

# Analysis of the Problem of Infectious Disease Report Cards in China

## An Example of the Novel Coronavirus Outbreak

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### ABSTRACT

The infectious disease report card is a critical tool for collecting and reporting infectious diseases. It is a prerequisite and foundation for the early detection of infectious diseases and plays a critical role in the entire infectious disease prevention and control system. By conducting a systematic review and evaluation of Chinese infectious disease-related laws and regulations, as well as relevant research reports, we can ascertain the current status of China's existing infectious disease report card reporting system and identify the practical issues that exist in terms of information omissions and management issues in the context of early warning failures in new crown epidemics. Simultaneously, to propose modifications in response to actual needs to serve as a source of information for improving infectious disease policy and system.

**Keywords:** *Infectious Disease Alert; Infectious Disease Report Card; Public Health; Legal Mechanism for Infectious Disease Alert*

### 1. INTRODUCTION

Reporting infectious diseases as a means of early warning is an essential component of the infectious disease mechanism that warrants more study. The infectious illness report card is a form required by applicable laws and regulations that the epidemic's responsible reporter completes when an infectious disease is found, including the patient's personal information, date of onset, and type of infectious disease. The infectious disease report card enables the first medical institution to accurately report patient data to the CDC (Chinese Center for Disease Control and Prevention, It is an administrative unit that implements national-level disease prevention and control and public health technical management and services in China) , facilitating the CDC's gathering and compilation of local infectious illness data and enabling early diagnosis and warning of infectious diseases. According to applicable rules, infectious disease report cards are available in two formats: computerized and print. Units subject to direct network reporting must complete electronic infectious disease report cards within the timeframe specified in

the direct reporting system. In comparison, units that are not required to report directly to the network will report the information to the appropriate units within the stipulated timeframe and will fax or mail infectious disease report cards to the reporting units on their behalf. [1]

### 2. CURRENT STATUS OF CHINA'S INFECTIOUS DISEASE REPORTING SYSTEM

Following the 2003 SARS outbreak, China enhanced its disease prevention system and built the National Net Direct Reporting System (NNDRS) to enable online reporting of lawfully documented infectious diseases on a case-by-case basis. [2] Medical institutions immediately notify the NNDRS when they identify or suspect patients with infectious illnesses. Through studying the NNDRS database, the national health department can gain a timely and comprehensive picture of the national infectious disease epidemic. [3] After more than a decade of development, NNDRS encompassed 70,000 healthcare institutions nationwide as of January 31, 2018, with almost 150,000 real-name

authorized users. [4]

The direct reporting mechanism for infectious disease networks is based on infectious disease report cards.

### 3. PROBLEMS WITH INFECTIOUS DISEASE REPORT CARDS IN THE NEW CROWN OUTBREAK

Between the medical investigation that discovered evidence of the first case prior to December 1, 2019, and January 11, 2020, when the Wuhan Municipal Health Commission issued a notification on viral pneumonia of unknown origin, announcing a preliminary judgment of novel coronavirus, there was a 40-day gap in this novel coronavirus outbreak. This suggests that the current early warning system for infectious illnesses was nearly "invalid" during this outbreak and affected the outbreak's prevention and control to some extent.

After poring over the reports of the new coronavirus outbreak and considering the regulations and research on infectious disease report cards, the author discovered several deficiencies in the infectious disease report cards, both in terms of technical content and a lack of scientific and effective management. The following details are included.

#### 3.1 Insufficient sensitivity for surveillance of emerging infectious diseases

Neoplasmosis was not yet a "legal infectious illness" during the outbreak's early stages but exhibited characteristics of "pneumonia of uncertain origin." The National Health Commission's most recent version of the Infectious Disease Report Card puts infectious diseases into four categories: Class A infectious diseases, Class B infectious diseases, Class C infectious diseases, and additional statutory management essential surveillance infectious diseases. However, because "pneumonia of unknown origin" is not listed under infectious illnesses categories A, B, or C, the reporter must select the "other statutory management and key surveillance of infectious diseases" option.

Furthermore, pneumonia of unknown origin is not included in the classification of infectious diseases in the People's Republic of China's Prevention and Control of Infectious Diseases Law, indicating that the existing legal system for infectious diseases does not devote sufficient attention to "pneumonia of unknown origin." Even if it is reported to the direct reporting system, attracting adequate attention from higher-level CDCs will be difficult until the epidemic develops widely. [5]

Indeed, the Health and Welfare Commission (formerly the Ministry of Health) issued the National Implementation Plan for Surveillance of Pneumonia Cases of Unknown Origin (Trial) in 2004 to screen for

possible SARS and human avian influenza cases, as well as other infectious respiratory diseases, to issue early warnings, and to take appropriate preventive and control measures. [6] The diagnostic criteria, reporting process, and early warning indicators for unexplained pneumonia are all given in detail. In theory, if medical institutions and health administration departments at all levels diligently enforce this legislation, it will considerably aid in the early discovery and warning of unexplained pneumonia. Researchers researching and evaluating data given by the PUE system discovered that the Pneumonia of Undetermined Origin monitoring system's positive predictive value might have been intentionally boosted, according to the study. It indicates that most patients who met the case description of Pneumonia of Undetermined Origin had their medical data "filtered" at some point before being submitted to the surveillance system, increasing the surveillance system's positive predictive value. [7]

#### 3.2 Incomplete information on infectious disease report cards

According to the National Health Commission's announcement announcing the current version of the infectious disease report card, the infectious disease report card is divided into required and optional information. The card number, report card category, patient name, gender, valid ID number, date of birth, patient origin, current address, population classification, case classification, date of onset, date of diagnosis, type of infectious disease, doctor who filled the card, and date of filling the card are among the required information.

Through the basic identification information and health status of these patients, the CDC can initially understand this case. However, due to the contagious and episodic character of infectious diseases, this information is insufficient to reflect the infectious disease's epidemiological history, such as the case's lack of recent exposure history and activity trajectory, which will be detrimental to subsequent assessment. Numerous worldwide and national investigations have demonstrated a strong correlation between the emergence of new unexplained respiratory infection symptoms and a history of infectious disease exposure. [8-10]

For instance, reporting on infectious diseases necessitates an emphasis on unexplained mass illnesses. The Ministry of Health's Emergency Disposal Plan for Mass Unexplained Diseases (hereafter referred to as the "Disposal Plan") specifies that unexplained mass diseases are defined as the simultaneous or successive occurrence of three unexplained diseases in a relatively concentrated area (e.g., a medical institution, natural village, community, construction site, school, and other collective units) within a specified period (typically two weeks). With three or more cases of the same

clinical signs happening concurrently or consecutively, the source of the sickness cannot be recognized or explained through expert consultation conducted by county hospitals or higher, and severe cases or deaths occur.

This provision indicates that the disposal plan focuses on a relatively small area of the group of unexplained diseases and that patients with infectious diseases are not necessarily all located in the same medical institution, which means that when the medical institution diagnoses unexplained diseases due to a lack of knowledge about the existence of other cases, they are unaware that they are part of a group of infectious events. The medical institution's report card at this time is just for isolated instances, and the infectious disease control department, which gathers and analyzes data on infectious diseases, is the key to identifying this unexplained mass illness. If these instances are transmitted from residence and employment, the CDC department can immediately establish a geographical link between these individual cases based on the information contained in the infectious disease report card regarding the place of residence and employment. However, assume the infectious disease is transferred away from one's dwelling or place of employment. In that case, it makes it slightly more difficult for the CDC to detect an association between these cases and prolongs the time required for early detection of the infectious disease, which is counterproductive to timely early warning of the infectious disease because the infectious disease report card lacks exposure history content such as relevant activity tracks.

### **3.3 Management issues of paper infectious disease report cards**

The card number is the first required item on each paper infectious disease report card. However, according to the Health and Welfare Commission's guidelines, the card number is prepared and filled out by the reporting unit, not by the Health and Welfare Commission, which creates complications for the Health and Welfare Commission in managing infectious disease report cards and cases.

According to the General Office of the National Health and Family Planning Commission, medical institutions were required to implement the "Infectious illness information reporting management standards" in 2015.

Implement a system of first consultation accountability, quickly report statutory infectious diseases by the legislation, and be accountable for managing infectious disease information reporting requirements.

The first physician stated above is the physician who discovers an infectious disease or suspected infectious disease for the first time, but the first physician is

frequently limited to the same medical institution inside the same medical institution. When a patient with a suspected infectious condition develops recurrent or more severe symptoms, he or she frequently elects to be readmitted to a higher-level hospital (which may be local or off-site). Because doctors at higher-level medical institutions are better equipped to diagnose infectious diseases due to their higher standards and more abundant medical resources, they will refill the infectious disease report card, resulting in the problem of duplicate infectious disease reporting. Because the CDC gets infectious illness report cards from individual medical institutions, it is hard to determine promptly whether they originate from the same case due to the lack of a uniform identification mark. There may also be instances where various medical institutions "bump the code," i.e., have the same code, posing complications for the CDC's subsequent handling of the card.

Another instance is the updating of infectious illness reports following their initial publication. According to the "Infectious Disease Information Reporting Management Code," when a health care institution reports a change in diagnosis, a reported case of disease-related death, or an error in filling out the card, the health care institution should promptly make a revised report and refill the infectious disease report card or extract the electronic infectious disease report card, with the revised item selected and the origin indicated. Suspected instances should be excluded or verified soon.

As can be seen, after the diagnosis of the case is updated, the medical institution must refill out the infectious illness report card, and the number on the revised infectious disease report card must still be generated by the hospital and must not be identical to the last report card number. When the CDC receives a new infectious disease report card, it must manually review the last report card and match the cases due to the absence of a unified identification mark, which slows and complicates the CDC's ability to check for duplication.

According to a survey of national infectious disease report cards, cumulative re-cards for statutory infectious disease reports totaled 1141229 by the end of 2017, with a cumulative re-card rate of 133.47/million, with the highest percentage of re-cards reported by the same institution at 67.27 percent in 2011 and the lowest at 50.95 percent in 2005. 2016 and 2017 added a total of 228,872 and 269,496 heavy cards, respectively. In 2017, there were 8,497 new cumulative heavy cards, 276,194 accumulated heavy cards, and 269,496 new cumulative heavy cards, with a chance of 3.55 percent for each new infectious disease reporting card. [11]

As can be shown, the rate of duplicate reporting is pretty significant when infectious illness report cards are used. As a result of the high rate of duplicate reporting

and the absence of scientific and standard administration of infectious illness report cards, inefficient or even lagged infectious disease management may follow.

## 4. PATHWAY TO INFECTIOUS DISEASE REPORT CARD ENHANCEMENT

### 4.1 *Recommendations for incomplete information on infectious disease report cards*

Firstly, the infectious disease report card may include information about the patient's activity pattern, contact history, and consultation records, as applicable.

According to the commonly used epidemiological investigation template, the epidemiological investigation should include basic personal information, the onset and consultation of the case, clinical manifestations of the case, the living environment and exposure, the home environment, living habits, previous health history, exposure prior to the onset of the case, and close contacts. [12] Compared to the infectious illness report card, the epidemiological survey is more extensive and professional, with a more detailed study of the infectious and clinical status of the entire infectious disease. The author believes that infectious disease report cards can incorporate some of the information in epidemiologic surveys, primarily for the following reasons.

The CDC can swiftly examine and judge infectious disease cases with more extensive epidemiological investigations on infectious disease report cards. Compared to prevalent infectious diseases, analyzing disorders with an unknown etiology and potential for transmission is frequently more difficult. When the CDC receives such a report card, it cannot make an accurate judgment promptly due to a lack of pertinent information and must rely on additional in-depth investigation, which is time-consuming and laborious and increases the risk of infectious disease exposure and spread and transmission. If the infectious disease report card contains more detailed epidemiological information, the CDC can initially determine whether the case is related to livestock or risk of human-to-human transmission. This significantly improves the preliminary report's efficiency and simplifies the subsequent in-depth study and isolation of infectious illnesses.

A complete epidemiological inquiry on the infectious illness report card can activate the early warning mechanism more quickly, maximizing the prevention of infectious disease spread. The following is an excerpt from the Wuhan Public Health Emergency Plan. A condition that constitutes a general public health emergency (Level IV) is characterized as one of the following:

#### 1.5.4.23 *A case of pneumonia with an unknown cause is discovered.*

The term "unexplained" is used in this context to refer to the above-mentioned "Emergency Response Plan for Mass Unexplained Diseases," with the core being the simultaneous or sequential occurrence of three instances in a substantially concentrated location. As discussed previously, the existing infectious disease report card does not adequately indicate a regional association between distinct instances and relies on further study. If the infectious illness report card includes a greater variety of epidemiological data, the CDC can swiftly assess whether a related region exists in the activity trajectory of these cases when it gets several infectious disease report cards. Suppose an association is discovered and certain conditions are met. In that case, an early warning mechanism can be rapidly activated, and appropriate measures are taken simultaneously, which buys time for infectious disease early warning and protects the safety of health care workers, CDC investigators, and residents.

Infectious illness report cards with more thorough epidemiological survey content can inform future public health research. As we have reached the era of big data, public health research also relies on extensive data analysis. If infectious illness report cards include more detailed epidemiological information, it will give accurate and reliable data for subsequent local public health investigations and scientific studies, which will promote overall public health development.

### 4.2 *Recommendations for infectious disease report card management*

As demonstrated in the preceding discussion, the absence of a unified card number for the paper version of the infectious disease report card creates certain management obstacles in terms of card identification. Given the high rate of repeated card reporting in today's world, the use of effective unified management can be faster and more efficient in terms of rapid analysis and management of infectious diseases. The author proposes that the CDC adopt the "case identification system" management model, in which a "person" account manages the CDC card, and the report card number is formed of "identity code" + "medical institution identification code." Both "Each "ID" and "provider ID" will be unique, i.e., each individual will have a unique "ID," and each provider will have a unique "provider ID." The "identifying code" is the most convenient of these. One of the most advantageous is that "An identification code may be used for an identification number. There are various advantages to adopting this management strategy.

As previously noted, when a patient appears with a more serious infectious disease, he or she may choose to

seek treatment at another medical institution due to the bad outcome of the initial visit, resulting in redundant reporting between multiple medical institutions. Because different hospitals use different codes, this is quite likely to create confusion in the management of the CDC's infectious disease report card, which is counterproductive to infectious disease management. With the adoption of the "case identification system" model, the "identification code" of the infectious disease report card number remains consistent regardless of which medical institution the patient visits, allowing the CDC to quickly assign these report cards to the "individual file" regardless of how many are received. This eliminates the issue of duplicating cards from several institutions.

There will be a reporting issue if a case is discovered in a higher-level facility located outside of the country. Similarly, if the "case identification system" card management mode is used, even if the cases are reported to separate CDCs by different medical institutions, the cases themselves can be easily linked using the "identifying code." In other words, infectious illness report cards will be tightly linked to individual instances on a national scale. They can be rapidly retrieved and evaluated when required.

According to the relevant provisions, when medical health institutions report a change in the diagnosis of cases, cases that have died of the disease, or card errors, medical health institutions should and refill the infectious disease report card; then, if the CDC receives the infectious disease report card using the "case identity system" management model, the CDC can quickly identify the report card's personal information. The current problem in practice is that the infectious disease report card cannot be accurately matched with the patient, and there are multiple cards for one person. If the "case identity system" management model is used in this case, the CDC can quickly identify the personal information on the report card upon receipt and then associate the card with the name of the individual case, allowing the CDC to make a more accurate assessment of the infectious disease's status.

Similarly, as this infectious disease evolves, the process is also a matter of clinical medicine and epidemiology. If this management approach is implemented, health care providers will be able to see the development, exacerbation, and death of infectious diseases with great clarity. This will result in precise and realistic data for disciplines such as medical statistics.

## 5. CONCLUSION

The infectious disease report card is a critical component of China's infectious disease early warning system because it serves as a conduit for transmitting infectious illness information from grassroots to

decision-making level units. However, the practice performance of infectious disease report cards demonstrates that they are insufficiently sensitive to monitor emerging infectious diseases. The information contained in the report cards is insufficiently comprehensive, and the management system for the report cards is insufficiently efficient. According to the reflected problem that identifying new infectious diseases is not sensitive enough, epidemiological investigation information should be appropriately added to the infectious disease report card so that the CDC

(Chinese Center for Disease Control and Prevention, It is an administrative unit that implements national-level disease prevention and control and public health technical management and services in China) can quickly identify new infectious diseases. Meanwhile, the CDC should establish a nationwide unique infectious disease report card code to facilitate off-site management and reduce duplicate reporting problems.

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