Original article

Infection control measures promoted by the public health center for “housing for the elderly” facilities during norovirus cluster outbreaks

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Abstract

Objective: “Housing for the elderly” is a type of facility where a few healthcare staff and care workers provide long-term care to residents. This study aimed to explore the infection control measures promoted by the public health centers (PHC) when a cluster of norovirus cases occurred in this type of facility.

Materials and Methods: This study involved a prefectural office in Japan and collected the records of PHC surveys/instructions of norovirus cluster cases that occurred in “housing for the elderly” facilities between 2017 and 2019. The records provided information about the case characteristics (cluster periods and number of infected individuals) and instructions for infection control by the PHC. We tabulated the case characteristics and performed a descriptive qualitative analysis to extract the instructions from the PHC.

Results: Twelve clusters of cases were included in the study. Approximately 16% of the residents and care workers in each facility were infected, and it took an average of 23 days from the start of the outbreak to the end. Nine categories of PHC instructions emerged after the data analysis. “Collaboration with community healthcare workers” included instructions by the PHC to share information with external physicians and home-visiting nurses. In “precautions when caring for elderly residents with functional decline”, the procedure for changing diapers and infection control measures considering the behavior of residents with dementia were advised. If the contents of the infection control manuals were deemed to be inadequate, an “improvement of the infection control manuals” was instructed.

Conclusion: To implement effective infection control by care workers at “housing for the elderly” facilities, the PHC should promote the involvement of community physicians and nurses and advise on clear procedures based on residents’ functional decline.

Key words: infection control, public health center, norovirus, cluster, housing for the elderly

Introduction

Japan is a rapidly aging country with an aging rate of 28.4%. Furthermore, the number of individuals needing long-term care has increased 1.4 times over the past ten years². Although more than half of people prefer to live at home even if they require care³, it is challenging to receive long-term care at home due to the increasing age of households and the decreasing birthrate. Therefore, the number of elderly individuals moving to aged care facilities is increasing⁴.

“Housing for the elderly” is a type of Japanese aged care facility. Residents can continue living there until the end of life because this type of facility employs care workers and provides daily care services. To respond to the increasing need for long-term care due to aging, the government has promoted “housing for the elderly” as an option when long-term care is needed and has promoted their establishment by providing subsidies. Therefore, the number of such facilities is rapidly increasing⁵.

However, residents’ health problems prevent them from continuing at “housing for the elderly” facilities. Such facilities do not need a full-time physician and can be oper-
Infections are a serious health problem. Infectious gastroenteritis caused by norovirus is the most common infection in aged care facilities. Although the number of facilities that have experienced norovirus infection among residents is lower than that of influenza or pneumococcus, the number of infected residents is estimated to be higher than that of other infections. Norovirus is likely to result in a cluster of cases due to its high attack rate (the proportion of people who develop infection among those exposed). In addition, residents of aged care facilities are four times more likely to die from norovirus infection than community dwellers because of decreased immunity, functional impairment, and decreased cognitive function. Therefore, infection control is necessary during a cluster outbreak.

How can “housing for the elderly” facilities effectively control the spread of infection with no or few healthcare workers? A public health center (PHC) is one of the resources that a facility can utilize. In Japan, if a cluster of infectious diseases occurs in a facility, they must contact a PHC. As the PHC employs physicians and public health nurses, they can provide advice to “housing for the elderly” facilities on how to prevent the spread of infection.

Although the number of “housing for the elderly” facilities has rapidly increased, the content of the instructions that the PHC should provide to these facilities amidst an outbreak has not been sufficiently clarified. Previous research has only reported the content of instructions commonly required for various facilities (e.g., elementary schools) and infections (e.g., influenza and enterohemorrhagic E. coli). Therefore, this study aimed to explore the infection control instructions given by the PHC when a cluster of norovirus occurs in “housing for the elderly” facilities. These findings will provide useful information for the PHC to prevent the spread of norovirus in these facilities in the future.

Materials and Methods

Design

This study used a descriptive qualitative approach because it is suitable for describing the contents of the instructions/advice given by the PHC to prevent the spread of infection at “housing for the elderly” facilities.

Public health center

The PHC is the frontline authority of public health in Japan. The PHC is required to provide broad-based services, services requiring specialized technologies, and services requiring the collaboration of various healthcare professionals. The PHC personnel comprise a PHC director, medical doctors, public health nurses, pharmacists, and other professionals. The PHC provides services, including the promotion and enhancement of public awareness related to community health, matters concerning maternal/child/elderly health, and the prevention of infectious diseases.

Housing for the elderly

Based on the framework of the Japanese Ministry of Health, Labor and Welfare, “housing for the elderly” includes the following types of facilities: 1) intensive care homes, 2) group homes for those with dementia, 3) nursing homes, 4) moderate-fee homes, 5) fee-based homes, and 6) elderly housing with care services. Intensive care homes must employ part-time physicians and one or more nursing staff members. There is no requirement to employ health care workers at the other types of facilities. When residents require healthcare, they can independently establish a contract with community hospitals, clinics, or visiting nursing agencies covered by the long-term care insurance system.

Definition of cluster

In Japan, social welfare facilities (including “housing for the elderly”) must contact the PHC when ten or more people are suspected of having the same infection. The present study applied this rule to the definition of a cluster.

Study setting and participants

We conducted a survey involving norovirus cluster cases of “housing for the elderly” facilities that occurred in a prefecture in Japan between 2017 and 2019. It was considered that a range of infection controls for clusters in “housing for the elderly” facilities could be collected because the chosen prefecture has more of these facilities than the national average.

Data sources and items

Information about the norovirus clusters in the “housing for the elderly” facilities was obtained from the survey and instruction records of the PHC. The records were filed in the prefectural office, after which we browsed and collected information with permission from the department in charge of infectious diseases. The information was collected between December 2019 and January 2020.

The following information was collected: facility characteristics (type of facility, number of residents, staff), infection status (detected virus, total number of infected residents, staff, the date the first infected person was confirmed, the date of confirmation by the PHC of the cluster outbreak, and the date of the end of the cluster), and the content that was instructed/advised about infection control (written in free form). All records were written by PHC staff (e.g., public health nurses and physicians).
Data analysis

We tabulated the facility characteristics and infection status. The instructed/advised content was analyzed using descriptive qualitative methods. After carefully reading the records of the information on infection control that the PHC provided, all meaningful text units were identified and coded. The information in each code was compared with other codes, and the codes were subsequently grouped and labeled with the name of a category. The authors agreed on the analysis of the initial coding and categories.

In addition, bivariate analyses were used to confirm the association between the presence of healthcare workers and infection status. The dependent variable was the facility type being an intensive care home, and the independent variables were the median rate of infected people, number of days from when the first infected person was confirmed until confirmation of the outbreak occurrence by the PHC, and number of days from when the first infected person was confirmed until the end of the outbreak. The calculations for the independent variables were performed based on the collected information. The Wilcoxon rank-sum test was used because the variables were not normally distributed. Analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC, USA).

Ethical considerations

This study was approved by the ethical review board of the Chiba Prefectural University of Health Sciences, Chiba, Japan (Ethics Approval Number 2019-25). The participant was informed of the purpose, procedures, and potential publication of this study and their rights of refusal and confidentiality. Written informed consent was obtained from the participant.

Results

Characteristics of the clusters

We collected the records of 12 norovirus clusters in “housing for the elderly” facilities. Seven facilities were intensive care homes that needed to employ part-time physicians and one or more nurses, while the others were nursing homes, fee-based homes, and elderly housing with care services that did not need to employ healthcare workers (Table 1). At the intensive care home facilities, the median rate of infected persons was significantly lower than that of other facilities (14.1% vs. 25.2%; P<0.05), and the number of days until the PHC confirmed the outbreak was low (3.0 vs. 7.0; P=0.58). The number of days to the end of the cluster was almost the same (23.0 vs. 22.0; P=0.75).

Instructions about infection control

Nine categories of infection control instructions were identified (Table 2). The PHC staff provided instructions about basic infection control practices for norovirus cases along with tailored advice due to the residents being elderly and the facilities not having healthcare workers. The descriptions of the results below use **bold italics** for the categories and *italics* for the codes. The research members have verified that the English translation matches the original Japanese records.

Environmental disinfection

The PHC instructed the selection and use of disinfectants suitable for the norovirus cluster. The instructions included: “use sodium hypochlorite at the proper concentration”, “environmental disinfection should be wiped off, not sprayed, and should be applied to all areas touched by hands”, and “spatial spraying of sodium hypochlorite
Dealing with vomiting

The PHC staff provided instructions based on the characteristic symptoms of norovirus infections. In particular, the PHC mentioned the disinfection of areas where vomiting occurred. They instructed, “disinfecting an area within a radius of two meters of vomiting as a necessity”, and “demonstrated the disinfectant procedure at the actual vomited site”.

Separating clean and soiled areas

There have been several cases in which clean and soiled areas were confused. The PHC advised to improve this area after observing the behavior of facility care workers, such as the following: “since the wagon used by the staff is used in common for all units, it needs to be used separately” and “staff touch the elevator buttons with gloves on; therefore, the gloves must be removed, and buttons must be touched with clean hands”.

Curtailing contact between residents, families, and staff

If the staff worked on multiple floors, the PHC advised them to limit their work area by suggesting the following: “fix the work floors of staff and establish a work system that can provide complete care services for residents on each floor”. In addition, the PHC mentioned the need to limit family visits and new occupancy; “if the number of patients increases, consider not only restricting families’ visitation but also restricting the acceptance of new residents”.

Table 2 Instructions for infection control at housing for the elderly facilities (n=12) provided by the public health center

| Category                              | Examples of the code                                                                                                                                                                                                 |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environmental disinfection            | Use sodium hypochlorite at the proper concentration. Environmental disinfection should be wiped off, not sprayed, and should be applied to all areas where the hands are touched. Spatial spraying of sodium hypochlorite should be discontinued as it may be harmful to the human body. Residents’ shared places should be disinfected (e.g., toilet, washroom). |
| Dealing with vomiting                 | Disinfect an area within a radius of two meters of vomiting as a necessity. Demonstrate the disinfectant procedure at the actual vomited site.                                                                      |
| Separating clean and soiled areas     | Keep the facility tidy because clean and dirty things and areas are mixed. Since the wagon used by the staff is used in common for all units, it needs to be used separately. Staff touch the elevator buttons with gloves on; therefore, the gloves must be removed, and buttons must be touched with clean hands. Since the paper towel holder in the hand-washing area is installed facing up, change the installation orientation. |
| Curtailing contact between residents, families, and staff | Fix the work floors of staff and establish a work system that can complete care services for residents on each floor. If the number of patients increases, consider not only restricting families’ visitation but also restricting the acceptance of new residents. |
| Sharing information among residents and families | Providing information about the epidemic situation and the prevention measures to the residents is required. Not only the family members of the infected person(s) but the families of all residents should be informed. |
| Collaboration with community healthcare workers | Report daily to the public health center for new cases and severe cases. Report the current situation to a part-time doctor at the contracting hospital. Cooperate with home-visiting nurses in the community that provide healthcare services to the residents. |
| Precautions when caring for residents with functional decline | Use personal protective equipment when changing diapers and assisting with excretion. Regarding the order of changing diapers, those with symptoms should be changed last. Environmental disinfection needs to be conducted multiple times a day, because dementia patients may use the toilet set aside for infected residents. Since it is difficult to isolate infected residents with dementia symptoms, it is necessary to thoroughly observe all residents’ and staff health. |
| Improvement of infection control manuals | Addition for the excretion care procedures that are missing in the manual is required. There is a manual, but the content is not appropriate, so guidance is given on matters that are highly necessary, such as when vomiting or diarrhea occurs. |
| Improvement of staff education        | Although infection control workshops have been held, some staff members do not understand the concentration of sodium hypochlorite. Therefore, we recommend conducting training and simulations to raise staff awareness regarding infection control. |
**Sharing information among residents and families**

If there was a cluster at a facility, but the residents or their family members were not informed of the infection, the PHC advised the facilities to inform the residents, and their family members of the situation and the prevention measures in place: “providing information about the epidemic situation and the prevention measures to the residents is required”, and “not only the family members of the infected person(s) but the families of all residents should be informed”.

**Collaboration with community healthcare workers**

The PHC advised involving healthcare workers. In particular, if the facility did not employ a full-time physician, the PHC instructed the facility to share information with part-time doctors and “report the current situation to a part-time doctor at the contracting hospital”. If the facility did not employ any healthcare workers, the PHC encouraged them to cooperate with those contracted by the residents: “cooperate with home-visiting nurses in the community that provide healthcare services to the residents”.

**Precautions when caring for residents with functional decline**

Since the outbreaks occurred in aged care facilities, some residents needed diaper changes and dementia care. Therefore, the PHC staff provided instructions based on the characteristics of residents: “regarding the order of changing diapers, those with symptoms should be changed last” and “environmental disinfection needs to be conducted multiple times a day, because dementia patients may use the toilet set aside for infected residents”.

**Improvement of infection control manuals**

Even if an infection control manual had been prepared in the facilities, the PHC confirmed whether the procedures were sufficient and highlighted any missing items: “addition for the excretion care procedures that are missing in the manual is required” and “there is a manual, but the content is not appropriate; therefore, guidance is provided on matters that are highly necessary, such as when vomiting or diarrhea occurs”.

**Improvement of staff education**

The PHC compared the infection control practices of care workers with the content that the facility used to educate their staff and noted what needed to be improved. “Although infection control workshops have been held, some staff members do not understand the concentration of sodium hypochlorite. Therefore, we recommend conducting training and simulations to raise staff awareness regarding infection control”.

**Discussion**

This study explored the infection control measures promoted by the PHC during norovirus outbreaks in “housing for the elderly” facilities in Japan. While some categories were considered basic infection control, we have considered the instructions/advice needed at facilities with mainly care workers supporting the residents.

**Involving community health care resources**

In “collaboration with community healthcare workers”, the PHC advised cooperation with external healthcare resources. A previous study reported that proper infection prevention practice was not necessarily performed by care workers in aged care facilities, and over 90% of them wished for external consultants for infection prevention behavior13). The code for “environmental disinfection” and “improvement of staff education” indicated that the knowledge of care workers and education in “housing for the elderly” facilities was insufficient. Moreover, the bivariate analysis results suggested that the absence of healthcare workers is associated with high infection rates. The involvement of community healthcare resources is necessary during outbreaks to promote appropriate infection prevention behaviors among care workers and control the spread of the infection.

In the above category, the PHC instructed them to contact physicians at community hospitals and home-visiting nurses. A previous study14) focused on “housing for the elderly” facilities reported that about 60–80% of the facilities received healthcare services from hospitals, clinics, or visiting nurse agencies. In such cases, cooperation with these resources enables appropriate healthcare provision and infection control depending on the resident’s disease and function. When the PHC becomes involved in an outbreak, it is necessary to confirm the contractual agreement and relationship between the facility and healthcare workers.

Nevertheless, some care workers find it difficult to obtain advice from external healthcare resources. A study clarified that care workers at “housing for the elderly” facilities felt uneasy about working with healthcare workers15). They are especially afraid that they do not know enough about health care. The PHC should eliminate the unnecessary anxieties of caregivers and advise them on what to confirm with the healthcare resources and how to work together, depending on the residents or infection situation.

**Consideration of the cognitive decline of the residents**

Patients with dementia or memory impairment cannot comply with mask-wearing or movement restrictions16), which increases their risk of infection. Dementia can increase the risk of outbreaks and death from a range of in-
fectious diseases in hospitals, clinics, and aged care facilities.

The prevention of infection in patients with dementia is a major issue in Japan. In particular, it is also difficult for staff at “housing for the elderly” facilities to prevent the spread of norovirus infection because generally, 70–90% of the residents have dementia. Almost all rooms in the facilities are private, so infected residents can be isolated in their rooms. However, patients with dementia cannot comply with these restrictions and leave their rooms. In “precautions when caring for elderly infected residents”, the PHC promoted the disinfection of common areas multiple times a day, based on the behavior of patients with dementia. If there are dementia patients in the facility, the PHC should suggest behavioral restrictions and provide advice on other infection control practices that may need to be adapted.

Many of the residents at “housing for the elderly” facilities have dementia and high locomotive function. The “care need level” in the long-term care insurance system (support required levels 1–2 and care need levels 1–5; the most severe is care need level 5) is lower than at other facilities. In addition, the proportion of bedridden patients with dementia was small. The high locomotive function of residents makes behavioral restrictions more difficult. Therefore, the PHC needs to confirm the cognitive and locomotive function levels of the residents at each facility. When it is difficult to restrict behavior, it is essential to provide advice to the staff about frequent environmental disinfection, thorough hand hygiene, and the creation and management of isolation/cohort areas.

**Improvement of infection control manuals**

The PHC confirmed whether the infection control manual at each facility was adequate and pointed out any missing items. Most elderly care facilities considered their own manual suitable for the occupants and equipment of their facility. However, approximately 30% of the manuals lacked information on the process when an infectious disease outbreak occurred. The PHC pointed out a lack of infection control procedures related to excretion care, vomiting, or diarrhea. A previous study reported an association between insufficient manuals and infection outbreaks in aged care facilities. The study mentioned above, which pointed out the lack of content in the manual, focused on facilities where physicians were employed. It may be difficult for “housing for the elderly” staff to implement adequate measures as there are few healthcare staff. Thus, to prevent the further spread of the infection, the PHC needs to check the manual of the facility where the outbreak is and advise on what needs to be improved.

In addition, there is a need for facilities to develop appropriate manuals before a cluster outbreak occurs. In Japan, the Ministry of Health, Labor, and Welfare has developed an infection control manual for aged care facilities. However, the manual is mainly aimed at facilities where physicians and nurses are employed and includes content that is difficult to implement in “housing for the elderly” facilities, such as holding an infection control committee with healthcare workers. To improve the infection control manual at such facilities, a manual tailored to elderly facilities where only care workers provide long-term care should be developed. The manual should include items such as collaboration with external healthcare workers.

**Limitations**

This study has several limitations. First, this study collected information on cluster cases that occurred in a prefecture between 2017 and 2019. Other findings may be confirmed in the future with studies conducted over a longer time period or in other areas. Second, although this study explored the content of instructions from the PHC, it was difficult to verify whether they prevented the spread of infection. Detailed confirmation of cluster cases or a quantitative analysis is required to examine the relationship between PHC guidance and infection.

**Conclusion**

We sought to explore the infection control measures promoted by the PHC when a cluster of norovirus cases occurs in “housing for the elderly” facilities and found that the instructions included advice on basic infection control as well as tailored information depending on the characteristics of the residents and staff. So that care workers can implement appropriate infection control measures, it is necessary to involve community healthcare resources and that the behavior of patients with dementia is considered. In addition, a tailored infection control manual that includes items that can be implemented in facilities with no healthcare workers is required.

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