



सत्यमेव जयते

Ministry of Health & Family Welfare
Government of India

Healthcare Associated Infections and their Surveillance

Training Session – VII A



National Center for Disease Control, New Delhi

Outline

A. Surveillance of HAIs

- Types of surveillance appropriate for HAIs
- HAI surveillance with limited resources
- Surgical site infection (SSI)
- Urinary tract infection (UTI)
- Respiratory tract infection (RTI)
- Bloodstream infection (BSI)
- Gastrointestinal infection
- National HAI Surveillance Network

Surveillance of HAIs

- Surveillance of HAIs allows the health system to
 - Estimate the burden of diseases in terms of cases reported, deaths occurred and costs incurred
 - Detect outbreaks and emerging pathogens and pattern of resistance
 - Monitor the quality of IPC measures/strategies
- Surveillance of HAIs is a basic requirement for organizing and maintaining an effective IPC programme and to substantially reduce morbidity and mortality

Surveillance of HAIs

- Routine HAI surveillance in HCFs should be conducted by an infection control officer and ICNs by systematically collecting patient-based, prospective, priority-directed data that yield risk-adjusted rates of incidence
- Risk-adjusted rates are controlled for variations in the distribution of major risk factors associated with the occurrence of an HAI event
- Such rates enable comparison between units within an HCF and between HCFs

**The infections should meet the basic definition of HAI,
i.e. should be detected after 2 calendar days of hospitalization**

Types of surveillance appropriate for HAIs

- Active surveillance
- Passive surveillance
- Process and outcome surveillance
- Clinical/patient-based surveillance
- Laboratory-based surveillance
- Priority-directed surveillance
- Comprehensive surveillance

HAI surveillance with limited resources

- In situations where no data exists, and resources are limited, efforts of surveillance should be focused on areas that have vulnerable patients, such as
 - Surgical units
 - ICU
 - NICU
 - Burns unit
 - High-risk procedures that are more prone to HAIs

HCFs with limited resources and minimally trained staff may consider process or outcome surveillance which involves auditing certain IPC practices (e.g., hand hygiene) against a standard evidence-based practice, guideline, or policy

Process surveillance

- Practices that could be monitored
 - Hand hygiene
 - Urinary catheter insertion
 - Using multi-dose vials
 - Safe injection practice
 - Preparation of surgical incision site
 - Insertion of vascular catheter
 - Waste segregation
 - Handling of sharps
 - CSSD, Laundry
 - Cleaning & Disinfection

Outcome surveillance

- HAIs which could be monitored
 - Surgical site infection
 - Urinary tract infection
 - Respiratory tract infection
 - Bloodstream infection
 - Gastrointestinal infection

HAI surveillance data to be collected

- Clinical chart review of all patients and those having fever and/or on antimicrobial therapy (a sensitive indicator of HAIs)
- Review the microbiology and drug susceptibility report if available
- Probable case includes patient number, age, gender, location, associated co-morbidity such as diabetes, type of infection, site, and severity of infection, investigations done for infection
- Numerators are the number of HAIs observed and the denominators include the number of patients present/admitted in the ward on that day/ total device days (in case of a device associated) of the existing patients in the ward

Minimum requirements for surveys

- Dedicated surveillance team including ICN
- Data entry and analysis
- Microbiology laboratory
- Medical and nursing chart reviews
- Details of indwelling devices (vascular/urinary catheters etc.), surgical operations
- Record of fever and other clinical signs consistent with infection
- Radiological investigations
- Antimicrobial therapy

Surgical site infection (SSI)

- Infections that occurs after surgery in the part of the body where the surgery took place
- SSIs can be
 - Superficial infections involving the skin only
 - Or more serious infections involving tissues under the skin, organs, or implanted material
- Date and type of surgery should be recorded

**Check if the surgery was performed at the hospital within the preceding 30 days
(or within 1 year if an implant was in place)**

SSI Definitions

- Superficial incisional SSI
 - Discharge of pus from the superficial incision
 - Pain, tenderness, localized swelling, redness, or heat
 - Positive culture from aseptically collected specimen
- Deep incisional SSI
 - Infection appears within 30 days of the procedure or within one year if there is an implant or foreign body, such as a prosthetic heart valve or joint prosthesis
 - Spontaneous dehiscence or “gaping” of wound
 - Fever $>38^{\circ}\text{C}$, localized pain or tenderness
 - Positive culture from aseptically collected specimen

SSI Definitions contd.

Organ/space SSI

- Infection appears in an organ or space within 30 days of the procedure in the organ/space that is opened or manipulated during the operative procedure
 - There is purulent drainage from a drain that is placed into the organ/space
 - Organisms are identified from fluid or tissue in the organ/space by a culture
 - An abscess or other evidence of infection involving the organ/space is detected on gross anatomical or histopathological examination, or imaging test evidence is suggestive of infection

Calculation of SSI rates

- SSIs rates per 100 operative procedures are calculated by:

$$\frac{\text{Number of SSIs}}{\text{Number of specific operative procedures}} \times 100$$

- SSIs will be included in the numerator of a rate based on the date of procedure, not the date of the HAI event
- SSI rates can be calculated separately for different types of operative procedures and stratified by the wound classification (clean, clean contaminated, contaminated, dirty)

SSI – Data to be collected

- Patient details: age, gender, and location
- The severity and the extent of the infection in the patient
- The type and location of the operation (surgical OT, emergency, gynae OT, etc.)
- Classification of operation: clean, clean contaminated, contaminated, dirty
- The time period in days between the operation and the of development the infection
- Comorbidities like diabetes or infection elsewhere in the body

Preoperative recommendations for the prevention of SSI



- In patients undergoing any surgical procedure, shaving hair is strongly discouraged at all times, whether preoperatively or in the OR, if absolutely necessary, should only be removed with a clipper
- Preparation of the surgical site: alcohol-based antiseptic solutions based on Preoperative bathing of patients
- CHG for surgical site skin preparation in patients undergoing surgical procedures
- Antimicrobial sealants should not be used after surgical site skin preparation
- Enhance nutritional support for underweight patients who undergo major surgical operations

Urinary tract infection (UTI)

- Positive urine culture limited to one-two species of organisms with 10^5 CFU/ml and, with at least one of following signs/symptoms with no other recognized cause
 - Fever ($>38^\circ\text{C}$)
 - Supra-pubic tenderness
 - Urgency
 - Frequency
 - Dysuria

Urine specimen for culture should be

- Collected using aseptic precautions
- Obtained aseptically from sample port in catheter tubing or by aspiration
- Non-catheterized patients, a clean voided specimen acceptable

Catheter tips and specimen from the urine bag should not be cultured

Catheter-associated UTI (CAUTI)

- CAUTI criteria: A UTI where an IUC was in place for >2 calendar days on the date of infection, with the day of catheter insertion being day 1

Calculation of incidence

- Patient days and urinary catheter days are the denominators used to determine incidence rates for UTI and CAUTI, respectively
- Urinary catheter days is the number of patients with a catheter
- Patient-day denominator is calculated as the total number of patients per day in the ICU/ ward under surveillance

Calculation of incidence contd.

- UTI rates in a Ward or ICU is calculated by:

$$\frac{\text{number of UTIs}}{\text{number of patient days}} \times 1000$$

- CAUTI rates in a Ward or ICU is calculated by:

$$\frac{\text{number of CAUTIs}}{\text{number of urinary catheter days}} \times 1000$$

Ventilator-associated pneumonia (VAP)

- If the patient is on mechanical ventilation and signs of infection appear after 2 days of stability/improvement on ventilator, VAP is recognized by the following criteria:
 - Worsening oxygenation
 - Temperature $>38^{\circ}\text{C}$ or $<36^{\circ}\text{C}$, or
 - White blood cell count $\geq 12\,000$ cells/mm³ or ≤ 4000 cells/mm³

Ventilator Associated Pneumonia contd.

- Purulent respiratory secretions (>25 neutrophils and <10 squamous cells/low power field) and positive microbiology culture of either sputum, endotracheal aspirate, bronchoalveolar lavage, lung tissue, protective specimen brush
- The definition criteria for VAP have many limitations in its differentiation from other complications that occur in mechanically ventilated patients

Role of quantitative microbiology culture

- In the absence of purulence, quantitative or semi-quantitative microbiology culture of respiratory secretions are required
- The significant counts of organisms in the various specimens are:
 - Endotracheal aspirate $>10^5$ CFU/ml
 - Bronchoalveolar lavage $>10^4$ CFU/ml
 - Lung tissue $>10^4$ CFU/ml
 - Protected specimen brush $>10^3$ CFU/ml

VAP – Calculation of incidence

VAP – Calculation of incidence

- Device days and patient-days are used for denominators
- Ventilator days, which are the number of patients managed with a ventilatory device, are collected daily, at the same time each day, according to the chosen location
- VAP rate per 1000 ventilator days:

$$\frac{\text{number of VAPs}}{\text{number of Ventilator days}} \times 1000$$

Bloodstream infection (BSI)

Criteria for BSI

- A recognized pathogen isolated from blood culture and not related to infection at another site is a BSI
- Associated Symptoms and signs of septicemia if a common commensal is causing the infection
- In patients >12 months of age: fever >38°C, chills or hypotension
- In patients <12 months of age: fever (>38°C), hypotension, hypothermia (<36°C), apnoea, bradycardia

Calculation of BSI incidence rates

- **BSI rate** (BSI per 1000 patient-days): divide the total number of reported BSI by the number of patient-days and then multiply by 1000
- **CLABSI rate** (CLABSI per 1000 central line days): divide the total number of reported CLABSI by the number of central-line days and then multiply by 1000
- **Device utilization rates:** the device utilization rates for central lines and ventilators are calculated by dividing the number of days of device use by the number of patient-days

Calculation of BSI incidence contd.

- BSI rates in a Ward or ICU is calculated by:

$$\frac{\text{number of BSIs}}{\text{number of patient days}} \times 1000$$

- CLABSI rates in a Ward or ICU is calculated by:

$$\frac{\text{number of CLABSIs}}{\text{number of central line catheter days}} \times 1000$$

Gastrointestinal infection

- Diarrhoea is defined as the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual)
- Diarrhoea occurring in a patient after 48 hours of admission is designated as an HAI
- There are three clinical types of diarrhea:
 - Acute watery diarrhea – lasts several hours or days, and includes cholera
 - Acute bloody diarrhea – also called dysentery
 - Persistent diarrhea – lasts 14 days or longer

Gastrointestinal infection contd.

Diarrhea in patients

- Infection can begin as gastroenteritis in neonatal patients but then spread to the bloodstream and present as septicemia or BSI
- If two sites of infection are present in one patient it will be considered as two infections
- The rate of infectious diarrhea is calculated as
 - Number of HAI patients with diarrhea divided by the number of patient days; then multiply by 1000

Environmental controls to prevent transmission of MDROs

- Environmental cleaning and disinfection are very important in the emergency department as there are multiple opportunities for contamination of the environment and patient care equipment in the emergency department
- Patients colonized or infected with MDRO can transfer microorganisms to their clothes, linen, guard rails, over-bed tables, blood pressure cuffs, the floor, and many other sites in their immediate vicinity
- Environmental contamination with MDRO can contaminate HCWs' hands during patient care



Questions?