

SURVEILLANCE AND EPIDEMIOLOGIC INVESTIGATION PART I

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SPICE

OBJECTIVES

- ▶ Describe the recommended components for an infection prevention program
- ▶ List the elements required for an organization surveillance system
- ▶ Discuss general principles of epidemiology
- ▶ Apply information to practice questions

INFECTION PREVENTION PROGRAM

▶ Overall Structure and Function

- ▶ Protect the patient
- ▶ Protect healthcare personal (HCP), and others in the healthcare environment
- ▶ Accomplish the two goals listed above in a cost-effective manner whenever possible
- ▶ Principle function:
 - ▶ Obtain and manage critical data
 - ▶ Develop and recommend policies and procedures
 - ▶ Prevent infection and interrupt transmission
 - ▶ Education of HCP, patients and nonmedical care givers

INFECTION PREVENTION TEAM

▶ Infection prevention committee

- ▶ Multi-disciplinary
- ▶ Not required by TJC but some states do require
- ▶ Dissemination of information is critical

▶ Infection preventionist

- ▶ Daily collaboration with all facets of healthcare
- ▶ Functions as consultant, educator, role model, researcher and change agent

▶ Healthcare epidemiologist

- ▶ May be the chair of committee or be technical advisory
- ▶ Often physician with special training in healthcare epidemiology and infection prevention

ROLE OF THE INFECTION PREVENTIONIST

- ▶ Collection and analysis of infection data
- ▶ Evaluation of products and procedures
- ▶ Development/review of policies/procedures
- ▶ Consultation on risk assessment, prevention and control strategies
- ▶ Education
- ▶ Implementation of changes mandated by regulatory, accrediting and licensure
- ▶ Application of epidemiologic principles, directed at improving patient care
- ▶ Antimicrobial management
- ▶ Research
- ▶ High quality services in a cost-efficient manner

STAFFING

- ▶ 1969 CDC recommended 1 FTE per 250 occupied beds (SENIC) acute care
- ▶ 2004 Health Canada model projected 3 FTE per every 500 beds in acute care
- ▶ Netherlands 1 FTE per 178 beds acute care
- ▶ APIC's Delphi project 0.8-1 IP for every 100 occupied beds, acute care
- ▶ LTC
 - ▶ Health Canada 1 FTE per 150-250 beds
 - ▶ Delphi project 0.8 per 100 beds and 3 per 500 beds
 - ▶ Dutch group 500 hours per 100 residents per year

PROGRAM DEVELOPMENT

▶ Consider:

- ▶ Number of beds
- ▶ Professional school affiliation
- ▶ Geography
- ▶ Volume of patient encounters
- ▶ Patient population served
- ▶ Clinical focus
- ▶ Number of employees
- ▶ Administrative philosophy

INFECTION PREVENTION AND CONTROL PROGRAM

- ▶ Mission and vision statement
- ▶ Outline of core values
- ▶ Establish goals and objectives by performing annual risk assessment
- ▶ Set priorities
- ▶ Conduct an annual evaluation

DOCUMENTING IMPACT OF HAI ON OUTCOMES AND COST

▶ Decision analysis studies:

▶ Cost-effectiveness:

- ▶ Refers to the outcome of care.
- ▶ Expressed as number of cases of disease prevented, number of lives saved, or the number of life-years saved

▶ Cost benefit

- ▶ Looks at outcomes in terms of cost
- ▶ Direct financial cost
- ▶ Decreased malpractice claims
- ▶ Protecting employees from injury
- ▶ Enhancing organizational image

PATIENT SAFETY

Tools used:

- ▶ Basic healthcare epidemiology:

- ▶ Surveillance
- ▶ Outbreak investigation
- ▶ Implementation science
 - ▶ Scientific study of methods to promote the uptake of interventions (or research findings) that have proven effective into routine practice with the aim of improving population health (healthcare)

- ▶ Quality Improvement tools

- ▶ Root cause analysis

HEALTHCARE INFORMATICS AND INFORMATION TECHNOLOGY

Key Concepts:

▶ Information technology

- ▶ Retrieve, distribute and store information
- ▶ Speed and simplify data collection and management
- ▶ Safeguards to protect health information

▶ Informatics

- ▶ Applying computer technology to the scientific process
- ▶ Foster QI via use of evidence to monitor and improve process/outcomes
- ▶ Support accurate, efficient extraction and upload of publicly reported data

DEFINITIONS

▶ Informatics

- ▶ Study of information processing with the purpose to translate knowledge into practice

▶ Healthcare Informatics

- ▶ Science of using IT to design, develop, apply, manage, organize, analyze and optimize healthcare delivery
- ▶ Goal to improve patient care processes

▶ Nursing Informatics

- ▶ Enhance documentation accuracy and enables data analysis of nursing practice

GENERAL PRINCIPLES OF EPIDEMIOLOGY

- ▶ Epidemiology-the study of the frequency, distribution, cause and control of disease in populations.
 - ▶ Aids in understanding of the cause of a disease by knowing its distribution; determinants in terms of person, place and time; and natural history
 - ▶ Both a body of knowledge and a method of study
 - ▶ Population based
 - ▶ Incorporates use of statistics to determine associations and test hypotheses
 - ▶ Professional discipline that encompasses all academic fields of study

EPIDEMIOLOGY IN HEALTHCARE

- ▶ Three categories of prevention (*Leavell's levels*)
 - ▶ Primary
 - ▶ Geared at prevention
 - ▶ Health promotion programs, wellness programs, immunization
 - ▶ Secondary
 - ▶ Early diagnosis and treatment (TST; mammograms, cessation of smoking)
 - ▶ Prevent further deterioration
 - ▶ Tertiary
 - ▶ Disease well established
 - ▶ Deals with sequelae (rehab and organ transplant)

USEFUL TERMS

Endemic

- ▶ The usual or expected occurrence of disease
- ▶ The “baseline”

Epidemic

- ▶ Increased occurrence of disease above the usual or expected frequency
- ▶ An “outbreak”

Herd immunity

- ▶ Immunity to infectious disease of an adequate number of individuals in a population to be protective for those who are not immune to the disease

Pandemic

- ▶ An epidemic that involves large geographical areas or several continents

Enzootic

- ▶ Usual presence of disease among animals within a geographic area

Epizootic

- ▶ Excess over expected extent of disease within an animal population in a geographical area during a specified time

Zoonosis

- ▶ A disease transmitted from animals to humans (cat scratch fever, psittacosis)

Question # 1: The use of influenza vaccines in school age children to decrease the number of cases in the community uses the principle of:


Epizootic

Endemic

Herd
immunity

Epidemic

Question # 2: Plague is endemic in parts of the Southwest United States. The word "endemic" means:

 When poll is active, respond at **PollEv.com/amypowell729**

 Text **AMYPOWELL729** to **22333** once to join

Natives are immune to plague

An expected number of cases occurs each year in a given geographical area

Plague has become resistant to all forms of treatment for this population

The disease is seen in a seasonal pattern each year for this area

Question # 3: A pandemic differs from an epidemic in that:

Only one disease is involved

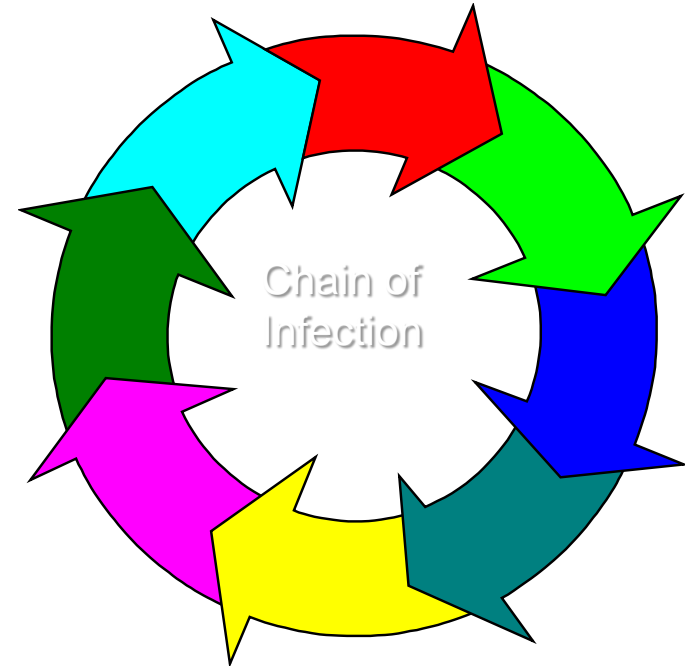
It is usually vector borne

There is a higher mortality rate

Several countries or continents are involved

ELEMENTS REQUIRED FOR AN INFECTION

- Chain of Infection:
 - Infectious agent
 - Reservoir
 - Portal of Exit
 - Portal of Entry
 - Means of Transmission
 - Susceptible host



SURVEILLANCE



DEFINITION

- “Surveillance is a comprehensive method of measuring outcomes and related processes of care, analyzing the data, and providing information to members of the healthcare team to assist in improving those outcomes and processes”



- ▶ Observation
- ▶ Monitor behavior
- ▶ Establish patterns/trends
- ▶ Measure outcomes, processes; Analyze data; feedback of data to improve outcomes and processes



KEY CONCEPTS

- ▶ Surveillance is an essential component of an effective infection prevention program.
 - ▶ Should be based on sound epidemiological and statistical principles
 - ▶ Should be designed in accordance with current recommended practices and consist of defined elements
 - ▶ Plays a critical role in identifying outbreaks, emerging infectious disease and bioterrorist events

EVOLUTION OF SURVEILLANCE PROGRAMS

- ▶ 1958: AHA recommended in response to outbreaks of *Staphylococcus aureus* infections in hospitals.
- ▶ 1960's: CDC recommended hospital base programs include surveillance
- ▶ 1976: TJC first included infection surveillance, prevention and control standards in its accreditation manual

RECOMMENDED PRACTICES FOR SURVEILLANCE

- I. Assess the population 
- II. Select the outcome or process for surveillance and determine the time period 
- III. Use surveillance definitions
- IV. Collect surveillance data
- V. Calculate and analyze infection rates
- VI. Apply risk stratification methodology
- VII. Report and use surveillance information
- VIII. **Validate surveillance methodologies and findings**

TYPES OF INFECTION SURVEILLANCE

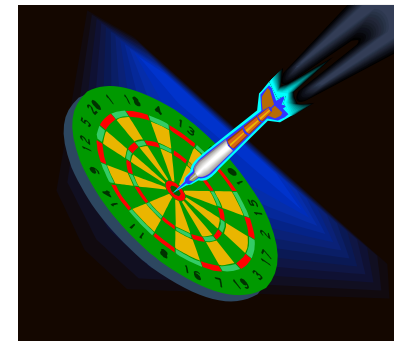
▶ Total House Surveillance

- ▶ All infections
- ▶ All locations
- ▶ All procedures



▶ Targeted

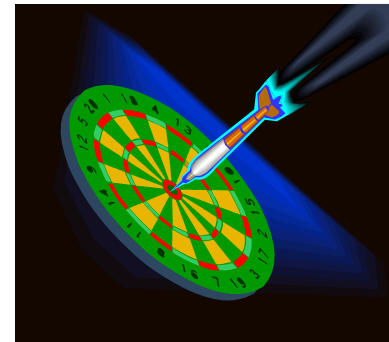
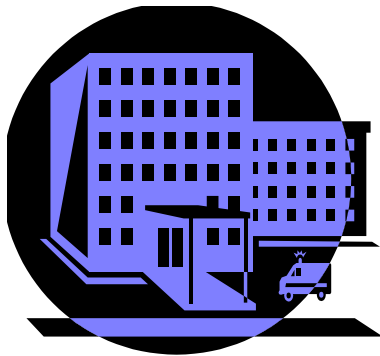
- ▶ Site specific
- ▶ Procedure specific
- ▶ Device associated
- ▶ Time defined



TYPES OF INFECTION SURVEILLANCE

► Combination Surveillance Strategy

- Monitor laboratory reports/selected HAIs facility wide
- Targeted events that occurs in a defined population



SURVEILLANCE

- ▶ **Total House versus Priority directed**
 - ▶ Advantages versus Disadvantages
 - ▶ Cost (-)
 - ▶ Labor (-)
 - ▶ Data volume (+-)
 - ▶ Quality of data (+)
 - ▶ Detection of outbreaks (+)
 - ▶ Risk adjusted data(+)



SURVEILLANCE

- ▶ **Process surveillance-**
observations of actions,
performance, or
documentation



SURVEILLANCE

- ▶ **Outcome surveillance** – begins with results then looks at risk factors



Question # 4: An appropriate indicator to monitor process compliance would be: :

Class 1 SSI rate

Appropriate antibiotic dosage

Central line-associated bloodstream infections in the NICU

Infections caused by multidrug-resistant organisms

Question # 5: Targeted surveillance focuses on:

Tracking high-risk, high-volume procedures and potentially preventable healthcare-associated infections

Providing whole-house infection rates

Tracking infections that are publically reported

Using the electronic surveillance systems to identify infections

SURVEILLANCE

- ▶ Non-Hospital associated infection events
 - ▶ Communicable diseases reported to public health
 - ▶ Industrial/School absenteeism
 - ▶ Community outbreaks
 - ▶ Monitoring of important organisms (such as Community acquired (CA) MRSA)
 - ▶ Employee infections
 - ▶ Prophylactic antibiotic administration

SURVEILLANCE RATIONALE

- ▶ Main purpose to provide information that can be use to target performance improvement activities
 - ▶ Voluntary participation and confidentiality
 - ▶ Standard definitions and protocols
 - ▶ Defined populations at risk
 - ▶ Site-specific, risk-adjusted infection rates comparable across institutions
 - ▶ Adequate number of trained IPs
 - ▶ Dissemination of data to healthcare providers
 - ▶ A link between monitored rates and prevention efforts

CONCLUSIONS

- ▶ Surveillance methodology evolves in response to changes in healthcare delivery, especially growing need for other settings
- ▶ Move from measuring clinical outcomes to performance improvement



Question # 6: What key infection control activity is defined as the systematic ongoing collection, management, analysis and interpretation of data followed by the dissemination of these data to public health programs to stimulate public health action?

Research

Surveillance

Benchmarking

Accreditation

Question # 7: For which of the following procedure(s) is the surveillance period for deep incisional or organ/space SSI 90 days

Cesarean section

Craniotomy

Coronary artery bypass graft

Laminectomy

A, B

B, C

C, D

A, D

Question # 8: Which of the following is indicative of a superficial SSI?

Pain at the incision site 10 days after a breast reduction procedure; drainage is culture positive for MSSA

Stitch abscess that is cultured 14 days after surgery and is positive for *Enterococcus faecalis*

Purulent drainage from an episiotomy that occurs within 5 days of delivery

Burn wound that cultures positive for *Acinetobacter baumannii* 10 days after debridement procedure

Question # 9: What type of rate would the IP want to calculate to give feedback to the surgeons at her facility?

Procedure-specific

Provider-specific

Unit-specific

Device-specific

OUTBREAKS

NOTICE.

PREVENTIVES OF

CHOLERA!

Published by order of the Sanatory Committee, under the sanction of the Medical Council.

BE TEMPERATE IN EATING & DRINKING!

Avoid Raw Vegetables and Unripe Fruit!

Abstain from COLD WATER, when heated, and above all from *Ardent Spirits*, and if habit have rendered them indispensable, take much less than usual.

- ▶ *Outbreaks of both infectious and noninfectious adverse events can occur in any healthcare setting and pose a threat to patient safety*
- ▶ Suspected when:
 - ▶ HAIs, recovery of specific pathogens or other adverse events occur above historical rates
 - ▶ When an unusual microbe or adverse event is recognized
 - ▶ Term Pseudo-outbreak used when there is a rise in test results without clinical disease

OUTBREAKS ARE

- ▶ Often multifactorial
- ▶ Most often caused by one or more of the following:
 - ▶ Lapses in infection prevention/clinical practices
 - ▶ Colonization or infection of HCW
 - ▶ Intrinsic contamination of device or product
 - ▶ Extrinsic contamination of device or product
 - ▶ Visitors with infectious/communicable disease (flu, chickenpox)



Goal:

Control by identifying and modifying contributing factors and to develop/implement measures to prevent similar outbreaks in the future



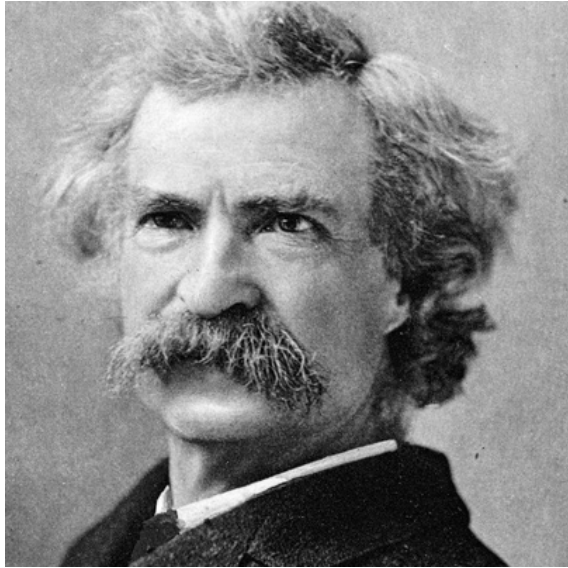
INITIAL INVESTIGATION

- ▶ Confirm presence
- ▶ Alert key individuals
- ▶ Perform a literature review
- ▶ Establish a case definition
- ▶ Develop a methodology for case finding
- ▶ Prepare an initial line list or epidemic curve
- ▶ Observation patient care activities
- ▶ Consider environmental sampling
- ▶ Implement control measures

FOLLOW UP INVESTIGATION

- ▶ Refining the case definition
- ▶ Continuing case finding and surveillance
- ▶ Reviewing regularly control measures
- ▶ Considering whether an analytic study should be performed
- ▶ Communication after an outbreak occurs

COMING SOON



**“There are 3 kinds of lies.
Lies, damned lies, and statistics.”**

~Popularized by Mark Twain



**“ I love statistics.
I just love numbers and data”**

~Popularized by Lauren DiBiase