

Seminar Series

Feasibility and potential benefits of a population-wide passive immunotherapy program during an influenza pandemic

Dr. Joseph Wu

**Assistant Professor
Department of Community Medicine
The University of Hong Kong**

Date: November 12, 2009 (Thursday)

Time: 14:00pm

**Venue: Room B6619, MEEM Conference Room,
Academic Building**

ABSTRACT

Treatment strategies of severe cases of pandemic influenza have generally focused on the use of antivirals, anti-inflammatory agents, and non-pharmacologic means such as optimal ventilator and fluid management. In contrast, passive immunotherapy with convalescent blood products has received limited attention. We use a mathematical model to test the hypothesis that a population-wide passive immunotherapy program that collects plasma from a small percentage of convalescent individuals can harvest sufficient convalescent plasma to treat a substantial percentage of severe cases during the first wave of the pandemic. We combine an age-structured transmission model with a queueing model for plasmapheresis to estimate the demand and supply of passive immunotherapy during an epidemic of pandemic influenza in Hong Kong. We find that if at least 15% of convalescent individuals donate their plasma, more than 82% of severe cases can be offered convalescent plasma transfusion in a moderately severe epidemic.

Increasing the donor percentage above 20% does not significantly boost the supply of convalescent plasma because supply is constrained by the plasmapheresis capacity during most stages of the epidemic. The demand-supply balance depends on the natural history and transmission of the disease via only the epidemic growth rate. These findings are applicable not only to pandemic influenza but also to other emerging infectious diseases. The current plasmapheresis operations in Hong Kong can provide sufficient convalescent plasma to a substantial proportion of severe cases of pandemic influenza even when only 10% to 15% of convalescent individuals donate their plasma. We recommend public health officials to consider the proposed passive immunotherapy program as a realistic pandemic mitigation option.

BIOGRAPHY

Dr. Wu's research focuses on using mathematical modeling to understand the spread and control of infectious diseases including influenza and HPV.

Dr. Wu's recent projects on pandemic influenza include devising pandemic mitigation strategies in the areas of drug-induced antiviral resistance, allocation of pre-pandemic vaccines, and household-based public health interventions. His recent projects on HPV include cost-effectiveness analysis of different combinations of cytology screening, HPV DNA screening, and HPV vaccination for the prevention of cervical cancer in Hong Kong. In addition to mathematical modeling, He is also conducting several field studies to track the age-specific attack rates of the H1N1 pandemic virus in Hong Kong in 2009.

Dr. Wu earned a BS in chemical engineering from MIT in 1999 and a PhD in operations research from MIT in 2003. Before joining the Department of Community Medicine in 2006, He was an assistant professor in the School of Industrial and Systems Engineering at Georgia Tech from 2003 to 2005 and a research assistant in the Theoretical Biology and Biophysics group at the Los Alamos National Laboratory from 2002 to 2003. of Industrial and Systems Engineering at Georgia Tech from 2003 to 2005.

Enquiry: 2788 8420

All are welcome!

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