

**NOSOCOMIAL INFECTIONS AND THE ROLE OF INFECTION
CONTROL COMMITTEE IN THEIR PREVENTION**

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ABSTRACT

Nosocomial Infections or Hospital Acquired Infections (HAI) are sometimes life threatening infections which occur to a patient in a hospital or other healthcare facility in whom the infection was not present or incubating at the time of admission. These infections are a major source of morbidity, mortality and also monetary burden on patients. Studies have shown that HAI prevalence varies from 3.8% to 18.6% depending on the population surveyed. UTI is the most commonly occurring Nosocomial infections which occupies of about 29.9% of total HAI. Duration of hospital stay and Immune deficiencies are the main reason for Nosocomial infections. Main organisms responsible are *Staphylococcus aureus*, *Clostridium difficile*. Infection control committee is group of hospital health care professionals

composed of infection control personnel, with medical, nursing, administrative and occasionally dietary and housekeeping department representatives, who plan and supervise infection control activities. A well-organized Hospital Infection Control Committees (HICC) and Pharmacist benefits hospitals by improving quality, lowering costs and most important in reducing patient morbidity, mortality and there by plays one of the important role in the prevention of Nosocomial infections. Functions include planning, monitoring, evaluating, updating and educating the patients and health care professionals, prevention of infection in staff members, protecting patients with appropriate use of prophylactic antimicrobials, nutrition and vaccination. Clinical pharmacist has to educate and counsel regarding the harmful effects and care to be taken to prevent Nosocomial Infections to the patients and medical staff in the hospital.

KEYWORDS: Nosocomial Infections, Staphylococcus aureus, Antimicrobials.

INTRODUCTION

NOSOCOMIAL INFECTIONS OR HOSPITAL ACQUIRED INFECTIONS

An infection occurring in a patient in a hospital or other healthcare facility in whom the infection was not present or incubating at the time of admission. This includes infections acquired in the hospital but appearing after discharge and also occupational infections among staff of the facility.^[1,2] Nosocomial infections are a major source of morbidity, mortality and also monetary burden on patients.^[3,4]

PREVALENCE OF NOSOCOMIAL INFECTIONS

An overall Hospital acquired infections(HAI) prevalence was 8.78% with highest in ICUs (33.3%) followed by paediatric wards (12.5%) and surgical wards (10.3%). Most common organisms isolated were *Pseudomonas aeruginosa* *Acinetobacter baumannii* and *Staphylococcus aureus*. It is estimated that 80% of all hospital deaths are directly or indirectly related to HAIs. Studies have shown that HAI prevalence varies from 3.8% to 18.6% depending on the population surveyed.^[5]

The most common Nosocomial infections category was urinary tract infection followed by respiratory tract infections and surgical site infection.

Prevalence of various hospital acquired infections in our hospital:-

S. No.	HAI group	Percentage of HA
1.	Urinary tract infection	29.9%
2.	Respiratory tract infections	23.3%
3.	Surgical site infection	19.5%
4.	Bloodstream infection	18.2%
5.	Burn wound infection	7.8%
6.	Others (skin infection)	1.3% ⁵

SITES OF NOSOCOMIAL INFECTIONS

Most common sites for nosocomial infections

- Urinary tract infections
- Respiratory tract infections
- Surgical site incisions
- Bloodstream infections (i.e., catheter-related).^[5]

URINARY TRACT INFECTIONS

A urinary tract infection when acquired in any healthcare setup due to cross transmission of pathogens is referred to as Nosocomial Urinary tract infection.^[6] Among all other sites of as Nosocomial Urinary tract infection(NUTI) approximately accounts for 40% of Nosocomial infections.^[7] Usually the most common cause of NUTI is due to catheter. Catheter-related urinary tract infection (UTI) occurs because urethral catheters inoculate organisms into the bladder and promote colonization by providing a surface for bacterial adhesion and causing mucosal irritation.^[8]

CATHETER RELATED UTI

Once a catheter is placed, the daily incidence of bacteriuria is 3-10%. Between 10% and 30% of patients who undergo short-term catheterization (ie, 2-4 days) develop bacteriuria and are asymptomatic. Between 90% and 100% of patients who undergo long-term catheterization develop bacteriuria. About 80% of nosocomial UTIs are related to urethral catheterization; only 5-10% are related to genitourinary manipulation.^[9]

PATHOGENS

Enteric pathogens (eg, *Escherichiacoli*) are most commonly responsible, but *Pseudomonas* species, *Enterococcus* species, *Staphylococcus aureus*, coagulase-negative staphylococci, *Enterobacter* species and yeast also are known to cause infection. *Proteus* and *Pseudomonas* species are the organisms most commonly associated with biofilm growth on catheters. *Candida*, especially *Candida albicans*, is the second-most-common organism that can cause catheter-associated urinary tract infection or asymptomatic colonization.^[9]

RESPIRATORY TRACT INFECTIONS

The bacteria causing respiratory tract infections becomes resistant in the nasopharynx which is the ecological niche where evolution towards resistance occurs.^[10] These resistance bacteria are able to cause Nosocomial infections in the respiratory patients, as the patients with acute respiratory failure are predisposed to acquire nosocomial infection primarily because they may need ventilator support, usually invasive mechanical ventilation.^[11] The patients admitted in the hospital with acute respiratory failure are prone to Nosocomial infections by two factors. In case of patients undergoing mechanical ventilation, first factor involves the endotracheal tube which create glitches in defense mechanism of the respiratory

tract and second, the risk of cross transmission of pathogens while handling and manipulating the ventilator and their associated devices.^[12]

COMMON PATHOGENS

- Coagulase-negative staphylococci
- *S.aureus*
- *P.aeruginosa*
- Respiratory syncytical virus.^[12]

SURGICAL SITE INCISIONS

Surgical site infections are one of the most common type of Nosocomial infections in all round the ground.^[13] It occurs during the dressing of wound results in cross transmission either by the hands of personnel or by contaminated instruments. The severity of infection also depends upon the type of surgery and wound.^[14]

The causative organisms involved in this are:

- Enterobacter isolates
- Acinetobacter isolates except *Escherichia coli*.^[14]

BLOOD STREAM

It mainly represents the failure of immune system by which dissemination of pathogens occur. It is the major Nosocomial infection causing mortality and morbidity.^[15,16]

COMMON PATHOGENS

- Coagulase-negative staphylococci
- *S.aureus*
- *P.aeruginosa*
- *Candida* species.^[16]

RISK FACTORS FOR NOSOCOMIAL INFECTION

- Duration of hospital stay
- Indwelling catheters
- Mechanical ventilation
- Use of total parenteral nutrition
- Antibiotic usage
- Use of histamine (H₂) receptor blockers (owing to relative bacterial overgrowth)

- Age-more common in neonates, infants and the elderly
- Immune deficiency.^[17]

SYMPTOMS OF NOSOCOMIAL INFECTIONS

- Inflammation
- Discharge
- Fever
- Abscesses
- Pain and irritation at the infection site.^[18]

MAIN CAUSES OF NOSOCOMIAL INFECTIONS

- Mainly caused by the pathogens that easily spread through the body
- Patients who have a weakened immune system are more susceptible to infections
- Lack of an Infection Control infrastructure and poor Infection Control practices (procedures)
- Inadequate facilities and techniques for hand hygiene
- Inadequate sterilization and disinfection practices and inadequate cleaning of hospital
- Lack of training in basic Infection Control
- Medical procedures can increase the risk of infection by introducing infectious agents in to the patient
- Long-term and irrational use of antimicrobials leads to development of resistant strains of pathogens
- Lack of isolation precautions and procedures.^[18]

PATHOGENS RESPONSIBLE FOR THE OCCURANCE OF NOSOCOMIAL INFECTIONS

- Staphylococcus aureus
- Methicillin resistant Staphylococcus aureus
- Candida albicans
- Escherichia coli
- Pseudomonas aeruginosa.^[19]
- Acinetobacter baumannii
- Stenotrophomonas maltophilia
- Clostridium difficile
- Vancomycin-resistant Enterococcus

- Legionnaires disease
- Coagulase-negative staphylococci.^[20]

NEGATIVE ASPECTS OF NOSOCOMIAL INFECTIONS

- Increases the use of antimicrobials (which increases antibiotic –resistant bacteria)
- Increases the health care expenditure
- Increases the time spent in the hospital
- Increases the mortality of the patients within the hospital
- Decreases the quality of life of the patients.^[21]

INFECTION CONTROL COMMITTEE

A group of hospital health professionals composed of infection control personnel, with medical, nursing, administrative and occasionally dietary and housekeeping department representatives, who plan and supervise infection control activities.^[22] This has a moral duty to provide a safe environment for its patients. The infection control committee investigates hospital-acquired or nosocomial infections and seeks to prevent or control them.^[23] Having a well-organized Hospital Infection Control Committees (HICC) benefits hospitals by improving quality, lowering costs and most important, reducing patient morbidity and mortality.^[24]

INFECTION CONTROL

The process by which health care facilities develop and implement specific policies and procedures to prevent the spread of infections especially in hospitals and human or animal health care facilities.^[25] Infection control mainly prevents the spread of infections within the healthcare system i.e., may be patient-to-patient, from patients to staff and from staff to patients, or among-staff.

MEMBERS OF INFECTION CONTROL COMMITTEE

- Chief Executive/Administrator or nominated representative
- Infection control officer/Doctors act as chairperson
- ✓ General physician
- ✓ Infectious disease specialist
- ✓ Surgeon
- ✓ Clinical microbiologist.^[26]
- Occupational health physician

- Representatives from the major clinical specialities
- Infection control nurse
- Clinical Pharmacist
- Representatives from other relevant departments
- ✓ Laboratory
- ✓ Housekeeping
- ✓ Pharmacy and central supply
- ✓ Administration
- ✓ Central sterilization
- ✓ Environmental services

FUNCTIONS

- Detects and investigates hospital acquired infections
- Investigation of environmental problems related to hospital infections
- Acts as a liaison between departments responsible for patient care and support services
- Addressing food handling, laundry handling, cleaning procedures, visitation policies, and direct patient care practices
- Obtaining and managing critical bacteriological data and information, including surveillance data
- Developing and recommending policies and procedures pertaining to infection control
- Recognizing and investigating outbreaks of infections in the hospital and community
- Intervening directly to prevent infections
- Educating and training health care workers, patients and nonmedical caregivers
- Supervision of standards of professional care in regards to infection
- Surveillance of hospital acquired infections
- Surveillance of staff health
- Standards of hospital domestic cleaning and food services hygiene
- Management of visitors in isolation circumstances
- Establishment and supervision of infection control team
- Matters of general hospital organization and purchasing where these may affect infection control.^[26]

ROLE OF INFECTION COMMITTEE IN PREVENTING NOSOCOMIAL INFECTIONS

The role of the Infection Control Committee is very multi-faceted. It should be involved in planning, monitoring, evaluating, updating and educating. It sets general infection control policy and provides input into specific infection control procedures and issues.^[27]

Planning

Successful prevention and control of infection requires careful planning. The Infection Control Committee is actively involved with the planning and implementation of new procedures that pose a potential infection control risk. The committee also may provide input into the selection of chemicals used to manage the environment, such as detergents and disinfectants. It may also provide input into the selection of equipment used to process instruments and accessories. The multidisciplinary composition of the committee makes it an ideal place to examine new product and procedure proposals from several aspects.

Monitoring

The Infection Control Committee also monitors infectious processes within the healthcare facility. They track nosocomial infections and incidents that have the potential to cause infections. They review infection control statistics from the facility in an effort to minimize risk, identify problem areas, and implement corrective actions.^[27]

When infections do occur, the committee undertakes epidemiological investigations to determine the cause of the problem and recommends the necessary education or changes in protocols.

Evaluating

Along with monitoring specific incidents, the Infection Control Committee also looks at the bigger picture as it continually strives to improve processes within the facility. This is demonstrated by the regular review of infection control procedures for all departments. The committee may also be called upon to evaluate practices and provide input regarding products and protocols.

Updating

Perhaps one of the biggest challenges that all Infection Control Committees face is keeping current. The constant advancement of medical technology introduces changes at all levels

within the healthcare facility, new bacterial strains complicate and challenge older infection control practices and new research often requires re-examination of established procedures. The Infection Control Committee's purpose is to provide guidance and leadership through these changes. This requires that all members of the team strive to keep abreast of changes within their area of expertise. By keeping current, they can assist the committee as it works to manage its facility's infection control policy.

Educating

As an integral part of its leadership, the committee must take an active role in staff education. That role may be a hands-on approach or it may be an advisory role in partnership with the facility's education department. However its functions, the committee must set direction for staff education and validation of that education.^[27]

The education process should address at least two specific areas. The first area should be that of general infection control education. This is usually accomplished through an annual education program designed for all employees. This program is designed to provide the groundwork for general infection control protocols, which create a safe environment for both patients and employees. Information such as standard blood borne pathogen education, etc. is covered in these programs.

The second educational need that the Infection Control Committee addresses is the need for updating. In the constantly changing healthcare arena, the committee must find a way to communicate changes and updates to the entire hospital staff. This is usually done through in services, newsletters, or published committee communications like meeting minutes. Whatever the method, the goal must be to create a smooth flow of information to all employees.^[27]

Preventing

Prevention of nosocomial infections requires an integrated, monitored, programme which includes the following key components:

- limiting transmission of organisms between patients in direct patient care through adequate hand washing and glove use and appropriate aseptic practice, isolation strategies, sterilization and disinfection practices and laundry.
- controlling environmental risks for infection

- protecting patients with appropriate use of prophylactic antimicrobials, nutrition and vaccination
- limiting the risk of endogenous infections by minimizing invasive procedures, and promoting optimal antimicrobial use
- surveillance of infections, identifying and controlling outbreaks
- prevention of infection in staff members
- enhancing staff patient care practices and continuing staff education.

Infection control committee is the responsibility of all healthcare professionals such as doctors, nurses, therapists, pharmacists, engineers and others.^[28]

ROLE OF CLINICAL PHARMACIST IN PREVENTING NOSOCOMIAL INFECTIONS

Health-system pharmacists should be proactive in helping hospitals to address the issues related to preventable HAIs and hospital-acquired conditions. Participation in hospital-based interdisciplinary committees such as Infection Control committees is another way that pharmacists can get involved in preventing the infections.^[29] Pharmacists play a fundamental role in infection control by incorporating strict infection strategies in medication preparation, dispensing and by ensuring that proper aseptic technique is used. As clinicians, pharmacists can evaluate patient medication profiles, make recommendations concerning the appropriate usage of antibiotics, decrease unnecessary antibiotic usage and focus on interventions that may enhance infection control.^[30] Pharmacy staff should participate in any annual hand washing or hygiene competencies offered by the hospital and involved in the preparation of intravenous medications should adhere to guidelines on compounding sterile preparations to minimize product contamination that could subsequently lead to an HAI. Other effective ways to prevent infection are through immunization protocols that involve patient screening and vaccination by pharmacists and other health care professionals.^[31]

CONCLUSION

Now-a-days Hospital acquired infections(HAI) or Nosocomial Infections(NI) are the serious kind of infections which are causing considerable mortality in the patients. In India, the Infection Control Committee(ICC) and its functioning is not getting implemented at a desired level. Most of the hospitals in India are not having Infection Control Committee. The government of India should release mandatory guidelines about the framing of ICC in every hospital. Clinical pharmacist plays a key role in identification of potential areas of

Nosocomial infections in the hospital and there by taking preventive measures to control HAI or NI along with other members of ICC.

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