Experiment of surveillance for long-term care facilities for elderly people

Junko Kurita[1], Tamie Sugawara[2], Yasushi Ohkusa[2] , Naomi Sakurai[3]

1 Department of Nursing, Daitoubunka University, Higashimatsuyama-shi ,Saitama, Japan

2 Infectious Disease Surveillance Center, National Institute of Infectious Diseases, Shinjuku, Tokyo, Japan

3 Ibaraki Prefectural University of Health Sciences, Ibaraki, Japan

*) Correspondence to:

Junko Kurita : kuritaj@ic.daito.ac.jp

ICMJE Statement

Contributors NS was responsible for the organization and coordination of the study. JK was the chief investigator and responsible for the data setting. TS and YO developed the estimation model. All authors contributed to the writing of the final manuscript.

Keywords: COVID-19, information sharing, long-term care facility for elderly people, situation awareness, surveillance

Abstract

Background: Long-term care facilities for elderly people have been vulnerable to COVID-19 outbreaks.

Object: We examined construction of a surveillance system to share information about facilities for elderly people with physicians, commissioned doctors, public health centers, and other nearby facilities. Then we operated the system as an experiment.

Method: We constructed the system and operated it at two facilities for more than three months. Especially, information sharing among commissioned doctors, local governments, public health centers, and medical associations was included in the system. Moreover, community situation awareness was done by including neighboring facilities, (nursery) schools, and prescriptions from other but similar surveillance systems.

Results: We constructed the system, operated it, and confirmed its feasibility for data entry at facilities. However, real time information sharing has not been activated because of the scarcity of corporate facilities. Moreover, situational awareness in the community has been developed using information from other systems.

Discussion: Experiments including a larger number of facilities with real-time information sharing represents an urgent challenge.

1. Introduction

Even before SARS-Cov-2 emerged, infection control at long-term care facilities for elderly people was regarded as important to save residents' life and safety [1,2]. The viruses causing most outbreaks at facilities were influenza or noroviruses at that time.

Since SARS-Cov-2 emerged, fatal cases of infected COVID-19 were concentrated at first among elderly people because of pneumonia [3–6]. After the delta variant strain emerged, underlying diseases caused death mainly in infected elderly people. Its effects were marked, even in Japan [7]. Therefore, long-term care facilities for elderly people have been the places which have been most vulnerable to COVID-19 outbreaks. In other words, surveillance and timely detection of outbreaks at these facilities are expected to be the most important countermeasures against COVID-19.

Nevertheless, surveillance of these facilities has remained underdeveloped, even though surveillance for (nursery) schools has been used widely worldwide [8–16]. Of course, school children and children younger than school age are susceptible to many infectious diseases. They have sometimes amplified outbreaks. By contrast, at least for COVID-19, mortality in children is certainly much less than among elderly people. In other words, surveillance at facilities for elderly people, in particular real time surveillance, is expected to be important to reduce disease burdens of COVID-19, even after omicron or the following variant strain dominated and countermeasures against COVID-19 among younger generations narrowed to become comparable with seasonal influenza.

Therefore, this study was conducted to examine construction of a syndromic surveillance system and to propose its mode of operation in the near future.

2. Method

We constructed a web system for smart phone reporting by each facility of the number of residents or staff members with certain symptoms or who had been diagnosed as having infectious diseases by units where residents live together and were managed. Staff designations were assumed to be a unit. Figure 1 presents the system concept. Targeted symptoms included fever, cough or difficulty breathing, vomiting, diarrhea, eruption, and others. Diagnosed infectious diseases included COVID-19, influenza, infectious gastroenteritis, herpes zoster, scabies, and others.

The figure shows a chart of the number of elderly people with symptoms or diagnosed infectious diseases and aberrations. Aberrations were defined by unit in each facility as C1 of the EARS algorithm [17,18], which was developed and recommended to use by the US CDC and which is widely used for syndromic surveillance.

If an aberration was detected, such information was delivered to commissioned doctors, public health centers, medical associations, and local governments that are allowed access to data at the facility, as shown on the right-hand side of Figure 1.

Moreover, an information exchange scheme among other neighboring facilities and other systems included (N)SASSy and prescription surveillance to present situational awareness, as shown at the left-hand side of Figure 1.

3. Results

We constructed the system and started to enter the situation at the facility from January 2022 at facilities in Ibaraki prefecture, Japan, in northern Tokyo. Unfortunately, as of May 2020, information at facilities has not been shared among involved persons such as commissioned doctors or public health centers, yet. Moreover, information exchange among other neighboring facilities and other systems including (N)SASSy and prescription surveillance to recognize situation awareness have been under construction.

We confirmed the feasibility of entering data at the facility. Moreover, the automatic aberration detection mechanism was confirmed to function precisely.

4. Discussion

Although an earlier study examined the practicality of surveillance at long-term care facilities based on observations by staff members [19], no prototype of such a system has been examined in any country. In this sense, the examination conducted for

this study yielded unique and valuable results.

Because data for each facility were analyzed, the criteria for aberration detection differed among unit and facilities. Therefore, these aberrations were robust to differences in definitions of symptoms or characteristics of residents among units and facilities. In other words, criteria for aberration detection incorporated these differences among units and facilities.

Unfortunately, facilities incorporated into the system were few. Information sharing among involved persons such as commissioned doctors and public health centers was not activated. Pervasion of the system among facilities and involvement of related individuals and organizations is the next urgent issue. To make the system more widely available, we have tried to develop automatic coordination with electronic care records used at the facilities.

Moreover, we plan to exchange information with other surveillance systems such as (N)SASSy [11–16] and prescription surveillance [20–24]. The former reflects the actual conditions of infectious disease at nursery schools and schools. Staff at facilities sometimes live distant from the facilities, but information provided by (N)SASSy is expected to be helpful to recognize situations where their children live. Moreover, the latter can detect influenza outbreaks rapidly. If drug therapy for COVID-19 is

administered to outpatients, then surveillance will reflect rapid detection of influenza. Exchange information is anticipated as the next challenge.

Limitations

First, as described above, the constructed system in the current version had limited function. Therefore, we cannot evaluate the overall system including real time information sharing and situation awareness using other surveillance systems in the community. To do so, we must expand corporate facilities to concerns such as public health centers that want to join the system.

Second, if the facilities record care reports electronically, the system must upload information from facilities automatically to eliminate effort expended at entering the data manually. To realize such coordination, it might be challenging to modify and upload the necessary data for the software which is used by facilities. Although the proportion of such an electronic care records might not be high currently, such coordination will play a key role in widening the use of this system.

Third, evaluation of the usefulness of this system should be done when most facilities in the community join the system and after the unreconstructed or unrealized functions of the system described above are implemented. Currently, we cannot evaluate the

system completely.

5. Conclusion

We constructed the system and operated it at a very few facilities with limited functionality. Experiments to examine more facilities with real-time information sharing and exchange of information with other surveillance systems are urgent challenges. Therefore, we cannot evaluate its usefulness until those goals are achieved.

6. Acknowledgement

We acknowledge financial support from Ibaraki Prefectural University to the research project of “Development of Training Course for Staff in Facilities for the Elderly” headed by Dr. Naomi Sakurai (No.2164-1). We also acknowledge all staff in corporate facilities.

7. Conflict of interest

The authors have no conflict of interest to declare.

8. Ethical considerations

Data used for this system constructed and operated for this study were aggregated and de-linked from personal information related to residents: these are anonymous data. Therefore, no ethical issues are posed by these data for this study. Moreover, we did not analyze or show the entered data to the system by facilities at all in this study. Therefore,

this study did not treat any information in the system.

9. References

[1]. Kariya N, Sakon N, Komano J, Tomono K, Iso H. Current prevention and control of health care-associated infections in long-term care facilities for the elderly in Japan. J Infect Chemother 2018,24:347-52.

[2]. Smith PW, Rusnak PG. APIC guideline for infection prevention and control in the long-term care facility. Am J Infect Control 1991,19 :198-215

[3]. Shimizu K, Maeda H, Sando E, Fujita A, Tashiro M, Tanaka T, Izumikawa K, Motomura K, Morimoto K. Epidemiology of SARS-CoV-2 infection in nursing facilities and the impact of their clusters in a Japanese core city. J Infect Chemother 2022 ;28:955-61.

[4]. Vijh R, Ng CH, Shirmaleki M, Bharmal A., Factors associated with transmission of COVID-19 in long-term care facility outbreaks. J Hosp Infect 2022;119:118-25.

[5]. Konetzka RT, White EM, Pralea A, Grabowski DC, Mor V. A systematic review of long-term care facility characteristics associated with COVID-19 outcomes. J Am Geriatr Soc 2021.69:2766-77

[6]. Dykgraaf SJ, Matenge S, Desborough J, Sturgiss E, Dut G, Roberts L, McMillan A, Kidd M. Protecting Nursing Homes and Long-Term Care Facilities From COVID-19: A Rapid Review of International Evidence. J Am Med Dir Asso. 2021.22:1969-88.

[7]. Kurita J, Sugawara T, Ohkusa Y.Pathogenicity of the omicron variant strain comparison with delta variant strain and seasonal influenza in Japan. https://jxiv.jst.go.jp/index.php/jxiv/preprint/view/59

[8]. Schmidt WP, Pebody R, Mangtani P: School absence data for influenza surveillance: a pilot study in the United Kingdom, Eurosurveillance 2010 ;15:19467

[9]. Calvin K.Y. Cheng, Benjamin J. Cowling, Eric H.Y. Lau, Lai Ming Ho, Gabriel M. Leung, and Dennis K.M. Ip, Electronic School Absenteeism Monitoring and Influenza Surveillance, Hong Kong, Emerg Infect Dis 2012 ;18:885-7.

[10]. Besculides M, Heffernan R, Mostashari F, Weiss D.:Evaluation of school absenteeism data for early outbreak detection, New York City. BMC Public Health 2005;5:105.

[11]. Kurita J, Nagasu N, Nagata N, Okuno H, Sugawara, Ohkusa Y. Outbreak of Human¥ Metapneumovirus in Ibaraki, Japan and Its Descriptive Epidemiology, Health 2018; 10:Article ID:85348.

[12]. Kurita J, Sugawara T, Matsumoto K, Nakamura Y, Ohkusa Y. Association among (Nursery) School Absenteeism Surveillance System and Incidence of Infectious Diseases, School Health 2018;14:21-7.

[13]. Kurita J, Nagasu N, Nagata N, Sakurai N, Ohkusa Y, Sugawara T. Descriptive Epidemiology for Mycoplasma pneumoniae Infection Using (Nursery) School Absenteeism Surveillance System, and Proposal for Countermeasures. Journal of Biosciences and Medicines 2018.6;33-42.

[14]. Sugishita Y, Sugawara T, Ohkusa Y. Association of influenza outbreak in each nursery school and community in a ward in Tokyo, Japan. J Infect Chemother 2019; 25:695-701.

[15]. Tanabe Y, Kurita J, Nagasu N, Sugawara T, Ohkusa Y. Infection Control in Nursery Schools and Schools Using a School Absenteeism Surveillance System, Tohoku J Exp Med, 2019, 247:173-8.

[16]. Kurita J, Sugawara T, Matsumoto K. Ohkusa Y. Cost-Effectiveness Analysis of (Nursery) School Absenteeism Surveillance System, Pediatric International 2019, 61, 1257-60.

[17]. Hutwagner L, Thompson W, Seeman GM, Treadwell T. The Bioterrorism Preparedness and Response Early Aberration Reporting System (EARS). J Urban Health 2003;80:i89-i96.

[18]. Hutwagner L, Browne T, Seeman GM, Fleischauer AT. Comparing Aberration Detection Methods with Simulated Data. Emerg Infect Dis. 2005;11:314-6.

[19]. Heudorf U, Schulte D. Surveillance of nosocomial infections in a long-term care facility. Incidence and risk factors. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz 2009;52:732-43. (in Germany)

[20]. Sugawara T, Ohkusa Y, Kamei M. Effect of the Routine Varicella Immunization on Herpes Zoster in Japan in the First Half of the Year, Journal of Biosciences and Medicines 2018; 6:30-6.

[21]. Sugawara T, Ohkusa Y, Kawanohara H, Kamei M. Short Term Prediction of Infectious Diseases Patients from Prescription Surveillance. Journal of Biosciences and Medicines 2018; 6: 61-8.

[22]. Ohkusa Y, Sugawara T, Kawanohara H, Kamei M. Evaluation of the global action plan on antimicrobial resistance in Japan during its first eighteen months. Drug Discov Ther 2018; 12:182-4.

[23]. Sugawara T, Ohkusa Y, Kawanohara H, Kamei M. Prescription surveillance for early detection system of emerging and reemerging infectious disease outbreaks. Biosci Trends 2018;12:523-5.

Figure 1: Concept of Facility Surveillance including real-time information sharing and situation awareness in the community.