SURVEILLANCE OF NOSOCOMIAL INFECTIONS

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Your taxes at work
What is a Nosocomial Infection?

- An infection which is acquired during hospitalization and which was not present or incubating at the time of admission.

- An infection which is acquired in the hospital and becomes evident after discharge from the hospital.

- A newborn infection which is the result of passage through the birth canal.
What is a Nosocomial Infection?

Practically to establish that an infection is hospital acquired,

SHOW THAT the patient:

- 1- HAS AN INFECTION, not a simple colonization
- 2- WAS NOT infected at the time of admission
- 3- HAD SUFFICIENT TIME to develop infection,
True Infection NOT Colonization

- Infection are accompanied by signs and symptoms of infection:
  - → fever, malaise
  - → in localized infections: swelling due to inflammation, heat, pain, erythema (tumor, dolor, rubor, calor)
- Use definitions which establish minimum characteristics for infection
- **Remember**: Immunocompromised patients do not show signs of infection as normal patients. Neutropenic patients (≤500 neutrophils /mm3) show no pyuria, no purulent sputum, little infiltrate and no large consolidation on chest X-ray
NO Infection at Time of Admission

- establish prior negativity
- check history, symptoms and signs documented at time of admission, lab tests & chest X-rays done
  - normal physical examination,
  - absence of signs and symptoms,
  - normal chest X-ray,
  - negative culture or lack of culture

For example if urine cultures are collected at day 7 of hospitalization and none was collected before, it implies that no signs of infection were present in urine before.
Sufficient Time to Develop Infection

3. Diseases with specific incubation period: stay in hospital $\geq$ incubation period

3. Numerous infections do not have well set incubation periods (for example, staphylococci, E.coli infections) these infections rarely develop in less than 2 days.
To establish a nosocomial infection meeting the definition criteria is sufficient there is no need to have proof *beyond the shadow of a doubt*
CDC definitions for nosocomial infections, 1988.
Am J Inf Ctrl 16 (3): 128-140
Rates: Numerators

- Number of infections
- Number of patients infected
- Note:
  → Infections caused by **multiple organisms of similar origin** at the same site = single infection
  → In a patient with a previously established nosocomial infection, a **second nosocomial infection** should be recorded in two situations:
    1. the appearance of clinical infection at a new and different site
    2. the appearance in culture of new and different organisms if deterioration in patient's condition.
Rates: Denominators

- Number of patients admitted (or discharged)
- Number of hospital days
- Number of device days
Hospital wide Rates

- Hospital wide nosocomial infection rate /100 Admissions for a given period: month, quarter, year.
  \[ \text{Number of nosocomial infections} \times 100 \]
  Number of patients admitted
  In this rate a patient with 2 infections is counted twice

- Hospital wide patient infected rate /100 Admissions for a given period: month, quarter, year.
  \[ \text{Number of patients infected} \times 100 \]
  Number of patients admitted
  In this rate a patient with 2 infections is counted only once
Ward Specific Rates

- Rate of infection /1,000 HD
  \[= \text{Number of infections} \times 1000 \div \text{Number of hospital days}\]

- Rate of Patients infected /1,000 HD
  \[= \text{Number of patients infected} \times 1,000 \div \text{Number of hospital days}\]
Device Specific Rates, Procedure Specific Specific Rates

● Surgical Site Infection rate:
  \[ \text{Surgical Site Infection rate} = \frac{\text{Number of surgical site infections}}{\text{Number of patients operated on}} \times 100 \]

● Ventilator Associated Pneumonia rate:
  \[ \text{Ventilator Associated Pneumonia rate} = \frac{\text{Number of ventilator associated pneumonia}}{\text{Number of patients on ventilator.days}} \times 1,000 \]

● Catheter Related Blood Stream Infection rate:
  \[ \text{Catheter Related Blood Stream Infection rate} = \frac{\text{Number of Catheter related BSI}}{\text{Number of patients on IV line .days}} \times 100 \]
The Device Utilization Rate (DUR) is the proportion of patient days for which a certain device is used.

DUR are specific to a certain device: catheter, IV line, ventilator.

DUR reflects the amount of devices used and is a reflection of the patient severity.

\[
\text{DUR} = \frac{\text{Number of Device Days}}{\text{Number of Patient Days}} \times 100
\]
NNIS

- National Nosocomial Infections Surveillance = NNIS
- Started in 1970 with 62 hospitals
- Provide acute care, 100+ beds, ≥ 1 ICP
- Not necessarily representative of all acute care hospitals
- Progressively extended to 300 hospitals in 42 states
- Voluntary, confidential
- Benchmark rates published for inter-hospital comparisons
- Comprehensive hospital-wide surveillance carried out until 1991, discontinued in 1998
- Replaced by targeted surveillance
NHSN

- National Health Safety Network = NNIS
- Designed to facilitate participation by large number of hospital
- Expand enrollment to other types of health care settings
NHDS

- National Hospital Discharge Survey = NHDS
- Probability survey of characteristics of in-patients discharged from non-federal short-stay hospitals in the US
- 3 stage random sampling:
  - Geographic areas: counties
  - Hospitals
  - Patient discharges
- Patient age, gender, diagnoses, procedures, admission & discharge dates
- 2002: 445 hospitals, 37.5 million discharges
Estimates of Health Care Associated Infections in USA

- 176.4 million patient days (PD)
  - 93% in children & adults
  - 7% in newborns
- 1.7 million HAI
- 99,000 deaths
- Rates
  - ICU 13 /1,000 PD
  - High risk nursery 7 /1,000 PD
  - Well baby nursery 3 /1,000 PD
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### Estimates of Health Care Associated Infections in USA


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<thead>
<tr>
<th></th>
<th>Well Baby</th>
<th>Hi risk nursery</th>
<th>ICU</th>
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<tbody>
<tr>
<td>UTI</td>
<td>0.19</td>
<td>0.5</td>
<td>3.38</td>
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<tr>
<td>BSI</td>
<td>0.76</td>
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<tr>
<td>Pneumonia</td>
<td>0.24</td>
<td>0.9</td>
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<td>SSI</td>
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<td>Other</td>
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<tr>
<td>Total</td>
<td>2.56</td>
<td>6.88</td>
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