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Infection control and preventive strategies in ICU

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Contents

List of tables

List of figures

List of abbreviations

- **AGNB** : Aerobic Grame Negative Bacilli.
- **APACHE**:Acute Physiology And Chronic Health Evaluation.
- **CDC** : Centers for Disease Control and Prevention.
- **CFU** : Colony-forming units.
- **CoNS** : Coagulase-Negative Staphylococci.
- **CVC** : Central Venous Catheter.
- **ESBL** : Extended-Spectrum B-Lactamase.
- **FEV** : Forced Expiratory Volume.
- **GALT :** Gut associated lymphoid tissue.
- **GI tract** : Gastro-intestinal tract.
- **HCW** : Health-Care Worker.
- **H influenza** : Hemophylus influenza.
- **ICU** : Intensive Care Unit.
- **IV** : Intra-venous.
- **MRSA** : Methicillin-resistant Staphylococcus aureus.
- **NI** : Nosocomial infection.
- **NNIS** : National Nosocomial Infection Surveillance system.
- **P aeruginosa** : Pseudomonas aeruginosa.
- **PPMs** : Potential pathogenic micro-organisms.
- **S aureus :** Staphylococcus aureus.
- **S pneumonia :** Staphylococcus pneumonia.
- **SDD** : selective digestive decontamination.
- **SSI** : Surgical site infection.
- **UTI** : Urinary tract infection.
- **VRE** : Vancomycin-resistant enterococci.
- **VRSA** : Vancomycin-resistant Staphylococcus aureus.

بسم الله الرحمن الرحيم

قالوا سبحانك لا علم لنا إلا ما

علمتنا إنك أنت العليم الحكيم

صدق الله العظيم

Introduction:

Microbial organisms (microbes) make up about 90% of the living matter on this planet. They are all around us: in the air we breathe, the food we eat, and the water we drink. They are on our skin, under our fingernails, in our nose and mouth, and armies of them congregate in our intestinal tract **(Marino, 2007).**

Most microbes have nothing to gain by invading the human body (viruses will be excluded here), but they have much to lose because they are killed by the inflammatory response. It seems then that survival would dictate that microorganisms avoid the interior of the human body, not invade it **(Marino, 2007) .**

When thinking about patient's safety, the connection to infections might not readily come to mind as a strong correlate in comparison with other high-risk healthcare activities, such as the medication use process. Yet, there is a significant relationship between infections and patient safety; In fact, healthcare-acquired infections are one of the leading causes of morbidity and mortality in patients **(Chapman, 2001).**

Nosocomial infections (NIs) now concern 5 to 15% of hospitalized patients and can lead to complications in 25 to 33% of those patients admitted to ICUs. The most common causes are Pneumonia related to mechanical ventilation, intra-abdominal infections following trauma or surgery, and bacteremia derived from intravascular devices. This overview is targeted at ICU physicians to convince them that the principles of infection control in the ICU are based on simple concepts and that the application of preventive strategies should not be viewed as an administrative or constraining control of their activity. But, rather, as basic measures that are easy to implement at the bedside **(Eggimann & Petit, 2001).**

Definitions and Epidemiology

1- DEFINITIONS

Hospital acquired infection:

An infection found to be active, or under active treatment at the time of the survey, which was not present on admission. In general, infections that manifest after 48 hours of admission are generally considered to be nosocomial in origin. With patients recently admitted, it is necessary to judge if any infection was being incubated on admission, and to mark such as not hospital acquired, i.e. established infection which has resulted from an earlier admission is recorded as suffering from hospital and not community acquired infection **(Garner, 1996).**

Decontamination:

Decontamination is a process which removes or destroys microorganisms to render an object safe for use. It includes cleaning, disinfection and sterilization **(Garner, 1996).**

Disinfection:

Disinfection is a process that reduces the number of pathogenic microorganisms, but not necessarily bacterial spores, from inanimate objects or skin, to a level which is not harmful to health **(Garner, 1996).**

Asepsis:

The prevention of contact with micro-organisms **(Garner, 1996).**

Colonization

Colonization is defined as the presence of a micro-organism in an internal organ that is normally sterile (e.g., lower airways, bladder), without an inflammatory response of the host **(Silveteri et. al, 2005).**

Infection

Infection is a microbiologically proven clinical diagnosis of inflammation, local and/or generalized. This includes not only clinical signs, but also the presence of at least a moderate (2+) number of leukocytes and micro-organisms of more than or equal to 10 CFU/ml in diagnostic samples obtained from an internal organ, or the

isolation of a micro-organism from blood, cerebro-spinal fluid, or pleural fluid **(Silveteri et. al, 2005).**

Sepsis

Is defined as clinical signs of generalized inflammation caused by micro-organisms and/or their products **(Silveteri et. al, 2005).**

Septicemia

Is sepsis combined with a positive blood culture **(Silveteri et. al, 2005).**

Surgical site infection (SSI):

Any infection occurring within 30 days of an operative or accidental procedure involving a break in the designated epithelial surface with any of the following:

-At least one sign or symptom of infection is present, such as pain or tenderness, localized swelling, redness, or heat.

-Pus or culture-positive fluid discharges from a closed incision;

-A surgeon opens a closed incision, unless it is culture-negative;

-Incision dehiscence unless culture results are negative;

-Abscess diagnosed post operatively using imaging techniques; and discharge of pus from beneath a drain **(Eggimann & Petit, 2001).**

Blood stream infection:

Primary blood stream infection refers to a bacteremia (or fungemia) for which there was no documented distal source and includes those infections resulting from an IV line or arterial line infection clinical sepsis has one of the following clinical signs or symptoms with no other recognized cause:

Fever (38°C); hypotension (systolic blood pressure 90mmHg); or oliguria (20mL/h); plus all of the following: blood culture not performed or no organism detected in blood; no apparent Infection at another site; and the physician administers appropriate antimicrobial therapy for sepsis **(Eggimann & Petit, 2001).**

Lower respiratory tract infection:

i- Pneumonia:

New or increased production of purulent sputum and/or a fever 38°C with clinical signs (ie, rales, dullness to percussion) and/or chest radiograph showing new or progressive infiltrate, consolidation, cavitations, or pleural

effusion not attributable to another disease **(Eggimann & Petit, 2001)**.

ii-Ventilator–associated pneumonia:

New radiographic infiltrate for at least 48h and at least two of the following: fever 38.5°C or 35.0°C; leukocytes 10,000/L or 3,500/L, purulent sputum, or isolation of pathogenic bacteria from lower respiratory tract **(Eggimann & Petit, 2001).**

2- Epidemiology

Epidemiologic data collected from surveillance activities are used to determine nosocomial infection rates. Benchmarking then may be used to monitor their evolution and to detect any unusual variation that may be potentially suspect of outbreaks or high endemic rates of NI. Importantly, NI rates vary widely according to the type of ICU and the population served **(Eggimann & Petit, 2001).**

A-Risk factors:

Independent risk factors for NIs have been identified in several studies, Among them, the severity of underlying illness assessed by scoring systems such as APACHEII/III or simplified acute physiologic score II are the most widely used. However, these scores were designed to predict mortality and are less consistent predictors of NIs **(Keita-Perse and Gaynes, 1996).**

A prolonged length of stay in hospital, mechanical ventilation, and the use of vascular accesses also