Epidemiology and Principles of Infection Control

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- **What is it and what is it good for?**

- "It may seem a strange principle to enunciate as the very first requirement in a hospital that it should do the sick no harm"

Florence Nightingale

- Nosocomial infection = Hospital Infections= Healthcare associated infections
- **Any infection that is not present or incubating at the time the patient is admitted to the hospital**

History of infection control and hospital epidemiology

- Pre 1800: Early efforts at wound prophylaxis
- 1800-1940: Nightingale, Semmelweis, Lister, Pasteur
- 1940-1960: Antibiotic era begins, *Staph. aureus* nursery outbreaks, hygiene focus
- 1960-1970's: Documenting need for infection control programs, surveillance begins
- 1980's: focus on patient care practices, intensive care units, resistant organisms, HIV
- 1990's: Hospital Epidemiology = Infection control, quality improvement and economics
- 2000's: ??Healthcare system epidemiology

Why do we need hospital epidemiology??

Hospitals are complex institutions where patients go to have their health problem diagnosed and treated

But, hospitals and medical/surgical interventions ***introduce risks*** that may harm a patient's health

Consequences of Nosocomial Infections

- Additional morbidity
- Prolonged hospitalization
- Long-term physical, developmental and neurological sequelae
- Increased cost of hospitalization
- Death

Challenges to the hospital epidemiologist

- Make a hospital safe
  - Prevent harm to the patient and employees
    - initial focus on infectious diseases
    - increasingly all adverse (harmful) events are targets
- Improve hospital efficiency
  - Eliminate unnecessary costs
  - Eliminate wasteful practices

What is hospital epidemiology?

The fundamental roles of hospital epidemiology are to:

- Identify risks
- Understand risks
- Eliminate or minimize risks

What is the role of hospital epidemiology?

Identify risks to patient's health

- Find nosocomial infections
  - surveillance
- Identify and study risk factors for nosocomial infection
  - understand epidemiologic principles and methods
    - case-control and cohort studies,
    - understand nosocomial pathogens

What is the role of hospital epidemiology?

Eliminate or minimize risks to a patient's health

- organize care to minimize risk
  - eliminate risk factors
  - work around risk factors
  - develop improved policies and procedures
- educate physicians and nurses regarding risks
- study risk factors to learn more about them and how to eliminate them

Responsibilities of the Infection Control Program

- Surveillance of nosocomial infections
- Outbreak investigation
- Develop written policies for isolation of patients
- Development of written policies to reduce risk from patient care practices
- Cooperation with occupational health
- Cooperation with quality improvement program
- Education of hospital staff on infection control
- Ongoing review of all aseptic, isolation and sanitation techniques
- Monitoring of antibiotic utilization
- Monitoring of antibiotic resistant organisms
- Eliminate wasteful or unnecessary practices

Areas of interest to a hospital epidemiologist

- Surveillance for nosocomial infection
  - bloodstream infections
  - pneumonia
  - urinary tract infections
  - surgical wound infections
- Patterns of transmission of nosocomial infections
- Outbreak investigation
- Isolation precautions
- Evaluation of exposures
- Employee health
- Disinfection and sterilization
- Hospital engineering and environment
  - water supply
  - air filtration
- Reviewing policies and procedures for patient care

Areas of interest to a hospital epidemiologist

- Antibiotic use
- Antibiotic resistant pathogens
- Microbiology support
- National regulations on infection control
- Infection control committee
- Quantitative methods in epidemiology

Regulatory Strategies in Infection Control

Regulatory approach

- External organizations establish rules and regulations
- Data collection for comparison with outside standards
- Inspections for compliance
- Penalties for non-compliance

Regulatory approach

- Internal organization of hospital staff to develop goals and methods
- Data collection for internal review
- Continuous efforts to improve
- Failure belongs to the entire system, not an individual

Organizing for Infection Control

- Requires cooperation, understanding and support of hospital administration and medical/surgical/nursing leadership
- There is no simple formula:
  - Every hospital is different
  - Every hospital's problems are different
  - Every hospital's personnel are different
- The hospital must develop its own unique program

Essential Components of an Effective Infection Control Program

- One full time infection control practitioner per 250 beds
  - optimal ratio may be different
- A physician with training and expertise in infection control
- Surveillance and feedback of rates to clinicians
- Control activities (interventions, policies, training)

Organizing for Infection Control

- Main elements
  - Develop an effective surveillance system
  - Establish policies and regulations to reduce risks
    - Develop with clinicians (physicians and nurses)
  - Develop and maintain a program of continuing education for hospital personnel
  - Use scientific (epidemiologic) method to study problems and test hypotheses

Organizing for Infection Control

- Additional elements of an effective program
  - Antibiotic monitoring and control
  - Microbiologic laboratory contact
  - Antibiotic susceptibility data dissemination
  - Occupational health
  - Provide resource to other departments for quality improvement study design and data analysis

Key elements of surveillance

- Defining as precisely as possible the event to be surveyed (case definition)
- Collecting the relevant data in a systematic, valid way
- Consolidating the data into meaningful arrangements
- Analyzing and interpreting the data
- Using the information to bring about change

Infection Control Committee Purpose

- Advisory
  - Review ideas from infection control team
  - Review surveillance data
- Expert resource
  - Help understand hospital systems and policies
- Decision making
  - Review and approve policies and surveillance plans
  - Policies binding throughout hospital
- Education
  - Help disseminate information and influence others

Infection Control Committee

Committee Representatives

- Hospital Epidemiologist
- Infection Control Practitioners
- Administrator
- Ward, ICU and Operating room Nurses
- Medicine/Surgery/Obstetrics/Pediatrics
- Central Sterilization
- Hospital Engineer
- Microbiologist
- Pharmacist

Infection Control Committee

Qualifications to be on the committee

- Interest
- Represent group in hospital
- Experts in their field
- Diplomatic
- Good communicators

Resources: Where to get more information or help

- Training Courses
  - Society of Hospital Epidemiologists of America (SHEA)
  - Association of Professionals in Infection Control (APIC)
  - National courses and congresses
- Books
  - Textbooks: Bennett and Brachman - Wenzel - Mayhall
  - APIC Curriculum and Guidelines
  - CDC Guidelines
- Journals
  - Infection Control and Hospital Epidemiology
  - Journal of Hospital Infections
  - American Journal of Infection Control
- Consulting services
  - National: CDC, Ministry of Health
  - Colleagues

What is Hospital Epidemiology good for?

- Infection control
- Quality improvement
- Controlling costs

An effective hospital epidemiology program can help achieve all three goals

Risk factors for surgical wound infection

- Age
- Obesity
- Malnutrition (low albumin)
- Diabetes
- Steroids/immunosuppression
- Prolonged pre-op hospitalization
- Infection at another site
- Prolonged procedure
- Drains
- Urgency of surgery
- Foreign body
- Skill of surgeon

Strategies to develop effective patient care practices

- Team collaboration
- Staff education
- Communication

Identify problems with polices and procedures Example: Pre- and Post-Operative Care

• PROBLEM AREA	→ RECOMMENDATION
• Skin shaved the night before surgery	→ Eliminate shaving of skin the night before surgery
• Inappropriate peri-op antibiotic prophylaxis	→ Single dose peri-op antibiotic prophylaxis guidelines
• Instruments used for dressing changes submerged disinfectant	→ Use individual sterile packs of wound care instruments
• Large containers of antiseptics, no routine for cleaning and refilling	→ Use small containers of antiseptics; clean and dry containers before refilling

Cultures of Walls, Floors and Other Smooth Surfaces

- All hospitals have some bacterial colonization of environment
- What is the evidence that the environment directly infects the patient?
  - Hospitalized patients infect the environment
  - Poor technique, poor handwashing, poor disinfection have all been shown to infect the patients but these are all related to poor practice not the environment directly
- Floors, Walls, Tables, Beds etc. should be cleaned properly but not cultured

Hospital infections causes to

- Elongation of hospital staying
- Increasing of morbidity ve mortality
- Deterioration in the quality of life
- Loss of labor force and productivity
- Increasing of RESİSTANCE to antibiotics
- Increasing of cost

Hospital infections

- In different studies ,additional hospitalization are between 4-34 days, average 10 - 20 days
  - Bacteremia 7 – 21 days
  - Surgical site 7 – 8 days
  - VAP 6-7 days
  - Urinary tract system 1-3 days

Organization and support

A. Institutional support

- Infection control as a department
- Placement in the organization
- Authority
- Personnel
- Other resources

Organization and support

B. Infection control committee

- membership
- support by the medical staff
- participation by other disciplines
- annual planning

Organization and support

C. Infection Control Program

- quality assessment
- information for clinicians
- educational/informational resource
- surveillance data
- outbreak investigation
- assurance of appropriate asepsis, sterilization, disinfection
- minimize risk from invasive procedures/devices
- use of isolation
- occupational health

WASH

YOUR

HANDS