

The difficulties of early detection for infectious disease outbreak in China: A qualitative investigation ☆

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Abstract

Objective: To make intensified analysis upon the existing difficulties in early detection for the infectious diseases outbreak in China and put forward some effective measures to improve it. **Methods:** Field investigation and in-depth interview were applied in 23 interviewees from different-level CDC. **Results:** The study findings suggest that although the timeliness of outbreak detection has been improved since SARS epidemic in China, some problems still exist, such as: ① lacking syndrome surveillance; ② report quality of infectious disease should be improved; ③ difficulties of identifying the cases at lower social economic status; ④ a definite financial compensation mechanism for the operation of web-based report system is absent; ⑤ insufficient information exchange among different branches. **Conclusion:** Some effective measures must be taken including developing syndrome surveillance system; affording more education and training for related staff; increasing payout on surveillance and establishing an information exchange platform for early detection of disease outbreak.

Key words: infectious disease; outbreak; early detection; qualitative study

INTRODUCTION

In recent years, the appearance of “new” infectious diseases, the reemergence of “old” established infectious diseases, and the deliberate introduction of infectious diseases through bioterrorism have become global problems. At present human beings are confronted with soaring threats posed by diverse infectious diseases^[1-2]. These threats caused by infectious diseases, not only usually appear within a very short period of time, but also cause huge consequences to the public health. The earlier we can detect these kind of emerging public health events, the sooner we can take emergency actions to

respond to them. So the early detection of disease outbreak has long been a concern of public health because of the potential to reduce loss^[3-5]. The primary aim of this study is to explore whether early detection for infectious disease outbreak has been, or is being achieved in China and to analyze the current existing difficulties in early detection. For this purpose a qualitative investigation was conducted with some staff members from different Centers for Disease Control and Prevention (CDC) in China.

MATERIALS AND METHODS

Research design

A qualitative design was used to explore current conditions and analyze the existing difficulties for early detection of infectious disease outbreaks in China. In-depth, semi-structured face-to-face interviews were conducted with 23 related staff members from different

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Sample

The sample included related staffs whose daily work were involved directly in surveillance, management and control of infectious disease and directors who were responsible for communicable disease control in CDC. The sample was recruited from three provincial CDC (six interviewees), four civic CDC (ten interviewees) and three CDC centers at district or county level (seven interviewees), all of these interviewees had been in their positions over five years.

Interviews

A semi-structured schedule was used. Topics included the current condition of early warning for infectious disease outbreak, the successful examples of early warning in their working practice, and the existing difficulties for early warning in China. Participants were also free to introduce any issues they considered relevant and a conversational style was adopted throughout. Duration of interviews ranged from 45 min to 2 h and all were conducted by the first author and a research assistant. During the interview, the interviewers wrote notes and audiotaped the interview.

Analyses

After the interview, verbatim transcriptions of interviews were completed. The narratives from these transcripts were coded, sorted, analyzed and summarized to identify concepts and develop categories that provide a structured framework for organizing the data.

RESULTS

The primary approach and facing difficulties of early detection for disease outbreak from analysis of interviews were summarized below. Quotations were taken from transcripts of individual interviews.

The primary approach of disease outbreak detection in China

In China, the detection of disease outbreak relies primarily on “state clinician” to identify diseases, confirm clinical suspicions, and notify the appropriate public health authorities. Another important approach is the reports of clusters of diseases from units with a dense population such as schools or building sites. And sometimes the reports of suspected outbreaks from alert community members can also do help.

“Last year we identified a dengue fever case as early as possible. You know, if dengue fever was transmitted to our city, there may have been an epidemic. Luckily the patient came to hospital and the clinician who meet him had just learned the diagnosis and treatment of dengue fever from Guangdong Province two weeks ago. So in

this case the clinician identified the disease and reported it to us quickly. If the clinician was not familiar with the clinical manifestations of dengue fever, maybe the disease couldn't have been identified in time and may have spread out.” “Sometimes we also can get reports of possible disease outbreaks from alert community members, but generally these turn out to be based on false information or rumors. Reports from clinicians tend to be far more accurate and in China today this is the most important approach in obtaining information about an outbreak.”

“Reports about the clusters of diseases from units with a dense population are also important to detection of disease outbreaks. But often only until a large number of similar disease cases have emerged, would the unit report to us. In this case it is too late for early detection.”

The difficulties facing early detection of disease outbreak in China

The notifiable infectious disease reporting system has been improved greatly since a web-based information system has been established in 2004. But from interviews, we could find there were still many difficulties concerning the early detection of outbreaks.

Besides traditional statutory communicable disease surveillance, other surveillances such as syndromic surveillance in China are conducted insufficiently

Surveillance systems for infectious diseases are used for early detection of outbreaks, analyzing trends and generating hypotheses. Most diseases surveillances in China are case-based at present; only surveillances of a few kinds of diseases such as influenza, acute flaccid paralysis (AFP), pneumonia of unknown cause, and intestinal infectious diseases employ syndromic surveillance.

“It is difficult for us to prevent and control outbreaks actively with case-based surveillance. What we can do is to try our best to take emergent public health actions as a response after the initial outbreak.”

“We just conducted surveillance of cases, but in other aspects we did less work such as surveillance about the susceptibility of population (host), environmental conditions favorable for outbreaks, pathogens and their occurrence in the environment, syndromic surveillance and so on.”

Report quality of statutory communicable disease should be improved

The levels of diagnosis and treatment of infectious disease should be improved: Almost all interviewees referred that the risk of communicable disease outbreak was much higher in rural areas than that in cities. Although a web-based report system has been implemented, some-

times clinicians in rural areas couldn't identify and treat communicable diseases accurately because of their limited knowledge and instruments, which would affect the timeliness and accuracy of the communicable disease report.

"There were two reasons that clinicians in rural areas couldn't report communicable disease timely, firstly, they couldn't identify disease accurately; secondly, they wanted to get more profits so they didn't ask patients to experience further laboratory confirmation. The longer the duration of the disease, the more medications they could sell to patients and get more profits. They didn't recognize there would be an outbreak until the similar cases became more and more."

In addition, because of huge change of the ecosystem, such as mutation of pathogens and so on, the symptoms of some classical infectious diseases became more and more obscure and some emerging infectious diseases unknown to us have appeared. Under these conditions, even experienced clinicians couldn't identify the disease accurately and timely.

The caliber of communicable disease reporting from medical personnel needs to be strengthened: In China, once clinicians have identified a reportable contagious disease case they must write re-reporting cards including the demographic characteristics, symptoms, diagnoses and treatment information about the case in required time-frame. Also, the personnel responsible for inputting data into the hospital's computerized reporting system must collect the reporting cards from physicians and input corresponding information every 2–3 h.

In reality a clinician must provide medical service to a huge amount of patients everyday in Chinese hospitals, so they are often far too busy to complete the reporting cards in time, and medical staff who input data into system sometimes don't check and correct errors in the reporting cards because of their inattention or knowledge deficiency, which also goes on to affect the reports quality greatly.

People of lower socioeconomic status seldom come to hospitals for help when they are infected with disease: In China, the burden of medical care is becoming heavier for the general population at present. For poor people, often they don't choose to see doctor unless their illness becomes very serious. When they suffer some symptoms they usually go to drug stores to purchase cheap medications or in some cases don't look for any medications at all. When they are infected with a contagious disease, they have no chance to obtain effective treatments and go on to become a continuous source of infection, to transmit to other people. In these circum-

stances communicable disease cases couldn't (and can't) be found out timely because the current surveillance system is hospital-based.

A definite financial compensation mechanism is absent to support the operation of the web-based report system in China: Although the central government have invested funds to establish the required information system; including computers and internet. Funds to be used for the computer maintenance, internet usage and electricity supply must be provided by local government. In some undeveloped areas, local governments have too limited funds to support the attachment constructions of information system. For example when there are some problems with internet or computer, little funds can be invested to fix them and this eventually affects the performance and effectiveness of the system.

"In the hospital of the villages and towns, financial support for reporting system operation is insufficient. Some local governments ask the hospitals to raise funds by themselves to support the operation of report network, but for some hospitals, they haven't enough money to pay the staff's salary, so it is impossible for them to spend money on report network maintenance."

Information exchange among different branches in China is insufficient: Currently interagency taskforces are set up only for selected diseases such as avian influenza and pig streptococcus disease in China.

"We seldom get information from other agencies such as agriculture and wildlife departments. If the relationship between the different local departments goes well, we may get information from them... but I think government must establish corresponding laws or regulations to promote and guarantee an efficient information exchange between different agencies."

"As a priority the government has attached importance to diseases such as avian influenza. In this case the information exchange performs well, but for other diseases, the exchange is obviously insufficient."

DISCUSSION

At present, the threats of communicable diseases have placed ever-increasing demands for the early recognition of an outbreak. Syndromic surveillance, government investment on public health, the caliber of medical personnel, and the timely exchange of related information all seem to be vital for early detection of an outbreak. The study findings suggest that there are some difficulties in these aspects, which block the achievement of early detection for infectious disease outbreak in China.

Syndromic surveillance and other related surveillance

Traditional disease surveillance techniques require the identification and reporting of diseases to the local health department, with the information subsequently making its way to state and national level. This is based on confirmed or suspected cases and is generally relatively insensitive in detecting initial cases, where the symptoms and signs are non-specific. Syndromic surveillance refers to methods relying on the detection of clinical case features that are discernable before confirmed diagnoses are made. This type of surveillance involves the collecting and analyzing statistical data on health trends—such as symptoms reported by people seeking care in emergency rooms or other health care settings—or even sales of certain medicines^[6-7]. Focusing on symptoms rather than confirmed diagnoses, syndromic surveillance aims to detect diseases outbreaks earlier than would be possible with traditional disease surveillance systems^[4,8-11]. Other surveillance methods such as monitoring the immunity level of the general population, infection status of related animals or pets, pathogens and their occurrence in the environment and so on can also help to identify the clues of disease outbreak.

For poor people when they are infected with communicable disease, they have too little money to come to hospitals for help so it is difficult to find this kind of cases with traditional surveillance, but with syndromic surveillance they may be found through over-the-counter (OTC) pharmaceutical sales and absenteeism.

Since traditional surveillance is case-based, it will depend largely on the ability of primary care and emergency department physicians to identify and immediately report typical cases^[12]. Syndromic surveillance however doesn't need clinicians to diagnose the patients accurately, and they just need to report some syndromes, which is very convenient to clinicians, especially to those at grass-root level due to their deficiencies of knowledge and instruments. Even emerging infectious diseases, which are insensitive to traditional surveillance and can't be identified quickly by clinicians, could be detected early with syndromic surveillance.

The caliber of medical personnel

An astute clinician is the most critical component of any national surveillance system^[13]. Improving the caliber of medical personnel refers that not only improving their medical knowledge and skills, but also improving their consciousness of communicable disease report and helping them to learn about related requirements of disease reporting repeatedly.

Timely information exchange

Indeed a key component of an effective surveillance

and response to outbreaks is close coordination and data exchange between agencies including federal, state and local public health sectors, and agriculture and wildlife departments^[14]. Surveillance on disease or infection status of wildlife, domesticated animals and derived products is particularly inadequate in China and public health departments seldom get relevant information from other government sources.

Recommendations

Early detection is critical to an effective defense against new and reemerging infectious disease outbreak and the current monitoring networks are far from adequate. Surveillance systems based on passive physician reports frequently have low sensitivity and therefore are often untimely^[15].

Disease surveillance has traditionally been seen primarily as a national responsibility, and the government needs to invest enough funds to support it. Since SARS epidemic in China, the Chinese government has invested much more on early warning system establishment than ever before to develop capabilities for early detection and monitoring of disease outbreaks. But from our interviews, there are aspects that need to be strengthened: ① Conducting pilot studies of syndrome surveillance in some areas and establishing flexible, convenient and effective syndrome surveillance system in China gradually; ② Expanding training and regularly updating physicians on clinical knowledge of contagious diseases, especially emerging diseases, and helping physicians grasp communicable disease reporting requirements repeatedly; ③ Establishing a definite financial compensation mechanism for the operation of the web-based report system and outbreak control; ④ Promoting CDC to carry out more and effective surveillance work.

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Chemoprevention of cancer: opportunities and challenges, with special emphasis on selenium

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Michael Sporn over 2 decades ago introduced the concept of chemoprevention: the use of compounds intended to decrease the risk of cancer for broad proportions of the world's population. Evidence that this was possible came from epidemiologic literature, as well as from basic science. A wide range of compounds has been investigated, and much of this investigation is under way. As these investigations have proceeded, and it has become clear that even benign-appearing chemopreventive agents may have negative side effects, their safety has begun to gather concern: Whether they are suitable for the general population or are better used by targeting to high risk populations. A major challenge is how these compounds will be tested and shown to be efficacious and safe; the roles of in vitro and in vivo preclinical testing, of epidemiology, and of prevention trials remain to be specified. A major question concerns the application of epidemiologic findings to identification of chemopreventive agents. Selenium has received a great deal of attention; Clark's tests of selenium through the Nutritional Prevention of Cancer trial had a huge impact. Nonetheless, the distinct characteristics of the population on which Clark conducted this trial bear careful consideration. A range of important trials have been inspired by Clark's trial; these include a trial of selenium to prevent recurrence of adenomatous polyps, of selenium for lung cancer patients after definitive treatment, of selenium for men with a prostate condition believed to be premalignant, of selenium and vitamin E among men at average risk of prostate cancer, single- and multiple-dose pharmacokinetic trials of selenium alone and in combination with other possible chemopreventive agents. Our experiences with selenium illustrate many of the challenges of chemoprevention.

