WEB OF SCIENTIST: INTERNATIONAL SCIENTIFIC RESEARCH JOURNAL
ISSN: 2776-0979, Volume 4, Issue 1, Jan., 2023

MATHEMATICAL MODELING OF THE DEGREE SEVERITY OF COMMUNITY-ACQUIRED PNEUMONIA IN ADULTS

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ABSTRACT

Modern ideas about the clinical picture of VP and methods of its diagnosis. It should be noted that pneumonia is classified into two types, depending on the conditions under which the disease occurred. These are community-acquired and nosocomial (hospital) pneumonia. Pneumonia should be singled out separately in patients with immunodeficiency conditions. The validity of this approach is due to various causes of pneumonia and different approaches to the choice of antimicrobial chemotherapy. Recently, pneumonia associated with the provision of medical care (healthcare-associatedpneumonia) has been increasingly isolated. This category can include pneumonia in people who are in nursing homes or other long-term care facilities; if there is a history of previous antimicrobial therapy in the last three months or hospitalization for more than two days in the last 90 days. According to the conditions of occurrence, such pneumonia is considered as non-hospital. However, they may differ from the latter in the composition of excitants and the profile of their antibiotic resistance. Modern guidelines suggest avoiding the term “atypical pneumonia” and applying the concept of “pneumonia caused by atypical pathogens”, since it is impossible to fully clarify the nature of community-acquired pneumonia. Usually the onset of the disease is acute, less often gradual. Sometimes ARVI or tracheobronchitis precede the development of pneumonia. The clinical picture of pneumonia is well studied and usually consists of signs such as fever to febrile and subfebrile numbers, cough, sputum production. Specific clinical manifestations include general intoxication syndrome, the main symptoms of which are general weakness, adynamia, headaches, myalgia, decreased appetite, nausea, sweating. Most often, this syndrome indicates the severity of the disease and increases with the appearance of purulent or septic complications in the patient. Some patients have chills, hyperhidrosis, discomfort and soreness in the chest (pleural pain), shortness of breath.

Keywords: Community-acquired pneumonia, mathematical model, correlation, Fisher criterion.

INTRODUCTION

Methods for determining the etiological factor of pneumonia by the presence of antigens in the blood serum at the initial stage of the disease and are usually not recommended for routine use. Serological tests are usually performed to detect intracellular bacteria and include an assessment of the level of IgG and IgM antibodies in paired sera at intervals of several weeks. As express methods, methods for detecting antigens of microorganisms in urine are used. Currently, tests are available in clinical practice to detect S. ppeimopia and L. antigens. pneumophila of group 1 (responsible for 70% of all cases of legionella infection). These methods were first recommended by the American Thoracic Society in 2007 as a screening to determine the possible etiology of VP and prescribe appropriate etiotropic therapy. The speed, ease of implementation and sufficiently high sensitivity (50-80%) and specificity (more than 90%) ensure the convenience of using these tests. In our country, these methods of express diagnostics have been registered relatively recently and so far their use has not gone beyond individual clinical centers.

RESEARCH METHODS

The creation of mathematical models to assess the severity of hospital-acquired pneumonia was carried out on the basis of the results of 105 indicators reflecting the clinical picture, as well as laboratory instrumental data in 98 examined patients. In the cohort examined, men made up 54 (55.1%), women 44 (44.9%) aged from 18 to 83 years.All the examined patients were divided into two groups according to the severity of VP, namely: mild course – 50 people (51%) and severe course – 48 people (49%). When distributing

According to the severity of the examined patients, we were guided by the practical recommendations of the RPO for the diagnosis, treatment and prevention of community-acquired pneumonia in adults.Prerequisites for the development of a mathematical model were considered by the stage of early diagnosis of the severity of VP (during the first day after admission to the hospital).When building models, we relied on a variety of symptoms and syndromes, followed by the selection of the most important data. Discriminant analysis was used to accomplish this task.The Fisher criterion was determined for each feature. Based on the received digital value, the quantitative contribution of each attribute was evaluated. Symptoms for which the significance level according to the F criterion corresponded to $p<0.05$ were included in the mathematical model. The multidirectional parameters of the hemogram were also taken into account - both elevated and lowered for the most complete coverage of laboratory data. The basis of the mathematical model of gravity was composed of

signs, constants and coefficients of equations determined by the least squares method. The sign of the coefficient corresponded to the sign of correlation between the disease code and the corresponding information indicator.

CONCLUSION

Mathematical modeling in the field of pulmonology is important because it provides an objective approach to assessing the severity of the patient's condition, allowing you to correctly diagnose, determine the prognosis, prescribe adequate therapy (Samoilov R.G., 2007). Therefore, at the next stage of the study, we developed a mathematical model of the severity of the course of pneumonia for early diagnosis on the first day of admission of patients to the hospital.When developing the model, we took into account the most important signs of the disease. To implement this task , the following was used discriminant analysis.The Fisher criterion was determined for each feature. Based on the obtained digital value, the quantitative contribution of each disease sign was evaluated. Symptoms for which the significance level according to the F criterion corresponded to $p<0.05$ were included in the mathematical model.

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