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Foreword

Management of infections in pediatric critical care

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In this special issue of the Journal of Pediatric Intensive Care, we have compiled a series of articles addressing the management of infections in critically ill children. Directed antimicrobial treatment and concurrent supportive care are key aspects of pediatric critical care. According to the World Health Organization, in 2013, approximately 50% of all childhood deaths worldwide were caused by the combination of bacterial, viral, fungal, and parasitic infections [1]. The development of a systemic inflammatory response to an invasive infection defines the sepsis syndrome and sepsis remains the leading cause of multiple organ dysfunction in the pediatric intensive care unit (PICU) [2, 3]. Recent estimates suggest that over one-third of children who die in the PICU suffer from sepsis [4]. Perhaps most worrisome is that the overall prevalence of severe sepsis and septic shock appears to be rising, likely reflecting an expanding vulnerable population with acute and chronic comorbid conditions and increasing rates of multi-drug resistant organisms and opportunistic infections [4–12]

With the current ease of international travel, pediatric intensivists working in both developed and developing countries need to be well-versed in the management of a wide variety of infections that can lead to critical illness. We have therefore chosen to select articles that address a broad range of infectious topics, including basic and advanced management considerations applicable for pediatric intensivists worldwide.

In the first article, directed antibiotic therapy against common bacterial causes of sepsis is reviewed by organism and site of infection. Several studies in adults, and increasingly in pediatrics, have demonstrated that early antibiotic therapy improves outcomes in bacterial sepsis [13–16]. However, these benefits rely on appropriate empiric antibiotic selection which requires attention to the most likely bacterial pathogens affecting a given patient [17]. The second and third articles review adjunctive and novel therapies for pediatric septic shock, including consideration for sepsis/hemophagocytic lymphohistiocytosis/ macrophage activating syndrome overlap that is characterized by hyperferritinemia, persistent cytopenias, and evidence for uncontrolled systemic inflammation.

In the fourth article, the management of common and severe viral infections is reviewed. Although targeted management remains limited for most viral infections, several pathogens may be amenable to specific therapies and the approach to supportive care can also vary

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between different viral syndromes. Considerations for treating patients during seasonal influenza outbreaks, as well as the role of the pediatric intensivist during global pandemics, is addressed in the fifth article. Bacterial co-infection in children with an underlying viral syndrome presents a particularly important challenge as diagnostic tests lack necessary sensitivity and specificity. However, given the significant adverse impact of bacterial co-infection, particularly *Staphylococcus aureus*, on morbidity and mortality in the PICU [18], antibiotic management strategies are reviewed for patients with influenza and other viral syndromes.

The management of invasive fungal infections, parasitic diseases and special considerations for patients with immune compromise are each reviewed in a dedicated article. The most common invasive fungal infection seen in critically ill children is invasive candidiasis, and this is the main focus of the sixth article. Empiric, preemptive and definitive therapy for invasive candidiasis is reviewed, and recommendations for evaluation of disseminated candidiasis are provided. Severe manifestations of parasitic infections necessitating intensive care are discussed in the review of parasitic diseases. The epidemiology, presentation and diagnosis, treatment, and prevention of malaria, neurocysticercosis, *Strongyloides*, Chagas disease, baylisascariasis, and amoebic meningoencephalitis are reviewed. In the eighth article, management of infections in the immunocompromised host is reviewed, including host factors, key diagnostic considerations, and management of bloodstream and pulmonary infections.

The final article addresses the management of children with healthcare-associated infections (HAIs), an increasing, costly, and largely preventable problem in hospitals and PICUs across the world [19–21]. This review addresses common HAIs, including central line-associated bloodstream infections, catheter-associated urinary tract infections, ventilator-associated events and nosocomial viral infections. For each problem, recommendations for targeted management are provided, in addition to strategies to prevent and reduce the occurrence of HAIs.

Despite important public health advances over the last century, including improved sanitation, clean drinking water, peri-partum antimicrobial prophylaxis, and access to growing repertoire of vaccines, we will always share our world with a wide variety of microorganisms whose only evolutionary goal is to infect and reproduce. The management of bacterial, viral, fungal and parasitic infections will therefore remain a cornerstone of the care that we provide as pediatric intensivists. The compilation of articles in this issue of the Journal of Pediatric Intensive Care provides an important overview of the complex management strategies necessary to restore the health of our world's most previous resource–our children.

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