Mongolian Emergency Service
Hospital Hygiene Project
MeshHp.mn

How to detect and count nosocomial infections (NI)

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Definitions

Prevalence

- Proportion of **all** cases in relation to whole group at one time point
- Number of nosocomial infections : number of all patients x 100
- Unit: %

Incidence (incidence rate, incidence density)

- Proportion of **new** cases in time period in relation to person time under risk
- Number of new nosocomial infections : total of patient days under risk x 1,000
- Unit: number per 1,000 risk (patient) days

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Example

Prevalence

- One day in hospital, 200 inpatients, 10 cases of nosocomial infections
- 10 : 200 x 100 = 5
- Result: 5 %

Incidence (incidence rate, incidence density)

- Study over 8 days, 200 patients for the whole period, 10 cases of nosocomial infections – 200 x 8 = 1,600 patient days
- 10 : 1,600 x 1,000 = 6.25
- Result: 6.25 per 1,000 patient days

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Definition:

- Within first 2 days: brought from outside
- After 2 days stay: nosocomial infection
  (Healthcare associated infection = HAI)

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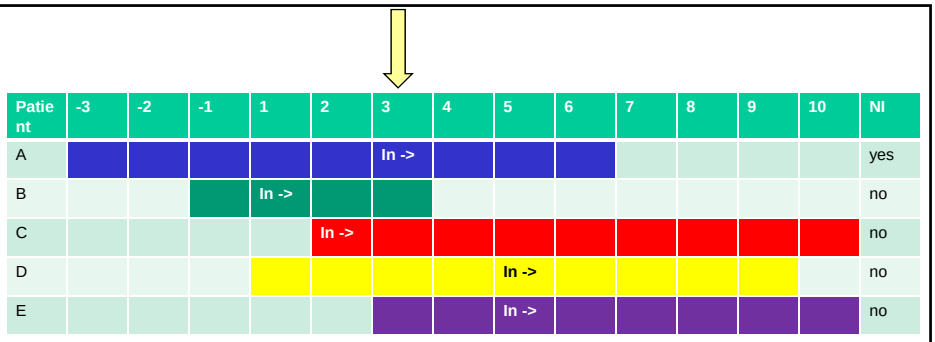

One day prevalence

Study done on day 3
Patients: 5
Nosocomial infection: A
Prevalence: 1 : 5 x 100 = 20 %

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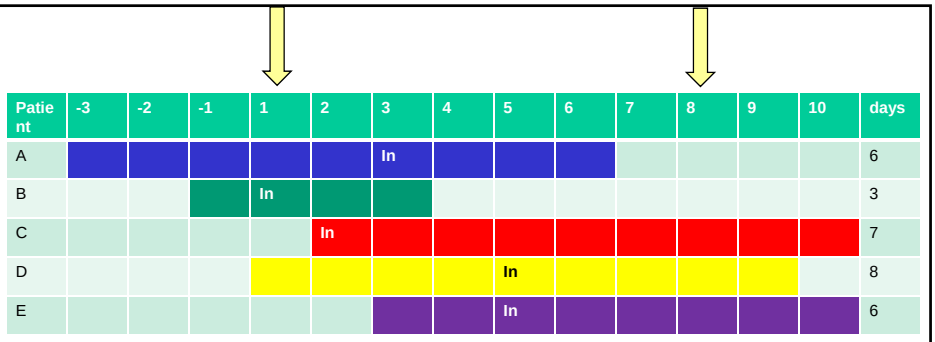

Incidence

Study done from day 1 to 8
Patient days under risk: 6 + 3 + 7 + 8 + 6 = 30
Nosocomial infection: A, D, E
Incidence: 3 : 30 x 1,000 = 100 per 1,000 patient days

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Typical nosocomial infections which are counted:

- Surgical site infections
- Device-associated infections like
  - sepsis,
  - pneumonia,
  - urinary tract infections

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Prevalence of hospital-acquired infections and antibiotic use in two tertiary Mongolian hospitals

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Data collection

A one-day prevalence study was conducted during two consecutive weeks: the weeks starting 30 September 2008 in hospital A and 8 October 2008 in hospital B. On the study day, each of the 18 ICPs was designated 20–30 patients in surgical departments, intensive care and emergency units (IC&EU) or 30–40 patients in obstetrics and gynaecology (O&G), and medical departments.

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SUMMARY

Health statistics of Mongolia indicate that hospital-acquired infections (HAIs) occur in 0.01–0.05% of all hospital admissions. This is considerably lower than internationally reported rates. A one-day survey was conducted in two tertiary hospitals of Ulaanbaatar in September 2008 to estimate HAI prevalence, associated risk factors and patterns of antibiotic usage. Among 933 patients surveyed, 50 (5.4%) were diagnosed with HAI. Prevalence of surgical site infection was 1.1% (3.9% among surgical patients), bloodstream infection 0.3%, respiratory tract infection 1.3%, urinary tract infection 1.3%, and other HAI 1.4%. Microbiological investigations were only documented for 18.9% of all patients. A total of 558 patients (59.8%) were taking 902 courses of antibiotics; 92.1% of patients were prescribed antibiotics without a sensitivity test. Multiple logistic regression analysis revealed that HAI was significantly associated with the admission source, the hospital, length of hospital stay, surgical and other invasive procedures, urinary catheters and other indwelling devices. The study results were comparable with reports from some other developing countries and confirm that official statistics underestimate the true frequency of HAI in Mongolia.

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Antibiotic use

A total of 558 (59.8%) patients were taking 902 courses of antibiotics with the average number of antibiotics per patient being 1.62 (SD: 0.88; range: 1–6). In hospital A, 208 (51.4%) patients were taking 308 antibiotic courses with an average of 1.48 (SD: 0.75; range: 1–5) antibiotics per patient, whereas in hospital B, 350 (66.3%) patients were taking 594 courses with an average of 1.70 (SD: 0.94; range: 1–6) antibiotics per patient. At the time of the study, the mean duration of antibiotic therapy was 3.63 days (SD: 2.47; range: 0–14; median: 4.0) in hospital A, 3.71 days (SD: 3.21; range: 0–22; median: 3.0) in hospital B, and 3.68 days (SD: 2.90; range: 0–22; median: 3.0) overall.

Twenty-two types of antibiotic were administered to patients, the most common being ampicillin, gentamicin and cefazolin, together accounting for 72.2% of all antibiotics administered. The

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Antibiotic use

A total of 558 (59.8%) patients were taking 902 courses of antibiotics with the average number of antibiotics per patient being

Germany: 25 %

60 % - 25 %
Mostly „blind“ therapy!

Result in Mongolia:
40 – 70 % ESBL in Gram negative bacteria! (Prof. Pfeffer, Düsseldorf)
Germany: < 10 %

the most common being ampicillin, gentamicin and cefazolin, together accounting for 72.2% of all antibiotics administered. The

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What you can do

One day prevalence study: good overview

Ongoing study starting with certain procedures:
- Reoperation because of infection
- Antibiotics given
- Microbiologic positive result

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One day prevalence study

Define a day.
Inform the wards.
Go on that day on every ward and go through the patient records.
Best with help of ward staff.

You also can go to ward 1 and 2 on day 1 and on ward 3 and 4 on day 2 and…

Advantage:
It gives you some impression about the situation.
It would be a BIG step in Mongolian hospitals.
It is easy to do.

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Study starting with reoperation because of infection

Wound infection rate may be too low because patients are lost after leaving hospital.
Usually patients come back in hospital when they have problems after operation.
Define indicator operations.

Get the operation plan every day and ask about reason of reoperation.
Count the infections and all patients with this operation.
Infections : all operations x 100
Result: %

Rather easy to do, number to look for is small.

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Study starting when antibiotics are given

Go every day to ward and have a look who is getting antibiotics.
Ask: why?
If reason is infection – count

Problem:
Too many antibiotics given in Mongolia with no clear reason.
Maybe not good method.
But: It may raise concern about use of antibiotics.

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Study starting with microbiologic positive result

Easy: you get it from lab.
Then go to ward and clarify reason.
If nosocomial: count. Also all inpatients or group you look on.

Problem: Few microbiologic investigations, questionable lab quality.

Easy to perform for positive blood cultures!!
But it depends, that blood cultures are taken always if patient has fever without clear reason.

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3.1.1 Superficial incisional

Infection occurs within 30 days after the operation and involves only skin and subcutaneous tissue of the and at least one of the following:

- purulent drainage with or without laboratory confirmation, from the superficial incision
- organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incisic
- at least one of the following signs or symptoms of infection: pain or tenderness, localised swelling, or heat and superficial incision is deliberately opened by surgeon, unless incision is culture-negativ
- diagnosis of superficial incisional SSI made by a surgeon or attending physician.

3.1.2 Deep incisional

Infection occurs within 30 days after the operation if no implant[i] is left in place or within 90 days if implant is in place and the infection appears to be related to the operation and infection involves deep soft tissue (e.g. fascia, muscle) of the incision and at least one of the following:

- purulent drainage from the deep incision but not from the organ/space component of the surgical site
- a deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (> 38°C), localised pain or tenderness, unless incision is culture-negative
- an abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination
- diagnosis of deep incisional SSI made by a surgeon or attending physician.

3.1.3 Organ/space

Infection occurs within 30 days after the operation if no implant[i] is left in place or within 90 days if implant is in place and the in
organs and spa
the following:

- purulent
- organism
- an absc
during r
- diagnosi

Important: Definition of infections!

You need definitions in order to decide whether it is a nosocomial infection!

3.2 Bloodstream infection

3.2.1 Case definition

Patient has at least one positive blood culture for a recognised pathogen

– or –

Patient has at least one of the following signs or symptoms: fever (> 38 °C), chills, or hypotension

And

two positive blood cultures for a common skin contaminant (from two separate blood samples, usually within 48 hours).

Skin contaminants = coagulase-negative staphylococci, *Micrococcus* spp., *Propionibacterium acnes, Bacillus* spp., *Corynebacterium* spp.

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3.3 Pneumonia (PN 1–PN 5)

X-ray

Two or more serial chest X-rays or CT-scans with a suggestive image of pneumonia for patients with underlying cardiac or pulmonary disease* (in patients without underlying cardiac or pulmonary disease, one definitive chest X-ray or CT-scan is sufficient).

Symptoms

and at least one of the following:

- fever > 38 °C with no other cause
- leukopenia (< 4 000 WDC/mm3) or leucocytosis (≥ 12 000 WDC/mm3).

and at least one of the following (or at least two, if clinical pneumonia only = PN 4 and PN 5):

- new onset of purulent sputum, or change in character of sputum (colour, odour, quantity, consistency)
- cough or dyspnea or tachypnea
- suggestive auscultation (rales or bronchial breath sounds), rhonchi, wheezing
- worsening gas exchange (e.g. O_2 desaturation or increased oxygen requirements or increased ventilation demand)

and

according to the used diagnostic method:

Microbiology

a) Bacteriologic diagnostic performed by:

Positive quantitative culture from minimally contaminated LRT specimen **(PN 1)**

- broncho-alveolar lavage (BAL) with a threshold of ≥ 10^4 colony forming units (CFU)/ml or ≥ 5% of BAL-obtained cells contain intracellular bacteria on direct microscopic exam (classified on the diagnostic category BAL)
- protected brush (PD Wimberley) with a threshold of ≥ 10^3 CFU/ml
- distal protected aspirate (DPA) with a threshold of ≥ 10^3 CFU/ml.

Positive quantitative culture from possibly contaminated LRT specimen **(PN 2)**

- Quantitative culture of LRT specimen (e.g. endotracheal aspirate) with a threshold of 10^6 CFU/ml.

b) Alternative microbiology methods **(PN 3)**

- positive blood culture not related to another source of infection
- positive growth in culture of pleural fluid
- pleural or pulmonary abscess with positive needle aspiration
- histologic pulmonary exam shows evidence of pneumonia
- positive exams for pneumonia with virus or particular germs (e.g. Legionella, Aspergillus, mycobacteria, mycoplasma, *Pneumocystis jiroveci [previously P. carinii]*):
  - positive detection of viral antigen or antibody from respiratory secretions (e.g. EIA, FAMA, shell vial assay, PCR)
  - positive direct exam or positive culture from bronchial secretions or tissue
  - seroconversion (example: influenza viruses, *Legionella, Chlamydia*)
  - detection of antigens in urine (*Legionella*).

c) Others

- positive sputum culture or non quantitative LRT specimen culture **(PN 4)**
- no positive microbiology **(PN 5).**

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Some simple definitions			
Nosocomial infection	**Simple criteria**	**Microbiology**	**X-ray**
Surgical site infection	Any purulent discharge, abscess, or spreading cellulitis at the surgical site during one month after operation	(Needed)	
Urinary infection	Positive urine culture (1 or 2 species) with at least 105 bacteria/ml, with or without symptoms	Needed!	
Respiratory infection	Respiratory symptoms with at least two of the following signs appearing during hospitalisation: ▪ Cough ▪ Purulent sputum ▪ New infiltrate on chest X-ray consistent with infection		(Needed)
Vascular catheter infection	Inflammation, lymphangitis or purulent discharge at the insertion site of catheter	(Needed)	
Septicaemia	Fever or rigours and at least one positive blood culture	Needed!	

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Thank you for your attention!

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