



Fund “Nauka” Project № 22005 Resume – Competition-Based Session 2022:

“Surveillance and control of healthcare-associated infections – contemporary challenges and opportunities for health promotion”

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The surveillance and control of healthcare-associated infections (HAIs) are among the most priority activities in healthcare related to the prevention of infectious pathology. Modern health care efforts are aimed at limiting the occurrence and spread of HAIs and antimicrobial resistance (AMR) by creating a patient-safe environment. By “patient safety” is meant the absence of unnecessary or probable harm to the patient associated with health care.

The aim of the project is to study the system for surveillance and control of HAIs in the University Multiprofile Hospital for Active Treatment (UMHAT) “St. Marina” for a ten-year period (2011-2021) and to create an integrated health promotion model for the management of HAIs in the modern hospital environment.

The tasks of the research are:

1. To study and analyze the incidence of HAIs in UMHAT “St. Marina” for a ten-year period (2011-2021);
2. To study and compare the relative share of patients who used antibiotics and the incidence of HAIs in the UMHAT “St. Marina” for the 2011-2021 period;
3. To study and analyze the etiological and clinical structure (localization) of HAIs in UMHAT “St. Marina” for the 2011-2021 period;
4. To study and analyze the activity related to disinfection, disinsection and deratization in the UMHAT “St. Marina” for the 2011-2021 period;
5. To study and analyze epidemic outbreaks that have occurred in UMHAT “St. Marina” for the 2011-2021 period;
6. To study the organization of prevention, surveillance and control of HAIs in UMHAT “St. Marina”.

Materials: Quarterly forms with the registered HAIS, protocols of conducted internal microbiological control, diaries of carried out disinfection, disinsection and deratization measures, programs of the hospital facility.

Research methods: theoretical, documentary, statistical and epidemiological.

Expected results:

1. To outline trends related to the level of HAIs in order to adequately manage the processes of control and surveillance of HAIs at the hospital level.
2. To confirm the need to develop adequate targeted programs in hospital treatment facilities (HTPs) regarding the organization of activities for the surveillance,

prevention and control of HAIs, including annual training of all staff on the problems represented in the HAIs control standard.

3. To prove the role and need of the infection control team (ICT) for the management of HAIs in the HTPs, as well as the need to work together with all units and levels in the hospital structure to achieve effective surveillance and control, to improve quality of patient and staff life.

Achieved results:

This study represents the most comprehensive epidemiological analysis conducted to date in Bulgaria, covering the period 2011–2021, on healthcare-associated infections, antibiotic use, and infection control practices in a university hospital of national significance. The findings contribute to expanding scientific knowledge regarding the dynamics of hospital-acquired infections within highly specialized healthcare settings and provide a robust national dataset for comparison with European benchmarks.

The study demonstrates a significant association between the COVID-19 pandemic, increased antibiotic exposure, and changes in the incidence, clinical presentation, and etiological structure of healthcare-associated infections. These trends are consistent with internationally reported patterns and highlight the critical influence of global epidemic events on hospital infection dynamics.

Distinct phases of change in the etiological and clinical profiles of infections have been identified, characterized by a persistent predominance of multidrug-resistant Gram-negative microorganisms and a marked increase in fungal infections, particularly in intensive care settings and in contexts of elevated antibiotic use. Comparative analysis with European reference data from the European Centre for Disease Prevention and Control (ECDC) confirms the reliability of the data and highlights unique features of hospital microbiological ecology in Bulgaria.

For the first time at the national level, a systematic correlation analysis was conducted, revealing statistically significant relationships between the localization of healthcare-associated infections and their causative agents. The identified microbiological profiles by clinical form have direct practical implications for optimizing empirical antibiotic therapy and implementing targeted preventive measures.

From a practical perspective, key high-risk hospital units – including intensive care, dialysis, and hematology departments – have been identified as concentrating the highest incidence of infections and multidrug-resistant microorganisms, making them priority targets for epidemiological surveillance and infection control. The effectiveness of a multimodal disinfection control approach, incorporating microbiological, physicochemical, and rapid monitoring methods, has been documented and may serve as a model for other healthcare institutions.

The study also demonstrates the feasibility of implementing innovative technological solutions, such as intelligent disinfectant dispensers integrated with staff identification badges, as tools for personalized monitoring and analysis of hand hygiene practices, aimed at

enhancing the effectiveness of preventive programs. Based on these results, an integrated model for the management and surveillance of healthcare-associated infections has been developed, combining epidemiological surveillance, digital technologies, continuous staff training, antibiotic stewardship, and hospital environment control within a unified organizational framework. This model has the potential to serve as a national reference for best practices in hospital epidemiology.