Relying on Radiological Findings in Critically Ill H1N1 Infected Patients-how Logical?

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There were three Influenza 1A pandemics in the 20th Century: H1N1 in 1918, H2N2 in 1957, and H3N2 in 1968. The 21st Century influenza pandemic arrived in April 2009. This novel H1N1 virus was initially termed "swine origin influenza virus-SOIV". It was later termed 2009 H1N1 influenza by the United States Centre of Disease Control and Prevention (CDC) and Pandemic H1N1/09 by the World Health Organization (WHO). On 10 August 2010, the Director-General of the WHO announced the end of the H1N1 pandemic, and announced that the H1N1 influenza event has moved into the post-pandemic period. Though virus activity has significantly subsided since then the 2009 H1N1 virus is expected to circulate as a seasonal virus for some years.1 According to earlier WHO statistics (July 2010), the virus killed more than 18,000 people since it appeared in April 2009.2 However, by 2012, research showed that many more people could have been killed by the disease, as only those fatalities confirmed by laboratory testing were included in the original number. Majority of these deaths occurred in Africa and Southeast Asia. Experts have agreed that an estimated 284,500 people were killed by the disease.3 Compared to H1N1 virus, MERS- CoV (Middle East Respiratory Syndrome Corona Virus) is a more virulent virus, causing severe disease in patients with underlying co-morbid conditions for which no vaccine or specific anti viral medication is available currently. The present CDC definition for patient under investigation (PUI) for MERS-CoV includes travel from the Arabian Peninsula or the neighbouring countries within 14 days in addition to clinical criteria.

The most important complications of 2009 H1N1 are lower respiratory tract involvement, acute respiratory failure and Acute Respiratory Distress Syndrome (ARDS) with refractory hypoxemia. Other severe complications include secondary bacterial infections, septic shock, acute renal failure, cardiac dysfunction, and the multiple organ dysfunction syndrome (MODS). Worsening of underlying chronic diseases such as asthma, COPD or congestive heart failure may occur. Extrapulmonary complications, though less common can be varied- myositis, rhabdomyolysis, myoglobinuria, myocarditis and pericarditis. At times central nervous system (CNS) complications may arise which include encephalitis, transverse myelitis and Guillain-Barré syndrome and Reyes syndrome.4

In the present issue of the journal Borse RT, et al have retrospectively studied clinical and radiological correlation in ICU patients with confirmed infections with H1N1 virus.5 They made some novel observations that presence of certain symptoms like fever, cough and tachypnea were associated with nodular followed by reticulo-nodular radiological pattern. Also RLZ, RMZ and LMZ involvement on Chest X-ray and persistence of radiological lesions were associated with poor prognosis. As noted from previously published literature on this subject, the predominant findings consist of ground-glass opacities or areas of consolidation, or a mixed pattern. Bilateral opacities are common, with involvement of multiple lung zones. Findings in four or more zones and bilateral peripheral distribution occurred with significantly higher frequency in patients with poorer outcomes.6 Scoring system described by Opravil, grades the severity of pulmonary infiltrates in Chest X Ray (CXR): each lung is divided into four equal quadrants and each quadrant is scored on a scale of 0-3 (0: normal, 1: subtle increase interstitial markings, 2: prominent interstitial opacities, 3: confluent interstitial and acinar opacities). This system allows a maximum score of 24 for both lungs.7 In published articles on H1N1 influenza, in this journal from Gujarat state it was reported that young individuals between 13 and 45 were the most affected causing a significant loses of DALY's (Disability Adjusted Life Years) during H1N1 pandemic8 and development of ARDS and presence of co-morbid medical condition were associated with poor prognosis.9 In previous avian influenza outbreaks, such as SARS and H5N1, CXR has been shown to be useful in the prognostication of the disease.10 In a large series of hospitalised patients from the United States in April-June 2009, who tested positive for the 2009 H1N1 virus, of the 249 patients who underwent chest radiography on admission, 40% had findings that were consistent with pneumonia; the median age of these patients was 27 and 66% had an underlying medical condition. Radiographic findings included bilateral infiltrates followed by, an infiltrate limited to one lobe, and multilobar infiltrates limited to one lung. Seventy nine percent patients received antibiotics in addition to anti-viral drugs. Of the patients who received corticosteroids, 76% had an underlying medical condition; the most common conditions were asthma or chronic obstructive pulmonary disease (COPD), immunosuppression, and cardiovascular disease.11 In a study of hospitalized patients with confirmed H1N1 infection from Karnataka, typical consolidation was conspicuous by its absence and pleural effusion was present in 14% of the cases. Hypoxemia and thrombocytopenia were the major risk factors for the mortality with H1N1 pneumonia. It was also observed that involvement of four or more lung zones and bilateral peripheral opacities was associated with higher mortality in these patients.12

As far as application of these findings in clinical practice is concerned it is important to note that unlike most strains of influenza, H1N1 does not disproportionately infect adults older than 60 years. Even in previously healthy persons, a small percentage will develop pneumonia or acute respiratory distress syndrome (ARDS). According to large studies, out of hospitalized patients, 25% require ICU care and 7% die.13 Deterioration is rapid, with many patients progressing to respiratory failure within 24 hours, requiring immediate admission to an intensive care unit and often, mechanical ventilation. Radiological findings can be due to primary viral or secondary bacterial infection and it is recommended that flu patients whose chest X-ray indicates pneumonia receive both antivirals and antibiotics. Patient of H1N1 infection with normal CXR can still have a serious illness.
if they have hypotension, hemoptysis, or severe asthma. And in a given patient prognosis will depend on presence of co-morbid illnesses, arterial blood gas analysis result, and non-pulmonary organ dysfunction in addition to radiological findings. CURB-65, also known as the CURB criteria, is a clinical prediction rule that has been validated for predicting mortality in community-acquired pneumonia and is recommended by the British Thoracic Society for the assessment of severity of pneumonia. It is an acronym for five non-radiological risk factors- confusion, Urea >19 mg/dL, Respiratory rate>/=30 breaths per minute, BP < than 90/60 mmHg and age 65 or older. Presence of pleural effusion is the only radiological finding considered by Pneumonia Severity Index (PSI), which is used to determine if patient needs hospitalization.

Clinicians should consider influenza, including 2009 H1N1 infection, in the differential diagnosis for patients presenting with fever and respiratory illness or pneumonia, especially in presence of co-morbid conditions or pregnancy. The benefits of anti-viral treatment are probably greatest when such therapy is started early. In those beyond 48 hours who are moderately or severely ill, antivirals may still be beneficial. People in at-risk groups should be treated with antivirals (oseltamivir-oral or zanamivir-inhaled) as soon as possible when they first experience flu symptoms. Patients with known or suspected resistance to oseltamivir should be treated with zanamivir. Peramivir is also a neuraminidase inhibitor formulated for intravenous administration in patients with life threatening H1N1 infection, not responding to oral or inhaled antiviral therapy. Corticosteroids should not be used routinely to treat patients with the H1N1 influenza but low doses of corticosteroids are considered for patients in septic shock who require vasopressors and have suspected adrenal insufficiency. Prolonged use of or high dose corticosteroids can result in serious adverse events in influenza virus-infected patients, including opportunistic infection and possibly prolonged viral replication. Concomitant antibiotics are usually required in patients with abnormal finding on CXR. When combined with clinical and biochemical predictors, radiological findings help determine prognosis in patients with H1N1 pneumonia.

References