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MODERN APPROACHES TO THE REHABILITATION OF COMMUNITY-ACQUIRED PNEUMONIA IN CHILDREN

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Annotation: To provide cutting-edge information for the management of community-acquired pneumonia in children under 5 years, based on the latest evidence published in the literature. In the era of largely implemented bacterial conjugate vaccines and widespread use of amplification nucleic acid techniques, respiratory viruses have been identified as the most frequent causative agents of community-acquired pneumonia in patients under 5 years. Hypoxemia (oxygen saturation ≤96%) and increased work of breathing are signs most associated with community-acquired pneumonia. Wheezing detected on physical examination independently predicts viral infection and the negative predictive value (95% confidence interval) of normal chest X-ray and serum procalcitonin <0.25 ng/dL was 92% (77---98%) and 93% (90---99%), respectively. Inability to drink/feed, vomiting everything, convulsions, lower chest indrawing, central cyanosis, lethargy, nasal flaring, grunting, head nodding, and oxygen saturation <90% are predictors of death and can be used as indicators for hospitalization. Moderate/large pleural effusions and multilobar infiltrates are predictors of severe disease.
Keywords: Pneumonia, CAP, treatment, method.

INTRODUCTION

Community-acquired pneumonia (CAP) is still a leading cause of death among children aged less than 5 years worldwide, with an estimate of 0.921 million deaths in 2015. Indeed, CAP was second only to preterm birth complications, being the leading cause of death in countries with high under-5 mortality rate, yet important in medium high, and medium child mortality countries. Furthermore, CAP imposes a substantial burden on health services and is a major cause of hospital referral and admission. According to the last estimate, in 2020, roughly 265,000 deaths due to CAP took place in hospitals, 99% of them in developing countries.

MATERIALS AND METHODS

Up to the 1990's, bacterial infections were the main concern about CAP etiology, particularly pneumococcal infection. Besides being a classical concept in medicine, derived from the available bacteriological assays that were routinely used to investigate CAP etiology, this concept was highlighted by the finding that death due to CAP was mainly secondary to bacterial infection. Based on this finding, the World Health Organization (WHO) launched a program with guidelines aiming to identify children at risk of having CAP, who should receive empiric antibiotic treatment promptly. As a matter of fact, this program was quickly deemed to have a substantial effect on child mortality.

RESULTS AND DISCUSSION

The screening of children with complaints of acute respiratory infection to diagnose pneumonia relies initially on clinical aspects. Since the early 1990's, the WHO has recommended the use of quantitative tachypnea (age-specific elevated respiratory rates) to identify children that would require treatment with antibiotics for possible pneumonia. It is necessary to clarify that the WHO respiratory rate criteria were selected based on field, observational studies in target epidemiologic settings due to their high sensitivity, reasonable specificity, and ease of implementation where access to formal medical evaluation was limited. Additionally, the evidence base for establishing these criteria is prior to the introduction of vaccines against Hib and *S. pneumoniae*, regarded as the two major causes of CAP mortality. It is also necessary to emphasize that the WHO respiratory rate criteria are not a diagnostic approach; instead, it was recommended to be employed as an easy tool to identify, among children under 5 years with acute respiratory infection complaints, those who had chance to have acompromised lower respiratory tract, who could then be atrisk of dying.

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The gold standard usually considered in the investigation of predictive signs of pneumonia is radiologically-confirmed pneumonia. Radiologic findings consistent with pneumonia include pulmonary infiltrate, either alveolar or interstitial; alveolar infiltrate is characterized as a dense or fluffy opacity that occupies a portion or the entire lobe,or even the entire lung, which may or may not contain air-bronchogram, and interstitial infiltrate is defined as linear and patchy densities in a lacy pattern. Interestingly, it had been demonstrated that the sensitivity(95% CI) of radiologically-confirmed pneumonia for pneumococcal infection was 93% (80%---98%); conversely, the negative predictive value (95% CI) of normal chest X-ray was 92% (77%---98%). These findings were detected among hospitalized and non-hospitalized children.The use of blood inflammatory biomarkers to distinguishbacterial from viral CAP has been investigated. Procalcitonin (PCT) and C-reactive protein (CRP) have shown some value in the identification of bacterial infections but it has not been established yet a relevant clinical cut-off point for their use. For instance, in an Italian randomized clinical trial, children with non-severe CAP were admitted at the hospital specifically to be included in this PCT investigation: 155 received antibiotics if the mean serum PCT upon admission was 0.25 ng/mL and the remaining 155 children received antibiotics based on the clinical evaluation of the attending physician. Antibiotics were prescribedto 133 children (85.8%) from the first group and 155 children (100%) from the second group, ($p < 0.05$). The length of antibiotics use was lower (5.37 *vs*. 10.96; $p < 0.05$) as well as the frequency of adverse events related to antibiotics use (3.9% *vs*. 10.96%; $p < 0.05$) in the group that had serum PCT measured. It is necessary to emphasize that none of the patients who did not receive antibiotics worsened or needed antibiotics afterwards. There is a general agreement among distinct international guidelines that orally administered amoxicillin is the first line option to treat outpatients, and ampicillin or aqueous penicillin G or amoxicillin (initiated initially by intravenous route) are the first line options to treat inpatients with CAP in the under-5 years group. Such agreement is based on a general consensus that *S. pneumoniae* is the most common and dreadful bacterial causative agent in childhood CAP among children under 5 years and therefore it should be the target of antibiotic therapy. For example, *S. pneumoniae*detection by blood PCR was recently identified as predictor of hypoxemia among children hospitalized with CAP.

CONCLUSION

CAP is still a major cause of morbidity and mortality amongchildren aged under-5 years, worldwide. Currently, respiratory viruses are being recognized as major causative agents. Hypoxemia and increased work of breathing are the most associated signs with CAP. In regard to severity assessment, danger signs (inability to drink/feed, vomiting everything, convulsions, lower chest indrawing, central cyanosis, lethargy, nasal flaring, grunting, head nodding, and oxygen saturation <90%) have been recognized as predictors of death and can be used as indicators for hospitalization. The first line option for antibiotic treatment comprises oral amoxicillin for outpatients and ampicillin or aqueous penicillin G or amoxicillin (initiated initially by intravenous route) for inpatients. Future investigations should prioritize the identification and validation of tools to distinguish among children with CAP those with viral infection from those with bacterial infection.

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