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View Point

The Future of Nosocomial Infections

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Abstract

Nosocomial infections remain one of the most severe public health issues, infecting millions of patients worldwide each year. The global prevalence of nosocomial infections varies between 3.0% and 20.7%, with an incidence rate ranging from 5% to 10%. In this short article, we have tried to present a different perspective on the future of nosocomial infections from the author's viewpoint. According to our assessment, due to megatrends such as global exposure, population aging, and augmenting drug resistance, nosocomial infections are expected to become more severe in the future. On the other hand, advancements in health technologies such as e-health, Artificial Intelligence, the Internet of Things, and less invasive interventions form a new generation of hospitals capable of preventing and controlling nosocomial infections. Presenting novel approaches to nosocomial infection management will transform medicine. Therefore, it seems that in the following years, nosocomial infections will follow a different trend.

Keywords: Nosocomial Infections; Past; Future; Megatrends

Introduction

Nosocomial infections (NI) represent a significant global public health concern. These infections can occur during treatment for other illnesses or following a patient's discharge. NI also is a risk to healthcare workers (1). Annually, many patients experience NI, with estimates indicating that 10 out of every 100 inpatients in developing countries and 7 out of every 100 inpatients in developed countries contract these infections (2). These infections increase morbidity, mortality, disability, prolonged hospitalization, and antibiotic resistance. In addition, it imposes a substantial financial burden on healthcare systems (3-5).

As pathogens become more resistant, the number of effective antibiotics for treating these infections has decreased (6, 7). Patient characteristics, on the other hand, have shifted dramatically. Patients in hospitals are substantially older than they were two decades ago, and they have a bigger number of chronic diseases simultaneously (8). Furthermore, there is a significant gap between the availability of guidelines and their actual usage (9). In addition, self-medication, inappropriate antibiotic dose, long-term use, and overuse of antibiotics in hospitals have resulted in the rise of Multidrug-

Resistant Organisms, making these infections increasingly difficult to treat (10).

On the other hand, new technologies in the future are likely to create bigger changes in human life and the world (6, 11-13). these new technologies will be accompanied by the discovery of new methods and processes so that humans can choose wiser options to deal with problems. But according to the mentioned possible, the question arises will NI be a hot topic in the future, or will it be possible to control them better? So far, the future of NI has not been investigated and studied, so in this short article, we have tried to have a relatively different look at the future of NI by reviewing the texts from the perspective of the author.

Discussion

NI has changed over the last century. Some factors that increase NI are related to the conditions and characteristics of the patients, while others are related to global exposure, hospital setting, and diagnostic and treatment factors. On the other hand, factors such as E-health, artificial intelligence, the Internet of Things, less invasive interventions, non-chemical drugs, and new molecular diagnostic techniques lead to the prevention and control of NI. Nevertheless, extrapolation of the past trend of the NI risk in the prediction of the future would not be acceptable. Positive and negative signals will alter the direction of NI in the future, which are discussed in the following paragraphs (Fig. 1).

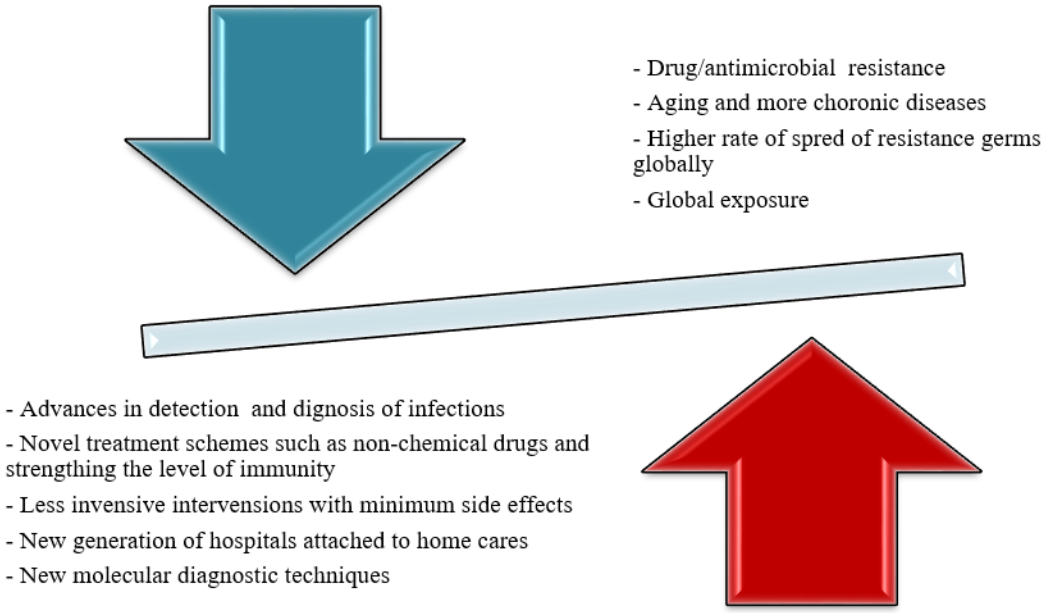

Fig. 1: Factors influencing nosocomial infections in the future

What factors may escalate the burden of NI?

Due to megatrends such as global exposure, population aging, and augmenting drug resistance, NI is expected to become more severe in the future.

We live in a global village where exposures are not limited to a specific region and have a global aspect. Because of the increased transportation, it is now possible to pass resistant infections from one part of the world to another (14). Furthermore, climate change and environmental manipulations, which can be regarded as a worldwide issue, impact the factors that are effective in the emergence and control of infectious diseases (15). In addition, the number of older people worldwide has been increasing (16). The aged ones are more vulnerable to infections due to changes in the function of

their immune system, and chronic co-morbidities (17, 18). Moreover, in recent years, we regularly have seen a higher rate of drug resistance emerging than new antibiotic production (19). In conclusion, global exposure is expected to have considerable effects on NI. Moreover, the number of old patients in the intensive care unit will probably increase, which affects the increase in NI. Furthermore, the treatment of multi-drug resistance infections will be a real concern of clinicians globally.

What factors may lessen the burden of NI?

Advancements in health technologies such as E-health (including Telemedicine, Health Information Systems (HIS), wearable devices, etc.), Artificial Intelligence (AI), Internet of Things (IoT), and less invasive interventions form a new generation of hospitals that are capable of preventing and controlling NI. Moreover, Non-chemical drugs and new molecular diagnostic techniques are also essential in the prevention and management of nosocomial infections.

The use of e-health in medicine and healthcare is increasing rapidly. E-health is used for diagnosis, treatment, prevention, and healthcare management (20). In addition, this technology can be used for remote monitoring and medication administration when used in conjunction with AI and IoT systems (21). It will significantly alter the way diseases are treated. To illustrate, consider the drug delivery that using nanorobots for drug delivery reduces side effects and expedites therapy (22). Moreover, efforts are being made to employ nanorobots to strengthen the body's immune system. Additionally, the use of new technologies is likely to reduce the usage of invasive techniques. In addition, Non-chemical drugs are an essential tool in the fight against nosocomial infections. They may be able to target specific pathogens without harming bacterial flora and combat antibiotic-resistant bacteria (11). Furthermore, the molecular diagnostic method is one of the most significant advances in detecting nosocomial infections (12, 13). These techniques allow for rapid identification of pathogens by detecting their genomes in biological samples. Also, the next-generation of sequencing technologies have revolutionized pathogen identification by allowing for simultaneous detection and characterization of multiple pathogens in a single sample. As a result, using these technologies reduces hospitalizations and the burden of hospital visits, which reduces NI. Moreover, non-chemical drugs and molecular diagnostic techniques will probably be one of the things that strengthen the immune system and also reduce the damage of infections in the future.

Conclusion

Recent advancements are essential in shaping the future and adapting to new situations. Emerging technologies not only improve disease diagnosis; they also improve treatment through the release of medication, administering rapid and complete therapies with minimum side effects. On the other hand, technologies that influence environmental and social factors help control NI. As a result, presenting novel approaches to NI management will transform medicine. Therefore, it seems that in the following years, NI would not follow its historical trend.

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Conflict of Interest

The authors declare that there is no conflict of interests.

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