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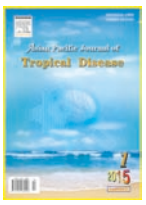

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Simulation as a tool for managing Ebola infection

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ABSTRACT

Ebola virus disease is the present deadly infection. The outbreak in Africa becomes the great concern globally. Several attempts have been launched to manage the problem since its first appearance in Africa. The use of simulations as a tool to manage the problem is very interesting. In this short article, the author briefly summarizes and discusses on this topic.

1. Introduction

Ebola virus disease is the present deadly infection. The disease is caused by a pathogenic virus that can induce severe acute febrile illness with hemorrhagic complications[1,2]. The outbreak in Africa becomes the great concern globally. Several attempts have been launched to manage the problem since its first appearance in Africa. However, the problem in controlling is still existed. To find and apply effective measures is necessary[3]. The use of simulations as a tool to manage the problem is very interesting. In this short article, the author briefly summarizes and discusses on this topic.

2. Clinical simulation towards Ebola virus disease

During an outbreak of a new emerging disease, preparedness becomes an important issue. Using clinical simulation technique can be a useful tool to improve the quality and safety of the management of patients. This is usually useful in managing the highly communicable diseases such as Ebola virus disease. Focusing on the present Ebola virus outbreak, there are some reports on the success of using clinical simulation for preparedness. A good example is the reported from UK[4]. The clinical simulation was studied at the Heathrow Airport. In that study, nurse is trained by clinical simulation[4]. Based on this report, increased self-confidence in managing the case among trained nurse can be obtained[4]. In fact, the clinical simulation for educating and training medical and nurse students is accepted for its usefulness[4-7]. In case of Ebola virus disease, it is approved for providing safety to the trainees[5]. Finally, Ragazzoni *et al.* noted that using virtual reality simulation could help "increase staff safety and create a safe and realistic environment[8]."

3. Computational simulation for Ebola virus disease control and surveillance

Applicability of computational technique to Ebola virus disease control and surveillance is possible. The design of the model has to be based on current update situation[9]. Spatiotemporal variations have to be kept in mind during model development[9]. King *et al.* noted that mathematical model adjustment to correspond to possible error was needed[10]. The good example of good model

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is recently published by Bachinsky and Nizolenko[11]. In that work, Bachinsky and Nizolenko developed a model based on "the range of major countermeasures: preventive and emergency mass vaccination, vaccination of risk groups as well as search for and isolation/observation of infected cases, contacts and suspects, and quarantine[11]." The application of the computation technique can be useful for disease surveillance[3]. Prediction of incidence can be done and this is useful for specific preventive action planning.

The use of computational simulation can also be useful for assessment of intervention towards Ebola virus disease[12]. The simulation to test the effect of vaccine trial can be done. The reports by Bellan *et al.* and Getz *et al.* are the good examples[13,14]. However, as previously note, the control of possible errors such as spatiotemporal variations is needed to decrease the false positive[13]. Not only vaccine trial but also antiviral drug trial can be assessed by simulation technique. Lanini *et al.* noted that simulation of randomized controlled trial clinical study towards Ebola virus disease could be useful and additional contribution to the standard experimental studies[15]. In order to correspond to rapid progression of outbreak, the computational prediction can be the good clue for the practitioners.

4. Bioinformatics study using simulation technique

With advance computational and biological science, the bioinformatics study can be helpful for studying any new emerging disease including Ebola virus disease[16]. Using simulation is a basic principle for prediction in bioinformatics. There are some reports on this topic. Using simulation technique, finding of new antiviral drug and vaccine for Ebola virus disease can be done. For example, Khan *et al.* recently reported successful use of simulation technique for assessment of epitope for Ebola virus[17]. Similar report is published by Omotuyi[18]. Omotuyi successfully identified envelope glycoprotein derived peptide that can be the focus for vaccine development[18].

5. Obstacle of simulation study for Ebola virus disease

As previously noted, simulation can be a useful tool for managing of Ebola virus disease. However, an important concern is the availability of the technique in the outbreak area. Africa is the area with resource limitation. Due to the extremely restricted resource, the development of a good computational simulation model can be problematic[3]. To fight and overcome the problem, international collaboration and multidisciplinary team approach is needed[3].

6. Conclusion

Simulation can be useful in managing of Ebola virus disease. Clinical simulation can help practitioner recognize the problem and can be the safe way for training. Computational simulation can be Ebola virus disease control and surveillance. The good model design is needed. Also, simulation technique is the basic principle for bioinformatics study on the disease.

Conflict of interest statement

We declare that we have no conflict of interest.

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