Infection Control in the Intensive Care Unit

2nd Edition

Origin of Potential Pathogens Outside the Patients

Secondary Endogenous Infection

Oropharyngeal Carriage
Stage 1

Primary Endogenous Infection

Gastric Carriage

External Antimicrobials

Hygiene

Lower Airway Colonization
Stage 2

Lower Airway Infection
Stage 3

Exogenous Infection

Pathogenesis of 3 Different Types of Lower Airway Infections
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Infection Control in the Intensive Care Unit
Infection Control in the Intensive Care Unit

Second Edition

Series edited by
Antonino Gullo
Preface

Seven years have passed since the first edition of ‘Infection Control in the Intensive Care Unit’ was published. That book was a compilation of the lectures read at an intensive course on management of infection in the critically ill organised by Professor A. Gullo in Trieste, Italy, and has been completely rewritten by Italian, Spanish, South American, Dutch and Anglo-Canadian authors in this second edition. The book is up to date, with references to publications from 2004. We regard it as important that all statements are justified by the best available evidence. All authors have made efforts to avoid unsubstantiated expert opinion. Although prevention is not entirely separate from therapy, prevention rather than cure is pivotal in this publication.

There are five sections in this second edition. The first section deals with basics in microbiology specifically as they operate in supporting infection control. Surveillance cultures of throat and rectum are an integral part of the microbiological approach of this publication. Surveillance cultures are required to determine the carrier state. Carriage is indispensable for the classification of micro-organisms into low level, high level pathogens and potentially pathogenic micro-organisms. This distinction is crucial as prevention methods target only potentially pathogenic micro-organisms and high level pathogens. The front cover illustrates the usefulness of classifying infections occurring on the intensive care unit [ICU], again using carriage as detected by surveillance cultures. Primary endogenous pneumonias are the main infectious problem on the ICU, with an incidence of about 55%. Primary endogenous pneumonia caused by potential pathogens, both ‘normal’ and ‘abnormal’, usually occurs within a week of admission to ICU. Previously healthy individuals including trauma and surgical patients develop early endogenous pneumonias with the ‘normal’ potential pathogens such as Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis and Staphylococcus aureus. Patients with underlying chronic conditions such as diabetes, alcoholism and chronic obstructive pulmonary disease and who are referred to the ICU from home or from other wards and hospitals, may carry abnormal aerobic Gram-negative bacilli [AGNB] such as Klebsiella, Acinetobacter and Pseudomonas species in their admission flora. This type of patient may develop a primary endogenous pneumonia with abnormal flora. Fortunately, most patients recover from their primary endogenous pneumonia after intensive care treatment including antibiotic therapy. About one third of ICU admissions may develop a late pneumonia, usually after the first weeks’ treatment on ICU. These patients invariably acquire abnormal AGNB, which are associated with the ICU-environment, in their oropharynx. This leads to secondary carriage and oropharyngeal over-
growth, migration and colonisation/infection of the lower airways. This sequence of events is termed secondary endogenous pneumonia because the pneumonia is preceded by oropharyngeal carriage. Finally, *P. aeruginosa* has been described as possessing an intrinsic tropism to colonise lower airways rather than the oropharynx when both sites are equally accessible to bacterial entry. The pathogenesis of this type of pneumonia is termed exogenous because the lung is infected by *Paeruginosa* after direct inoculation without previous carriage. The incidence of exogenous lower airway infections is about 15%, and this exogenous pneumonia can occur at any time during treatment on the ICU.

A new chapter not present in the first edition is dedicated to the standard operating procedure of surveillance cultures. How to process surveillance cultures in order to distinguish the ‘normal’ from the ‘abnormal’ carrier state is described in a separate chapter.

The second section deals with antimicrobials both parenteral and enteral. The most recent systemic antibiotics are discussed. Enteral antimicrobials are often old, but a new chapter on all aspects of enteral non-absorbable antimicrobials is added to the new edition.

Section three deals with policies, infection control, antibiotic and device guidelines. A new addition is the chapter on evidence based infection control. For the first time, 57 outbreaks of infection on ICU - all using molecular techniques for outbreak analysis - are carefully analysed and one third found to be polyclonal rather than, as expected, monoclonal. The four components - parenteral, enteral antibiotics, hygiene and surveillance cultures as part of selective decontamination of the digestive tract - are discussed in a separate chapter.

Section four deals with the infections occurring on neonatal, paediatric and adult ICUs. Infections developing in a particular subset of patients including those with trauma, burns, liver transplant and AIDS are part of section four. Compared with the first edition, a new chapter on clinical virology in all three types of ICU is inserted. Therapy of infection is based on six principles [i] surveillance and diagnostic cultures to identify micro-organisms; [ii] immediate and adequate antibiotic treatment to sterilise the internal organs; [iii] the source of potential pathogens requires elimination for recovery of the original infection and prevention of relapses and/or superinfections; [iv] the use of topical antimicrobials such as aerosolised antimicrobials to sterilise the lower airways; [v] removal or replacement of the foreign device such as the endotracheal tube; [vi] surveillance samples are indispensable to monitor efficacy of treatment. This approach – albeit not always evidence based – is described in a separate chapter.

The last section comprises special topics such as nutrition, gut mucosal protection, the role of the pharmacist in infection control and the control of multi-resistant AGNB and methicillin-resistant *Staphylococcus aureus*. The addition of enteral to parenteral antimicrobials has been shown to be an approach for the control of antimicrobial resistance on the ICU. A five year experience is presented. Evidence based manoeuvres on the ICU are analysed in the final chapter.
We are very grateful to Lynda Jones and Julie Owens for their superb secretarial assistance, to Ken Maddocks for his diagram on the cover page, to Prof. Antonino Gullo for his constructive suggestions, and to Donatella Rizza and Catherine Mazars from Springer for their loyal support.

This second edition is twice the length of the first edition. This is a drawback because good books should be concise, but it is our aim to prune for the third edition in 2012. We hope that this book is instructive, is helpful in your daily clinical practice and that you enjoy it.

H.K.F. van Saene
L. Silvestri
M.A. de la Cal
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