

Free research paper on surveillance systems for severe acute respiratory syndrome...

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1. 0 Background Information on SARS

Severe acute respiratory syndrome (SARS) is a newly emerged febrile lower respiratory viral disease that has been described in Asia, Europe, North America and recently Middle East. The disease was first reported in Asia, specifically in Guangdong Province of Southern China, in late 2002. It then spread to Hong Kong, Vietnam, Singapore, Canada, Taiwan, Thailand, Canada, the U. K, U. S and Slovenia at an unprecedented rate, so that in a period of weeks it had spread to 37 countries and was thus a pandemic of global concern in 2003. SARS is reported to be the first global pandemic in the 21st century that affected over 8000 people and caused nearly 800 deaths in 37 countries. The highly contagious disease had a crude mortality of 9-10% rapidly spread through travelers to health workers and then household contacts. The health care workers and hospital transmissions appear to play pivotal role in the spread of the disease with 46-63% of the cases being reported in healthcare workers in large and mature outbreaks in Hon Kong, Hanoi, Singapore and Toronto.

The etiology of SARS has been linked to a novel Coronavirus that was later named after the disease i. e. SARS coronavirus (SARS-CoV). The virus is thought to have jumped species from animals to humans because in Southern China, where SARS was first described, it mainly involved animal handlers, caterers and chefs, before spreading to their contacts (first healthcare workers and then family and friends). The disease is easily spread through respiratory secretions and droplets, other infectious secretions, fluids and substances and contaminated objects/environment (indirect contact). SARS has been mainly reported in adults between the age of 25

and 70 and very few cases have been reported among children under the age of 15 years. The disease has an incubation period of 2-10 days and begins with a high fever ($> 38.00\text{C}$) accompanied by symptoms like chills, headache, body aches, general discomfort, myalgias and malaise. In a few cases the early stages of the disease may be associated with the mild respiratory symptoms and diarrhea. The lower respiratory phase sets in after 2-7 days and is associated with dry, non-productive cough, dyspnea accompanied by, or progressing into hypoxemia. This phase may require mechanical ventilation in 10-20% of the incidences and develops into pneumonia in most of the cases. Early diagnosis and recognition of incidences of SARS and employing the appropriate infection control measures is vital in controlling future epidemics. The laboratory diagnosis and findings of SARS is fully described in section 3.0. The infectiousness of SARS and the rapid spread during the 2002-2003 outbreak informed the urgent need for global, national and local surveillance systems. In addition, unlike smallpox, SARS (though no recent cases have been reported) has not been eradicated because it is probably still present in the natural host (animals) and could easily be retransmitted to humans. As such, an effective surveillance system is the foundation of the efforts to control the reemergence and spread of SARS

2.0 Key characteristics of a good surveillance system

WHO in collaboration with CDC have come up with characteristics that are used to benchmark, monitor and evaluate disease surveillance systems with an aim of providing tools for improving surveillance systems. The key characteristics of a good and effective disease surveillance system are as

outlined below.

1. Completeness of various dimensions of the systems, including completeness of case reporting, surveillance data, surveillance forms and sites. In a good surveillance system, the number of reporting sites should be known and definite and the proportion of sites that submit surveillance reports should be close to 100%. Completeness of case reporting has to do with the correlation between the reported cases of the disease and the actual cases. The expected minimum data should match with the reported data as much as possible (completeness of surveillance data).

2. Timeliness mainly refers to how timely the data are submitted, investigations are carried out and control measures taken. Each country has predetermined/preset standards to measure timeliness, which is often a function of the speed between the different steps in the surveillance system. Other factions of this characteristic are timeliness of immediate notification (in 24hrs), weekly and monthly reporting.

3. Usefulness/ quality of the data: a Useful system must be able to detect disease outbreak in good time, determine the spread and distribution of disease, inform effective and appropriate responses, estimate disease burden, determine trends of incidences over time, identify risk groups, evaluate control measures and to measure the outcomes and impact of the interventions. Data quality on the other hand refers to the validity of information, which is determined by examining the percentage of unknown responses to known items on surveillance forms.

4. Simplicity has to do with the ease of implementation and the structure of the surveillance system. The structure of the system should simple enough

to allow ease of flow of information from one point to another. The different steps should complement one another and be reviewed regularly. Ease of collection, analysis and reporting are factors to be considered in the evaluation of the simplicity of implementation. Too many steps in a surveillance system make it complicated and thus the need to evaluate and see if there are steps that can be combined or eliminated all together. However, a system must be able to meet the objectives despite being simplicity. Simple systems are more timely and acceptable.

4. Acceptability of a system refers to the willingness of the organizations and people to take part in the system. It also has to do with the willingness of the users to agree with and use the generated data and the staff to operate the system. In an acceptable is one where the staff, the stakeholders and the community at large supports the system as appropriate to meet the intended objectives.

5. Flexibility of the system has to do with the capacity of a system to adapt to change in order to accommodate dynamic needs for instance the exclusion or inclusion of other diseases and modification of the frequency of reporting among other changes.

6. Sensitivity in surveillance has to do with the fraction of actual incidences in a population detected and reported through the system. This requires a comparison of different data sources such as lab records and discharge forms.

7. Specificity has to do with the fraction of the population of the population without the disease that is detected as such by the system.

8. Positive predictive refers to the fraction of the population detected by the

system to have the disease that actually have the disease, in other words the accuracy of the system.

9. Representativeness of the system has to do with the extent to which the cases reported by the system are a reflection of the distribution and occurrence of all the incidences in the entire population.

10. Stability has to do with the reliability of the system with regard to the ability to collect, manage and avail the data without failing. A stable system should be reliable enough not to fail when it is needed most.

3. 0 National and international best practices for managing SARS

After the 2002-2003 SARS epidemic, a network of physicians, healthcare workers and scholars under the umbrella of WHO studied the spread of the highly contagious virus with an aim to recommend strategies to prevent the spread of the disease. Some of the recommendations of the study was the isolation (quarantine) of the patients suspected of having SARS and the screening of airline passengers to identify those with SARS' symptoms. The quarantine was effectively employed in Singapore, Hong Kong, Taiwan and Canada. In Hong Kong and Singapore, schools were closed for almost two weeks to control the spread. Singapore even instituted ten day mandatory home quarantine of those who had had come into contact with SARS patients. The discharge confirmed SARS patients were put under twenty one days mandatory home quarantine while suspected discharged patients are put under 14 days mandatory home quarantine. In addition, Singapore designated Tan Tock Seng Hospital as the only centre for both suspected and confirmed SARS treatment and isolation. The hospital workers are required to have their temperature checked at least twice a day.

The international recommendations for the prevention of SARS involves isolation of persons suspected to have been exposed to SARS and with fever or respiratory symptoms for 72 hours until the symptoms are resolved. If the symptoms are not resolved but don't develop into pneumonia, the isolation is extended for a further 72-hours and the patients monitored. If pneumonia develops then the isolation is extended to 10 days after the improvement in body temperature and respiratory symptoms. It is vital to note that the isolation is not in hospitals unless in special cases e. g. in cases of travelers, the homeless or where the requirements of the home isolation are not feasible. In addition, isolation is voluntary but can be mandatory when voluntary isolation fails.

A critical part of the management of SARS is timely and accurate diagnosis. Any person with the mentioned symptoms of SARS, that has had contact with SRA patient or that has traveled to the areas identified by WHO to have had recent transmission of the virus and with a positive x-ray is considered a probable SARS case. Laboratory findings that confirm SARS include PCR, ELISA, immunofluorescence (IFA) and virus isolation from blood, stool, sputum and tissue specimens. PCR detection of the virus' genome in two different samples (say stool and sputum) or the same sample (say stool) collected on two or more days is considered confirmatory for SARS.

Detection of antibodies by ELISA or IFA (10 and 21 days respectively after the disease onset) is also confirmatory of the disease. While the PCR tests are specific they are not equally sensitive and thus it is easy to have a false negative result. On the other hand, antibody based tests can only detect the disease several days after the onset of the disease (10-21 days), are

laborious and require high level of expertise. The most accurate confirmation of SARS is the isolation of SARS-CoV in cell cultures from any of the mentioned specimen followed by PCR detection of the virus in the culture . The next step in the management of SARS after positive laboratory confirmation is treatment. Unfortunately, there is no known cure for SARS but a regimen of antibiotics, antipyretics, antiviral agents and corticosteroids are currently being used for the treatment of the disease. Ribavirin and oseltamivir are the antiviral agents that have been recommended most frequently for the treatment of SARS (Florida Department of Health, 2003; Svoboda, et al., 2004; WHO, 2013).

4. 0 Evaluation of the adequacy of the current Washington's Surveillance system

As earlier stated the cornerstone of the control of SARS activities is surveillance. In Washington, surveillance is based on rapid identification and reporting of SARS cases and their close contacts by hospitals and healthcare providers. The healthcare providers must establish exposure history (contact with infected person or travel to an area with ongoing virus transmission) before carrying out confirmatory tests. One of the strengths of the surveillance system is that it is flexible enough to be modified according to the level of SARS activities locally and globally. As such, the surveillance system is bifurcated to accommodate surveillance in the global absence and presence of SARS activity. In the absence of the of SARS activity in the world, SARS screening should be considered in patients admitted with pneumonia of unknown cause. More investigations should be carried out within 10 days after the SARS symptoms emerge if the patients recently travelled to China,

Taiwan or Hong Kong or is a health worker in direct contact with patients. In the presence of worldwide activity, any person with SARS exposure history in the 10 days before emergence of the symptoms or with fever or cough should be screened.

The surveillance system is simple and reliable enough because it is dependent on the global SARS activity. As such, when there is activity anywhere in the world the system is modified to detect as many cases as possible by modifying the screening criteria and the requirement for screening. For instance, in the absence of worldwide activity people are only screened if they are hospitalized with pneumonia of unknown etiology. On the other hand, in the presence of disease fever and exposure history call for extensive screening. This makes the system flexible, simple and reliable. The system also complete in the sense that it goes to the level of provision of information on control of the disease to the close contacts, isolation of confirmed cases and follow up monitoring of the cases identified.

5. 0 Addressing the inadequacies of the system

One of the inadequacies of the current Washington SARS surveillance system is that it is heavily dependent on the health care providers and hospitals and affords the general public very little space to participate. Given that SARS is a major public health concern, it is unacceptable for the public to be left out. Secondly, the system does not specifically target health care facilities despite the role played by the facilities in the epidemiology of SARS as is shown by the graph below.

Figure 1: Graph of the proportion of SARS cases among the healthcare workers in the Total reported SARS Cases Country

Adopted from Duchin (2005)

The recommended surveillance system will improve community participation by creating designated SARS awareness centers in each county. The centers will have information on symptoms of the disease, the control measures and screening facilities. The centers should also be charged with the responsibility of disseminating information on SARS a function that would be intensified when SARS activity is reported anywhere in the world. With the public aware of the symptoms of SARS and the control measures, they would be encouraged to report any suspected cases to the awareness centers.

Designated health workers (specialists) in the centers would carry out screening and further investigation without charging the patient in question any fee. Public awareness would also help the community to understand the risk of the rapid transmission of SARS and thus they would easily cooperate with the centers. Members of the public travelling from China, Hong Kong and Taiwan or any country or region with a reported case of SARS would be encouraged to voluntarily visit the nearest center for screening.

The centers should also isolation room (s) for healthcare providers that have exposure history or SARS symptoms to prevent the spread of the disease to the general population because health care workers are a pivotal component in the spread of the disease. The specialists who have screened and investigated a case reported by the public to the centers or identified a case of SARS through voluntary screening would be isolated in the room (s) for investigation to determine if s/he could be infected and if so for treatment. The center directors could send weekly reports to the department of health for action. In case of a confirmed case then the department of health should

come in to help with the quarantine process and engage the neighboring counties and states in control measures to prevent the spread of the disease.

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