The Critical-Care strategy managing The Next H1N1 Flu Pandemic

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إستراتيجية الرعاية المركزة في مواجهة وباء أنفلونزا الخنازير

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Walid Ahmed Refaat

List Of Abbreviations

AD	After Date
AEF	American Expeditionary Force
ANZIC	Critical care services and 2009 h1n1 influenza in australia and new zealand. N engl j
ARDS	Acute Respiratory Distress Syndrome
BAL	Bronchoalveolar Lavage
BEF	British Expeditionary Force
BMI	Body Mass Index
CDC	Centers For Disease Control And Prevention
CPR	Cardiopulmonary Resuscitation
CSF	Cerebrospinal Fluid
DFA	Direct Immunofluorescent Antibody Testing
DH	Department Of Health
DOH	Department Of Health
ECMO	Extracorporeal Membrane Oxygenation
GCS	Glasgow Coma Score
GISN	The global Influenza Surveillance Network
GMT	Geometric Mean Titre
H	Hemagglutinin
HCWs	Healthcare Workers
HFOV	High-Frequency Oscillatory Ventilation
HHS	U.s. Department Of Health And Human Services
HIV	Human Immunodeficiency Virus

HPA	The Health Protection Agency
ICS	The Intensive Care Society
IFA	Indirect Immunofluorescent Antibody Testing
ILI	Influenza-Like Illness
MAU	Medical Admissions Units
MMWR	Morb Mortal Wkly Rep
MRSA	Methicillin-resistant s. Aureus
N	Neuraminidase
NIOSH	National Institute For Occupational Safety And Health
NIV	Noninvasive Ventilation
PEEP	Positive End Expiratory Pressure
PPE	Personal Protective Equipment
RCGP	The Royal College Of General Practitioners
RCOA	The Royal College Of Anaesthetists
RCOG	The royal College Of Obstetrics And Gynaecology
rRT-PCR	Real-Time Reverse Transcriptase- Polymerase Chain Reaction
RT-PCR	Reverse Transcriptase Polymerase Chain Reaction
SARS	Severe Acute Respiratory Syndrome
SOFA	Sequential Organ Failure Assessment
SPN	Sentinel Provider Network
US	United States
VAERS	Vaccine Adverse Event Report System
VSD	Vaccine Safety Datalink
WHO	World Health Organization

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Introduction

Influenza is a major cause of morbidity and mortality with its greatest burden on the elderly and patients with chronic co-morbidities in the intensive care unit (ICU).An accurate prognosis is essential for decision-making during pandemic as well as interpandemic periods. Seasonal influenza is an acute respiratory illness caused by influenza A or B viruses which occurs every year and causes more than 200,000 hospitalizations and 40,000 deaths in the United States each year ***(McGeer A et al., 2007).***

Preparing for an influenza pandemic is difficult for healthcare systems because of many uncertainties. Strikingly little knowledge has been obtained from the scattered cases of avian influenza in humans ***(Boussarsar et al., 2006).***

During the 20th century ,pandemic influenza occurred in 1918, 1957, and 1968 (namely, the 1918 Spanish, 1957 Asian, and 1968 Hong Kong influenza pandemics) ; the pandemic of 1918 killed nearly 675,000 people in the United States and 20 million people worldwide, whereas the subsequent 2 pandemics resulted in a total of 103,600 deaths in the United States alone. Based on past pandemics, it is estimated that 15% to 35% of the U.S. population may become clinically ill with the influenza virus during the next influenza pandemic ***(Hitchcok et al., 2006).***

Recent outbreaks of human disease caused by avian influenza strains in Asia and Europe highlight the fact that a pandemic can occur at any time ***(Thompson et al., 2004).***

On July 8/2009 : in New York City, 909 patients with confirmed pandemic H1N1 influenza have been reported,225(25%) have required ICU care and 124 (14%) have required mechanical ventilation with 59 attributed deaths. On August 21/2009: a total of 177 countries reported 182,166 cases on influenza A (H1N1) virus infection ,1799 of which were fatal ***(Perez-Padilla R et al., 2009).***

Planning for pandemic influenza encompasses a number of areas including surveillance, vaccination, communications, maintenance of necessary services, and ability of the healthcare system to provide needed services. Planning for pandemic influenza is necessary to successfully strengthen the health care system's ability to respond and to efficiently allocate scarce hospital resources ***(Thompson et al., 2004).***

Although H1N1 may cause the next human influenza pandemic, its attack rate, virulence and susceptibility to antivirals or vaccines remain uncertain. However, there is less uncertainty that—if the next influenza pandemic is severe—the number of critically ill victims will overwhelm most communities' traditional inpatient and critical care capacity. To assist hospitals in preparing and responding to such events requiring large surges in critical care capacity, the Working Group on Emergency Mass Critical Care promulgated a set of recommendations. One of the major recommendations was for healthcare organizations to have a standardized method for allocating scarce resources (e.g., mechanical ventilators) when the number of patients in need far exceeds available capacity ***(Christian et al., 2006).***

Objective of research:

To highlight on:

(1) Preparation for the next H1N1 flu Pandemic.

(2) ICU role in the next pandemic influenza.

History of Influenza

Influenza Epidemics:

Epidemics of influenza occur in most countries in some years and in some countries in most years. Firstly, epidemics tend to occur in winter months when cold, crowding of people and higher humidities are a feature. Indeed, in areas where continuous high humidity is a characteristic, infections may occur throughout the year. Secondly, in more recent times epidemics are often first seen in Eastern or Southern Hemisphere countries and later spread to Europe and North America in the winter months of these areas. Seeding of infection may occur prior to epidemics, to be followed by epidemics when conditions are optimal. Thirdly, epidemics are more likely to occur when a variant virus appears which shows antigenic changes from previous strains and cross-reacting antibody acquired by previous infection, is low in both percentage positive and titre ***(Beveridge, 1991)***.

The influenza virus has radiating from the surface multiple copies of two glycoproteins termed haemagglutinin (H) and neuraminidase (N), it is antibody to these proteins which equates with immunity and it is accumulating mutations in these glycoproteins, particularly the haemagglutinin which constitutes the virus variation termed antigenic drift. The monitoring of antigenic variation in the influenza virus is a key factor in anticipating epidemics and in vaccine design where for any year the prevalent virus strain(s) must be incorporated into the current vaccines. The responsibility for monitoring virus variation rests with the

World Health Organization(WHO) who have commissioned over a hundred research laboratories in various parts of the world to monitor antigenic changes in the infecting viruses and the incidence and spread of infection. Most of the deaths occur among the elderly, such as those with chronic heart and lung disease or metabolic disorders. Although vaccine against the prevalent virus strains is produced each year, the use of this has not been wide only a proportion of the at risk group receive vaccine, and although shown to protect 60-90% of the individuals against infection, and a higher percentage against hospitalization. Immunization has never made an impact on the course of an epidemic ***(Beveridge, 1991)***.

Influenza Pandemics:

Two conditions must be satisfied for an outbreak of influenza to be classed as a pandemic. Firstly, the outbreak of infection arising in a specific geographical area, spreads throughout the world, a high percentage of individuals are infected resulting in increased mortality rates. Secondly, a pandemic is caused by a new influenza virus A subtype, the H of which is not related to that of influenza viruses circulating immediately before the outbreak, and could not have arisen from those viruses by mutation ***(Webster and Laver, 1972)***.

Each influenza A virus possesses one of 15 distinct H molecules, designated H1, H2, H3, and so on, which do not cross-react in serological tests, so immunity to influenza is principally related to antibody to the H and the appearance of a new virus subtype with a different H means that immunity acquired from past influenza infection confers no protection

against the new virus subtype and the spread of infection ***(Hobson et al., 1972)***.

Pandemics before 1700:

The outbreak of influenza reported in 1173 is not considered to be a pandemic and other reports to 1500 are too meagre to allow comment. In contrast, the outbreak of 1510 was probably a pandemic reported with spreading from Africa to engulf Europe. The outbreak of 1557 was possibly a pandemic, but the first influenza pandemic agreed by all authors occurred in 1580. This pandemic originated in Asia during the summer of that year, spread to Africa and then to Europe along two corridors from Asia Minor and North-West Africa **.** The whole of Europe was infected from south to north in a 6-month period and infection subsequently spread to America. Illness rates were high; 8000 deaths were reported from Rome and some Spanish cities were decimated ***(Beveridge, 1991).***

Pandemics from 1700 to 1830:

Data from 1700 is more informative of pandemics than those of previous years and Figure 1 gives a diagrammatic record of pandemics from that date to the present time. The first agreed influenza pandemic of the 18^{th} century began in AD 1729.