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
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

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Additional Factors</th>
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<tbody>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td>Infection at another site</td>
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<tr>
<td>Malnutrition (low albumin)</td>
<td>Prolonged procedure</td>
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<tr>
<td>Diabetes</td>
<td>Drains</td>
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<tr>
<td>Steroids/immunosuppression</td>
<td>Urgency of surgery</td>
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<tr>
<td>Prolonged pre-op hospitalization</td>
<td>Foreign body</td>
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<td>Skill of surgeon</td>
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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**
  - Skin shaved the night before surgery
  - Inappropriate peri-op antibiotic prophylaxis
  - Instruments used for dressing changes submerged disinfectant
  - Large containers of antiseptics, no routine for cleaning and refilling

- **RECOMMENDATION**
  - Eliminate shaving of skin the night before surgery
  - Single dose peri-op antibiotic prophylaxis guidelines
  - Use individual sterile packs of wound care instruments
  - 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
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