Denisa Jakubcová[1], Martin Rusnák[1], Viera Rusnáková[1], Predrag Đurić[2]

Effects on quality of communicable diseases notification achieved by provision of access to the EU case definitions for primary care physicians in Tuzla, Bosnia and Herzegovina

Vplyv na kvalitu hlásenia prenosných ochorení prostredníctvom sprístupnenia EU štandardných definícií prípadov pre lekárov prvého kontaktu v Tuzle, Bosna a Hercegovina

Abstract

Introduction: The Public Health Reform II project was implemented in Bosnia and Herzegovina from December 2011 till December 2013 and funded by European Union. Principal aim of the project was to strengthen public health services in the country through improved control of public health threats. During several rounds of interviews with general practitioners inadequate use of case definitions was revealed. Trainings for family primary care physicians were organized to improve the situation and increase notification rates in eight selected primary care centres. The main aim was to increase notifications by trainings provided for primary care physicians. **Methods:** We compared quality of notifications from physicians in Tuzla before and after training, which took place on 15th of March 2013. The timeliness was used as indicator of quality. Timeliness reflects the speed between steps in a public health surveillance system. it means time interval between the first symptoms of diseases and reporting. We compared medians of timeliness before and after training by Wilcox test and averages by t.testusing R project with level of significance $p<0.05$. **Results:** There were 980 reported cases, 80% were before training and 20% were reported after the training. We found out significantly lower median of timeliness of all reported cases after the training (median=1 day) compared to the

[1] Mgr. Denisa Jakubcová, Department of Public Health, Faculty of Health Care and Social Work, Trnava University, Univerzitnenamestie 1, 918 43 Trnava, Slovakia, denisa.jakubcova@gmail.com, Trnava University in Trnava, Faculty of Health Sciencesand Social Work, Department of Public Health, Slovakia

[2] Department of Epidemiology, Faculty of Medicine, University of Novi Sad, Vojvodina, Serbia

median of timeliness before the training (median=6 days) ($p<0.05$). **Conclusion:** Significant reduction in time response between the first symptoms and disease diagnosis represent results of the training in Tuzla. Primary care physicians provided better quality of reported data after the training.

Abstrakt

Úvod: V Bosne a Hercegovine bol implementovaný projekt Public Health Reform II v období od decembra 2011 do decembra 2013 zo zdrojov Európskej únie. Hlavným cieľom projektu bolo posilniť služby zdravia verejnosti v krajine prostredníctvom zvýšenej kontroly hrozieb zdravia verejnosti. Počas niekoľkých rozhovorov s praktickými lekármi bolo zistené nedostatočné uplatňovanie štandardných definícií prípadov. Pre zlepšenie situácie a pre zvýšenie miery hlásenia boli organizované tréningy pre lekárov prvého kontaktu v ôsmich vybraných centrách zdravotnej starostlivosti. Hlavným cieľom bolo zvýšiť hlásenie prenosných ochorení prostredníctvom tréningov pre lekárov prvého kontaktu. **Metodika:** Porovnali sme kvalitu hlásenia lekármi pred a po realizácii tréningu, ktorý sa konal dňa 15. marca 2013 v Tuzle.Ako indikátor kvality bola použitá včasnosť hlásenia. Včasnosť odráža rýchlosť medzi krokmi v systéme surveillance prenosných ochorení. Predstavuje časový interval medzi objavením prvých príznakov ochorenia a hlásením. Porovnali sme mediány včasnosti hlásenia pred a po tréningu použitím Wilcox testu a priemery použitím t.testuv R projekte s hladinou významnosti $p <0,05$. **Výsledky:** Spolubolo hlásených 980 prípadov, 80% bolo pred tréningom a 20% bolo hlásených po tréningu.Medián včasnosti všetkých hlásených prípadov po tréningu (medián = 1 deň) bol štatisticky výrazne nižší v porovnaní s mediánom včasnosti pred tréningom (medián = 6 dní) ($p<0,05$). **Záver:**Výsledkom tréningu v Tuzle bolo štatisticky významné zníženie časovej odozvy medzi objavením prvých príznakov ochorenia a jeho hlásením. Po tréningu hlásili lekári prvého kontaktu dáta vyššej kvality.

Introduction

Communicable disease control relies on effective disease surveillance. Communicable disease surveillance is defined as ongoing, systematic collection, analysis, interpretation and dissemination of infectious disease

data for public health action[3,4]. Effective communicable disease surveillance provides information about infections that are the most important causes of illness, disability and death, populations at risk, outbreaks, demands on health care services and effectiveness of control programs so priorities for prevention activities can be determined [5, 6].

Main aim of surveillance is to eliminate and eradicate disease incidence with two core function: early warning system for outbreaks and early response to disease occurrence. An early warning and response system for the prevention and control of communicable diseases is essential for ensuring public health at the regional, national and global levels. Recent cases of severe acute respiratory syndrome, avian influenza, hemorrhagic fevers and especially the threats arising from the possibility of misuse of biological and chemical agents demonstrate the need for an effective system of surveillance and early warning at national level providing higher data structure [7,8,9].

The structure of the surveillance system is based on existing legislation, setting goals and priorities, implementation strategies, identification of stakeholders and their mutual connections, networks and partnerships and also capacity for disease diagnosis. In the whole process of surveillance and data flow primary care physicians of first contact play a crucial role. Surveillance system relies on the detection of communicable disease in the patients and disease notification [10,11,12].

[3]World Health Organization. Communicable disease surveillance and response systems. [Accessed February, 2006]. Available from: http://www.who.int/csr/resources/publications/surveillance/WHO_CDS_EPR_LYO_2006_2.pdf

[4]World Health Organization. Recommended Surveillance Standards. Second edition. [Accessed October, 2009]. Available from: http://www.who.int/csr/resources/publications/surveillance/whocdscsrisr992.pdf

[5] Centers for Disease Control and Prevention: Progress in improving state and local disease surveillance – United States, 2000–2005. [Accessed July 21, 2001]. Available from: http://www.cdc.gov/MMWR/preview/mmwrhtml/rr5013a1.html

[6]Lemon S. et al. Global Infectious Disease Surveillance and Detection: Assessing the Challenges-Finding Solutions; Washington, DC: The National Academies Press 2007

[7]European center for disease control and prevention. Surveillance objectives. [accessed March, 2015]. Available from: http://ecdc.europa.eu/en/activities/surveillance/Pages/surveillance_objectives.aspx.

[8]Weinberg J. Surveillance and control of infectious diseases at local, national and international levels ClinMicrobiol Infect 2005, 1, pp. 11-14

[9]Rolfhamre P., Grabowska K., Ekdah K. Implementing a public web based GIS service for feedback of surveillance data on communicable diseases in Sweden. BMC Infect Dis 2004, pp.4-17

[10]Jamison D. et al. *Disease Control Priorities in Developing Countries, 2nd edition;* Washington (DC): World Bank 2006

In Bosnia and Herzegovina, there was implemented The Public Health Reform II project from December 2011 till December 2013 and funded by European Union. Principal aim of the project was to strengthen public health services in the country through improved control of public health threats. One out of three components of the project dealt with enhancing and improving assessment of global public health and the system of communicable diseases notification.

During the implementation of project activities and interviews with general practitioners following challenges of surveillance system were revealed: very long list of mandatory diseases without clear case definitions and rationale for surveillance, mixture of case-based and syndromic surveillance, lack of capacity for cases confirmation and a low level of communication between all surveillance stakeholders.

Due to the fact that the primary care physicians play the most important role in data flow, trainings for family primary care physicians were organized in eight primary care centers during the March 2015. The aim of trainings was to improve the situation and increase notification rates in eight selected primary care centers. Expected outcome of the training is to improve primary care physician's knowledge and skills in disease notification and to increase effectiveness of surveillance system. In this report we share results from evaluation of training from one of the center – Tuzla, on data quality effects.

Methods

Study design

The study was designed with the aim to reveal potential effects of updating primary care physicians with details of surveillance. Thus a cohort of primary care physicians was used to follow effects. Selection of participants was on the basis of interest. No attempts to randomize were taken. The project collected baseline data on notification from the database maintained by the Tuzla epidemiologists for year 2012 up to February 2013. Workshop was carried in March 2013. The project tried to keep contact with participants by emailing and by personal visits. Data from the same source were collected until October 2013. There were 20 participants at the first workshop. We cannot estimate what proportion it makes from

[11]Baker M.G., Fidler D.P. *Global Public Health Surveillance under New International Health Regulations*. Emerg Infect Dis 2011, 7, pp. 1058-1063

[12]Souty, C. Improving disease incidence estimates in primary care surveillance systems. Popul Health Metr 2014, 19, pp.12

all, who serve the region, as total number listed in 2014 was 378 physicians [13] as our participants were mostly from offices within the city of Tuzla. Our estimate is based on average number of citizens per general practitioner in the region is 1263 inhabitants per GP, Tuzla has 120441 inhabitants according to the census from 2013, which results in about 95 general practitioners in the city. Thus participation at the workshop represents approximately 21% of all primary care physicians in Tuzla.

Workshop

The workshop started with an introduction of aims and expected outcomes. Assessment of knowledge on surveillance, disease reporting and attitudes to disease notification followed. Principles of communicable disease surveillance and use of case definitions with emphasis on importance of surveillance, techniques, categories and use of EU case definitions were presented by the project. Following discussion dealt with everyday problems and opinions on the system of surveillance as well as the use of EU case definitions. In the end of the workshop each participant received a copy of EU case definitions, translated to local language. Local management of primary health care centres and people from epidemiology department were also invited to participate as observers.

Data processing

The timeliness for notifications obtained from primary care physicians in town of Tuzla was compared before and after the workshop. The timeliness was used as an indicator of quality, as it reflects the speed between steps in a public health surveillance system[14]. We have chosen following definition of timeliness out of several options: "Average time interval between date of onset and date of notification by general practitioners/hospital (by disease, region, and surveillance unit). it means time interval between the first symptoms of diseases and reporting." as defined by the ECDC[15]. Timeliness was computed from dates stated in individual notifications separately for those noted before the workshop and after. The file was sorted based on ICD 10 diagnosis stated by the physician notifying the case and laboratory confirmed. Timeliness was

[13]Institute of Public health of Federation Bosnia and Herzegovina. *Health statistics annual federation of Bosnia and Hercegovina 2013.*[Accessed January, 2013]. Available from: http://www.zzjzfbih.ba/wp-content/uploads/2014/04/ZSG-FBiH-2013-novo-18-12-2014.pdf

[14]Thackers S. B., Stroup D. F. Future directions for comprehensive public health surveillance and health information systems in the United States. Am J Epidemiol 1994, 140, pp. 383-397

[15]European Center for Disease Control and Prevention. *Data quality monitoring and surveillance system evaluation – A handbook of methods and applications*. European Centre for Disease Prevention and Control, Stockholm 2014

computed for all diagnosis as well as selected ICDs for tuberculosis (A15), scarlet fever (A38), enteritis (A09) and scabies (B86).Difference in medians before and after was statistically tested for significance by two-sample Wilcoxon test using Wilcoxon Rank Sum and Signed Rank Tests from the R project [16] with the level of significance $p<0.05$.

Results

There were 980 reported cases, 80% were before training and 20% were reported after the training. Totally 147 primary care physicians reported incidence of communicable diseases (140 before the training and 69 after the training).

Table I: Timeliness totally

Sample	Total	Before	After	p-value
Cases	980	784	196	
Median	1	6	1	$p<0.05$
Average	11.96	20.2	9.2	$p<0.05$
Range	0-152	0-152	0-133	

The difference in medians of timeliness for total sample (table 1) indicates a reduction from 6 days to 1 after the workshop; the average reduced to one half. The difference was statistically significant with $p<0.05$.

Table II: Tuberculosis (A15) timeliness

Tuberculosis (A15)	Total	Before	After	p-value
Cases	159	99	60	
Median	58	60	13	$p<0.05$
Average	57.1	57.6	27	$p<0.05$
Range	0-152	0-152	0-133	

Median of tuberculosis timeliness (table 2) after the training (median=13 days) was significantly lower compared to the median of timeliness before the training (median=60 days) and also there was significant reduction in averages ($p<0.05$).

[16]The R development core team. R: *A Language and Environment for Statistical Computing. Reference Index. R Foundation for Statistical Computing,* 2009

Table III: Enteritis (A09) timeliness

Enteritis (A09)	Total	Before	After	p-value
Cases	132	86	46	
Median	2	3	2	p<0.05
Average	3.7	3.2	2.7	NS
Range	0-41	0-41	0-23	

Median of timeliness notification of enteritis case (table 3) was significantly lower (median=2 days) compared to the median of timeliness before the training (median=3 days) (p<0.05).

Table IV: Scarlet fever (A38) timeliness

Scarlet fever (A38)	Total	Before	After	p-value
Cases	33	17	16	
Median	0	1	0	NS
Average	1.8	1.6	1.5	NS
Range	0-13	0-13	0-13	

As table 4 illustrates, there was no significant difference in medians of scarlet fever timeliness before the training and after the training (p=NS).

Table V: Scabies (B86) timeliness

Scabies (B86)	Total	Before	After	p-value
Cases	98	71	27	
Median	0	1	0	NS
Average	1.7	3.9	2.7	NS
Maximum, Minimum	37 0	37 0	13 0	

Median of scabies notification timeliness (table 5) after the training was not lower compared to the median of timeliness before the training (p=NS).

Discussion

The surveillance system in Bosnia and Herzegovina suffered after the war. it is not stabilized yet, experiences lack of funds, and is both, organizationally as well as politically atomized. it is run on regional basis, where all primary care physicians are legally required to notify cases based on syndromic diagnosis. Such a system is characterized by underreporting linked to lack of responsibility and weak supervision from authorities. Nevertheless, authors demonstrated effects of an information campaign on

improved notifications in a province of Vojvodina, Serbia[17] where public health services operate in similar environment to Bosnia.

Timeliness is a key performance measure of public health surveillance systems and should be periodically evaluated because it can reflect the time delay between steps in the public health surveillance process. Timeliness can vary by disease diagnosis and its epidemiological characteristic, aim of data use and type of surveillance level. Surveillance system timeliness depends on a number of factors and its assessment should include a consideration of how the data will be used and the diseases under surveillance[18].

This report presents significant reduction in time response between the first symptoms and disease diagnosis as results of the training in Tuzla. Primary care physicians provided better quality of reported data after the training which is baseline premise for an effective surveillance.

In other studies, timeliness of disease notification was also followed and reported, before and after some type of intervention with main aim: reduce time response between 2 steps in the process of reporting. By implementation of electronic laboratory reporting was achieved median of timeliness 20 days versus 25 days for non-electronic laboratory reporting ($p<0.001$)[19] . Within this kind of intervention, median of timeliness notification was lower for 17 days from year 2000 to year 2006. [20] Result of intervention implementation was reduction in time response and also higher rate of notification completeness.

This study also highlighted the importance of training for primary care physicians in communicable disease notification by using standard case definition. Standard case definition is premise for data quality and validity. [21]By training implementation for primary care physicians with case definition was achieved higher level of knowledge about communicable

[17]Duric P., Ilic S. *Quality of infectious diseases surveillance in primary health care.* Sri Lankan Journal of Infectious Diseases 2012, 2, pp. 37-46

[18]Yoo H.S. et al. Timeliness of national notifiable diseases surveillance system in Korea: a cross-sectional study. BMC Public Health 2009, 9, pp.93

[19]Samoff E. et al. *Improvements in Timeliness Resulting from Implementation of Electronic Laboratory Reporting and an Electronic Disease Surveillance System*. Public Health Rep 2013, 128, pp.393-398

[20]Jansson A. Timeliness of case reporting in the Swedish statutory surveillance of communicable diseases 1998-2002. Scand J Infect Dis 2004, 11, 865-872

[21]Jajosky R. A., Groseclose S. Evaluation of reporting timeliness of public health surveillance systems for infectious diseases. BMC Public Health 2004, 4, pp.29

disease notification, dedication to reporting with data quality- timeliness and completeness of reporting[22,23].

Our study has some limits. at first, value of timeliness median can be influenced and biased by the factors that are not able to be managed, especially the patient's awareness of symptoms, the patient's search for medical care, capacity for case confirmation, the laboratory reporting test results back to the physician and to other surveillance stakeholders and public health agencies.

Second, limits of study also rely in data collection and analysis. We followed reported cases after the training only short time; this is the reason due to 80% of cases were reported before the training and 20% of cases were notified after the training. Another bias can be in fact, in process of data analysis, we did not selected physicians who did not participate in the training.

Conclusion

Communicable disease surveillance is first step towards prevention and it is one of the most important tools used in public health. Surveillance system should be regularly evaluated in terms of usefulness and quality by defined standards and recommendation. In this report, we shared results of surveillance system evaluation in Tuzla, Bosnia and Herzegovina by using one of quality standards- timeliness of disease notification before the training and after the training. This study underlined the importance and effectiveness of the training implementation for primary care physicians, using of standard case definition and also surveillance evaluation. Identified outcomes of evaluation should be the basis for the derivation of priorities and activities to improve the quality and effectiveness of surveillance.

[22]Turnberg W., Daniell W., Duchin J. Notifiable infectious disease reporting awareness among physicians and registered nurses in primary care and emergency department settings. Am J Infect Control 2010, 38:5, pp. 410-413

[23]Keramarou M., Evans M.R. Completeness of infectious disease notification in the United Kingdom: A systematic review. J Infect Prev 64:6, pp.555-564

References

1. Baker M. G., Fidler D. P., *Global Public Health Surveillance under New International Health Regulations*, Emerg Infect Dis 2011, 7, pp. 1058-1063
2. Centers for Disease Control and Prevention: Progress in improving state and local disease surveillance – United States, 2000–2005, [Accessed July 21, 2001], Available from: http://www.cdc.gov/MMWR/preview/mmwrhtml/rr5013a1.html
3. Duric P., Ilic S., *Quality of infectious diseases surveillance in primary health care*, Sri Lankan Journal of Infectious Diseases 2012, 2, pp. 37-46
4. European centre for disease control and prevention. Data quality monitoring and surveillance system evaluation – A handbook of methods and applications. European Centre for Disease Prevention and Control, Stockholm 2014
5. European center for disease control and prevention. Surveillance objectives. [Accessed March, 2015]. Available from: http://ecdc.europa.eu/en/activities/surveillance/Pages/surveillance_objectives.aspx
6. Institute of Public health of Federation Bosnia and Herzegovina. Health statistics annual federation of Bosnia and Hercegovina 2013.[Accessed January, 2013]. Available from: http://www.zzjzfbih.ba/wp-content/uploads/2014/04/ZSG-FBiH-2013-novo-18-12-2014.pdf
7. Jajosky R. A., Groseclose S., *Evaluation of reporting timeliness of public health surveillance systems for infectious diseases*, BMC Public Health 2004, 4, pp.29
8. Jamison D. et al., *Disease Control Priorities in Developing Countries*, 2nd edition; Washington (DC): World Bank 2006
9. Jansson A., *Timeliness of case reporting in the Swedish statutory surveillance of communicable diseases 1998-2002*, Scand J Infect Dis2004, 11, 865-872
10. Keramarou M., Evans M. R., *Completeness of infectious disease notification in the United Kingdom: A systematic review*, J Infect Prev64:6, pp.555-564
11. Lemon S. et al. *Global Infectious Disease Surveillance and Detection: Assessing the Challenges-Finding Solutions*; Washington, DC: The National Academies Press 2007
12. Rolfhamre P., Grabowska K., Ekdah K., *Implementing a public web based GIS service for feedback of surveillance data on communicable diseases in Sweden*, BMC Infect Dis 2004, pp.4-17
13. Samoff E. et al., *Improvements in Timeliness Resulting from Implementation of Electronic Laboratory Reporting and an Electronic Disease Surveillance System*, Public Health Rep 2013, 128, pp.393-398
14. Souty C., *Improving disease incidence estimates in primary care surveillance systems*, Popul Health Metr2014, 19, pp.12
15. The R development core team. R: A Language and Environment for Statistical Computing. Reference Index. R Foundation for Statistical Computing, 2009
16. Thackers S. B., Stroup D. F., *Future directions for comprehensive public health surveillance and health information systems in the United States*, Am J Epidemiol1994, 140, pp. 383-397

17. Turnberg W., Daniell W., Duchin J., *Notifiable infectious disease reporting awareness among physicians and registered nurses in primary care and emergency department settings*, Am J InfectControl2010, 38:5, pp. 410-413
18. Weinberg J., *Surveillance and control of infectious diseases at local, national and international levels*, ClinMicrobiol Infect 2005, 1, pp. 11-14
19. World Health Organization. Communicable disease surveillance and response systems. [Accessed February, 2006]. Available from: http://www.who.int/csr/resources/publications/surveillance/WHO_CDS_EPR_LYO_2006_2.pdf
20. World Health Organization. Recommended Surveillance Standards. Second edition. [Accessed October, 2009]. Available from: http://www.who.int/csr/resources/publications/surveillance/whocdscsrisr992.pdf
21. Yoo H.S. et al., *Timeliness of national notifiable diseases surveillance system in Korea: a cross-sectional study*, BMC Public Health 2009, 9, pp.93