

An overview of hospital acquired infections and the role of the microbiology laboratory

Nidhi Yadav, Dr Varsha Nigam Gaur

Research Scholar, Associate Professor

Himalayan University

ABSTRACT

As a result of the spread of infections in hospitals, many lives are lost each year. Known as hospital acquired infections (HAIs), nosocomial infections are acquired by patients while undergoing treatment for other diseases. Hospital acquired infections (HAIs) cause significant morbidity and mortality among those receiving healthcare, depleting the already limited financial resources committed to the delivery of healthcare services.

Keywords: Hospital Acquired Infection, Control, Microbiology

INTRODUCTION

Hospital acquired infection, according to the World Health Organization, is "an infection contracted in a hospital by someone who was admitted for another reason than that infection." As well as hospital-acquired infections, occupational infections among facility workers are included in this category. A hospital-acquired infection manifests 48 hours or more after being admitted, or 30 days after discharge..

HAI is a localised or systemic disorder caused by unfavourable reactions to the presence of infectious agents that were not present or incubating at the time of hospital admission.

MAGNITUDE OF THE PROBLEM

A worldwide phenomenon, hospital-acquired infections affect millions of people each year. It ranges from simple health care clinics with limited facilities to big complex hospitals with cutting edge technology, patients receive care in a variety of venues. Although public health and hospital care have improved, hospitalised patients and hospital employees are still susceptible to infection, despite the improvements made. Human AIDS, are a primary cause of death and impairment in patients, according to the World Health Organization (WHO).. Worldwide, about 1.4 million people are suffering from HAIs at any given moment, resulting in an estimated 80,000 fatalities per year, according to a HAI survey. Developed nations have real rates of 5 to 10 percent of all patients admitted to modern healthcare facilities, while developing nations have rates of up to 25 percent. Nations that are underdeveloped have healthcare-associated infections that are 2 to 20 times more prevalent than those that are developed

IMPACT OF NOSOCOMIAL INFECTIONS

Infections acquired in the hospital increase the patient's functional incapacity and emotional stress, and in certain situations, they can progress to debilitating conditions that reduce the patient's overall quality of life. Money and human suffering are huge expenses of nosocomial diseases.

It was estimated that healthcare-associated illnesses cost between \$28 and \$45 billion annually, according to a research released by the CDC in March 2009.

Aside from causing death, nosocomial infections are also a primary cause of death in hospitals. Patients' direct expenditures rise as a result of prolonged hospitalisation, as do indirect costs resulting from lost labour. Medication use, isolation requirements, and the utilisation of more lab tests and diagnostic procedures all increase costs.

Resources that might otherwise be allocated to basic and secondary health care are diverted to the treatment of potentially preventable illnesses due to hospital-acquired infections. As a result of their limited resources, governments in developing nations face a number of challenges.⁷

ROUTES OF TRANSMISSION

Multiple channels exist for the transmission of germs in hospitals, and the same microorganisms may be transferred more than once. There are four basic methods of transmission: direct contact, airborne, common vehicle and vector-borne transmission.¹

1. Contact route

There are two types of contact routes:

Direct Contact: Individuals or contaminated objects must physically encounter the susceptible host..

Indirect contact: Patient-to-patient transmission of diseases needs the use of a healthcare practitioner or medical equipment..

2. Air borne route

Droplet nuclei (5 microns or smaller) or dust particles harbouring infectious agents are responsible for airborne transmission. ⁸ An inhalable host may be exposed to the microorganism in the same room as the

source patient or a great distance away, depending on environmental circumstances. Mycobacterium tuberculosis, Legionella, and the Rubella and Varicella viruses are examples ..

3. Droplet route

It is possible to spread droplet particles to others by coughing, sneezing, or even by talking. Meningitis and pneumonia are two instances of diseases that can occur.

4. Common vehicle transmission

These germs are conveyed to the host by food, water, drugs, devices and equipment that are contaminated..

5. Vector borne transmission

The microorganisms are transmitted by mosquitoes, flies, rats, and other vermin

DIFFERENT TYPES OF INFECTIONS ACQUIRED IN HOSPITALS INCLUDE

“UTI (Urinary Tract Infection) (UTI), lower respiratory infection , gastro-intestinal (GI), skin and soft tissue, surgical site infections , ear, nose and throat (ENT) infections”.

ETIOLOGY

“However, bacterial agents are the most often identified cause of nosocomial infections. Gram-positive organisms such as Coagulase Negative Staphylococcus, Staphylococcus aureus, and Enterococci are usually responsible for nosocomial bloodstream infections”. As a result of this, it is important to know that other organisms, The same bacteria that cause urinary tract infections in hospitalised patients, such as Pseudomonas aeruginosa, Klebsiella spp., Proteus mirabilis, Staphylococcus epidermidis. Perhaps Legionella pneumophila is also to blame for hospital outbreaks of lower respiratory tract infections. Most bloodstream infections in newborns are caused by Klebsiella spp, pseudomonases, Proteus, and staphylococcus aureus (E. coli, Staphylococcus aureus). 9 Because broad-spectrum antibiotics are widely used, drug-resistant bacteria have become prevalent in healthcare facilities as a result. “Methicillin resistant Staphylococcus aureus (MRSA), penicillin resistant enterococci, and multi-drug resistant tuberculosis are examples of resistant pathogens that are resistant to antibiotics”.

HIGH-RISK SITUATIONS FOR ACQUIRING HOSPITAL-ACQUIRED INFECTIONS

For example, childhood and old age are periods of low bodily resistance. Major procedures and immune deficiency states are among the other variables that can affect a person's health. Hospitalization for an extended period of time is another risk factor..

There are certain parts of the hospital where the danger of HAI transmission is higher than others. The intensive care unit, the dialysis unit, the organ transplant unit, and the burns unit are just a few examples..

PREVENTION

These critical components are part of an integrated and supervised programme to prevent nosocomial infections::

- “Through hand washing, glove use, aseptic techniques, isolation methods, sterilization/disinfection practises, and laundry, direct patient care providers can limit the spread of germs to other patients”.
 - Reducing the danger of infection in the environment
 - Antimicrobial prophylaxis, diet, and immunizations are all effective ways to protect patients.
 - Invasive operations should be minimised, and optimal antibiotic use should be encouraged.
 - The monitoring of diseases, as well as the detection and control of outbreaks
 - Infection prevention for employees
 - Staff patient care procedures should be improved, and staff education should be maintained.
- Infection prevention and control is the responsibility of all healthcare personnel including doctors and nurses..

HOSPITAL INFECTION CONTROLPROGRAMME

Florence Nightingale once said, "The first requirement of a hospital is that it should do the sick no harm." A comprehensive infection control policy must be implemented in every healthcare facility to safeguard the well-being of both patients and staff.

To assist the infection control programme, An yearly work plan for assessing and promoting quality healthcare is required as well..

During the 1960s, the first infection prevention and control programmes were implemented in hospitals in the United States., but the greatest evidence of their effectiveness in lowering HAIs was not accessible until the release of SENIC in 1985.

Hospitals with infection control programmes that included surveillance and control components saw a 32 percent reduction in HAIs., according to the study.

In the hospital, infection control systems and practises are monitored and assessed using a planned, methodical manner. Opportunities for risk reduction are identified, risk reduction practises are proposed, and sterilisation is implemented..

This program's primary objective is to reduce the risk of infection during hospitalisation. Thirty-three percent of nosocomial infections can be prevented with infection control strategies in hospitals.

OBJECTIVES OF THE INFECTION CONTROL PROGRAMME

- By developing a surveillance system, hospital-associated infections may be monitored. When it comes to infection prevention and control programmes, SENIC's investigators determined that surveillance was the most important component. Observations must be frequently assessed and reported to those in a position to take necessary action as part of surveillance. Surveillance will create a database of Nosocomial infection rates.
- Health care workers' education and training in HAI prevention and control
- Investigation of outbreaks, Epidemiologically, HAIs account for 5% of all hospitalizations. 19 Important pathogens' epidemiology is often revealed during outbreak investigations.
- The outbreak will be contained by correcting any technological lapses, if any.
- Staff health is monitored to prevent the spread of infection from staff to patient and from patient to staff.
- Assist with isolation and infection control methods
- Including a waste disposal and laundry examination as well as a kitchen inspection.
- Antibiotic safety monitoring and advising

INFECTION CONTROL ORGANIZATIONS IN A HOSPITAL

Infection control organizations are essential features of an infection control programme.

These organizations are:

1. Infection Control Committee (ICC)

For the first time in 1958, the American Medical Association advised hospitals to appoint infection control committees. In all hospitals, the infection control committee is currently the policy-making body, despite the fact that the original policy was not widely supported when it was first introduced in 1976.

Among them are representatives from the departments of medical and nursing as well as engineering and administrative functions, as well as the CSSD and microbiology departments. The Infection Prevention and Control Committee formulates policy for infection prevention and control.

The hospital's administration can be contacted directly via the committee's elected chairperson. Infection control is the responsibility of the member secretary. Meetings are held at least three times a year.

2. Infection Control Team (ICT)

For the day-to-day management of infections, the infection control team members are responsible. Aside from designing infection control policies and procedures, they provide guidance on infection control issues, conduct regular audits and surveillance checks, identify and investigate outbreaks, and educate personnel on infection control issues.

3. Infection Control Officer (ICO)

Microbiologists and other physicians with an interest in hospital-associated infections are the most common types of infection control officers.

Functions:

- It is responsible for recording minutes and setting up meetings as well as serving as the committee's secretary.
- ICT consultant member and leader
- Pathogen identification and antibiotic sensitivity reporting
- Antibiotic resistance data, new diseases, and odd laboratory findings are regularly analysed and communicated.
- Initiation of hospital infection surveillance and outbreak detection

- Outbreaks are being investigated.
- Procedures for and practises of infection control training and education

4. Infection Control Nurse (ICN)²³

To fill this post, On a full-time basis, we should hire a senior nursing sister. There should be enough full-time or part-time nursing personnel on hand for the plan to be successful...

Functions:

- It is the responsibility of the microbiology department to coordinate with clinical departments in the detection and treatment of HAI
 - To work with the ICO to monitor infection rates and detect outbreaks.
 - The ICNs should be taught in basic microbiologic procedures in order to collect specimens and perform preliminary processing.
 - I.C.O.-supervised training and education
 - To promote knowledge of infection control among patients and visitors.
- #### 5. Infection Control Manual (ICM)

It is advised that each institution develop its own infection control manual based on available resources, taking into account local circumstances and risks.

ROLE OF THE MICROBIOLOGY LABORATORY

Microbiology laboratories play a critical role in the prevention of hospital-acquired illnesses. The clinical microbiology laboratory is a vital component of a comprehensive infection control programme. Laboratory testing should be part of every infection control programme. The hospital places a high value on its role in the hospital's infection monitoring system and in assisting the infection control programme to effectively and efficiently utilise laboratory services for epidemiological objectives, among other duties. 4 Patients benefit from the clinical microbiology laboratory's knowledge on a variety of microorganisms with clinical relevance. An infection control officer is often a microbiologist...

The role of the department in the HAI control programme includes:

- To identify common bacteria down to the species level, the laboratory should be equipped.
- The provision of antimicrobial treatment recommendations
- Advice on specimen collecting and transportation
- Information about the antimicrobial susceptibility of common pathogens.
- Antibiotic resistance and antibiotic compliance can be monitored by the microbiologist by providing periodic summaries of laboratory findings and information on antibiotic intake.
- Microbiology department provides a vital service by reporting hospital infection data and antimicrobial resistance patterns on a regular basis. The ICC should determine how often this should occur.
- The organism causing the infection can be identified by culturing carriers and studying the surroundings (outbreak organism).
- 31 Depending on the organism's known epidemiology and survival qualities, the site of the culture will be chosen accordingly.
- Typing isolates from cases, carriers, and the environment according to epidemiological criteria
- “Microbiological testing of hospital personnel or environment. Testing for possible carriers of pathogens of high epidemiological importance. For infection control purposes, a microbiology laboratory may be required to culture potential environmental and personnel sources of nosocomial illnesses at certain times”. As a general rule, this is reserved for situations involving an outbreak, in which the source and mode of transmission must be determined. It is not suggested to perform routine microbiological sample and testing.
- Providing support for sterilisation and disinfection in the facility including biological monitoring of sterilisation.
- When deemed required, providing microbial testing services for hospital materials.

- These may include infant feed sampling, blood product monitoring, and dialysis fluid quality management, among other things. Samples taken from cleaned and disinfected equipment Commercially sterilised equipment should not be subjected to additional sterility testing.
- Providing infection control training to all workers engaged
- “This forms an important part of the Infection Control Programme. Training programmes for employees should be developed by each hospital”. HAI is a contagious disease that can be prevented and treated by educating all hospital employees about its nature, as well as preventative and treatment methods. “The training course should be modified to suit the functional requirements of each category of hospital staff, and should be customised accordingly”..

The training programme should include the following:

- “Basic concepts of infection
- Hazards associated with their particular category of work;
- Acceptance of their personal responsibility and role in the control of hospital infection;
- Methods to prevent the transmission of infection in the hospital
- Safe work practice”.

COMMUNICATION BETWEEN THE PHYSICIAN AND THE MICROBIOLOGY LABORATORY

Regardless matter where a microbiological laboratory is located, effective communication is a must. Health care practitioners and laboratory personnel must be able to communicate easily, if not instantly. Because the information presented is almost always qualitative and interpretive, there must be suitable provisions for bidirectional interaction.

All of the hospital services converge on microbiologists and microbiology services for diagnosis, treatment and infection control.

CONCLUSION

Due to advances in medicine and an ageing and immuno-compromised population, infection management is a constant battle. “As part of a hygiene education programme, hospital staff, patients, and their families should be trained on maintaining good hygiene. Moreover As part of HAI prevention programmes, the microbiology laboratory is becoming increasingly important”. Microbiology laboratories are essential for

preventing HAI outbreaks and sporadic cases due to the emergence of novel infections and the development of new resistances in existing pathogens..

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