively inexpensive strategies, such as adherence to recommended infection prevention measures, especially hand hygiene and the use of gloves; attention to established disinfection and washing processes for contaminated instruments and items, followed by sterilization or deep disinfection; improving safety measures in operating rooms and other high-risk areas where serious injuries and contact with infectious agents frequently occur; reducing unnecessary and unsafe injections; and training all staff to dispose of needles and syringes in a designated sharps container without recapping, as recapping causes one-third of all needle stick injuries.

Hand Washing: This process physically removes visible dust, dirt, blood, or other body fluids from inanimate objects and reduces the number of microorganisms, thereby lowering the risk to those in contact with skin or objects. Microorganisms, which include bacteria, viruses, fungi, and parasites, are infection agents. Bacteria, for infection control purposes, can be further divided into three categories: vegetative (e.g., staphylococcus), mycobacteria (e.g., tuberculosis), and endospores (e.g., tetanus). Endospores are the most difficult to eliminate due to their protective shells.

Colonization refers to the presence of pathogenic microorganisms on or within a person (detectable through cultures or other tests) without causing symptoms or clinical manifestations. Infection occurs when colonizing microorganisms cause disease. Humans are the primary source, carrier, and recipient of microorganisms. Infection control is the responsibility of all healthcare workers—doctors, nurses, pharmacists, technicians, and others. The hands of medical staff are the main component in the transmission of nosocomial infections, which can be minimized by adhering to proper hand hygiene.

Infection prevention relies significantly on creating barriers between susceptible recipients and microorganisms. Protective barriers—physical, mechanical, or chemical—help prevent the spread of infection-causing microorganisms from person to person (patients, healthcare clients, or staff) or from equipment, instruments, and surrounding surfaces to people. Infectious diseases spread through several means:
- Airborne: Via the air (e.g., chickenpox or mumps).
- Blood or body fluids: When infected blood or fluids (e.g., with hepatitis B or HIV) come into contact with another person, such as through a needle stick injury.
- Direct or indirect contact: Touching open wounds or contaminated objects.
- Fecal-oral: Consuming food or water contaminated with human or animal feces.
- Foodborne: Consuming food contaminated with bacteria or viruses (e.g., hepatitis A from raw shellfish).
- Animal or insect transmission: Contact with infected animals or insects through bites or scratches.

In studies from the USA, the risk of contracting hepatitis B after a needle stick injury ranges from 27% to 37%, while the risk of contracting HIV is much lower, between 0.2% and 0.4%. Since it is not always possible to know in advance if a person is infected with hepatitis B or HIV, all contaminated instruments, needles, syringes, and other items should be handled as if the patient were infected.

Standard Precautions and Transmission-Based Precautions

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These should apply to all clients and patients in healthcare settings, regardless of their presumed diagnosis. Isolation categories are grouped based on transmission routes, called transmission-based precautions—specific clinical syndromes in hospitalized adults and children that suggest infection (so-called "empirical application" of transmission precautions). Standard precautions are designed for care of all individuals—clients and patients—who visit medical facilities. They concern blood, all body fluids, secretions, and excretions (except sweat), broken skin, and mucous membranes.

Key components of standard precautions

- Treat everyone (patients and staff) as potentially infected or susceptible to infection.
- Wash hands, which is the most important procedure for preventing cross-contamination.
- Wear gloves before touching anything wet—wounds, mucous membranes, blood, or other body fluids, or contaminated instruments or waste, and before performing invasive procedures.
- Use physical barriers like protective eyewear, masks, and aprons if splashes or spills of body fluids are expected.
- Use antiseptics for skin or mucous membrane treatments before surgeries or wound care.
- Safely dispose of infectious waste to protect those handling it and to prevent harm to the public.

Hand Hygiene

Improper hand hygiene is considered the leading cause of nosocomial infections and the spread of multi-resistant microorganisms. It is vital to educate medical students and staff on the importance of hand hygiene, proper hand washing, surgical hand preparation, and the benefits of these procedures in reducing the transmission of microorganisms and the frequency of hospital infections.

The most important initial step in this process is educating medical students and healthcare workers on the following: the importance of hand hygiene; the correct methods for handwashing and surgical hand disinfection; and the evidence supporting the benefits of these procedures in reducing the transmission of microorganisms and decreasing the incidence of nosocomial infections in patients. Finally, frequent handwashing prevents the transmission of infections not only from healthcare workers' hands but also from anyone's hands!

Transient and resident flora.

Transient flora is acquired through contact with patients, other healthcare workers, and contaminated surfaces (e.g., procedural tables, floors, or toilets) during the normal course of work. These organisms live in the upper layers of the skin and are partially removed by washing with plain soap and clean water. These microorganisms are most often responsible for nosocomial infections.

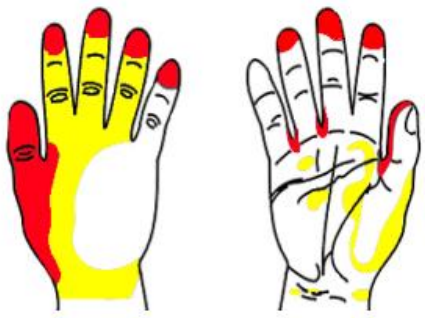
Resident flora, on the other hand, resides in the deeper layers of the skin, as well as inside hair follicles, and is not completely removed, even with vigorous handwashing using soap and clean water and thorough rinsing.

Hand hygiene significantly reduces the number of pathogenic microorganisms on hands and can minimize cross-infection (e.g., from healthcare worker to patient).

Why do you need special equipment?

Areas that are the hardest to clean

Areas that are not washed enough



The transmission of nosocomial infections can be minimized by maintaining proper hand hygiene. However, the quality of handwashing is often unsatisfactory.

Handwashing: The goal of handwashing is to mechanically remove dirt and traces of contamination from the skin and reduce the number of transient microorganisms. Washing hands with plain

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soap and clean water is just as effective as washing with antimicrobial soap (Pereira, Lee, and Wade, 1997). Moreover, plain soap causes significantly less irritation (Pereira, Lee, and Wade, 1990).

Hands should be washed before: Patient examination (direct contact); Putting on sterile or thoroughly disinfected surgical gloves before surgery; Putting on examination gloves for routine procedures, such as a gynecological exam.

Hands should be washed after any situation in which hands may have been contaminated, such as: Handling contaminated tools and other items; Touching mucous membranes, blood, or other body fluids (secretions or excretions); Prolonged or intense contact with a patient; Removing gloves.

Brush or soap? In one study, it was found that personnel using brushes had twice as many colonies of S. hominis, S. aureus, gram-negative bacteria, and Candida spp. on their hands compared to those using soap.

Personal Protective Equipment (PPE)

Gloves protect hands from infectious materials and protect patients from microorganisms on the hands of medical personnel. They are the most important physical barrier to preventing the spread of infection but should be changed between each patient to avoid cross-contamination. Medical workers are advised to use gloves to:

- Reduce the risk of infection from patients,
- Prevent the transmission of microorganisms from healthcare workers to patients, and
- Reduce cross-contamination between patients.

Despite recent improvements in glove quality, hands should still be washed or treated with antiseptic after gloves are removed or replaced. Gloves should not be washed or reused.

For example, examination gloves should be worn when handling blood, bodily fluids, secretions, excretions (except sweat), contaminated surfaces or equipment, and when touching damaged skin and mucous membranes.

Other PPE Guidelines

- Wearing caps and masks is not necessary, and aprons or gowns should only be worn to protect personal clothing.
- Cotton, gauze, or paper masks are ineffective, while paper masks with synthetic filters provide an effective barrier against microorganisms.

Masks should be used in specific situations:

- Patient protection: Healthcare personnel should wear masks in operating rooms, when in contact with immunocompromised patients, or during procedures involving penetration into body cavities. In these cases, surgical masks are sufficient.
- Staff protection: Healthcare workers should wear masks when dealing with patients with airborne infections or during procedures like bronchoscopy. High-efficiency masks are recommended in these cases.
- Infected patients: Patients with airborne infections should wear surgical masks when outside isolation areas.

There is no evidence that wearing caps and masks reduces mortality, infections, or bacterial colonization in hospitalized children.

Eye Protection and Other PPE

Eye protection shields staff from blood splashes or other potentially contaminated body fluids. Masks and goggles or face shields should be worn during any procedures where splashes to the face might occur. Operating suits or medical gowns are worn over street clothes mainly to protect workers' clothing.

- Surgical gowns were originally designed to protect patients from microorganisms on the body of healthcare workers. However, lightweight cotton gowns, commonly available in most countries, offer insufficient protection.
- Aprons made of rubber or plastic provide a waterproof barrier that protects the front of the body from contaminated fluids.
- Shoes protect feet from injury caused by sharp tools or heavy items. Sturdy shoes are sufficient in surgical areas, while booties are unnecessary and may even increase contamination risk by allowing blood to seep into shoes.

Glove Usage

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Hand hygiene, along with the use of protective gloves, is a key component in minimizing the spread of disease and maintaining an infection-free environment. Understanding when sterile or disinfected gloves are necessary, and when they are not, can reduce costs while ensuring safety for both patients and staff.

Depending on the circumstances, clean examination or utility gloves should be worn by healthcare workers whenever there is a real risk of contact with blood, bodily fluids, mucous membranes, or damaged skin, during invasive procedures (e.g., intravenous systems), or when handling contaminated waste or touching contaminated surfaces. A separate pair of gloves should be used for each patient to avoid cross-contamination. When utility gloves are unavailable, wearing two pairs of examination gloves or reused surgical gloves (two pairs) can provide some protection for cleaners and staff handling contaminated medical waste.

Types of Gloves

Three types of gloves are used in medical settings:

- Surgical gloves are used during invasive medical or surgical procedures.
- Examination gloves protect healthcare workers during their daily tasks.
- Utility gloves should be worn when cleaning instruments, equipment, and other items, handling contaminated waste, or cleaning contaminated surfaces.

If resources are limited and there is a shortage of examination gloves, disposable surgical gloves can be reused if they are disinfected by soaking in a 0.5% chlorine solution for 10 minutes, washed and rinsed, and then sterilized (in an autoclave) or deeply disinfected (with steam).

SPOLDING CRITERIA

All surfaces are classified into three categories based on their cleanliness and potential for contamination.

1. Critical Surfaces: Body cavities that do not communicate with the external environment and must be sterile, requiring the use of sterile instruments and gloves. Examples include abdominal and thoracic cavities.
2. Semi-Critical Surfaces: These require the use of clean, thoroughly disinfected instruments and gloves. Examples include the insertion and removal of an intrauterine device (IUD), primary surgical treatment of superficial, non-bleeding wounds, and vacuum aspiration of the uterine cavity.
3. Non-Critical Surfaces: These require cleanliness and pose no potential risk of infection, such as skin and intact mucous membranes. Examples include blood pressure measurement, fetal heart monitoring, external obstetric examinations (Leopold's maneuvers), and body temperature measurement.

Precautions to Prevent Airborne Transmission

These precautions aim to reduce the nosocomial transmission of particles sized 5 μm or smaller, which can remain airborne for hours and spread widely. Microorganisms that are fully or partially airborne include Mycobacterium tuberculosis, the varicella virus, and rubella virus. Airborne precautions are recommended for patients with identified or suspected agents of these infections, such as an HIV-infected person with cough, night sweats, or fever.

Precautions to Prevent Droplet Transmission

These precautions reduce the risk of nosocomial transmission of pathogenic organisms that are fully or partially spread by droplets larger than 5 μm (e.g., H. influenzae, N. meningitides, M. pneumoniae, influenza virus, epidemic mumps, and rubella). Other conditions include diphtheria, pertussis, pneumonic plague, and streptococcal pharyngitis (scarlet fever in infants and young children). Droplet precautions are simpler than airborne precautions, as particles remain in the air only for a short time and travel only a few feet; thus, close contact with the source is necessary for infection.

Precautions to Prevent Contact Transmission

These precautions reduce the risk of transmitting organisms from infected or colonized patients through direct or indirect contact. They are aimed at patients infected or colonized with pathogenic microorganisms causing gastrointestinal infections (hepatitis A virus or enteric viruses), herpes simplex viruses, hemorrhagic fever viruses, and antibiotic-resistant bacteria. Notably, varicella can be transmitted both airborne and by contact at various stages of the disease. Contact precautions should also apply to patients with draining infections that may be contagious (e.g., draining abscesses, shingles, impetigo, conjunctivitis, scabies, lice, and wound infections).

Empirical Application of Transmission Precautions

In the absence of a diagnosis, precautions should be applied based on the signs and symptoms observed in the patient (empirical basis) until a precise diagnosis is made. Furthermore, in healthcare settings with limited

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resources, including laboratory capabilities, isolation precautions based on a diagnosis may not always be practical. In these circumstances, the isolation system should rely entirely on clinical data (signs and symptoms).

The implementation of these precautions, including their empirical application, is intended to reduce the risk of infections transmitted by airborne, droplet, and contact routes among hospitalized patients and healthcare personnel.

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