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Recent Trends of Antimicrobial Therapy in ICU Patients

Essay

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Care

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Aim of the Work

This essay discusses recent trends of antimicrobial therapy in ICU patients.

Contents

S	Subjects I	Page
•	List of Tables	I
•	List of Figures	II
•	List of Abbreviations	III
•	Introduction	1
•	Chapter (1): Definition and Types of Antimicrobials	s5
•	Chapter (2): Strategic Use of Antimicrobials in ICU	15
•	Chapter (3): Antimicrobial Resistance	28
•	Chapter (4): Antimicrobial Management of Ventilat	or
	associated pneumonia (VAP) in ICU	42
•	Chapter (5): Antimicrobial Management of Sepsis in	n
	ICU	57
•	Summary	76
•	References	80
•	Arabic Summary	

List	of	ta	6	les

List of Tables

Table	Title	Page	
1.	Criteria for SIRS syndrome	58	

List of Figures

Fig.	Title	Page
1.	Mechanisms of antibiotic resistence	page32

List of figures

□ List of abbreviations

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5FC 5 Flurocystocine

AEAT Appropriate empirical antibiotic therapy

AMB Amphotercin B

ARDS Acute respiratory distress syndrome

AZT Zidovudine

BAL Bronchoalveolar Lavage

BALF Bronchoalveolar lavage fluid

CAP Community-Acquired Pneumonia

CLSI Clinical and Laboratory Standards Institute

CMV Cytomegalo virus

CORD Chronic obstructive respiratory disease

CPEs Carbapenemase-producing enterobacteraciae

CRP C-Reactive Protein

CVC Central venous catheter

CVP Central venous pressure

ScVO ₂ Central venous oxygen saturation

DAEAT Delayed appropriate empirical antibiotic therapy

□ List of abbreviations

ECV Epidemiologic Cutoff Values

ET Endotracheal Tube

EUCAS European Committee on Antimicrobial Susceptibility

Testing

FDA Food and Drug Administration

G6PD Glucose-6-Phosphate Dehydrogenase

GI Gastrointestinal

GU Genitourinary

HBV Hepatitis B virus

HIV Human Immunodefeciency Virus

HS Herpes Simplex Virus

IEAT Inappropriate empirical antibiotic therapy

IMV Invasive mechanical ventilation

MAP Mean arterial pressure

MDR Multi-Drug Resistant

MIC Minimum Inhibitory Concentrations

MRAB Multidrug Resistant A. baumannii

MRSA Methesillin Resistant Staphylococcus Aureus

PCT Procalcitonin

List of abbreviations

PCR Polymerase chain reaction

RCTs Randomized controlled trials

SIRS Systemic Inflammatory Response Syndrome

SNP Single nucleotide polymorphism

TREM-1 Triggering receptor expressed on myeloid cells

UTI Urinary Tract Infections

VAP Ventilator Associated Pneumonia

VRE Vancomycin Resistant Enterococcus

VRSA Vancomycin Resistant S. aureus

WBCs White blood cells

WCC White cell count

WT Wild Type

Introduction

An antimicrobial is an agent that kills microorganisms or inhibits their growth. Antimicrobial medicines can be grouped according to the microorganisms they act primarily against. For example, antibacterials (commonly known as antibiotics) are used against bacteria, antifungals are used against fungi and antivirals are used against viruses. They can also be classed according to their function. Antimicrobials that kill microbes are called microbicidal; those that merely inhibit their growth are called microbiostatic. Disinfectants such as bleach are non-selective antimicrobials (Kingston, 2008).

Examples of antimicrobial agents: Tetracycline, an antibiotic used to treat urinary tract infections, Oseltamivir, an antiviral that treats the flu, and Terbinafine, an antifungal that treats athlete's foot (Kingston, 2008).

Important considerations must be taken when prescribing antimicrobial therapy: obtaining an accurate diagnosis of infection, understanding the difference between empiric and definitive therapy, identifying opportunities to switch to narrow-spectrum, cost-effective oral agents for the shortest duration necessary, understanding drug characteristics of antimicrobial agents (such as pharmacodynamics and efficacy at the site of infection), as well as identifying host characteristics that influence antimicrobial activity, and the adverse effects of antimicrobial agents on the h1ost (Leekha et al., 2011).

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Antimicrobial resistance has emerged as an important determinant of mortality for patients in the intensive care unit. This is largely due to the increasing presence of pathogenic microorganisms with resistance to existing antimicrobial agents, resulting in the administration of inappropriate treatment. Effective strategies for the prevention of antimicrobial resistance within intensive care units are available and should be aggressively implemented (Marin et al., 2005).

These strategies can be divided into nonpharmacologic infection control strategies (e.g., routine hand hygiene, implementation of infection-specific prevention protocols) and antimicrobial management strategies (e.g., shorter courses of appropriate antibmicrobial treatment, narrowing of antimicrobial spectrum based on culture Results). Increasing current efforts aimed at the prevention of antimicrobial resistance is especially important given the limited availability of new antimicrobial drug classes for the foreseeable future (Marin et al., 2005).

Ventilator-associated pneumonia (VAP) is one of the most frequent hospital-acquired infections occurring in intubated patients. The principal determinant of VAP development is the presence of the endotracheal tube (ETT). Contaminated oropharyngeal secretions pool over the ETT cuff and subsequently leak down to the lungs through a hydrostatic gradient. Impairment of mucociliary motility and cough reflex cannot counterbalance with a proper clearance of secretions. Lastly, biofilm develops on the inner ETT surface and acts as a

reservoir for microorganism inoculum to the lungs. New preventive strategies are focused on the improvement of secretions drainage and prevention of bacterial colonization. VAP is a major cause of deaths, morbidity and resources utilization, notably in patients with severe underlying conditions. The development of new diagnostic tools and therapeutic weapons is urgently needed to face the epidemic of multidrug-resistant pathogens (Becher et al., 2011).

According to the American College of Chest Physicians and the Society of Critical Care Medicine, there are different levels of sepsis.

Systemic inflammatory response syndrome (SIRS) is the presence of two or more of the following: abnormal body temperature, heart rate, respiratory rate or blood gas, and white blood cell count.

Sepsis is defined as SIRS in response to an infectious process. Severe sepsis is defined as sepsis with sepsis-induced organ dysfunction or tissue hypoperfusion (manifesting as hypotension, elevated lactate, or decreased urine output). Septic shock is severe sepsis plus persistently low blood pressure following the administration of intravenous fluids (**Dellinger et al., 2013**).

Sepsis is the leading cause of death in critically ill patients in the United States. Sepsis develops in 750,000 people annually, and more than 210,000 of them die. A major shift has occurred in the way investigators view the problem of sepsis. Sepsis may not be attributable solely to an "immune system gone haywire" but may indicate an immune system that is severely compromised and unable