

Are Current Pandemic Preparedness Plans Adequate to Fight against Novel Pandemic Pathogens?

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The emergence of a novel coronavirus designed as Covid-19 in Wuhan, China, at the end of 2019 is a worldwide public health challenge requiring intensive health care and epidemiological surveillance activities [1]. The Covid-19 pandemic has put many health systems into a very difficult situation due to the higher number of patients requiring intensive care assistance. This situation raises the question: Are current pandemic preparedness plans adequate to fight against novel pandemic pathogens?

Although pandemics have occurred at irregular intervals along the history, pandemic preparedness plans have been developed worldwide only after the severe acute respiratory syndrome (SARS) and avian influenza H5N1 epidemics of 2003. The main reason for this change was the resolution of the World Health Assembly calling to the development of national and global pandemic preparedness plans and to setting targets for seasonal influenza immunization coverage. In 2005, the WHO published its first global guidance and checklist for pandemic planning [2].

The European Centre for Disease Prevention and Control (ECDC) has worked with the WHO's Regional Office for Europe since 2005 in strengthening pandemic preparedness in European countries. In 2009, the WHO's Regional Office for Europe [3] evaluated how pandemic preparedness plans developed by European countries aided the response to the influenza pandemic of 2009. The WHO found the following weaknesses: national plans were not always carried through to the local level and front line services, difficulties in adjusting general pandemic plans and preparedness to the specific requirements of a particular pandemic, sub-optimal information sharing during the pandemic, poor seasonal influenza vaccination coverage, inequitable access to vaccines across Europe, lack of capacity in intensive care and paediatric services, poor use of antivirals to treat influenza patients, lack of effectiveness of new interventions introduced during the pandemic, and excessive concern over the number of cases and deaths to the neglect of more important indices.

There was a common recognition of the danger of simply preparing for a repeat of the 2009 pandemic experience, since all pandemics are different and many countries wanted to move towards making pandemic preparedness a part of general preparedness for a wider range of emergencies [3].

Pandemic preparedness plans can include the following measures: stockpiling of drugs against potential pandemic pathogens, stockpiling of vaccines, stockpiling of personal protection equipment and masks, stockpiling of ventilators for treating critical patients with respiratory diseases, and stockpiling other health resources [3,4]. In addition, emergency preparedness plans should be designed for adjusting the capacity of the health system [3,4].

Pandemic mitigation measures can be implemented to slow the spread of a pandemic and reduce its morbidity and mortality. Nevertheless, pandemic mitigation measures could be implemented on time only when they are available during a pandemic. For this reason, pandemic preparedness plans should assess health needs in terms of drugs against pandemic pathogens, personal protection equipment, masks, vaccines, ventilators and other health resources. Sufficient resources should be allocated to develop and maintain stocks of pandemic measures.

Several evaluative studies have found that stockpiling of antiviral drugs against influenza is a cost-effective public health intervention. Sander, *et al.* [5] found that fully-targeted antiviral treatment and pre-pandemic vaccination against influenza in the United Kingdom were cost-saving from a social perspective. Siddiqui and Edmuds [6] found that stockpiling sufficient antiviral drugs during 30 years to treat all influenza patients was associated with a cost-cost-effective ratio lower than £30.000 per quality adjusted life year gained (QALY). The sensitivity analysis showed that the cost-effectiveness of stockpiling increased when the timing of the pandemic was lower than 30 years and decreased when it was higher than 30 years, but the strategy was also cost-effective when the pandemic occurred in 45 years. Milne, *et al.* [7] assessed the cost-effectiveness of public health interventions against influenza pandemics combining school closure, antiviral drugs for treatment and prophylaxis, workplace non-attendance, and community contact reduction. The study assumed that pandemic viruses were associated with a proportion of symptomatic cases (clinical attack rate) of 32%, a number of secondary cases per infected case (R_0) of 1.8 and case fatality rates ranging from 0.1% to 2.5%. The study found that interventions combining antiviral treatment of patients, antiviral prophylaxis of household contacts and school closure was the most cost-effective one in terms of cost per life year saved.

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