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Research Note

Pandemic Risk Assessment

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Abstract – Influenza is more than simple flu-like symptoms. Influenza comes in multiple strains, the most serious being type A. This subtype of virus has been responsible for large-scale death and the global spread of disease. Risk assessment is difficult due to the constantly mutating nature of influenza virus. In order to assess potential risk, organizations must constantly monitor patient data on local, state, national, and worldwide levels. Compilation of data and coordinated responses are necessary to prevent spread of the virus and develop vaccines. Additionally private sectors must coordinate effort with public sectors.

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What is Influenza?

Influenza comes in three basic types: A, B, and C. Influenza C is the weakest.[i] Influenza A and B can be equally as strong, but type B has never caused a worldwide pandemic. Influenza A is often distinguished by H's and N's. H stands for Hemagglutinin and has 16 different versions. N stands for Neuraminidase and only has nine versions. Each strain is assigned a letter H and a letter N, such as H9N7. While all flus can be carried in birds – technically making all flus a form of the bird flu – some cross over into other animals.[1]

H1N1 is commonly called the swine flu, but can actually be found in birds, pigs, horses and people.[2] It is not simply the ability for a virus to be contracted by multiple species that causes danger, but the ability of the virus to mutate upon encountering additional viruses. If a virus formerly only contagious to birds mixes with a cross-species virus such as swine flu, the new virus can be transmitted to the additional species, yet we have no previous immunities as humans to this virus. This new virus is referred to as a novel virus. Mutations such as these were considered the causes for the 1957 Asian flu pandemic and 1968 Hong Kong flu pandemic; killing over 100,000 Americans combined.[3]

Epidemics, Pandemics, Pandemonium

A disease outbreak is the term used when the number of reported disease cases exceeds the number of expected disease cases.[4] An outbreak itself has no specific geographic area, and no specific number. The term outbreak can actually refer to as few as one person or incident, if the disease is either new or thought to be absent from the population for a long time. An epidemic involves the rapid transmission of disease among many people, i.e. SARS 2003. A pandemic is a global disease outbreak such as HIV/AIDS. Occurrence of a pandemic is marked by: an unknown virus strain where humans have little immunity, much like the mutated influenza mentioned above, easy transmission of the virus such as through sneezing, and the global spread of serious illness. The World Health Organization (WHO) marks pandemics in six phases. Phase 1 denotes a virus in animals with no known human transmission. Phase 6 and the most serious marks human contagion in multiple countries and regions.[5]

Risk Assessment

Risk assessment begins with four primary steps. These steps include identification, assessment, prioritization of response, and continued monitoring.[6] Identification is difficult to do properly and must be managed across all organization levels, not simply the easiest

areas to identify and fix. Questions should be asked regarding both the greatest risk and the consequences of the unknown. In assessing risk it is important to understand both the probability and the magnitude of the threat.[7] For example, an influenza virus in birds would be highly likely with little to no impact on the human sector. A mutated influenza virus would be far less probable, but have a much greater magnitude of consequence, with the possibility of a disease outbreak.

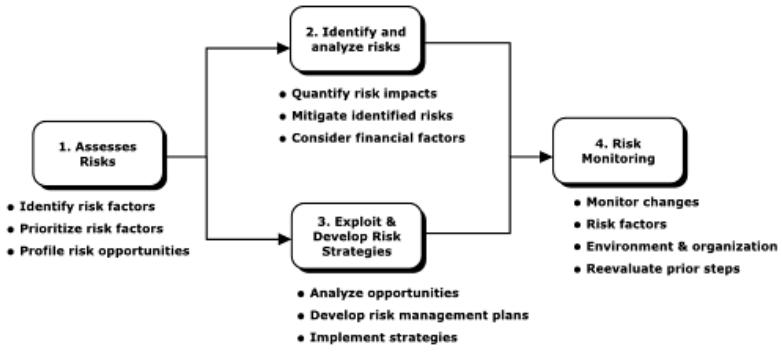
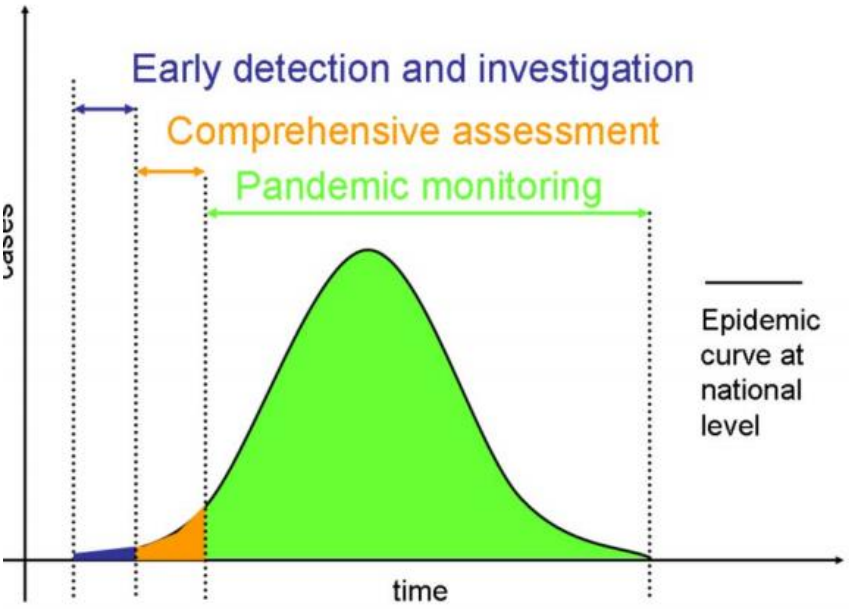


EXHIBIT 2.3 GRC Risk Management Processes [8]

Assessments are often done using computer simulations to map out possible consequences, however those same risks rarely following predictable models. Prioritization of response is often based off of these models to try and mitigate the threat. Constant monitoring must be conducted throughout to provide the most timely response possible.[9]

Monitoring of a Pandemic

Figure 2 Overview of the three (3) surveillance components at national level



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The World Health Organization demonstrates how pandemics need a different level of monitoring over different periods of time.[11] The first step includes early detection and investigation. At a national level, health providers are expected to detect, assess, investigate, control, and report all disease incidents above expected levels. If initial investigation shows sustained human-to-human transmission, then the first 100 cases are the most important. These cases will be used to help non-affected countries prepare for upcoming infection. The data is also used to help derive the necessary components of a future vaccine. The monitoring phase is mostly a data gathering phase, which can vary from

country to country, however many countries are starting to standardize procedures for data reporting of respiratory illness. Monitoring by country allows data to be compiled and monitored at a global level.[12]

Diseases Outbreak News

The World Health Organization monitors and reports all recent outbreaks. As of June 4th, 2013 through May 2013, three different diseases are listed on their report. Wild the polio virus has been reported in Somalia, the Horn of Africa, and Israel one time each. H7N9, an avian Influenza A has been reported 132 times with 37 deaths, but no confirmed cases of human-to-human transmission. The Middle Eastern respiratory coronavirus (MERS-CoV) has reported 50 confirmed cases and 30 deaths, with limited local patient transmission.[13] With these issues being current considerations, different groups conduct monitoring and response in different manners prior to reporting to the WHO.

US Government Planning – Federal Level

The Department of Homeland Security has taken measures to plan for the pandemic risks identified with influenza. In 2005 President Bush announced a *National Strategy for Pandemic Influenza* based on three pillars: preparedness and communication, surveillance and

detection, and response and containment.[14] Addressed in this strategy is the acknowledgement that full preparation for a pandemic can take years. Every segment of society must prepare and will be part of the response. The Federal Government is expected to provide clear criteria to inform State, local, and private sector responses. Federal Government response goals are the following: stop, slow, or limit the spread of disease in the United States; mitigate death, suffering, and disease; and sustain infrastructure and mitigate economic impact. The Federal Government will bear primary responsibility for containment of overseas infection and preventing spread of this infection to US soil. Additionally the guidance of how to take protective measures and changes in any needed regulations will fall under this jurisdiction. Further responsibility includes Modification to monetary policies to mitigate economic impacts, distribution of vaccines, and acceleration of disease research.[15]

Center for Disease Control and Prevention – Risk Assessment

As a Federal agency that will take a leading role in the case of a pandemic, the Center for Disease Control and Prevention, better known as the CDC has developed an Influenza Risk Assessment Tool (IRAT).[16] The risk assessment tool focuses on two different scenarios.

"Emergence" refers to a bird influenza virus acquiring the ability to spread easily to people. "Public Health Impact" refers to the potential severity of human disease and burden on society (missed work, hospital capacity, public services). The tool evaluates all new viruses based on the ten primary criteria which can be grouped into three categories: properties of the virus, attributes of the population, and ecology and epidemiology of the virus.[17]

The tool cannot predict a pandemic, but is meant to be a reliable tool for planning. IRAT allows for the prioritization and maximization of preparedness efforts by defining which risk factors are strongest. Updating of data is standardized and can help keep the information process transparent when informing management decisions. The ten criteria allow for different methods to weigh data and also designate key gaps in knowledge which may need further study. The IRAT should not be confused with other risk tools which provide quantitative measures about likelihood or exposure or disease risk. The tool focuses on specific existing strains of virus, currently only found in birds, and assesses the future pandemic potential.[18]

Private Sector Mitigation and Planning

Unlike other natural disasters such as earthquakes or floods, basic physical infrastructures will remain intact. Power lines will not fall down and computer networks will not go dark. The danger to the private sector is from a lack of personnel. At the height of a pandemic it is expected that up to 40% of employees could be out of work for a period of at least two weeks. Lesser levels of absence would also occur near the beginning and the end of the outbreak.[19]

Continuity in the private sector is of utmost importance in those areas considered to be critical infrastructure. The Federal Government defines, "Critical infrastructure encompasses those systems and assets that are so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, and national public health or safety."[20] The safeguarding of these infrastructures is considered indispensable, and 85 percent of this critical mass falls within the private sector. Key measures that need to be taken to prevent infrastructure loss include plans for maintaining a workable level of staff and also preventative measures to ensure the continued health of necessary workers.

Washington State

Washington State releases weekly reports on the status of influenza A within the state. For the week of May 12- May 18th, 2013, considered CDC week 20 there were a total of 154 tests performed and 0 were positive for influenza A.[21] No specimens tested have been determined novel, or avian, in origin. No specimens tested were considered antiviral resistant. Less than one percent of emergency room visits in week 20 were for influenza related symptoms throughout the state. Death statistics for the week show 5.4 percent of mortalities caused by pneumonia or influenza, and 54 total influenza related deaths in the entire 2012-2013 period.[22] The combined total data, along with seasonal flu knowledge would put Washington state at low risk overall for an influenza outbreak. Other factors such as population size by city, and the act of being a travel hub towards Asia may act to increase this risk, but it is not likely to be a drastic increase at this point. Additional data can found on national, international, and county levels through the following sources.

International Influenza Data: http://www.who.int/topics/influenza/en/
National Influenza Surveillance Report: http://www.cdc.gov/flu/weekly/
Washington Local Health Department Influenza Surveillance Reports:
Clark County: http://www.clark.wa.gov/public-health/diseases/flu.html
King County: http://www.kingcounty.gov/healthservices/health/communicable/immunization/fluactivity.aspx
Pierce County: http://www.tpchd.org/providers-partners/influenza-medical-providers
Whatcom County: http://www.whatcomcounty.us/health/flu/

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Researchers

The University of Washington is one of the local organizations that are working to understand existing data and help create predictive models for future planning and assessment. Researches collaborate across media and sharing of studies with organizations such as the CDC to better predict future consequences of a novel virus. Studying data from past outbreaks in the United States helped researchers develop a framework for the potential effects of a novel virus.[23] Epidemics were studied at both the beginning of an outbreak and during the end as more data becomes readily available. The process of combining the limited data from outbreak beginnings with the detailed data on full-blown epidemics is hoped to inform an evidence based assessment and guide decision making.[24]

Summary

Understanding the risks of influenza A is important to comprehend the risks involved. A constantly mutating virus that causes severe symptoms is difficult to combat. The disease outbreak can quickly multiply and become an epidemic or pandemic. The key to proper planning and risk mitigation lies in data gathering and cross collaboration. The World Health Organization acts as a team leader in assess potential threats and compiling data. In the United States, the

Center for Disease Control and Prevention works with Homeland Security and the Federal Government to monitor and assess influenza data. Additionally the Federal Government works to mitigate additional damage such as consequences in the economy and risk the private sector. The private sector operates 85 percent of the nation's critical infrastructure, which magnifies the importance of local data and response. Washington State releases weekly data on current influenza statistics allowing for timely response and assessment by employers. Additional resources are available at county and national levels to supplement this information. Finally, researches are regularly working to develop new and more accurate assessment tools, helping to guide efforts and decision making when preparing for a pandemic.

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