



INFECTION CONTROL

Part 3

HEALTHCARE WORKER MUST KNOW

- ▶ What infectious diseases are
 - ▶ How they spread
 - ▶ How they are controlled
-
- ▶ It's the responsibility not only to the patients entrusted in our care, but also to the entire public sector



MICROORGANISMS

- ▶ Grow in or on a host organism and cause disease
 - ▶ Know as infection
- ▶ Infection- establishment and growth of a microorganism on or in a host



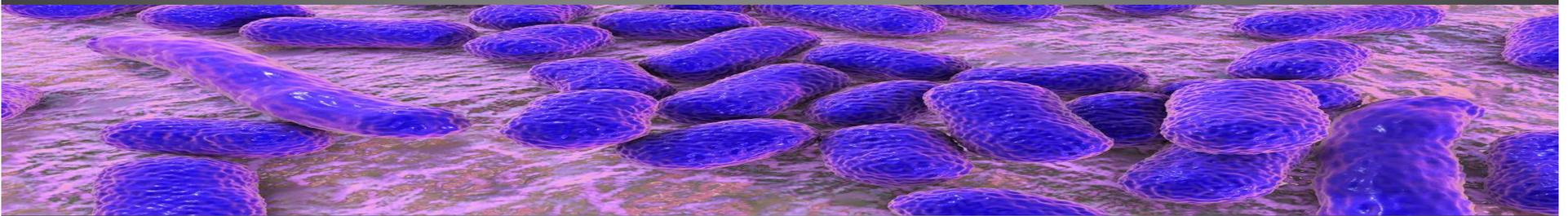
PATHOGENS

- ▶ Disease producing microorganisms
 - ▶ 1. multiply in large numbers and cause an obstruction
 - ▶ 2. cause tissue damage
 - ▶ 3. can secrete organic substances called exotoxins
 - ▶ Produce high temperatures, nausea, vomiting, or shock



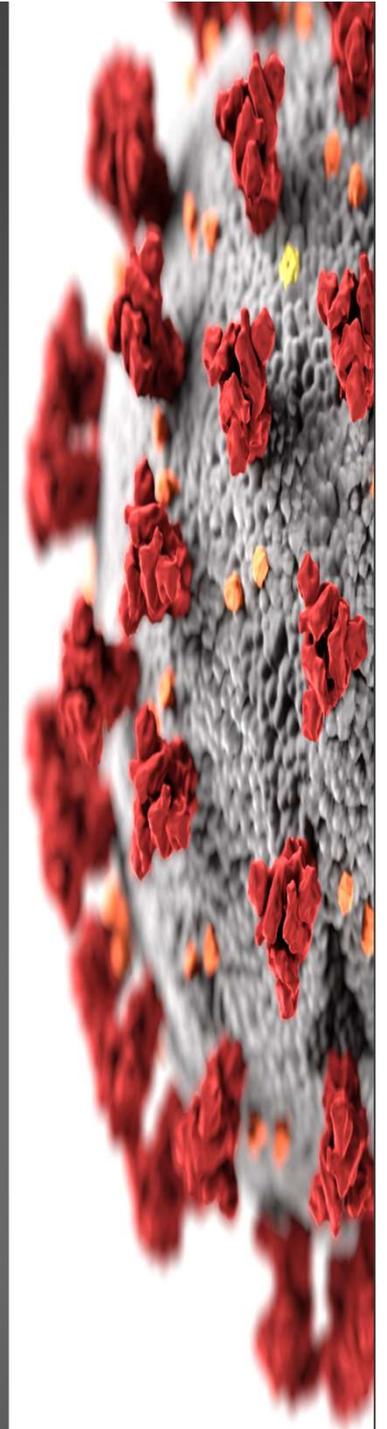
BACTERIA

- ▶ Microscopic, single-celled organisms
- ▶ May reside in host, in a group, or cluster
 - ▶ Known as colony
- ▶ Classification by size of shape:
 - ▶ Cocci or spheres
 - ▶ Bacilli or rods
 - ▶ Spirals
- ▶ Common bacterial infections encountered today:
 - ▶ Streptococcal pharyngitis (strep throat)
 - ▶ Klebsiella pneumoniae infection (bacterial pneumonia)
 - ▶ Clostridium botulinum infection (food poisoning)



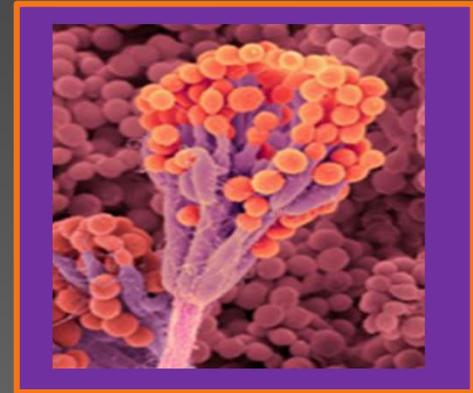
VIRUS

- ▶ Cannot live outside a living cell
- ▶ Depends on host cell to provide missing factors
- ▶ Viral particle (virion) attaches to host and inserts its genome or genetic information into the host
 - ▶ Genome redirects host cell and produces more viral particles
- ▶ Can lay dormant at times known as latent or dormant infection
- ▶ Common viral diseases:
 - ▶ Common cold (rhinovirus)
 - ▶ Infectious mononucleosis
 - ▶ Warts



FUNGI

- ▶ Singular = fungus
- ▶ Size much larger than bacteria
- ▶ Two important medical forms = yeast and molds
- ▶ Some medically important fungi are called dimorphic (can grow as either yeast or mold)
- ▶ Common fungal infections:
 - ▶ Athlete's foot
 - ▶ Ringworm
 - ▶ Tinea nigra



PROTOZOA



- ▶ Larger than bacteria
- ▶ Classified by their motility
- ▶ Live on or in other organisms at expense of host
- ▶ Usually have motile functionality
- ▶ Can ingest food particles, and some are equipped with digestive systems
- ▶ Common parasitic infections:
 - ▶ Pinworms
 - ▶ Tapeworms
 - ▶ Malaria



Cycle of Infection

(Chain of Infection)

- ▶ Four factors are involved with the spread of infection
 1. A host
 2. An infectious microorganism
 3. A mode of transportation
 4. A reservoir
- ▶ If at any point in the infection the chain is broken, the cycle cannot continue, and the infection will cease





I. HUMAN HOST

- ▶ Humans provide favorable host environment
- ▶ Abundance of organic nutrients and metabolites
- ▶ Different temperatures, pH, or body fluid to grow
- ▶ ***Microorganisms tend to like:
 - ▶ warm temperature
 - ▶ moisture
 - ▶ darkness

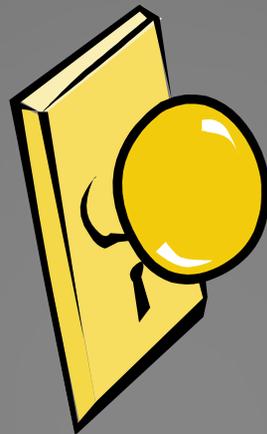
2. INFECTIOUS MICROORGANISMS

- ▶ Bacteria
- ▶ Viruses
- ▶ Fungi
- ▶ Protozoa



3. MODE OF TRANSMISSION

- ▶ Exogenously – from outside the body
- ▶ Endogenously – from inside the body



EXOGENOUSLY (OUTSIDE)

- ▶ Encounter with microbe in the environment
- ▶ Direct or indirect host-to-host
 - ▶ Indirect – vector or a fomite
- ▶ Direct host-to-host
 - ▶ Infected individual transmits an infection by any number of methods
 - ▶ Handholding
 - ▶ Coughing
 - ▶ Sexual contact
 - ▶ Secretions and excretions with infective microbes can remove them from the body and is the common transport media
 - ▶ Phlegm
 - ▶ Aerosols from sneezing



THEY MAY NEED A LITTLE HELP....

- ▶ Some microorganisms require a vector to enter and exit the host
- ▶ Vector usually an arthropod
 - ▶ Takes blood from one host and carries it to the other
 - ▶ Tick – lyme disease
- ▶ Fomite
 - ▶ Inanimate object that has been in contact with an infectious organism
 - ▶ Food, water, radiographic equipment, and latex gloves



ENDOGENOUS (INSIDE)

- ▶ Organisms already in the body or normal flora
- ▶ Normal flora transported to a different area
- ▶ Staphylococci on surface of skin can go deeper with a laceration



4. RESERVOIR

- ▶ Site where an infectious organism can remain alive and from which transmission can occur
- ▶ Types: people, animals and inanimate objects
- ▶ Person = carrier
 - ▶ Infected person who does not display the disease symptoms
- ▶ Animals- example cow
 - ▶ Ingestion of milk
- ▶ Inanimate objects – dusty corner, contaminated linen, and food





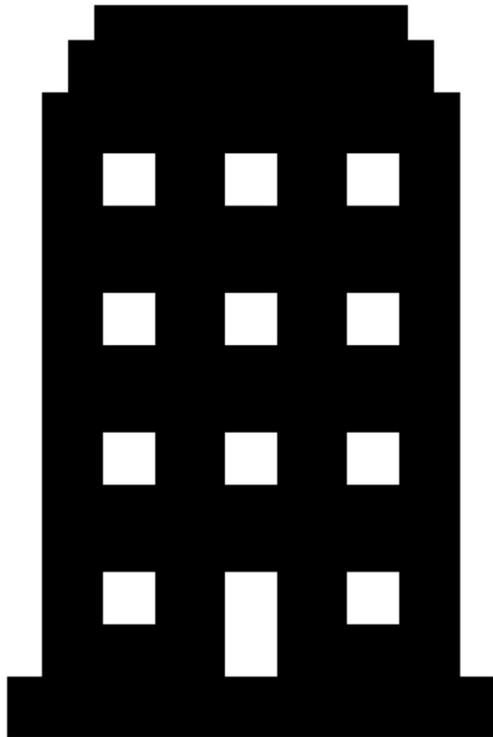
What are some infections I need to be aware of...

- ▶ Hospital acquired = nosocomial infections
- ▶ Communicable
- ▶ Human immunodeficiency virus (HIV)
- ▶ Hepatitis
- ▶ Multidrug-resistant organisms (MDRO)
 - ▶ MRSA
 - ▶ VRE
 - ▶ C. Diff
- ▶ Many more, we will talk about TB since we will x-ray for positive PPDs



Nosocomial Infections

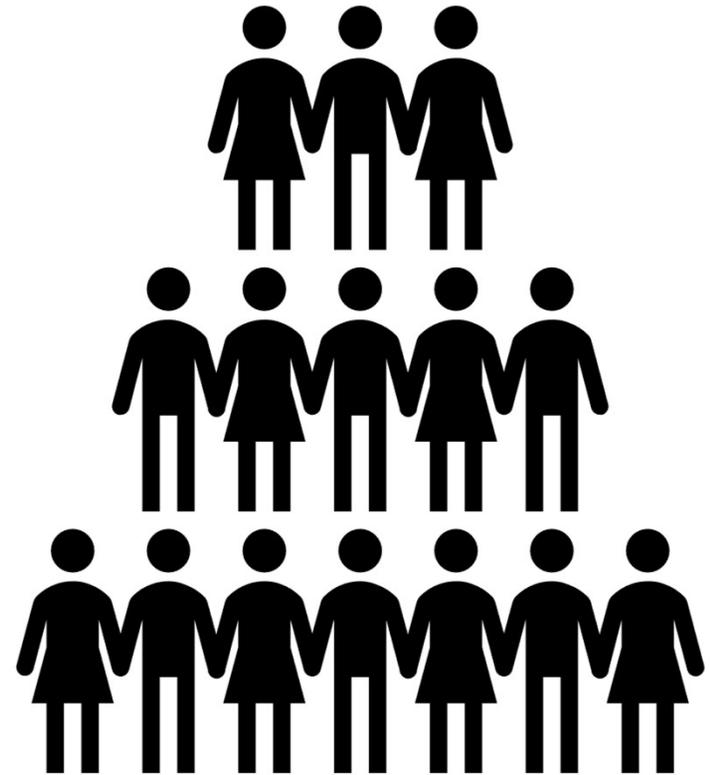
(Hospital acquired Infections)



- ▶ Approximately 5% of all hospital patients acquire an additional condition while in the hospital
- ▶ Iatrogenic – infection that is the result of intervention with a physician
 - ▶ Patient had lung biopsy and developed pneumonia
- ▶ Given the right condition it will try to take over
- ▶ Most hospital patients are:
 - ▶ Immuno-compromised
 - ▶ Immuno-suppressed
 - ▶ Greater sensitivity to infection



COMMUNICABLE DISEASES



- ▶ Some communicable diseases are:
 - ▶ HIV
 - ▶ HBV
 - ▶ Influenza
 - ▶ Malaria
 - ▶ Tuberculosis
 - ▶ Polio



HIV (BLOOD-BORNE PATHOGEN)

- ▶ Specifically infects the immune system CD4+ T cells in the human host
- ▶ Decreases cells effectiveness in preventing disease
- ▶ Is responsible for acquired immunodeficiency syndrome (AIDS)



HEPATITIS B (BLOOD-BORNE PATHOGEN)

- ▶ HBV
- ▶ Causes illness that primarily affects the liver
- ▶ Results in swelling, soreness, and loss of normal function in the liver
- ▶ Transmitted through:
 - ▶ **Contaminated needle – biggest for hospital workers**
 - ▶ Penetrating injury
 - ▶ Intimate contact



The best way to prevent Hepatitis B is ...

A microscopic image showing several spherical Hepatitis B virus particles. The particles are covered in small surface proteins (spikes) and have a distinct outer envelope. They are set against a background of purple and blue, suggesting a cellular or tissue environment.

Hepatitis B Vaccination

- Series of three injections
- After receiving the Hepatitis B vaccine and a positive antibody titer is obtained, there is no risk of Hepatitis B disease
- Hepatitis B vaccine is safe and effective

MDRO

Multi-Drug Resistant Organism



- ▶ Bacteria and other microorganisms that have developed resistance to antimicrobial drugs. Common examples of these organisms include:
 - ▶ **MRSA** - Methicillin/oxacillin-resistant *Staphylococcus aureus*
 - ▶ **VRE** - Vancomycin-resistant enterococci
 - ▶ ESBLs - Extended-spectrum beta-lactamases (which are resistant to cephalosporins and monobactams)
 - ▶ PRSP - Penicillin-resistant *Streptococcus pneumoniae*
 - ▶ Multi-drug resistant Tuberculosis (MDR)



MRSA (METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS)

- ▶ S. aureus is easily colonized on skin
- ▶ Assume all patients may be carriers
- ▶ Most susceptible patients:
 - ▶ Nursing home
 - ▶ Dialysis
 - ▶ The aged and debilitated
 - ▶ Intensive care
 - ▶ Hospitalized for long periods



MRSA: DISEASE PRODUCED

- ▶ Decubitus ulcers
- ▶ Pneumonia
- ▶ Endocarditis
- ▶ Bacteremia
- ▶ Osteomyelitis
- ▶ Septic thrombophlebitis



- ▶ This if from direct contact or contact with infected objects or surfaces



VRE (VANCOMYCIN-RESISTANT ENTEROCOCCUS)

- ▶ Part of the normal flora in the gastrointestinal tract
- ▶ Capable of causing disease when it affects blood, urine, or wounds
- ▶ Able to reproduce in large groups
- ▶ Has become resistant to many antibiotics
- ▶ It is also resistant to normal hand washing procedures, adheres to objects in the health care environment, and is difficult to remove





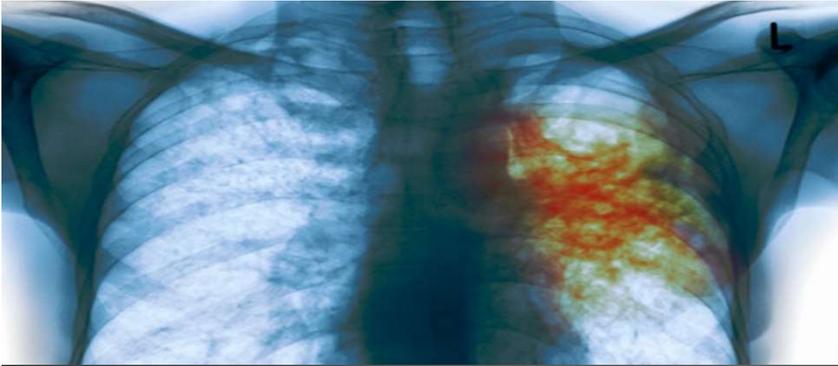
CLOSTRIDIUM DIFFICILE



C. DIFFICILE

(CLOSTRIDIUM DIFFICILE)

- ▶ Spore forming bacterium that releases toxins into the bowel
- ▶ Resistant to disinfectants
- ▶ Easily spread from the hands of health care providers
- ▶ Frequent cause of nosocomial infections



- ▶ Recurrent, chronic disease caused by the spore-forming *Mycobacterium tuberculosis*
- ▶ Mostly affects the lungs
- ▶ Communicable disease
- ▶ Treatable disease

TUBERCULOSIS (TB)

Drug resistant; Airborne bacilli



How Do I Prevent
Disease Transmission?

- ▶ Take transmission-base precautions
- ▶ As a healthcare worker you should:
 - Get your immunizations
 - Get boosters
 - Follow post-exposure protocols





Centers for disease control and prevention (CDC)

Purpose: Mission is centered on preventing and controlling disease and promoting environmental health and health education in the United States.

<http://www.cdc.gov/>



Isolation Techniques





Standard Precautions (Review)

- Used when performing procedures that may require contact with blood, body fluids, secretions, excretions, mucous membranes, and non-intact skin
- All patients in the department should be regarded as potentially infectious
- Practice Biosafety:
 - Handwashing
 - Gloving
 - Personal Protective equipment
 - Needle Recapping
 - Biospills



Handwashing

- Required for standard and expanded precautions
- Remember sing Happy Birthday twice
- Perform...
 - Immediately after removing PPE
 - Between patient contacts
- Wash hands thoroughly with soap and water or use alcohol-based hand rub



Needle recapping

- 800,000 needle stick injuries and other injuries from sharp objects occur to health care workers annually in the US
- Recapping used needles should be avoided
- If need to....
 - One-handed scoop technique or needle recapping device
- All sharps must be placed in ***sharps container***

Transmission- Based precautions

- Airborne
 - Droplet
 - Contact
 - RH has Additional Hand and Environmental Contact Precautions
- OR
- Applied when a patient is infected with a pathogenic organism or a communicable disease
 - When patient is at risk of becoming infected, such as immunosuppressed

- Used along with standard precautions (double protection)
 - Protect yourself and the patient
- Some infections and conditions fall into two categories





Airborne

- Pathogenic organisms that remain suspended in the air for long periods on aerosol droplets or dust
- TB, Chickenpox (varicella), and Measles (rubeola)
- Patients are placed in a negative-pressure isolation room
- Health care worker is required to wear N95 respirator

Hand Hygiene: alcohol rub or soap and water

STOP: AIRBORNE PRECAUTIONS

ALTO: PRECAUCIONES CONTRA LA TRANSMISIÓN POR LA VÍA AÉREA

IN ADDITION TO
STANDARD
PRECAUTIONS
ADEMÁS DE LAS
PRECAUCIONES ESTÁNDAR

CHECK WITH STAFF BEFORE ENTERING

CONSULTE CON EL PERSONAL
ANTES DE INGRESAR

BEFORE ENTERING ROOM

ANTES DE
INGRESAR A
LA HABITACIÓN



Perform
Hand
Hygiene
*Desinfectese
las manos*

DISINFECT
REUSABLE ITEMS
BETWEEN CLEANING

DESINFECTE
LOS OBJETOS REUTILIZABLES
EN CADA LIMPIEZA

HEALTHCARE WORKERS

ENTERING THE
ROOM MUST WEAR:

EL PERSONAL DE
ATENCIÓN MÉDICA
QUE INGRESE A LA
HABITACIÓN DEBE UTILIZAR:



N95
Respirator
*Quítese
el respirador
N95*



Limit Patient Transport
Place Mask on Patient
During Transport

*Limite el transporte del
paciente. Coloque una
mascarilla al paciente
al transportarlo*

VISITORS

ENTERING THE
ROOM MUST WEAR:

LOS VISITANTES
QUE INGRESEN A LA
HABITACIÓN DEBEN
UTILIZAR:



Surgical
Mask
*Mascarillas
Quirúrgicas*

BEFORE LEAVING ROOM

ANTES DE
SALIR DE LA
HABITACIÓN



Perform
Hand
Hygiene
*Desinfectese
las manos*

AFTER LEAVING ROOM

DESPUÉS DE
SALIR DE LA
HABITACIÓN



Close
Door
*Cierre la
Puerta*



Remove N95
Respirator/
Surgical Mask
*Quítese el
respirador N95*



Hand Hygiene: alcohol rub or soap and water

Droplet

- Infected with pathogenic organisms
- Rubella, mumps, influenza, and adenovirus
- Pathogens disseminate through large particulate droplets expelled from the patient during coughing, sneezing, or even talking
- Infect another person through contact with the mouth, nasal mucosa, or conjunctiva
- Health Care workers should protect themselves by wearing a surgical mask when within 3 feet of the patient

STOP: DROPLET PRECAUTIONS

ALTO: PRECAUCIONES CONTRA LA TRANSMISIÓN POR GOTAS

IN ADDITION TO
STANDARD
PRECAUTIONS
ADEMÁS DE LAS
PRECAUCIONES ESTÁNDAR

CHECK WITH STAFF BEFORE ENTERING

CONSULTE CON EL PERSONAL
ANTES DE INGRESAR

BEFORE ENTERING ROOM

ANTES DE
INGRESAR A
LA HABITACIÓN



Perform Hand Hygiene
*Desinfectese
las manos*

DISINFECT
REUSABLE ITEMS
BETWEEN CLEANING

DESINFECTE
LOS OBJETOS REUTILIZABLES
EN CADA LIMPIEZA

EVERYONE

ENTERING THE
ROOM MUST WEAR:

TODOS
LOS QUE INGRESEN
A LA HABITACIÓN
DEBEN UTILIZAR:



Mask
Mascarillas



Limit Patient Transport
Place Mask on Patient During Transport

*Limite el transporte del paciente
Colóquelo una mascarilla
al paciente al transportarlo*

BEFORE LEAVING ROOM

ANTES DE
SALIR DE LA
HABITACIÓN



Remove
Mask
Quite la mascarilla



Perform Hand Hygiene
*Desinfectese
las manos*

Contact

- A patient is infected with a virulent pathogen that spreads by direct contact with the patient or by indirect contact with a contaminated object (patient's dressing, bed rail)
- Staphylococcus aureus, hepatitis A, impetigo, varicella, and varicella zoster
- You will have to properly don on gloves, gown, possibly face shield and bouffant prior to going into the room
- All radiographic equipment should be cleaned with antiseptic solution after procedure is performed



STOP: CONTACT PRECAUTIONS

ALTO: PRECAUCIONES CONTRA LA TRANSMISIÓN POR CONTACTO

IN ADDITION TO
STANDARD
PRECAUTIONS
ADEMÁS DE LAS
PRECAUCIONES ESTÁNDAR

CHECK WITH STAFF BEFORE ENTERING

**CONSULTE CON EL PERSONAL
ANTES DE INGRESAR**

BEFORE ENTERING ROOM

ANTES DE
INGRESAR A
LA HABITACIÓN



Perform
Hand
Hygiene

*Desinfectese
las manos*

DISINFECT
REUSABLE ITEMS
BETWEEN CLEANING

DESINFECTE
LOS OBJETOS REUTILIZABLES
EN CADA LIMPIEZA

EVERYONE ENTERING THE ROOM MUST WEAR:

TODAS LAS QUE
INGRESAN A
LA HABITACIÓN
DEBEN UTILIZAR



Isolation
Gown

*Una bata
de aislamiento*



Clean
Gloves

*Guantes
limpios*



Limit Patient
Transport

*Limite el transporte
del paciente*

BEFORE LEAVING ROOM

ANTES DE
SALIR DE LA
HABITACIÓN

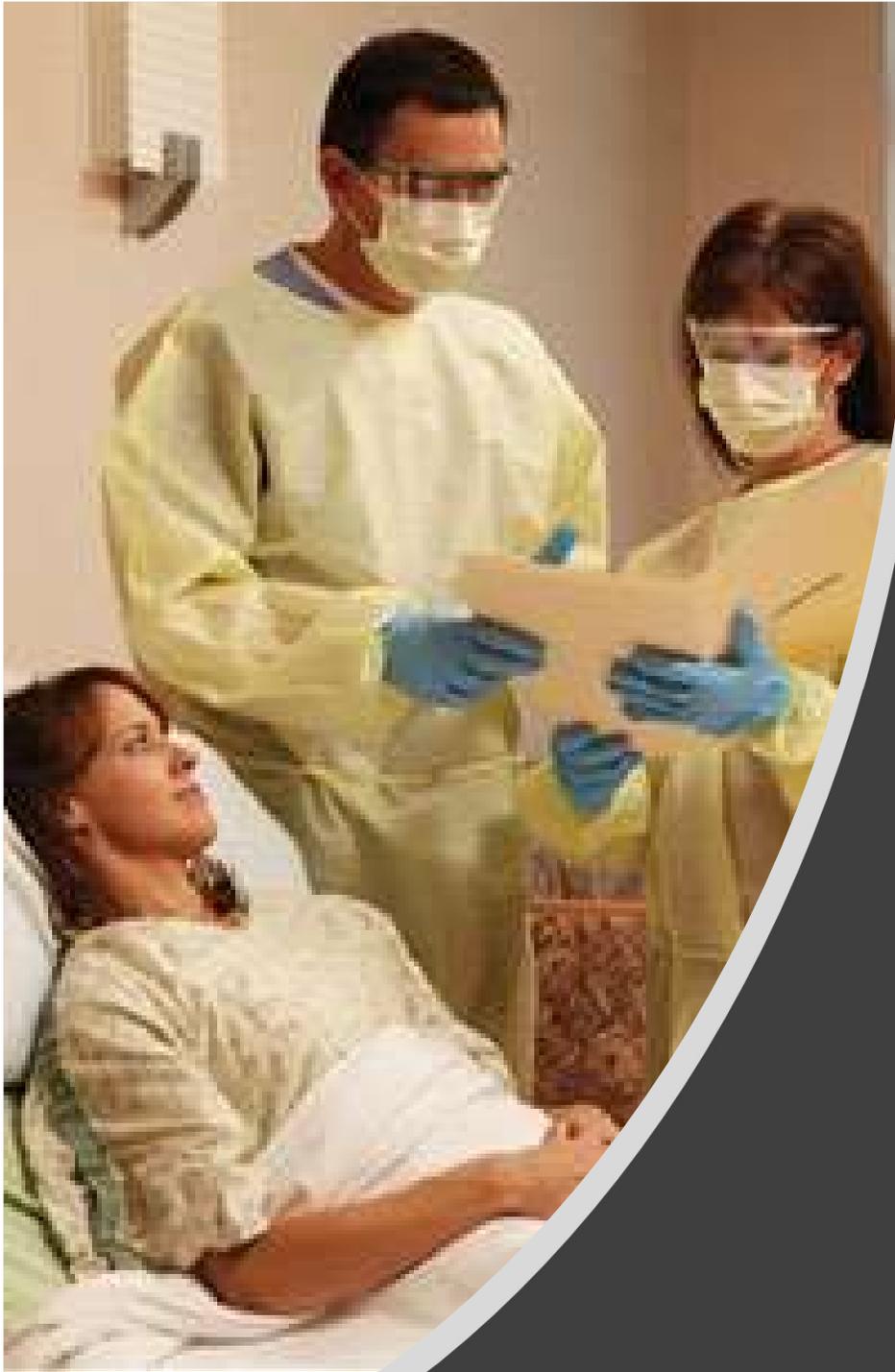


Remove
Gloves
then Gown
*Sáquese
los guantes
y después
la bata*



Perform
Hand
Hygiene

*Desinfectese
las manos*



Contact Precautions technique

****See pages 206-208**

Gloves and Handwashing



- Wear gloves when entering the room (“clean” gloves)
- Change gloves after being in contact with infective material
- Remove gloves prior to leaving the patient’s room
- Wash hands immediately with an antiseptic agent (alcohol rub or soap and water)
- Make sure your hands don’t touch potentially contaminated surfaces or items

Gown

- Wear gown when entering the room
- Remove gown before leaving the room
- Do not put a clean gown on and start walking in the hallways because you have a question = people think you are “dirty”



- C.diff
- Norovirus
- Having diarrhea of unknown origin

Additional Hand and environmental contact precautions

Hand Hygiene: Soap and Water

STOP: ENVIRONMENTAL PRECAUTIONS

ALTO: PRECAUCIONES AMBIENTALES

CHECK WITH STAFF BEFORE ENTERING

CONSULTE CON EL PERSONAL ANTES DE INGRESAR

BEFORE ENTERING ROOM
ANTES DE INGRESAR A HABITACIÓN



Perform Hand Hygiene
Desinfectese las manos

DISINFECT REUSABLE ITEMS BETWEEN CLEANING

DESINFECTE LOS OBJETOS REUTILIZABLES ENTRE LIMPIEZAS

BEFORE LEAVING ROOM
ANTES DE SALIR DE LA HABITACIÓN



Isolation Gown
Use bata de aislamiento



Clean Gloves
Guantes limpios



Limit Patient Transport
Limite el transporte del paciente

BEFORE LEAVING ROOM
ANTES DE SALIR DE LA HABITACIÓN



Bleach Cleaning Required
Se debe limpiar la habitación con lejía



Remove Gloves then Gown
Saque los guantes y despoje la bata



Perform Hand Hygiene
Lávase las manos con agua y jabón

Just one more to talk about...

- Compromised/Immunosuppressed patients (reverse isolation)
 - Also known as neutropenic and protective precautions
 - Patient who is at increase risk for infection against contact with potential pathogens
 - You wear PPE to protect the patient



Protective Precautions for Immunocompromised Patients

**Visitors, Physicians, Nurses, Hospital Personnel —
Report to Nurses Station With Questions**

1. Keep alone.
2. Strict handwashing — before and after patient care.
3. No sick visitors or personnel.
4. No live plants or flowers.
5. No raw foods — hot cooked foods only.
6. No foods brought from home.

**Medidas de Proteccion para el Paciente
de Inmunidad Comprometida**
Visitas, Medicos, Enfermeras, y Personal General:
**La Estacion de Enfermeras Contestara
sus Preguntas**

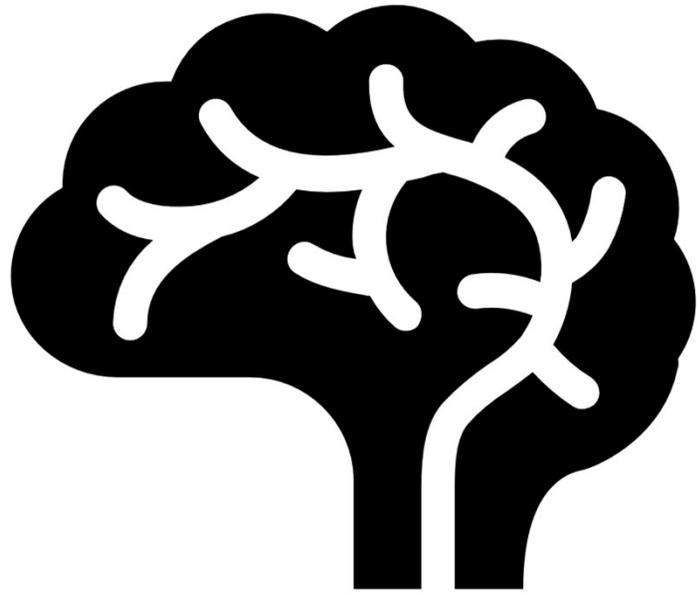
1. Mantenga el paciente solo.
2. Estricto lavado de manos — antes y despues del cuidado del paciente.
3. Nadie sintiendose enfermo, puede entrar; empleados o visitas.
4. No se permiten plantas o flores en el cuarto.
5. No se permiten comidas sin cocinar — solo comidas calientes.
6. No se permiten comidas traídas de la casa.

Conditions Requiring Protective Precautions

Aplastic Anemia
Leukemia
Lymphoma
AIDS
Severe Burns
Leukopenia
Myelosuppression

Medidas Preventivas se Requieren en los Siguyentes Casos

Anemia Aplastica
Leucemia
Linfoma
SIDA
Quemaduras Severas
Leucopenia
Medula Osea Suprimida



Psychological considerations of Isolation Precaution Patients

- Patient may feel alone and rejected
- Forced to remain in solitude for long periods and are often treated by visitors and hospital personnel as if they are undesirable
- You must treat them with respect and dignity
- Explain what is going to happen and ask if they have any concerns or questions
- They are no different than any other patient or person