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CURRENT STATUS OF INFECTIOUS DISEASE SURVEILLANCE SYSTEM IN HANOI AND THE EFFECTIVENESS OF SOME INTERVENTIONS

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ABBREVIATION

CDC	The Centers for Disease Control and Prevention
CHS	Commune Health Station
DHC	District Health Center
ECDC	European Centre for Disease Prevention and Control
EWARS	Early Warning and Response System
EWORS	Early Warning Outbreak Recognition System
ID	infectious diseases
IDSS	Infectious disease surveillance system
IHR	International Health Regulations
GOARN	Global Outbreak Alert and Response Network
NEDSS	The National Electronic Disease Surveillance System
PMC	Preventive Medicine Center
PPC	Private Polyclinic
PPV	Positive predictive value
ProMED	The Program for Monitoring Emerging Diseases
PM	Preventive medicine
PH	Public Health
SARS	Severe acute respiratory syndrome
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
WHO	World Health Organization

INTRODUCTION

In the world, new threats of diseases have been emerging with outstanding dangerous diseases such as SARS, Ebola, HIV/AIDS, Influenza (AH5N1, AH1N1,..), ... Many infectious diseases continue to be complicated as TB drug resistance, drug-resistant malaria; diseases related to the environment and lifestyle are increasing affecting the health of mankind and the socio-economic development of each country.

Monitoring infectious diseases, especially infectious diseases causing epidemics is part of the public surveillance system and health information system. In Vietnam, the surveillance system has a wide coverage across the country with passive monitoring, collecting and synthesizing information from health facilities. In recent years, the system has been improved, strengthening the legal framework to create close cooperation mechanisms among related sectors and strengthening the capacity of the system. The infectious diseases surveillance system in Vietnam has organized according to the requirements and contents of the Circular No. 48/2010/ TT-BYT dated 31/12/2010 of the Ministry of Health.

In Hanoi, since 2002, the monitoring and reporting procedure for infectious diseases has been implemented and since 2011 the system has been improved in organization and operated according to the Circular 48/2010/TT-BYT of the Ministry of Health. Up to now, there was no research to assess the status of infectious disease surveillance system in Hanoi. Many questions have been raised regarding the quality of system operation such as what does surveillance system currently has? How does it work and what shortcomings exist? In order to be able to answer these questions, it is necessary to determine the actual situation of the infectious disease surveillance system in Hanoi to identify the limited points, thereby providing appropriate interventions

to improve the quality and effectiveness of the Hanoi infectious disease surveillance system as required by Circular No. 54/2015/TT-BYT dated December 28, 2015 replacing Circular No. 48/2010/TT-BYT responding to the requirements of current epidemic situation, we have conducted the research on the "Current status of infectious disease surveillance system in Hanoi in 2012 and the effectiveness of some intervention measures" with 2 following targets:

1. Describe the current status of infectious disease surveillance system in Hanoi in 2012;

2. Evaluate the effectiveness of some interventions for enhance the quality of infectious disease surveillance system in Dong Da district, Hanoi.

New inputs in science and practical value of the research topic

The study has provided basic information and data on the status of current structure and operation of the infectious disease surveillance system in Hanoi at the period of 2011-2012 and the effectiveness of some implemented interventions in structure and operational quality improvement of the system (shorten the time to detect, diagnose and control disease cases, improve the quality of monitoring reports of the disease monitoring system of Dong Da district, improve sensitivity and positive predictive value (PPV) of the system, improve the accuracy of monitoring data, timeliness and completeness of monitoring reports of surveillance systems and increase team capacity through improving their surveillance knowledge and practices of health workers). These interventions were initially applied effectively in the surveillance practice for prevention of dengue epidemic in Hanoi in 2012-2013.

Thesis structure

The thesis comprises 144 pages, including: 3 pages of Introduction, 37 pages of Literature Overview, 22 pages of Research subjects and

methods, 43 pages of Research results, 36 pages of Discussion, 02 pages of Conclusion and 01 page of Recommendation.

The thesis has 43 tables, 1 figure, 3 diagrams, 19 charts, 132 references: Vietnamese (62), English (70).

Chapter 1

LITERATURE OVERVIEW

1.1 Situation of infectious diseases in the world and in Vietnam

Since the 1970s, many new infectious diseases (ID) have appeared with a frequency of more than one disease per each year. In total, more than 40 new diseases have been discovered in the past 30 years. It is possible to divide the ID having risk of epidemic outbreak into 4 groups: 1) Respiratory disease group A [Influenza A (H5N1), influenza A (H1N1), meningococcal meningitis, measles, Rubella,...); 2) Group of gastrointestinal diseases [hand, foot and mouth disease (HFMD), cholera, typhoid,...]; 3) Vector transmited disease group (dengue fever, Zika fever, Japanese encephalitis...); and 4) Animal-to-human transmited disease group (dengue fever caused by Marburg virus, virus Lassa, ..., Ebola disease, rabies, human streptococcal disease, etc). These are emerging dangerous diseases globally, with high incidence and mortality rates.

1.2 Infectious disease surveillance system

1.2.1 Concepts and definitions

Monitoring: Monitoring is the process of continuous and systematic information collecting about the situation and direction of disease, analysis, explanation to provide information for planning, implementation and evaluation the effective and in time preventive measures (According to the International Health Regulations 2005).

Disease monitoring: It is the practice of epidemiological surveillance to monitor the spread of disease to determine the progressive phenotype of

disease and epidemic outbreak. The main content of disease surveillance is the practice of case reporting of diseases (Wikipedia, https://en.wikipedia.org/wiki).

Infectious disease surveillance system (IDSS): A system of health units from the commune level to the central level, belonging to the public or private system, having functions and tasks of data collecting and statistic analysis on infectious disease, sending reports to responsible organizations of higher levels; implementing measures to respond to epidemic outbreaks according to the contents prescribed in Section 3, Chapter II, Law on Prevention and Control of Infectious Diseases (2007) of Vietnam.

1.2.2 Function, structure of infectious disease surveillance system

Function of the IDSS including general functions and other popular support functions. The general functions include case detection, case identify, report, analyze, investigate, respond to epidemics and information respond. The popular support functions are education, training, monitoring and evaluation.

The structure of the IDSS is determined according to legal requirements through international health laws, regulations and guiding documents of each country and the strategy of monitoring implementing and organization activities, the units have a decisive role in monitoring infectious diseases and the relationship between these units as well as with other networks and partners**.**

Monitoring strategy: The monitoring strategy is dependent on the type of surveillance that needs to be conducted, the objectives and the method of surveillance system, how to use the data to serve public health policies and practices .

Monitoring units and stakeholders: National surveillance systems on infectious disease often consist of 4 basic levels: central, intermediate level (region, province/city, districts), peripheral level (district health

facilities) and the community. Each level may include public health care facilities and private facilities. The circulation of data, information, monitoring results in the system and the use of information is clearly and publicly identified for monitoring members and relevant units.

Network and collaboration: Monitoring the IDs requires collaborative efforts between stakeholders and partners within and between the countries. At the national level, cooperation, linkages among ministries, and between key partners plays an important role in implementing effective and comprehensive systems. Thus, the coordination at all levels, interdisciplinary and countries is necessary to well implement early detection functions, rapid response of infectious disease surveillance system.

1.1.3. Monitoring forms

Passive surveillance: A form of monitoring by which the health information is reported passively and there is no attempt to actively seek information from the units in the system.

Active surveillance: A type of monitoring based on the regulations undertaken by a health unit. In fact, two forms of passive and active surveillance can be implemented intertwined to better accomplish the monitoring goal.

Case-based surveillance: A form of monitoring a specific disease by collecting specific data for each case of disease, for example, collecting specific data of acute flaccid paralysis cases in poliomyelitis surveillance.

Focus surveillance: A form of monitoring and data collection according to the determined sample size (random or intentional) in order to detect early cases or assess the trend of the epidemic.

Community-based surveillance: A form of monitoring using data discovered and notified by the community, include active monitoring

(case finding) or passive monitoring and is valid for the duration of the disease.

Hospital-based surveillance: A form of monitoring performed at a hospital where a patient is diagnosed with a specific disease or syndrome.

Laboratory-based surveillance: A form of monitoring to collect laboratory information to detect pathogens or monitor antibiotic resistance of bacteria provided by laboratories.

Syndrome based surveillance: A form of surveillance that collects and analyzes data related to health status before confirming diagnosis for a case or an epidemic to ensure the preparation for response actions in Public health.

1.2.4 Monitoring data source

Sources of monitoring data can be data on deaths, cases, testing data, case reports, outbreak investigation reports, sentinel surveillance reports, reports of public health surveys, data on different types of intermediate vectors for transmission, environmental monitoring reports, climate conditions ...

1.2.5 Steps of infectious diseases surveillance

The basic steps of a disease surveillance activity usually include: 1) detection and identification of cases; 2) reporting; 3) epidemiological investigation; 4) response action and 5) information feedback.

1.2.6 Periodic monitoring and evaluation

Periodic monitoring and evaluation the IDSSS is an important component in the operation of the system. As recommended by WHO, each country should periodically conduct system evaluation bi-annually to ensure that monitoring objectives are achieved and activities are carried out as planned.

1.3 The infectious disease surveillance systems in the world and in Vietnam

1.3.1 World Health Organization's early warning and rapid response system (GOARN)

The early warning and rapid response system to global epidemics and diseases (GOARN) is a system that uses the network of technical information of organizations and existence international networks to diseases detect, identify and timely response.

1.3.2 Other infectious disease surveillance systems in the world

- The national electronic disease surveillance system at USA- NEDSS.
- Surveillance Net in Germany - SurvNet
- Internet based disease surveillance system in Sweden - SmiNet-2.
- Information infectious diseases surveillance system of the Netherlands.
- Infectious diseases surveillance system in Middle East Region- MECIDS.
- Mekong Infectious diseases surveillance system - MDBS.
- Integrated monitoring network of infectious diseases in East Africa - EAIDSNet.
- South Africa's Center for Infectious Diseases Monitoring – SACIDS.
- *I*nfectious disease surveillance system in China.

1.3.3 Infectious disease surveillance system in Vietnam

The system was implemented in accordance with Directive 10/1998/ CT-BYT dated December 28, 1998 of the Ministry of Health for 26 infectious diseases. From 2011, the system has been operated according to the Circular No. 48/2010/TT-BYT of the Ministry of Health for 28 infectious diseases.

1.3.4 Monitoring and evaluation of infectious disease surveillance system

According to WHO and CDC guidelines, assessing an IDSS is to evaluate the four basic contents of the system: 1) Structure (legal basis, monitoring strategy, implementation units and system networks). 2) Main function (capacity to detect disease/epidemic cases, case recording, cases confirm diagnosis, case reports, analysis, feedback and ready competencies to respond and to control disease); 3) Supportive functions (standards, guidelines, training, support monitoring, resources and coordination) and 4) Operation quality of the system in line with monitoring targeted infectious diseases (representativeness, completeness, timeliness, simplicity, usefulness and flexibility of the system, sensitivity, specificity and predictive value).

Chapter 2

STUDY SUBJECTS AND METHODS

2.1 For Objectives 1. Discribe the current situation of infectious disease surveillance system in Hanoi

2.1.1 Study design

The describtive cross-sectional study using retrospective data and survey data of Hanoi in 2011-2012.

2.1.2 Research subjects

• The Health Units participating in the Hanoi Infectious disease surveillance System, including: Hanoi Preventive Medicine Center (PMC) (Department of Infectious Diseases Control and Vaccine and Laboratory Department), District Health Centers (Department of Disease Control and Testing); Commune Health Stations (CHS), city General Hospitals, district general hospitals, private health system in Hanoi (Hospitals, Polyclinics).

• Supervision staff (managers, supervisors of Hanoi PMC, of Health Centers and health staff of CHS, supervision staff of the hospitals/ polyclinics.

• Facilities and equipment for epidemic prevention and control.

• Secondary documents: Documents and reports related to ID monitoring activities of Hanoi in 2011-2012.

2.1.3 Study location and time

All 29 districts of Hanoi. The study was conducted from January 2012 to December 2012.

2.1.4 Sample size and sample selection

2.1.4.1 Sample size: All health units participated in Hanoi ID surveillance system (Hanoi PMC, 29 Health Centers (HC), 10 City General Hospitals, District General Hospitals and private Hospitals, Polyclinics.

Number of CHSs was determined by formula: $n = Z^2_{(1-\alpha/2)} \frac{p(1-p)}{d^2}$

(n: number of CHS to be investigated; Z^2 (1-α/2) = 1.96 (with α = 5%, 95% reliability); p: estimate the proportion of CHS sent surveillance reports on time. Since there was no data available, p = 0.5 was selected. d: desired accuracy = 0.1). Sample size n was calculated as 96, in fact, 115 CHS were surveyed, randomly selected from total of 577 CHS of Hanoi

- From the selected units, 440 health staff participating in ID monitoring were selected for interview.

- Secondary documents: documents and reports related to ID surveillance present at health units; the surveys, reports on investigation of cholera, Dengue heamorhagis fever (DHF), measles and influenza A/H5N1 epidemic outbreaks occurred during 2011-2012 period.

2.4.3. Sampling method

• Targetly select the units of IDSS (Table 2.1)

Table 2.1 Distribution of units and health workers participating in the surveillance system

Subjects	Number of Health Units	Number of Health staff
Department of Infectious Diseases Control - Hanoi PMC	1	14
Laboratory Department – Hanoi PMC	1	10
Department of Infectious Diseases Control- DHC	29	58
Laboratory Department - DHC	29	29
Commune Health Stations (CHS)	115	230
City General Hospitals (CGH)	10	20
District General Hospitals DGH)	15	30
Private general hospitals (PGH)	10	20
Private Polyclinics (PPC)	29	29
Total	**239**	**440**

2.1.5 Research variables

Research variables were selected according to 4 main contents of the surveillance system and WHO guidelines.

2.1.6 Methods and tools for data collection

Observe the checklist, survey monitoring activities using survey forms to assess the monitoring activities done by health units participating in the IDSS in Hanoi; review data on outbreaks and related documents.

2.2 For Objective 2. Evaluate the effectiveness of some quality improvement interventions of the Hanoi infectious disease surveillance system

2.2.1 Research design

Community-based intervention study without control. Evaluate the effectiveness of the intervention by comparing the data obtained before and after intervention (vertical comparison) and compared with the

standard criteria required by Ministry of Health using DHF and cholera models.

2.2.2 Study location and time

Location: Dong Da District.

Research period: from June to August 2013.

2.2.3 Research subjects

- Health units involved in ID surveillance at Dong Da district (the DHC, CHS, DGH, PGH and PGC of this district).

- Health staff involved in ID surveillance of Dong Da Health Center, health staff of 21 CHSs in Dong Da district, health staff in charge of epidemic surveillance of 3 PGHs and of 10 PPC in the district.

- Secondary data: documents and reports related to ID monitoring, including DHF, cholera suspected cases deterted at Dong Da district in 2012-2013.

2.2.4 Sample size and sample selection

All 36 health units of the ID surveillance system of Dong Da District, including the Department of Disease Control, Department of Laboratory of the Dong Da Health Center, 21 CHS of the district, 3 General Hospitals and 10 Private General Clinics at the district. 68 supervisors staff of the system were selected targetly for quantitative research, including 2 staff of the Department of Disease Control, 2 staff of the Laboratory Department of the District Health Center, 42 staff of CHS (2 staff/CHS), 12 staff of 3 General Hospitals (4 staff/hospital) and 10 staff of the PPC (1 staff/PPC).

Qualitative research: in-depth interviews was performed with 15 leaders of units and group discussions was conducted with 21 staff of 21 CHS.

2.2.5 Intervention issues

Consolidate and strengthen the structure and operation of the system; provide relevant legal documents, provide testing bio-products; improve the operational quality of the system.

2.2.6 Intervention implementation

Organized the conferences, training courses on technical and professional issues, technology transfer; provide quick test, biological test for testing activity. Establishing a team/staff specialized in statistics

on infectious diseases, assigning specific tasks. Surveying and assessing the status of system operation in Dong Da district, the knowledge and practice of monitoring staff on the content related to monitoring the problem. In-depth interviews with leaders of health units using pre-designed survey forms**.**

2.2.7 Research variables/indicators and collection methods

Data and information on the operation of the system before and after the intervention were collected through checklists. Information about the knowledge and attitudes of supervisory staff collected through questionnaires, in-depth interviews / group discussions.

2.2.8 Method of data analysis

Data entry with EpiData 3.1 software; analysis according to SPSS 16.0 software.

Calculation of efficiency index: (Results after intervention - Results before intervention)/Results before intervention x 100.

- For qualitative research: Remove tapes and analyze encrypted information, identify common problems.

2.3 Control of research errors: Select suitable sample size; appropriate questionnaires, KAP interview questions, contents of in-depth interviews and group discussions designed clearly and easily understood. Choose experienced, responsible, having supervising skill investigators. Survey data were double-blinded and cleaned before analysis.

2.4 Ethics in research: The thesis design has been approved by the Ethics Council in Biomedical Research of the National Institute of Hygiene and Epidemiology on the scientific and ethical aspects of research.

2.5 Limitations of the study

The study has been conducted after 1 year of implementing Circular No. 48/2010/TT-BYT, the impact of Circular application therefore may not be clear. The design of community intervention study has no control group, assessing the effectiveness of the intervention by comparing the results before and after the intervention (vertical comparison) so it is somewhat limited compared to the intervention study with control.

Chapter 3
RESULTS

3.1. The current status of Hanoi's infectious disease surveillance system

3.1.1 Structure of the infectious disease surveillance system of Hanoi

Hanoi IDSS includes Hanoi PMC, 29 District Health Centers (DHC), 577 CHSs, included also the participation of public hospitals (Central Hospital and other Hospitals in Hanoi) and private clinical facilities.

Human resources of IDSS: Staffs with a doctor's degree or higher account for a high proportion in the Hanoi PMC (40.9%), this rate of DHCs was accounted for 16% and 20.6% at the CHSs.

Table 3.5 Professional qualifications of commune health station staff

Main responsible Department in the system	Hanoi PMC (n=1)	DHC (n=29)	CHS (n=115)
Doctors	97	20,6	84,3
Bachelor of Public Health	13	2,8	11,3
Medical graduated	112	23,7	97,4
Nursing	98	20,8	85,2
Midwives	87	18,4	75,7
Technicients	2	0,4	1,7
Pharmasist	58	12,3	50,43
Others	5	1.0	4.3
Total	**472**	**100**	

Coordination among the units in ID surveillance: 100% of DHCs have directed and supported CHSs in ID monitoring, 24/29 units were colaborated with general hospitals, 18/29 units were in collaboration with private general clinics and 6/29 units colaborated with private hospitals. The CHSs were mainly coordinated with village health workers (70.4%) and medical collaborators (83.5%) in ID surveillance.

3.1.2 Current status of implementing the main functions of units of Hanoi infectious disease surveillance system

Method of data collection by Hanoi IDSS: 100% of DHC have collected data on infectious diseases from CHS and weekly came to hospital to

collect data (28/29 DHC). The CHS collected data on cases of illnesses from hospitals and PPCs in the area.

*Methods of recording and analyzing, interpreting data, planning to prevent epidemic prevention of units in the monitoring system***:** The method of recording cases of DHCs was mainly epidemic recording book and epidemic reporting book (93.1% and 97.4%), case investigated forms (86.2%). The CHSs used case examination books (A1) (99.1%), outbreak investigation books (93.9%), briefings with the village health workers (90.4%) and disease monitoring books for each disease (90.4% - 97.4). 93.1% of DHC and 39.1% of CHSs analyzed and interpreted data on infectious diseases.

Situation of establishment of Steering Committee for Disease Control and Prevention: 29/29 DHCs and 113/115 CHSs (98.3%) have established the Steering Committee for Disease Control (PCD). 29/29 of DHCs established mobile epidemic control team.

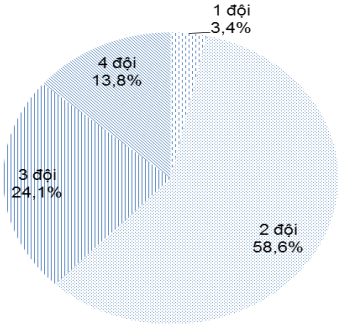

Figure 3.2 Establishment of a mobile epidemic prevention team at District Health Centers

The capacity of system to diagnose disease's pathogens: Most DHCs were unable to diagnose disease causative (A/H5N1: 0%, DHF: 3.4%, cholera: 6.9%), but has capacity to sample properly (influenza A/H5N1: 48.3%, DHF: 100%, cholera: 96.6%). The rate of hospitals and PPCs performed disease diagnosis variated from 20.6% to 28.6% and 38.1% - 55.6%, respectively**.**

3.1.3 Supportive function of infectious disease surveillance system

The availability of guidelines for case definition: The majority of DHCs (28/29) have a guide of case definition for all 28 diseases as prescribed.

Only 6.1% of CHSs and 9.5% of hospitals/PPC have all these documents.

Training on professional skills: Every year, Hanoi PMC organizes training on professional skills of outbreak prevention and control for health workers. Most of subjects of training were staff involved in disease monitoring, laboratory staff (100%), staff of the mobile outbreak prevention and control team (93.1%) and staff of the treatment division (51.7%).

Supportive monitoring: In 2011, the district health centers were supported in disease monitoring by Hanoi Preventive Medicine Center with an average of 5.5 visits/year and DHC also organized the supportive visits to commune health center with an average of 19.9 visits/year.

Equipping supportive materials: 100% of DHCs have enough computers/printers for use; 9.5% of hospitals and polyclinics did not have no computers, 33.3% did not have fax machines and 19% did not have internet connection, ...

3.1.4 Operation quality of Hanoi infectious disease surveillance system

Timeliness and completeness of infectious disease reports: Monitoring reports were more fully implemented at DHC and CHSs. The hospitals/clinics have rated with the highest rate of completeness, followed by DHC, the lowest were those performed by the CHS.

Bảng 3.28 Situation of report performance on infectious diseases

Units	**Reports performed**		**Report performed in time**		**Report performed with the completeness/total number of reports**	
	No	**(%)**	**No**	**(%)**	**No**	**(%)**
Weekly report						
DHC (Total=1.508)	912	60.5	666	73.0	834	91.4
CHS (Total=30.004)	6.152	20.5	4.201	68.3	4.655	75.7
Hospital/PGC	541	16.5	469	86.7	496	91.7

(Total=3.276)						
Monthly report						
DHC (Total=348)	306	87.9	270	88.2	244	79.7
CHS (Total=6.924)	4.715	68.1	3.706	78.6	3.314	70.3
Hospital/PGC (Total=756)	146	13.1	144	98.6	135	92.5

The simplicity and acceptability of the IDSS: 54% of staff said that the current surveillance procedure of IDSS of the system is suitable or relatively appropriate (30%); data on monitoring of asphalt is relatively accurate (65%) or accurate (27%).

About the ability to meet the system's PCD: 77% of supervisors of CHS commented that the system is capable of responding to the current local disease situation. This rate is low for supervisory staff at health centers, hospitals, and general hospitals (45% and 24%). Main reason was the lack of professional staff, lack of funds and lack of equipment.

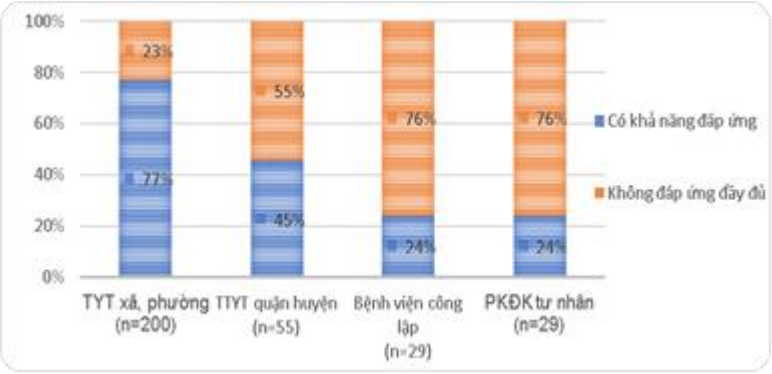

Figure 3.15 Comments of health staff on response capacity of infectious disease system

Knowledge and practice on monitoring the infectious diseases of health staff: The number of staff with good knowledge about ID monitoring of rather good and good level was accounted for 30.3% and 5.9%, this rate among health workers at DHCs was 65.4% and 20%, respectively, much higher than those of CHS staff and staff of private general clinics.

Health staff of General Hospital has good and relatively good practice score (41.4% and 13.8%), much higher than preventive medicine staff (DHC and CHS).

3.2 Effectiveness of some interventions to improve the quality of infectious disease surveillance system in Dong Da district, Hanoi

3.2.1 Effectiveness of the intervention to improve quality of monitoring dengue fever and cholera suspected cases

Early detection capacity, rapid response to dengue fever was enhanced with the shortening of the average time accounted from the first patient's detection date to the end of the outbreak from 19.5 ± 4.5 days down to 16.9 ± 3.2 days for dengue fever disease (Table 3.32). For cholera suspected case, the intervention has also shortened the average time accounted from the date when patient was detected to the date of case investigation of 0.5 ± 0.7 days, meeting the requirements of the Ministry of Health.

Timing (days)	**Before intervention** M±SD	**After intervention** TB±SD	**Comparison (ttest & Mann-Whitney test)**
From date getting sick to the date case detected	7.4 ±3.2	3.9 ± 1.4	p<0.001
From date case detected to the date of case reported	0.3 ± 0.6	0.3 ± 0.5	p>0.05
From date case detected to the date of case investigated	1.6 ± 1.6	1.1 ± 0.5	p>0.05
From date getting sick to the date patient's sample was investigated	5.9 ± 3.4	3.9 ± 1.5	p<0.05
From date taken sample to the date having testing results)	0.8 ± 1.9	0.2 ± 0.4	p>0.05
From date getting sick to the date of having test result	7.7 ± 4.2	4.0 ± 1.6	p<0.001
From date 1st patient detected to the date of	9.2 ± 3.5	5.1 ± 1.5	p<0.001

outbreak detected			
From date 1st patient detected to the date outbreak first treated	10.3 ± 3.5	5.9 ± 1.7	p<0.001
From date 1st patient detected to the date outbreak completely controlled	19.5 ± 4.5	16.9 ± 3.2	p<0.05

Note: Mean±SD = Mean time ± standard deviation.

Sensitivity and positive predictive value in monitoring Dengue dengue fever: The sensitivity of IDSS of Dong Da district in monitoring of DHF disease has increased from 59.3% to 71% after intervention with the efficiency index (EI) reached 20 %. Similarly, the positive predictive value was increased to 99.5% after the intervention. The responded comments on in-depth interviews about the effectiveness of intervention in shortening the time of case detection, case investigation were all highly appreciated the operational quality of the surveillance system.

Improving the quality of implementing infectious disease surveillance reports of infectious disease surveillance system in Dong Da district:

The quality of performance of weekly and monthly reports by the CHSs was improved markedly after intervention with an efficiency index of 34.6% for weekly and 2.0% for monthly reports. The percentage of reports that contain all necessary information as required was 100% with an efficiency index of 61.5% -72.7% ($p < 0.05$) (Table 3.35).

Quality of the performance of periodic monitoring reports of Dong Da Health Center has been improved with the EI of 400% - 420%, increasing the rate of full reporting of up to 100% ($p < 0.05$) (Table 3.36). The responded comments from in-depth interviews and group discussions showed the implementation of interventions in accordance with the local situation.

Table 3.35 Improved the quality of monitoring reports of Commune Health Stations

Report	Before intervention (%)	After intervention (%)	Effective Index (%)	p
Weekly report				
Reports performed	76.5	100	30.8	p<0.05
In-time Reports	72.5	98.9	34.6	p<0.05
Full information reports	61.9	100	61.5	p<0.05
Monthly report				
Reports performed	98.0	100	2.0	p>0.05
In-time Reports	98.0	100	2.0	p>0.05
Full information reports	57.9	100	72.7	p<0.05

Improving skills of data analysis on infectious disease surveillance: Skills to analyze data on disease surveillance of staff at CHS were improved markly after intervention: 100% of CHS could analysed data by the factors (Mortality rate/morbility rate), by the time, place,… with EI reached from 233% to 1900% (p <0.001).

3.2.2 Improve knowledge and practice of health staff at Dong Da district

There was a significant improvement in knowledge and practice of staff of CHS participating in IDSS after intervention compared to the that before the intervention with the average score of knowledge and practice increased by 12.4 and 2 points (p <0.0001). Concerning DHC, after intervention, the average points of knowledge among health staff has increased 26.75 points [p <0.05; OR 26.75 (4.5 - 49)].

Table 3.38 and 3.39 Improvement of knowledge, practice about infectious disease surveillance among health staff after intervention

Indicators	Before intervention	After intervention	OR (95%CI)	p (*)
Health staff of CHS:				
Average points of knowledge (scale of 71)	44.1	56.5	12.4 (8.5 - 16)	<0.0001
Average points of practice (scale of 10)	4.5	6.6	2.0 (1.4 – 2.6)	<0.0001
Health staff of DHC:				
Average points of knowledge (scale of 100)	69.25	96.25	26.75 (4.5 – 49)	0.042
Average points of practice (scale of 10)	6.75	7.75	0.75 (-10 – 8.7)	0.5

(*) Independent - Sample T Test was used.

Results of interviews and group discussions showed the agreement of staff opinions on appropriateness of interventions measures and the sustainable of surveillance system after the intervention.

Chapter 4

DISCUSSION

4.1 Current status of Hanoi infectious disease surveillance system

4.1.1 Structure, organization of Hanoi surveillance system

Nowadays, Circular No. 54/2015/TT-BYT dated December 28, 2015 on "Guidelines for reporting infectious diseases" is applied to replace Circular 48/2010/TT-BYT, focusing on case reporting and prescribing the application of online reporting forms in addition to other forms of reporting. However, this study was conducted at the time Circular

No.48/2010/TT-BYT has been used for organizing, structuring and implementing, so the system assessment was based on criteria related to the regulations of this Circulars. The survey showed that the coverage of documents and contents needed for monitoring the problem is still a problem for the commune levels, especially for the clinical health care units. *Regarding the structure of the ID surveillance system in Hanoi:* The system has been structured quite clearly, initially meeting the epidemic prevention and control task but only 46.6% of the hospitals/clinics have applied the Circular No.48/2010/TT-BYT. *Regarding human resources of ID surveillance system in Hanoi*: Human resources of DHCs were found sufficient in number, but still limited in terms of expertise, only 95 doctors participate in disease surveillance activities. The full-time staff at the district and commune levels were mainly physician and nurses and part of them worked with several function concurrently. *Regarding the collaboration among units in surveillance system*: There were still gaps in the surveillance collaboration between health centers and private hospitals/private clinics in the area in accordance with the coordination regulations of Circular No.48/2010/TT-MOH and Circular 54/2015/TT-BYT in infectious case detection and case reporting within 24 hours.

4.1.2 Implementing the main function of the Hanoi infectious disease surveillance system

Regarding the status of monitoring activities of the system: The performance of reporting on disease monitoring results done by health care facilities and sent to Hanoi Preventive Medicine Centers and District Health Centers was passive and uneven, so 96.6% of DHC still have to appoint officers come to hospitals for data collecting. *Regarding the method of recording and the quality of case monitoring reports*: Most of DHCs and CHSs reported cases according to the required prescribed forms and with full reporting form types, but among

the hospitals and clinicals, 6.3% - 52.4% of units have all required report forms and mostly used monthly report (52.4%). This may affect the reporting performance of these units. The reason for not reporting according to staff of treatment units was that they do not know what to do to report (48.5% of the units) or thought do not need to do the reports (27.3% of the units).

Regarding data analysis and data interpretation: Most of the DHCs (93.1%) have analyzed the infectious disease monitoring data, but this activity was still limited at the CHS level and at the hospital or the clinics. The main reason was the thought of not necessary for clinical staff to perform or did not know how to analyze (47.8%), lack of statistical software (19.1%) or lack of skills (17.4%). The ability to apply warning thresholds in disease monitoring was also limited (only 12/29 DHC applied) due to lack of statistical equipment/software (41.2%), lack skills (35,3%) and lack of manpower, lack of guidance, or not knowing how to apply (17.6%). This is an issue that can be improved by training and equipping necessary materials for the units in the monitoring system. The storage of reports and data at district health centers still needs to be paid attention to ensure sufficient quantity and meet the data storage regulations of the Ministry of Health. Information feedbacks were provided by 100% of DHCs in Hanoi, applying the form of periodic briefings on infectious disease monitoring with staff within the network at commune level, and through the monthly Notice of infectious disease monitoring result (21/29 os DHCs used). But only 17/29 DHCs sent feedbacks to the private general clinics; 11/29 DHCs sent feedbacks to DGHs or health agencies. This is a necessary issue and can be improve.

Regarding the development of anti-epidemic response and planning: The preventive medicine units have carried out this activity regularly and actively with rates ranging from 86.2% - 96.6% among DHCs and

55.7 % - 95.7% among CHSs depending on epidemic situation in localities. The steering committee for epidemic prevention and epidemic response team were established at 100% of DHCs. For CHS, epidemic response activities were mainly being ready with available human resources, epidemic control materials and communication materials for the community. At the time of survey, 95% of CHSs have enough epidemic prevention control materials, but 3% of CHSs could not be able to be prepared and 2% of CHSs were not aware of the needs for epidemic prevention readiness.

Regarding testing activities of surveillance system in Hanoi: Because many institutes and national hospitals located in Hanoi and there is Hanoi PMC basically developed well in testing capacity in both quantity and quality, so the testing activities of the DHCs in Hanoi have just limited at taking samples, correctly preserving the samples and transporting them to the higher level laboratory for testings (100% DHCs). The proportion of hospitals and general clinics performing diagnostic tests was low (20.6% for cholera and 28.6% for dengue fever disease). The main reason was due to the lack of qualified laboratory staff, lacks of laboratory diagnostic equipment and biological products.

4.1.3 Supportive functions and means to support the monitoring system

The supportive function of the SDSS is expressed through standards and guidelines, training activities, support monitoring, resources, monitoring, evaluation and coordination activities. The results showed that the provision of adequate and regular disease surveillance guidelines and training provided for staff of the system should be considered. Regarding means to support the monitoring system, there are basically all kinds of support facilities in the health center but there is a lot of shortage at CHS. This situation is similar to research results conducted in other provinces in 2011-2012. For the clinical facilities, the essential equipment for statistical work was found not being paid

attention. The available software serves only for hospital management, does not meet the requirements of monitoring the disease epidemic, affecting therefore the timeliness of providing updated information related to epidemic prevention and control.

4.1.4 Operational quality of Hanoi infectious disease surveillance system

Study results showed the uniform quality of Hanoi IDSS at the time of conducting survey at all levels. Weekly and monthly reporting rates for DHCs were 60.5 and 87.9%, respectively; these at CHSs were 20.5% and 68.1% and at the hospitals/clinics were 16.6% and 13.1%, respectively. Such activity reported at the hospitals and PGCs was limited. The main reason was: do not know the need to report (48.5%), thought of not necessary to report (27.3%). However, the timeliness and completeness of weekly and monthly reports done by the hospitals/clinics were high compared to DHCs and CHSs, possibly related to the method and information collection system and information management at clinical facilities. This problem can be improved if there is regular contact and exchange of of information about infectious diseases and cases between the preventive medicine units and health care units.

About the simplicity and acceptability of Hanoi IDSS: most respondents answered that the monitoring procedure appropriate (54%) or relatively appropriate (30%), simple reporting forms (21%) or accepted (64%) and is applicable. Data were accurate monitored (27%) or relatively accurate (65%). However, there was a small gap of the procedure, forms and data that need to be improved. *Regarding the capacity to respond to epidemic prevention and control of the IDSS*: There were 55% -76% of the opinions saying that the system has not been able to fully respond to meet the epidemic prevention and control requirement. The underlying

cause was attributed to a lack of good qualified staff, lack of funding and a lack of laboratory staff and lack of equipment. These are the arears that need to be improved in order to improve the responsiveness of the system when a disease occurs.

Regarding the knowledge and practice in monitoring the infectious disease among health staff: The results of surveying the current status of knowledge and practice in disease monitoring of health staff participated in surveillance in Hanoi showed that the percentage of staff of DHCs having good knowledge (65.4%) and excellent good knowledge (20%) was much higher than that of staff of CHSs (26.8% and 3.1%, respectively), this rate was lowest among the staff of the hospitals (13.8% and 3.4%) and of the general clinics (3.4% and 0%). But those of the general hospitals showed to have high rate of good or very good scored for practice (41.4% and 13.8%), much higher than that among staff of DHCs (29.1% and 0%), of the PPCs (20.7% and 3.4%) and staff of CHSs (0.5% and 3.5%). This might be related to the working environment and the conditions for being trained on monitoring.

4.2 Effectiveness of some interventions to improve quality of infectious disease surveillance system in Dong Da district, Hanoi

In order to enhance the performance quality of Hanoi IDSS, the study has chosen Dong Da District as the location for implementating the interventions; dengue hemorrhagic fever epidemics and cholera suspected cases were choosen as target disease model to measure the effectiveness of intervention. Reasons for selecting this location and the two issues to measure the impact of interventions were related to the epidemic situation in Hanoi in recent years.

Currently, all activities related to IDSS are carried out in accordance with Circular No. 54/2015/TT-BYT dated December 28, 2015 guiding the epidemic outbreak reporting and reporting procedure in the direction of case reporting through online software. However, there were basically not many changes related to the timelines requested for case detection, diagnosis and case control reports. Therefore, the evaluation results of the intervention effectiveness in this study are considered appropriate and up-to-date in the spirit of Circular 54/2015/TT-BYT.

Initial analysis results showed that the intervention was highly effective in shortening the timeline for case detection, diagnosis and case control; improved the monitoring quality of IDSS of Dong Da district, improved the sensitivity and the positive predictive value of surveillcane; enhanced the capacity of staff through improved their knowledge and practices on disease monitoring of health workers; improved the accuracy of monitoring data, timeliness and completeness of report according to the guidelines, thereby increasing the capacity to respond promptly to two targeted diseases in the study in particular and IDSS in general in Dong Da district.

Effectively shortened the time to detect, diagnose and control cases: Among 524 suspected cases of DHF, 37% were detected when visiting the district hospitals, 25% were detected at Dong Da hospitals, 18% were reported from CHS. Thus, if only based on the official report data of the medical examination and treatment facility located within the district, it might be omitted about 37% of the cases. Improving the coordination and information exchange between health facilities in the city and improving the capacity of the district system to detect cases in the community has increased the capacity to detect cases of dengue disease, shortened time to detect and outbreaks control with statistically

significant, meeting the requirements of the Ministry of Health. This is one of the success indicators of intervention activities to improve the quality of operation of the infectiou disease surveillance system.

The quality of infectious disease monitoring is also expressed by system characteristics such as the sensitivity and positive predictive diagnostic value, accuracy of monitoring data, timeliness and completeness of disease surveillance report. The sensitivity of IDSS in Dong Da district for dengue hemorrhagic fever in this study increased from 59.3% before intervention to 71% after intervention ($p < 0.05$). The positive predictive value of the surveillance system reached 99.5% after the intervention, thus proves that DHF case definition is suitable and well applied, this finding was confirmed by the responders – the unit's leaders during deep-interview. For cholera, the study results showed that the intervention has also shortened the time from case detection to date obtaining test results, meeting Ministry of Health's requirements for Group A epidemic control (report as soon as the case is detected and investigated within 24 hours of detection).

Intervention effectiveness in improving the quality of monitoring report and data analyzing capacity: The quality of weekly and monthly monitoring reports of monitoring units at commune level in Dong Da district was found significantly improved with 100% units performed the reports and the percentage of units sent reports on time reached 98.9% - 100%; 100% units had surveillance reports full with required information, different statistically significant cpmpared with that before intervention. The intervention effectiveness in improving the quality of reporting of the units participated in IDSS was also reflected in the timeliness and completeness of the report's information. 98.9% of weekly reports done by the CHSs and 100% of weekly reports done by the DHCs have been performed in time with the EI of 34.6% and 420%,

respectivly. The same situation was found with monthly reports. The monthly reporting rate with sufficient information achieved 100%, increased by 30.9% compared to that before intervention, and the EI achieved from 61.5% to 100% ($p < 0.05$). After intervention, the data analyzing skills of the CHS in Dong Da district were markly improved: 100% of units knew how to analyze the ID surveillance data, in particular determined the mortality/morbidity rate and follow up by the factors (time, place, people) with improved efficiency index from 233% - 1900% ($p<0.001$). However, the results of evaluation of reporting the communicable diseases data according to Circular No. 54/2015/TT-BYT at Bac Giang in 2016 showed that up to present time, the timeliness and completeness were still challenges for reporting the infectiuous disease surveillance data in some provinces.

Intervention effectiveness in improving the knowledge and practice of health staff of IDSS in Dong Da district: After conducting training courses on disease monitoring theory and practice, the knowledge and practical capacity of health staff on infectious disease monitoring in Dong Da district have been significantly increased. At commune health stations, the average difference in knowledge scored points before and after intervention implementation was 12.4 (95% CI: 8.5-16) and average the difference in practice scores between before and after the intervention was 2.0 points (95% CI: 1.4-2.6). At the district health center, after intervention, the average knowledge scored point of health staff was also increased 26.75 points ($p<0.05$). This can be considered as a key measure in the intervention organization, creating good efficiency for the capacity and quality of operation of the system, contributing to increase early detection capacity, quick response to epidemics, increasing professionalism and modernity (in line with the development trend of the whole health system) of monitoring activities at the district level. Thus, after intervention, the operational capacity of

the infectious disease surveillance system in Dong Da district has improved markedly. These are initial figures showing the success of the interventions.

CONCLUSION

1. Actual situation of infectious disease surveillance system in Hanoi

The infectious disease surveillance system in Hanoi includes Hanoi Preventive Medicine Center, 29 District Health Centers, 577 Commune Health Stations and medical examination and treatment units at all levels. Most hospitals and private polyclinics (84.1%) have coordinated with the monitoring system but still passive. Human resources of the system was sufficient in quantity but limited in quality (16% of doctors and 18% of the total number of staff directly participated in the epidemic prevention and control; 84.3% of commune health stations have doctors).

The monitoring activity of the system was not not the same among health units (monthly reports and weekly reports were conducted with the rate of 87.9% and 60.5% at the district health centers, of 68.1% and 20.5% at commune health station and 13.1% and 16.6% at the hospitals, polyclinics. The ability to interpret and analyze surveillance data was still limited at commune healthe centers, hospitals and polyclinics. Most of district and commune units of the system were unable to perform diagnostic tests).

The supportive function was carried out rather well at all levels (100% of units have staff being trained on surveillance of infectious diseases; 100% of district health centers and 91.3% of commune health stations and 74.6% of treatment facilities showed to have standard documents

guiding the definition of cases) and well supplied with supportive equipment and materials.

The operational quality of Hanoi infectious disease surveillance system was not the same among the district health centers, cummune health centers an hospitals/polyclinics (68.3% - 98.6% of units sent reports in time and 70.3% - 92.5% units have reports completed with required information). The monitoring procedure was evaluated appropriately and monitoring data was relatively accurate. Knowledge and practice on disease survellance was variated among preventive units and treatment units.

2. Effectiveness of some interventions in improvement of quality of infectious disease surveillance system in Dong Da district, Hanoi

The implementation of number of interventions on infectious disease surveillance system in Dong Da district has remarkably effective; intervention measures were evaluated appropriate, feasible and accepted by staff in the monitoring system. The timelines for detecting, investigating, testing and dealing with Dengue hemorrhagic fever cases have been shortened compared to the that of before intervention, with the total time calculated from the first day of the patient's illness to the end of the outbreak from 19.5 ± 4.5 days to 16.9 ± 3.2 days ($p<0.05$); for cholera suspected cases, the intervention has shorten the timeline from case detection date to the date of investigation to 0.5 ± 0.7 days, meeting the requirements of the Ministry of Health; the sensitivity of the system increased from 59.3% to 71% ($p<0.05$) and the positive predictive value increased from 94.6 to 99.5%.

The quality of disease monitoring reports has been significantly improved at commune and district levels (100% of weekly and monthly reports were performed by all levels; timely reports reached 98.9% -

100%; information completed reports achieved 100% and 100% of district level units have capacity to analysis monitoring data with efficiency index of 300% - 1900%). Knowledge and practice on monitoring infectious diseases of staff has been significantly improved.

RECOMMENDATION

1. Hanoi Health Department instructs to strengthen training ACTIVITY to improve knowledge and practice among epidemic supervisory staff at all levels, especially at Commune Health Stations; stabilize the human resource for epidemic surveillance at all levels.

2. Continuing to strengthen and improve the ability of quick response of outbreak control mobile teams, each district health center needs to establish at least 02 teams and equip suitable facilities to be ready for epidemics control. Enhance the application of informatic technology in surveillance of infectious diseases

3. Hanoi is interested in investing in equipment for laboratories of the District Health Center to be able to identify the pathogens early, localize and control the epidemics promptly. Promote the policies to attract doctors to the District Health Center and Commune Health Station.

LIST OF PUBLISHED SCIENTIFIC ARTICLES RELATED TO THIS THESIS

1. **Nguyen Minh Hai, Nguyen Khac Hien, Hoang Duc Hanh, Trinh Quan Huan (2016)**, "Current status of infectious disease surveillance system in Hanoi in 2013", Vietnam Journal of Preventive Medicine - XXVI, No. 13 (186).

2. **Nguyen Minh Hai, Nguyen Khac Hien, Hoang Duc Hanh, Trinh Quan Huan (2016)**, "The effectiveness of intervention to increased the capacity of case early detection and timely response to some infectious diseases caused outbreak at Hanoi", Vietnam Journal of Preventive Medicine - XXVI, No.113 (186).