

ORIGINAL ARTICLES

Health Information Systems for Early Warning and Surveillance of Infectious Diseases and Public Health Events in Quang Ninh province, 2019

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ABSTRACT

Objectives: 1) Describe the results of implementing the information systems for infectious disease warning and public health events in Quang Ninh province, April 2019; and 2) Assess the quality of reporting information of the infectious disease surveillance system in Quang Ninh province, April 2019.

Methods: Using a descriptive cross-sectional design, the study was conducted in all 7 provincial/district hospitals, 14 district health centers and 40/186 commune/ward health stations in Quang Ninh province from January to June, 2019. Information was collected from infectious disease case reports and monthly reports generated by Circular No. 54 software, EBS reports of April 2019, and staff who are responsible for infectious disease reporting. Data were entered and analyzed using Excel.

Results: 100% of units assigned staff to act as focal points for online reporting according to Circular No. 54 and event-based surveillance (EBS) reports; 100% of units had a good Internet connection speed for statistics and reporting. However, up to 44.2% of units still lack of computers; only 55.7% of units recorded warning signs about public health events. In addition, 73.7% of cases were updated late on software required by Circular No. 54; up to 82.5% of hospital outpatient cases and 72.6% of cases visiting commune health station for medical services were missed for being reported in the system.

Conclusion: It is crucial to provide solutions on improving the quality of the surveillance information system at all levels, to build data interoperable systems to collect information sufficiently, accurately and timely about infectious diseases.

Key words: Surveillance, Infectious Diseases, Circular No. 54, IBS, EBS, Quang Ninh

BACKGROUND

Since 2007, Viet Nam has promulgated the Law on Prevention and Control of Infectious Diseases (1). Over the years, the preventive medicine system has made important achievements in disease prevention and public health. Some

dangerous infectious diseases have been contained and controlled. We eradicated polio in 2000 and eliminated neonatal tetanus in 2005. However, local endemic infections still occur annually such as gastrointestinal, respiratory tract infections and other parasitic infections. More dangerously, the recurrence of a number



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of epidemic-prone infectious diseases has been seen, such as dengue, measles, hand-foot-and-mouth disease (2, 3). Along with the international integration, Viet Nam will have to face dangerous international epidemics. Therefore, the infectious disease surveillance information system must be competent in early detection, rapid response as well as warning of dangerous epidemics and public health events.

Quang Ninh is located in the northern key economic region and one of the four major tourist centers of Viet Nam. Due to the strong development of industry and tourism, with many border gates exchanging trade with foreign countries, the risk of penetrating dangerous diseases, including infectious diseases, from abroad into the local community is quite high (4). Therefore, Quang Ninh Provincial Department of Health (DOH) and the Center for Disease Control (CDC) have paid great attention in disease surveillance, as well as in the quality of the warning system for diseases and public health events. Currently, there are two forms of surveillance and feedback in Quang Ninh including Indicator-Based Surveillance (IBS) and Event-Based Surveillance (EBS).

Quang Ninh is one of the first provinces to deploy the IBS system down to the commune level and is also the first province nationwide to be selected to pilot the EBS system from September 2016. Evaluating these information systems is essential, reflecting concern of Quang Ninh DOH's leaders. Therefore, we conducted this study with two objectives: 1) To describe the results of implementing the information system for early warning of infectious diseases and public health events; and 2) To assess the

quality of reported information from the infectious disease surveillance system in Quang Ninh province. The study's results provide scientific evidence, which serves as a basis for proposing solutions to improve the quality of the system to support the early warning of diseases, infectious disease epidemics and public health events in Quang Ninh province.

METHODS

Study design: Descriptive cross-sectional design.

Duration: The study was conducted from January 2019 to December 2019.

Study sites: All 7 provincial and district hospitals, all 14 district health centers and 40/186 commune health stations in Quang Ninh province (a total of 61 research units).

Subjects:

Staff who are responsible for infectious disease reporting according to Circular No. 54 and EBS.

Case reports as required by Circular No. 54 and EBS monthly reports.

Sample size and sampling methods:

At each research unit, an interview was conducted with one health officer who was in charge of reporting infectious diseases. A total of 61 health officers were selected.

Data collection methods

Before conducting the research, the Quang Ninh CDC sent an official letter to the research units to introduce the study objectives and approaches, and requested the

units to collaborate with data collection. At each research unit, the following activities were conducted:

- Observing the available equipment and facilities, and interviewing the health staff being in charge of reporting infectious diseases and EBS, using the designed quantitative questionnaire.
- Collecting available information by reviewing case reports generated from Circular No. 54 software, medical examination and treatment software, and EBS reports.

Variables:

- Variable for objective 1: Human resources, facilities and equipment (internet connection, computers) for infectious disease reporting, modes of reporting, and frequency of accessing Circular No. 54 software.
- Variable for objective 2: The proportion of missed cases which was not updated into the Circular No. 54 software; the quality of information on recorded cases (late entry compared to requirements in the regulations, missing information, failure to update information, and duplication of cases).

Methods of data analysis: Collected data were entered into Excel software. The quantitative results are presented by frequency and percentage (%).

Research Ethics: The study was conducted in compliance with the research ethics rules, causing no harm to spiritual and physical status of the participants involved in the study. The study results will be reported to the locality upon completion of the study.

RESULTS

Implementation of the health information system for early warning of infectious diseases and public health events in Quang Ninh province

Implementation of activities and staffing

The study results show that 100% of health centers, public and private hospitals located in the province have reported infectious disease information, thus helped to provide adequate and timely information of infectious diseases. All (100%) units have assigned focal points for reporting infectious diseases. The General Planning Department in 71% (5/7) of hospitals was assigned to act as the focal point in making reports for Circular No. 54 software and EBS, and such an assignment was also given to the Department of Infectious Diseases in 29% (2/7) of hospitals, while 100% of District Preventive Medicine units assigned the Department of Disease Control as the focal point for statistics and reporting.

Most staff in charge of statistics and reporting work are assistant doctors, accounting for 75% of the total number of personnel in charge of surveillance and reporting for infectious diseases required by Circular No. 54, and 78.8% of the total number of personnel in charge of EBS reporting. Doctors who performed EBS reporting accounted for 18%, and who were responsible for Circular No. 54 reports accounted for 23% (Table 1). Over 70% of staff have been undertaking their assignment for more than 1 year, while only about 23% of staff were either new or in a rotation with their assignment for a duration of less than 1 year.

Table 1. Qualifications of staff acting as focal points for surveillance and reporting

No.	Level	<i>Event-Based Surveillance (EBS)</i>		<i>Circular No. 54 Software</i>	
		<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
1	Doctor	11	18.0	14	23.0
2	Nurse	1	1.6	1	1.6
3	Assistant Doctor	48	78.7	46	75.4
4	Other	1	1.6	0	0
Total		61	100	61	100

Infrastructure and equipment for statistics and reporting

The research results show that 100% of the surveyed units ensured a good Internet connection speed for statistics and reports of infectious diseases according to Circular No. 54 requirements. This is very important in updating information on the software as well as delivering disease reports to the higher level units.

The percentage of the surveyed units ensuring sufficient number of computers for synthesis and statistical reporting of infectious diseases

as required by Circular No. 54 and EBS was still low (55.8%). Up to 44.2% of units, especially commune health stations (CHSs), still found it difficult or unable to ensure sufficient facilities for the statistics and reporting.

Methods of infectious disease reporting

The study results show that only 65.6% of the surveyed units have developed their own procedures for EBS reporting and 77% of the units have developed a infectious disease reporting process on Circular No. 54 software (Chart 1 and Chart 2).

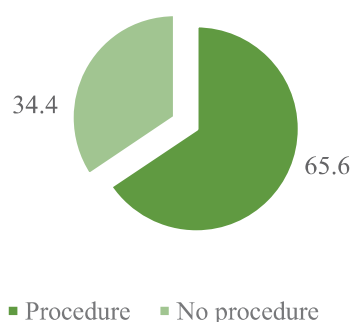


Chart 1: Percentage of surveyed units that have developed an EBS reporting procedure

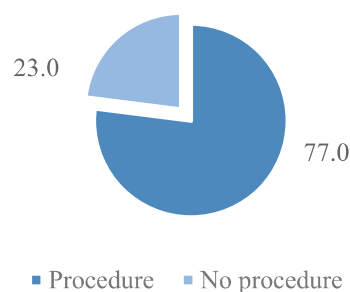


Chart 2: Percentage of surveyed units that developed a Circular No. 54-based reporting procedure

13/61 units (21.7%) did not use the Ministry of Health’s case definition for identification of infectious disease cases in surveillance. Most of the units (61.5%) have accessed Circular

No. 54 software with once a day frequency, while 38.5% of units - mainly hospitals in the province, with a frequency of 2 or more times per day (Chart 3).

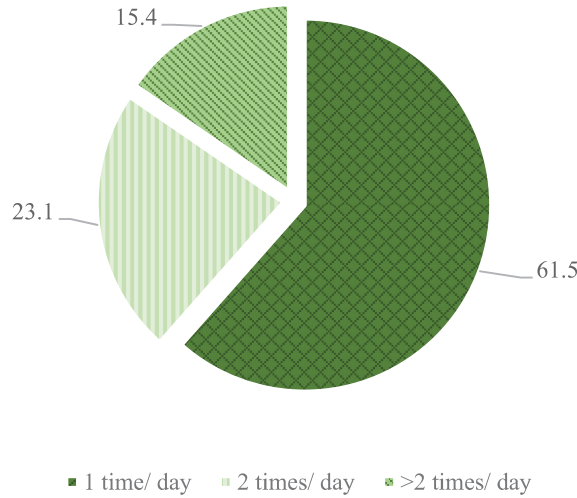


Chart 3: Frequency of accessing Circular No. 54 software

Assessing the quality of the Infectious Disease Surveillance system in Quang Ninh

Quality of surveillance information on Circular No. 54 software

The study was conducted to cover 5 commonly-seen infectious diseases in hospitals, and 6 commonly-seen diseases at commune health stations having inpatients. The research team members have listed the cases recorded in the medical examination

and treatment software (Column 1 - Table 2) and then found cases that were also entered in Circular No. 54 software (Column 2 - Table 2). The results show that the highest proportion of cases entered on both systems was for inpatient cases treated at the hospital, accounting for 71.1%, and the omission rate was 28.9%. However, hospital outpatients and CHS inpatients had a very high rate of omission for software data entry - 82.5% and 72.6% respectively (Table 2).

Table 2. Completeness of statistics and reporting the number of infectious disease cases with the online system according to Circular No. 54

No.	Clinical cases	Number of cases (Source: medical examination and treatment software) (Column 1)	Number of cases (Source: Circular No. 54 software) (Column 2)	Percentage of omitted cases (Column 3)
1	Examination and treatment at commune health station	475	130	72.6%
2	Outpatient with examination & prescription at hospitals/ health centers	63	11	82.5%
3	Inpatient with treatment at hospitals/health centers	246	175	28.9%

Only about two-thirds of the surveyed units updated their case information when changes were made. Results of reviewing 259 cases at district hospitals and health centers reported on Circular No. 54 software system from April 1, 2019 to April 30, 2019 show that the

late data entry rate was 73.7%. The proportion of cases without updated information on hospital discharge and referral was quite high (59.8%); and cases without updating or exploiting vaccination history was 21.2% (Table 3).

Table 3: Quality of infectious disease reporting data according to Circular No. 54

No.	Data quality	Number of cases (n)	Percentage (%)
1	Out of date	191	73.7
2	Missing phone number	12	4.6
3	Missing address of living place	2	0.8
4	Lack of history of vaccination	55	21.2
4	No update of the test result	8	3.1
5	No update of hospital discharge status	155	59.8
6	Duplication of cases	8	3.0
Total		259 cases	

Implementation of event-based surveillance (EBS)

In April 2019, 55.7% of surveyed units recorded warning signs and public health events. These signs were verified and timely responded for disease prevention. Maintaining the event-based disease surveillance is crucial for a disease warning system, because we track the sign and public health event when it was just a sign and risks have not been given warning. This information is also essential for warning zoonotic diseases which could be transmitted to human such as rabies and avian influenza.

DISCUSSION

Implementation of infectious disease reporting

Infrastructure, equipment and documentation for infectious diseases reporting

One of the strong advantages of Circular No. 54/TT-BYT is that it clearly stipulates the reporting of infectious diseases by online software (5), so in 2018, Quang Ninh was one of the first provinces to pioneer using Circular No. 54 software system - the new version approved by the General Department of Preventive Medicine. Particularly, Quang Ninh is also the first province to apply the Circular No. 54 software at commune level, and provide software accounts for 186 commune health stations, 14 district health centers for better management and supervision. The software was built on Web-based platform, which is easy to use, accessible on any computers connected to the Internet through accounts and log-in passwords. With authorization at different levels, users can

generate reports or view reports, edit and save data sent by the lower level units. Therefore, having a computer with internet connection is required to implement the infectious disease reporting system according to Circular No. 54 as well as EBS. At present, although each commune health stations might have at least 2 computers with stable Internet connection, those computers are often prioritized for medical examination and treatment with health insurance reimbursement activities, or for immunization activities. The study results show that although the units did not encounter difficulties in internet connection, only 55.8% of the units had enough number of computers for professional work. In order to further promote the infectious disease surveillance and local healthcare activities more effectively, leadership of Provincial People's Committee and Provincial Department of Health need to provide additional computers for disadvantaged units.

Regarding the current technical guidelines at all levels, they are separated guidelines for each or group of infectious diseases compiled under different programs and projects, and therefore they were fragmented, inconsistent, and non-systematic. Most of facilities at grassroots level do not have these documents available for reference when needed. Especially, many health units (21.7%) still neither know nor follow the Ministry of Health's "Case definitions for infectious diseases" guidelines in identifying cases of infectious diseases in accordance with 3 definitions: suspected cases, probable cases and confirmed cases (7). Surveillance reports of Quang Ninh CDC showed that many hospitals were still waiting for a confirmed positive test result before entering the case

data in the system; or they entered data of a probable case report but when the test result was negative, they changed the diagnosis or deleted that case from the system without notice (8). This greatly affects the quality of information recorded on the Circular No. 54 software system. Training courses on surveillance of infectious diseases for staff at all levels are necessary.

Methods of implementing infectious disease surveillance:

The research results indicate that there are differences in the organization and operation of the surveillance systems - namely Circular No. 54-based and EBS between the preventive care and curative care systems. 100% of the preventive medicine units assigned the management, administration and operation to the Department of Infectious Disease Control. But for the hospitals, 71% assigned the tasks to the General Planning Department, and only 2 units, namely Obstetric/Pediatric Hospital and Bai Chay Hospital assigned the Department of Infectious Diseases to act as a focal point.

The research results show that 34.4% of the units did not have a procedure for generating EBS reports and 23% did not have a procedure for reporting infectious diseases in the units. If the health unit does not have a procedure for reporting infectious diseases and EBS, which should be a legal basis binding the responsibilities and powers of the relevant departments, for those Health Centers with dual functions, omission of cases or failure to report cases from such treatment departments as obstetrics, pediatrics, infectious diseases, clinics are likely to occur frequently. The development of reporting procedures

is essential to ensure that information on infectious cases is fully and timely communicated, especially in hospitals, multi-function health centers.

For hospitals that the General Planning Department staff act as a focal point, most of staff did not directly use the data set available on the system, or possibly they did not understand the definitions of infectious disease cases to report. There were no reconciliation or review ... rather it was simply re-entering data of cases from the summary form. In fact, the hospitals have their own software for managing hospital health information, including patients with infectious diseases. However, since this software has not yet been connected to Circular No. 54 software, hospital staff have to re-enter the case data into the Circular No. 54 system, which was time consuming, causing errors and omissions. This explains the poor quality of information recorded by the current infectious disease surveillance system.

The quality of information recorded by the infectious disease surveillance system

The results show that the rate of cases not being updated on the Circular No. 54 software was quite high for outpatient hospital visits, medical examinations and treatment at commune health stations (about more or less than 80% omitted). The omission rate for hospital inpatient was lowest but it also accounted for 28.9%. This might be possible that inpatient cases, health workers had more time to monitor, evaluate and do the clinical test, so the reporting was better. Cases receiving examination and prescription were usually mild cases, without test results showing causes of diseases, so they were often

overlooked by health workers. Additionally, the time that medical staff had contacts with outpatients was very short, so it was difficult for them to obtain patients' information, and then enter data on Circular No. 54 software. For the commune health stations, the number of omitted cases without being reported was mainly those with clinical manifestations of influenza or fever with measles-like rash. The results of this study are quite similar to Do Kien Quoc's assessment of the southern region in 2017 (9). One of the causes of the failure to update information into the Circular No. 54 software was due to the fact that the medical staff have recorded the patient's information in the medical examination and treatment software, so it is usually subjective to update later on Circular No. 54 software, and then sometimes they forgot about that.

For cases updated on Circular No. 54 software, the timeliness of information was low - only 26.3% of cases were reported on time. The problem of accuracy still remains such as duplication of cases (3%), sometimes inconsistency in information updating. Information is sometimes not fully recorded such as lack of residence address, phone number of the family members or patients; or the patient's vaccination history details. This finding is similar to that of the study by Nguyen Minh Hai that recently assessed the quality of information on infectious disease surveillance system in Ha Noi (10).

Potential factors affecting the quality of data of the infectious disease surveillance system and public health event warnings in Quang Ninh province were analyzed in part 1 of the discussion, including 1) no use of the case definitions for infectious diseases as prescribed by the Ministry of Health;

2) lack of a standardized procedure for reporting infectious diseases and assigning responsibilities for reporting; and 3) no interoperability among medical examination and treatment software, and Circular No. 54 software and EBS warning system software.

The strength of this study is that it describes the quality of information recorded on Circular No. 54 software. However, the limitation of the study is that it has not provided an in-depth and specific analysis of EBS system quality and therefore specific recommendations to strengthen this system have not been made.

CONCLUSION AND RECOMMENDATIONS

The system of online infectious disease surveillance and event-based disease surveillance in Quang Ninh province has made great efforts. In order to bring into full play the effectiveness of this system, it is necessary to actively address data quality-related shortcomings such as improving the completeness, accuracy and timeliness. In addition to providing more training courses on infectious disease surveillance, reviewing and developing a surveillance procedure for infectious diseases in the health facilities, Quang Ninh province needs to develop/apply a software which could be interoperable among medical examination and treatment software, infectious disease management software required by Circular No. 54 and EBS reporting software. This will form the basis for integration of different information systems into a data warehouse to effectively use data from this surveillance system to provide early warnings, rapid response to

epidemics and public health events in Quang Ninh province.

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