A Gastroenteritis Outbreak Associated with Norovirus In Eight Long-Term Care Facilities

Public Health Investigation Report*

* For the peer-reviewed publication of this investigation, please see **LM Nguyen and JP Middaugh.** Suspected transmission of norovirus in eight long-term care facilities attributed to staff working at multiple institutions. *Epidemiology and Infection* 2012. **140:** 1702-1709.

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This report represents the findings of the Southern Nevada Health District in the investigation a gastroenteritis outbreak that was associated with norovirus infections in eight long-term care facilities located in Clark County, Nevada.

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SUMMARY

The Southern Nevada Health District, Office of Epidemiology investigated a large norovirus outbreak in eight long-term care facilities in Clark County, Nevada during February and March 2010. Of 954 residents, 299 (31%) were ill, and of 843 staff, 95 (11%) were ill. In the eight facilities, attack rates among residents ranged from 17% to 55%. Propagation of disease by person-to-person spread was suspected in all facilities. Among residents, the hospitalization rate was 2.5%, and no death was reported. Eight staff members were employed or had social interactions with ill residents at multiple affected facilities. Timing of illness suggested that ill staff may have introduced disease into three facilities. Overall, 30 stool specimens were positive for norovirus by rRT-PCR or EIA. Four norovirus specimens from two facilities were sequenced; three were identical and one differed from the others by one nucleotide. All sequences were closely related to norovirus GII.4 New Orleans. At one facility, both norovirus and *Clostridium difficile* outbreaks were detected. Upon encountering gastroenteritis outbreaks in facilities which house the elderly, there should be a high degree of suspicion of norovirus infections, but other pathogens may be found. Investigation of this norovirus outbreak led to the identification of a concurrent outbreak of *C. difficile* that otherwise may have gone undetected. When investigating outbreaks of gastrointestinal disease at healthcare facilities, public health staff should consider the role of staff members who are employed at multiple facilities. Long-term care facilities have special obligations to protect their residents, and meticulous adherence to infection control procedures must be enforced.

INTRODUCTION

Noroviruses (NoVs) are the most common cause of outbreaks of acute gastroenteritis (AGE),[1] and have been responsible for approximately half of all outbreaks of GE worldwide.[2] In the United States, NoV are also acknowledged as the leading cause of viral GE, with an estimated 23 million people affected annually.[3, 4] Most reported outbreaks occur where individuals live in close proximity to each other, with prolonged NoV outbreaks frequently reported among elderly persons living in long-term care facilities (LTCFs).[5, 6] The impact of the disease may be severe among the elderly, who often have underlying medical conditions and are particularly vulnerable to complications resulting from AGE. [7, 8]

Transmission of NoV can occur through the fecal-oral route, through ingesting particles of vomitus that have been aerosolized, and through contact with contaminated environmental surfaces. Notable symptoms include rapid onset of severe vomiting and diarrhea, and they can occur with no or little prodrome. The low inoculums required for transmission and prolonged shedding period make the spread of NoV infections difficult to control.[9]

Individuals who reside or work in LTCFs are at high risk for prolonged outbreaks of NoV.[10,11,12] Enclosed living quarters and reduced levels of personal hygiene in elderly persons resulting from fecal incontinence, cognitive impairment, and immobility can facilitate the

transmission of disease in LTCFs. Outbreaks in these residential settings are often characterized by the rapid spread of disease, difficulty in outbreak containment, and high attack, hospitalization, and death rates.[13,14,15] Control of NoV outbreaks in these facilities relies on prompt responses and meticulous enforcement of infection control measures by LTCFs administrators and staff.

Here, we describe the epidemiology of a large NoV outbreak in Clark County, Nevada that occurred in eight LTCFs during February and March 2010. We will also depict the methods used to identify the sources of the infections, the detection of a concurrent outbreak of *Clostridium difficile*, and the infection control measures used to control the NoV outbreak.

METHODS

Epidemiological Investigation

The Southern Nevada Health District (SNHD), Office of Epidemiology received the first report of an AGE cluster at a State-licensed residential care facility in Clark County in February 2010. In the month that followed, we received information regarding AGE illnesses in seven additional LTCFs in the same county. We worked in conjunction with the Nevada State Health Division, Bureau of Health Care Quality and Compliance (HCQC) and the Southern Nevada Public Health Laboratory (SNPHL) to investigate and contain the outbreaks.

The OOE initiated an investigation upon receiving the initial GE cluster report from an administrator or Infection Control Practitioner (ICP) of each facility. To determine the status of the AGE clusters, we conducted telephone interviews with the reporter from each facility to obtain the following information: The number of residents and staff at the facility, illness onset date for case(s) since the beginning of the outbreak, the main symptoms and duration of illness, age of ill people, number of residents and staff who became ill each day of the outbreak, the common residential areas or activities shared among ill people, and preliminary control measures that were already instituted by the LTCFs to prevent spread of illness. We also solicited information regarding the number persons who were hospitalized and deaths. The names of hospitalized individuals were referenced with all deaths in Clark County for three months after the outbreak to determine if any hospitalized patients had died. We inquired to the method that each facility was employing to isolate the ill residents and staff from people who were not ill. Further, we requested the identity of patients who were ill with GE symptoms shortly before, or after, they were transferred into an affected LTCF. Mantel-Haenszel χ^2 tests were used to compare proportions of hospitalization and attack rates among the different types of LTCFs. Fisher exact 2-tail p-value was reported when a sample size is ≤5. The p- values ≤0.05 were considered significant.

To identify ill staff members who worked in multiple LTCFs and may have served as source cases at these facilities, we obtained the current staff rosters of all eight affected facilities. The names of employees from all facilities were cross-referenced with each other to find staff members who worked at more than one facility. Further, we obtained the identities of

ill residents from affected facilities who were admitted to local hospitals for AGE-related treatment. The ICPs at the admitting hospitals were notified, and they were asked and to report additional cases to us during the outbreaks.

Our staff performed an early assessment of the symptoms experienced by ill people to narrow the possible pathological agents. We also confirmed type of facility and the identity of the regulating entity providing the operating licenses to these LTCFs. Furthermore, we investigated the possible associations between these LTCFs that may explain the occurrences of all eight outbreaks within a short time period.

Case Finding

A case was defined as a resident or staff of the LTCFs who, as the facility's administrator reported, experienced recent AGE symptoms of diarrhea (several loose stools per day) and/or vomiting in a period of a day. In the initial investigation, the number of people who became ill each day since the start of the outbreak was self-reported by the affected facility. After the initial reports, we detected additional cases by contacting each LTCF daily to inquire to the number of residents and staff who became ill within the previous day. After the peak of the outbreak, we monitored for additional ill residents and staff using a daily fax *Continuing Outbreak Surveillance Daily Form* (Appendix B). When a LTCF reported no new AGE case in a period of seven consecutive days, we terminated case finding activities with this facility. The number of ill cases versus the date of illness onset of each case was used to generate the epidemiological curve for all eight LTCFs.

The duration of the outbreak at each LTCF was calculated from the day cases were observed by facility administrators until no new AGE case was reported by that facility. The duration of surveillance was calculated from the day the outbreak was reported and continued until no new AGE cases was reported by that facility for at least seven consecutive days. The overall period of surveillance conducted by the OOE began with the report of the first AGE cluster, and continued until seven days after the last facility reported its last case.

Laboratory Testing

We advised the LTCFs to select a limited number of cases to provide stool specimens for laboratory testing. The SNPHL distributed stool specimen collection kits to facilities C and F to collect specimens for NoV, *Rotavirus*, and enteric culture tests. The staff of these facilities was advised to select cases that recently experienced symptoms. The tasks of selecting ill patients for testing and collecting specimens were performed by the respective staff of each LTCF. Stool specimens (n=7) were refrigerated at these facilities until processed by the SNPHL. The SNPHL performed real time reverse transcriptase polymerase chain reaction (rRT-PCR) testing for NoV, enzyme-linked immunosorbent assay (ELISA) testing for *Rotavirus*, and stool culture for bacterial pathogens (*Salmonella, Shigella, Campylobacter,* strain O157 of *Escherichia coli*, and *Yersinia)* on these stool samples. The SNPHL submitted specimens that were positive for NoV to the Nevada State Public Health Laboratory (NSPHL) for sequence typing and genetic analysis.

Facilities B and E submitted stool specimens from their respective ill residents to the same local commercial diagnostic laboratory for testing. Facility C submitted stool specimens to a diagnostic testing company that was different than the one used by facilities B and E. We performed medical records reviews to obtain laboratory submissions from these three facilities concerning four tests (NoV, *C. difficile*, ova & parasites (O&P), and enteric cultures) for the months of February and March, 2010. The private laboratories employed rRT-PCR to detect NoV in four stool specimens and the rest by enzyme immunoassays (EIA). The presence of antigens to the *C. difficile* toxins A and B was detected by EIA, microscopic evaluations for O&P, and cultures for routine bacterial pathogens in the stool of ill patients. The other four facilities reported no stool specimen submission for testing.

RESULTS

Outbreak Investigation

Of the 2210 persons who resided or worked at the eight LTCFs, 394 people (attack ratio=17.8%) met the case definition criteria (Table 1). Of 1179 residents, 299 (25%) were ill, and of 991 staff, 95 (9.7%) were ill. The outbreaks were person-to-person in nature in all LTCFss. Symptoms were first observed in patients at half of the eight facilities, but first in staff at facilities A, B, F, and G. Illness then spread to other residents and staff. The outbreaks began in the affected facilities during a four-week period, with a mean duration of 15.5 days (range 5-31 days). The epidemic curve (Figure 1) summarizes the outbreaks, and shows the starts of the outbreaks were staggered.

Table 1 summarizes the scope of the outbreaks, the attack rates, and hospitalization of residents and staff by each facility. Of the eight facilities, three were Skilled Nursing Facilities (SNF), and five were residential care facilities (one licensed an Adult Group Care (AGC), three were AGC for Alzheimer's (AGZ), and one facility contained both an AGZ and AGC). The attack rates were higher in residents (range 17-55%) than staff (range 3-35%) in all facilities. The median number of ill residents and staff among all eight LTCFs was 35 and 12.5 persons, respectively. Attack rates between the AGCs and the AGZs, and the SNFs were not significantly different from each other.

There were two clusters in the age distributions of ill persons (Fig. 2). The first consisted mostly of the comparatively younger staff, whose age ranged from 19 to 78 (n=85; median=43.5 years). The latter age cluster was composed almost entirely of residents, with age range 44 to 99 years (n=225; median=84.5 years).

Major symptoms experienced by ill people included cramps, diarrhea and/or vomiting. Among 217 cases where symptoms data was available, most individuals [n=171 (78.8%)] suffered from diarrhea and 43.8% (n=95) reported vomiting. The duration of illness characteristically lasted 24 to 48 hours and was self-limiting in ill persons who did not seek additional medical care. Ten affected residents from four facilities were hospitalized (Table 1), and no hospitalization was reported among staff. Hospitalization rates were not significantly

different between the AGCs and the AGZs. Hospitalization rates were significantly higher in the AGZs and AGCs, compared with the SNFs (0-12% vs 0-2% respectively, χ^2 8.51, Fisher exact p = 0.0063). Ill residents of all LTCFs received varying levels of hydration therapy at these facilities, and residents of the SNFs who tested positive for *C. difficile* were treated with antibiotics on-site. No fatality related to these GE clusters was observed in any of the LTCF.

Based on the reported clinical symptoms and the duration of illness, we suspected NoV as the etiological agent at the LTCFs early in the outbreak investigations. Each AGE cluster was reported to HCQC, the regulating authority on all of these affected facilities and their respective kitchens. The *SNHD Guidelines for the Prevention and Control of NoV in Extended Care Facilities and Nursing Homes* (Appendix B) was electronically mailed, or the SNHD website containing the guidelines was referred, to each affected facility. In addition, all LTCFs were instructed to implement the following infection control measures: Confine ill residents in their rooms, residential floor and wing, or building until 72 hours after symptoms resolve; restrict staff movement within the facility; closure of the facility to new admissions and visitors; furlough ill staff until 72 hours after the resolution of symptoms and advise ill staff who work in multiple LTCFs to observe furlough guidelines at all places of employment; intensify surface disinfection procedures using appropriate disinfectants for NoV, and practice strict hand-hygiene. We also recommended that the HCQC dispatch advisors and/or inspectors to the affected LTCFs to ensure the implementation of cleaning guidelines and other infection control measures.

Case Finding

The distribution of cases for each of the eight LTCFs over time is illustrated in Figure 1. The OOE learned of the illnesses from seven of the eight facilities through reporting from the administrators of these facilities. The AGE cluster at facility E was reported by an administrator of facility D, who noticed that there were many ill people at the former facility. The initial *C. difficile* infections at facility E was identified after these infections were detected by the facility's administrators during the course of its NoV outbreak. Prior to reporting the outbreaks to the SNHD, 80 (20.3%) of the cases were already observed at the eight LTCFs. The remaining cases [n=314, (79.7%)] were reported through surveillance.

The overall illness surveillance period conducted by the OOE started with the report of the first AGE cluster at facility A on February 13 and ended on April 5, 2010, seven days after facility E reported its last case of illness (Table 1). All facilities were monitored for illness for seven days after the last reported case with the exception of facility A, the first to report its GE cluster to us. A median of sixteen days (range=3-34 days) of disease surveillance was provided to each facility.

There were extensive movements of ill staff among the affected facilities. Cross-referencing the names on the employee rosters from all facilities revealed nine staff members who worked or have social interactions among these facilities. Of these nine workers, eight were identified as being employed in multiple affected facilities, with four of the eight reporting illness. Facilities A and D shared one staff (none ill), A and H shared two staff (one ill), B and H

shared one (none ill), C and E shared one (none ill), and D and F shared three (all three ill). We were not able to identify any staff connection between facility G and the other affected facilities.

At least three outbreaks were preceded by illness among staff members who worked at multiple affected LTCFs. The ill employee who worked at facilities A and H, who had the earliest onset date among all outbreaks, may have served as the source case for facility A (S1, Fig. 1). Of the three shared workers from facilities D and F, two became ill shortly prior to the outbreak at facility F and may have served as source cases for this facility (S3-S4, Fig. 1). The third shared employee (S5, Fig. 1) from these two facilities was the last person to report illness at facility D, and was counted among ill people from facility F. The ninth staff member worked at facility B and was not employed at more than one facility. However, this worker became symptomatic after she visited her ill parent at the parent's home. This parent received hospice care at the parent's home from a hospice company that also provided services to facility D. This employee was suspected of being the source case at facility B (S2, Fig. 1). Illness among workers of the hospice care that provided services to this employee's parent and facility D was not known. None of the outbreaks was preceded by illness among food handlers in any of the LTCFs.

Patients who were ill with AGE symptoms were commonly transferred from local hospitals and other healthcare centers into facility E after the onset of illnesses at this facility. We identified four patients who were recently ill with AGE symptoms prior to their admittance into facility E, with one of the four persons a transfer from facility D. Patient transfers into the other facilities during their respective outbreaks were not observed.

Laboratory Testing

Table 2 shows of the stool samples submitted to either the SNPHL or to the commercial laboratories, 32 (51.6%) were positive for the presence of NoV. Genogrouping of the NoV specimens at the SNPHL revealed that they all belong to genogroup (G) II. The genogroups of the NoV specimens analyzed by the commercial laboratory were not known as this laboratory did not perform differential genogrouping tests. The PCR products of the 172-nucleotide long B region of the NoV genome were obtained from four of the six specimens submitted by the SNPHL to the NSPHL for sequence typing. Attempts to acquire PCR products from the other two submitted specimens were unsuccessful due to low viral load. Three PCR-amplifiable NoV sequences submitted by facility C appeared to be identical, with 99% nucleotide identity (three nucleotide substitutions) to the NoV strain Hu/GII.4/Orange/NSW001P/2008/AU (GenBank Accession GQ845367), which is one of four reference strains labeled as GII.4 NewOrleans (NSW001P_AUS08) in the Centers for Disease Control and Prevention (CDC) CaliciNet Database. The last PCR-amplifiable sequence was obtained from a specimen submitted from facility F, and it differed from the three sequences from facility C by one nucleotide.

Eleven (20.4%) of the stool specimens submitted for *C. difficile* testing were positive (Table 2); and of these positive specimens, ten (91%) came from facility E and one (9%) from facility C. Two of the positive *C. difficile* specimens which came from facility E were obtained

from two ill residents, whose stool specimens were also positive for NoV. None of the specimens submitted by facility B was positive for *C. difficile*.

All stool specimens submitted by the four facilities to either the SNPHL or the commercial laboratories were negative for O&P, enteric cultures, and *Rotavirus* (Table 2).

DISCUSSION

To our knowledge, this was the largest reported NoV outbreak in LTCFs in the state of Nevada with 394 identified cases in a four-week period. Cases had similar symptoms, and nearly identical NoV sequences were detected from cases at two affected facilities. The simultaneous detection of NoV and *C. difficile* in residents is indicative of co-infections by these pathogens in at least one facility. Ten residents were hospitalized, and no death was reported.

Because none of the outbreaks was preceded by illness among food handlers in any of the LTCFs, there was no evidence to suggest that these outbreaks were caused by foodborne-transmission. Since GII.4 strains of NoV are frequently transmitted by person-to-person spread in closed or semi-closed settings,[16,17,18] this most likely accounted for the propagated mode of transmission of NoV in these LTCFs. As elderly residents seldom leave the facilities, this strongly implies that the initial transmission was from staff members to residents, perhaps by person-to-person contact during the administration of care. Direct contact with NoV-containing fecal matter or aerosolized vomitus, or by indirect contact with them via environmental surfaces, may have spread the virus to other residents and staff.

NoV sequences from single-source outbreaks are typically identical, but the CDC have detected one-nucleotide difference in NoV sequences during prolonged outbreaks (Verbal communication between the NSPHL and the CDC). The homology among the sequences obtained in this outbreak is much higher when compared to the 90% nucleotide sequence identity reported previously in another single source large multi-LTCFs outbreak.[19] Although the relatedness of the outbreaks cannot be based solely on molecular evidence given that NoV GII.4 NewOrleans was the most common strain circulating throughout the United States this year (Unpublished data, CDC CaliciNet Workshop, March 31, 2010), the short period of time when all the outbreaks occurred, the many staff interactions between the affected facilities, and the isolation of almost identical NoV genetic sequences from different facilities provide strong foundations for the conclusion that these outbreaks were linked.

The mean duration of this outbreak (15.5 days, range 5-31 days) is similar to other reported NoV outbreaks in semi-closed settings. Despite our increased surveillance time surveying each facility for seven days after its last case of illness, additional cases were not detected during this period.[20]

The consequences of infection in the elderly populations within LTCFs, who often have underlying medical conditions, can be severe resulting in hospitalization and death. Although we did not observe any death associated with elderly persons who were hospitalized, mortality has been estimated at around 2% in this group.[19] In our study, the overall hospitalization rate

among the residents in all eight facilities was 2.5% (range 0-12%). The NoV-associated hospitalization rate is lower than the 10.2% observed in the elderly population who resided in LTCFs by Calderon-Margalit *et al* (2005), and higher than the rates of 0.33% reported to describe the entire population in England & Wales.[20] Our analyses show that hospitalization rates are significantly higher between the SNFs compared to the AGCs and AGZs. These differences may be explained by Federal licensing requirements, which required the medical care of SNF patients to be supervised by physicians and skilled on-site nursing staff. On the contrary, no such requirements exist for AGCs and AGZs, of which staff members often have limited or no medical training. The significantly lower hospitalization rate at the SNFs might be attributed to the implementation of medical supportive care to affected residents on-site rather than transporting them to hospitals. The disparity in the different types of LTCFs and its influence on NoV hospitalization and morbidity rates among elderly residents should be examined more closely.

Although NoV infections were suspected early in the investigative process, the positive *C. difficile* laboratory results highlight the importance of testing to detect multiple potential pathogens during a single outbreak. Infections of *C. difficile* have been suspected in AGE outbreaks at healthcare institutions when the true etiological pathogen was NoV .[21,22] Detection of *C. difficile* in healthcare and LTCFs, where it is endemic and many patients are asymptomatically colonized, can contribute to confusion regarding the causative agent. However, we do not believe that coincidental detection of *C. difficile* colonization due to increased testing,[23-24] and false-positive results associated with these tests [25-26] were encountered in this NoV outbreak. As 91% of the specimens that were positive for *C. difficile* came from one facility, this provides strong support that there was a concurrent outbreak of *C. difficile* and NoV at this facility. The importance of distinguishing the true enteric pathogen responsible for an outbreak is critical, since the implementation of preventive and therapeutic strategies differs for multiple pathogens.

Prompt and stringent cohorting of affected residents and staff, prohibition of visitors, and the cessation of new admissions aided in the containment of the outbreak at most facilities. However, poor adherence to these infection control practices could have led one facility to incur concurrent infections by NoV and *C. difficile*. New admittance of ill residents into a LTCF facility once an outbreak began might have enabled new pathogens to gain footholds in an elderly population already made more vulnerable by recent infections. As we observed, the consequences of multiple infections were a 55% attack rate among elderly residents and a protracted outbreak that was very difficult to contain. The implementation of aggressive isolation intervention measures at the beginning, and re-evaluations of these infection control measures at the end, of an outbreak may be necessary to limit the introduction of new pathogens and decrease morbidity in these settings.

Finally, staff members who were simultaneously employed at multiple LTCFs can facilitate the spread of pathogens among them, and identifying these individuals may help in determining the source cases of outbreaks. Affected facilities frequently shared common staff members; thus, if an ill employee was identified as working in multiple LTCFs, this information

can be shared with this employee's other place of employment, along with recommendations to the second facility's infection control staff to be vigilant for and report AGE cases to the local health department. However, due to delays in reporting the outbreaks and the time lags in forwarding the employee roster to us, it was difficult to identify such staff members early in the outbreaks. Therefore, it is imperative to stress that all ill staff, in addition to being furloughed for 72 hours after the cessation of symptoms as recommended by the CDC,[27] should also not work at other LTCFs within this period. Furthermore, it is estimated that 32% of infected individuals may be asymptomatic[28] and fecal shedding[2] of NoV can be prolonged.[29] These reports and our findings may necessitate the evaluation of the recommendations regarding staff resuming their duties while convalescing from recent NoV infections.

There were several limitations of our investigation. One limitation was the small number of specimens available for NoV testing by RT-PCR and for nucleotide sequencing. All affected facilities were encouraged to test a limited number of ill persons; however, only half complied. Additionally, only four (7%) stool specimens submitted for NoV testing were genetically sequenced for further analyses. The staff at many of the affected facilities was neither trained to collect, nor were these facilities equipped to properly store clinical specimens until they can be analyzed. This suggests that public health investigators need to supply assistance, and perhaps even the means, to the affected facilities to ensure clinical specimens will be properly collected, tested, and sequenced during NoV outbreaks. The second limitation is our surveillance of NoV and other AGE outbreaks in these settings relies mainly on mandatory reporting by LTCFs administrators, emergency rescue personnel (who observed increases in ambulance transports from LTCFs), and members of the public who have knowledge of these outbreaks. This passive reporting process does not have the sensitivity to monitor for the complete reporting of illnesses related to such outbreaks. For example, we were unable to establish illness occurrences among family members and other visitors, or to verify that the outbreak was limited to these LTCFs or had spread to the general community. A more responsive monitoring system to detect such outbreaks can result in several advantages: Earlier public health interventions at such facilities to minimize morbidity, the elucidation of the impact of prolonged outbreaks in the context of the larger community, and to facilitate the study of NoV illnesses to advance strategies for their control and prevention.

In conclusion, this was the largest reported outbreak involving multiple LTCFs in the state of Nevada, as eight affected facilities were linked by epidemiological and molecular support. Once recognized, the public health response led to the rapid identification of this multi-facility NoV outbreak. The HCQC collaborated with the SNHD to conduct an epidemiologic investigation and perform on-site visits to oversee implementation of infection control measures using national guidelines. Findings from the epidemiologic investigation underscore the importance of diagnostic testing of ill persons. In the midst of the NoV outbreak, we discovered a concurrent outbreak of *C. difficile* that might otherwise have gone undetected. The LTCFs need to adhere to national guidelines for the control of NoV and other nosocomial infections and to take measure during an outbreak to isolate the affected from the unaffected, especially staff members who are employed or have interactions with multiple facilities.

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APPENDIX A Tables and Figures

Table 1. The numbers of residents and staff affected at the Long-Term and Residential Care Facilities.

Facility	Type	Outbreak Dates	Surveillance Dates	Group	Exposed (n)	Affected (n)	Attack Rate (%)	Hospitalization Rate [n (%)]
A	AGZ	Feb 11-15	Feb 13-15	Total	110	17	15.5	0
				Residents	57	12	21.1	
				Staff	53	5	9.4	
B	SNF	Feb 20-Mar 14	Feb 26-Mar 21	Total	495	50	10.1	1 (2.0)
				Residents	245	42	17.1	
				Staff	250	8	3.2	
C	SNF	Feb 25-Mar 18	Mar 1-25	Total	310	100	32.3	0
				Residents	191	80	41.9	
				Staff	119	20	16.8	
D	AGZ	Feb 26-Mar 6	Mar 2-13	Total	160	44	27.5	5 (11.1)
				Residents	95	30	31.6	
				Staff	65	14	21.5	
E	SNF	Feb 25-Mar 29	Mar 2-Apr 5	Total	260	68	26.2	0
				Residents	94	52	55.3	
				Staff	166	16	9.6	
F	AGZ	Mar 2-9	Mar 5-16	Total	90	25	27.8	3 (12.0)
				Residents	44	14	31.8	
				Staff	46	11	23.9	
G	AGC	Mar 9-21	Mar 11-28	Total	129	56	43.4	1 (1.8)
				Residents	83	40	48.2	
				Staff	46	16	34.8	
H	AGC	Mar 11-18	Mar 11-25	Total	168	7	4.2	0
				Residents	105	7	6.7	
				Staff	63	0	0.0	
	AGZ	Mar 11-17	Mar 11-25	Total	75	27	36.0	0
				Residents	40	22	55.0	
				Staff	35	5	14.3	
Total		**Feb 11-Mar 29**	**Feb 13-Apr 5**		**1797**	**394**	**21.9**	**10 (2.5)**

Table 2. Distribution of laboratory tests submitted among four facilities.

Test	Facility	*n*	Positive	%
Norovirus	B, C, E, F	62	32	51.6
Clostridium difficile	B, C, E	54	11	20.4
Ova & Parasites	B, C, E	31	0	0
Enteric cultures	B, C, F	17	0	0
Rotavirus	C	7	0	0

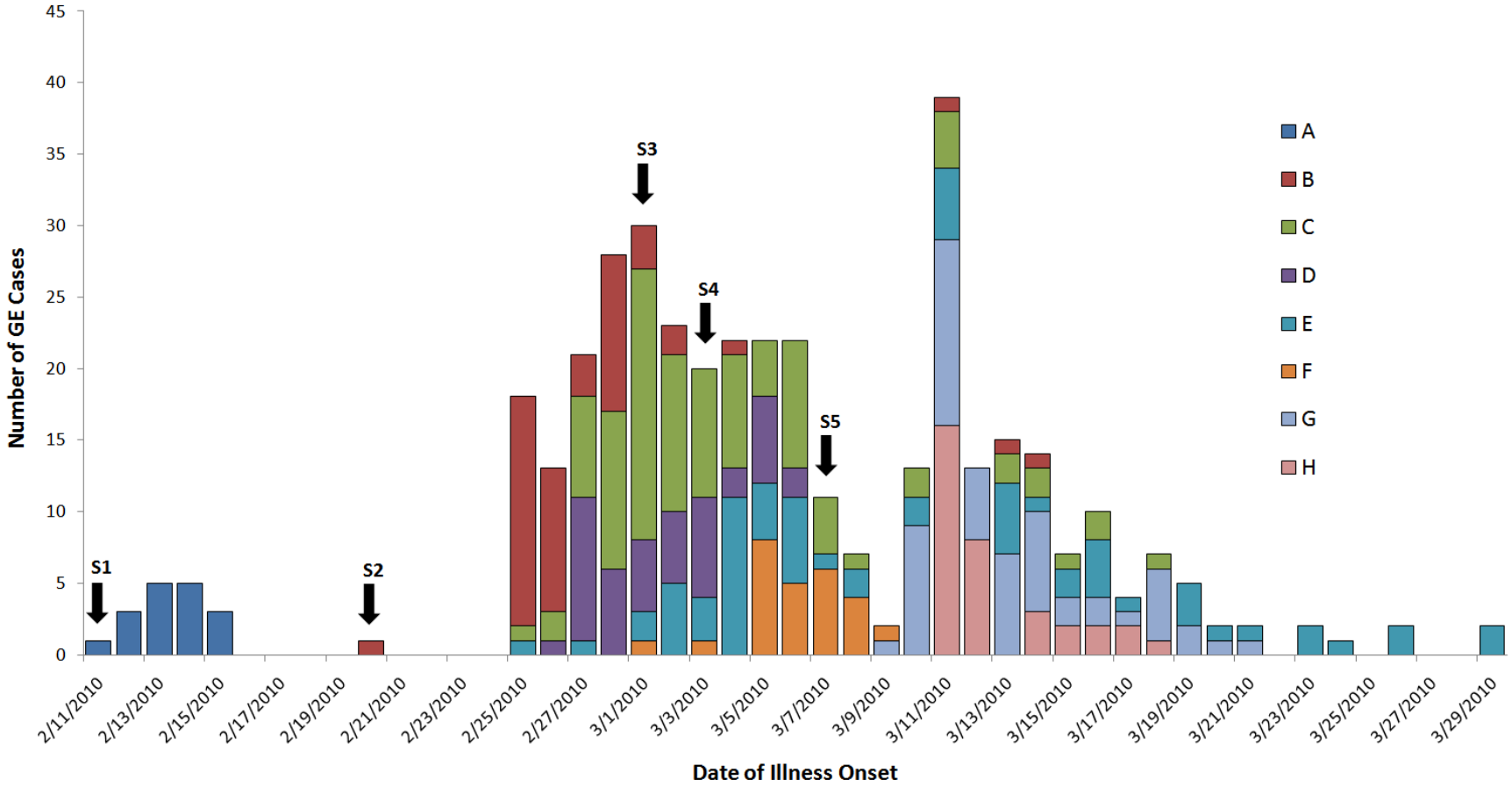

Figure 1. Distribution of cases by illness onset date (*n*=394) at all eight Long-Term and Resident Care Facilities, Clark County, Nevada. February-March 2010. Black arrow = Onset date of a staff member.

Figure 2. Age distribution of ill staff and residents (*n*=308).

APPENDIX B Forms and Guidelines

Continuing Outbreak Surveillance Daily Form

Southern Nevada Health District Guidelines for the Prevention and Control of *Norovirus* in Extended Care Facilities and Nursing Homes

- Paper Version
- Electronic Version: http://www.southernnevadahealthdistrict.org/health-care-providers/norovirus-guidelines.php

Continuing Outbreak Surveillance Daily Report

To provide ongoing surveillance of the infectious disease outbreak at this facility, please complete and return this form daily to the Southern Nevada Health District, Office of Epidemiology (SNHD, OOE) by fax at 702-759-1414. This report must be received daily by noon, and the reporting period ("Date for which you are reporting") is the day previous to the reporting date.

Reporting Date (Today's Date): _____ Date for which you are reporting: _____

Reporter Name: _____Reporter Telephone: _____

Facility Name: _____

Was there any <u>resident</u> ill with gastrointestinal symptoms within this reporting period? No or **Yes** (Circle one)**.**

If "Yes", list the name(s) of ill residents, Date of Birth, and symptoms. If necessary, use additional sheet.

Was there any <u>staff member</u> ill with gastrointestinal symptoms within this reporting period? No or **Yes** (Circle one)**.**

If "Yes", list the name(s) of ill staff members, Date of Birth, and symptoms.

Did any resident or staff member submit clinical specimens for <u>lab testing</u> <u>related to this outbreak</u>? No or **Yes** (Circle one)**.** If "Yes", list name, date of birth, and laboratory name.

Did any resident seek medical care at other healthcare facilities (ER, Quick Cares, private medical providers, etc.) within this reporting period for <u>illness related to this outbreak</u>? No or **Yes** (Circle one)**.**

If "Yes", list patient name, date of birth, and name of the hospital.

Was any resident transferred to other healthcare facilities within this reporting period for <u>illness related to this outbreak</u>? No or **Yes** (Circle one)**.**

If "Yes", list patient name, date of birth, and name of facility to which the patient was transferred?

Please fax this completed form to the SNHD, OOE at 702-759-1414. If you have questions regarding this surveillance report, please contact the OOE at 702-759-1299. Thank you for your assistance.

CONTROL MEASURES FOR RESIDENTS:

- Limit new admissions until the outbreak is over. An outbreak is generally considered to be over when a sufficient amount of time has passed without onset of illness in new cases. This determination will be made by the health authority.
- Confine residents with vomiting or diarrhea to their rooms until symptom-free for 72 hours or more.
- Cancel group activities until the outbreak is over.
- Do not transfer residents (symptomatic or not) from outbreak-affected to unaffected wards, unless it's medically urgent to do so, until the outbreak is over.
- Ask family members and visitors with vomiting and/or diarrhea to stay home until symptom-free for 72 hours or more.
- Do not allow children to enter the facility until the outbreak is over.
- Dedicate the use of patient-care equipment to a single resident or among similarly symptomatic residents. If the use of common equipment or items is unavoidable, clean and disinfect the equipment before another resident uses it.
- Consider giving anti-emetics to patients with vomiting.

CONTROL MEASURES FOR STAFF AND VOLUNTEERS:

- Maintain the same staff to resident assignments.
- Discontinue "floating" staff from the outbreak-affected to unaffected wards.
- Furlough staff and volunteers with vomiting or diarrhea involved in viral gastroenteritis outbreaks for 72 hours after symptoms cease. Work restrictions during bacterial gastroenteritis outbreaks depend on the bacterium.
- Exclude non-essential personnel from outbreak-affected wards.
- Wear gloves and gowns when entering the rooms of residents with gastroenteritis.
- Remove gloves and gowns after contact with an affected resident and before contact with an unaffected resident in the same room. Remove gloves before leaving the room and wash hands immediately.
- Clean up fecal and vomit accidents promptly. Disinfect with an effective virucide[1] or 1000 ppm available chlorine bleach** solution (1 part bleach to 50 parts water).
- Increase the frequency of routine ward cleaning, with special attention to frequently handled things like light switches, telephones, faucets, door handles, toilet flushers & bath rails.

CLEANING UP VOMIT AND FECES

Staff who clean up vomit or feces should use the following precautions to reduce their risk of infection.

GENERAL PRINCIPLES:

- wear disposable gloves and gowns*
- clean soiled areas with detergent and hot water
- always clean with paper towels or disposable cloths and dispose in infectious waste bags
- disinfect hard non-porous environmental surfaces with 1000 ppm bleach** solution (1:50 bleach to water). In areas with high levels of soiling and resistant surfaces, up to 5000 ppm chlorine bleach** (1:10 bleach to water) may be used **or** use one of the effective virucides[1] listed below according to manufacturers directions
- dispose of gloves, gown and cloths in infectious waste bags
- wash hands thoroughly using soap and water and dry them just as thoroughly

Handwashing is the single most important procedure for preventing the spread of infection between you, your coworkers and your clients. Frequent handwashing with soap and water for at least 20 seconds of vigorous rubbing, thorough rinsing under a stream of clean water, and drying with disposable towels is recommended. Faucets should be turned off with paper towels.

SPECIFIC SITUATIONS:

Cleaning specific items*

Bed linens, bed curtains, & pillows: launder in detergent and hot water in soluble alginate laundry bags; use 1000 ppm chlorine bleach** solution to disinfect pillows with impermeable covers or use an effective virucide[1]. Soiled linens should be handled as little as possible and with minimal agitation.
Carpets: use paper towels to soak up excess liquid and transfer these and any solid matter directly into a healthcare risk waste bag: clean with detergent and hot water using a disposable cloth then disinfect with an effective virucide[1] or; disinfect with 1000 ppm chlorine bleach** solution. Carpet may be steam cleaned after disinfection.
Hard surfaces: clean with detergent and hot water; disinfect with an effective virucide[1] or 1000 ppm chlorine bleach** solution; launder non-disposable mop heads in a hot wash. In areas with high levels of soiling and resistant surfaces, up to 5000 ppm chlorine bleach** (1:10 bleach to water) may be used
Horizontal surfaces, furniture and soft furnishings (in the vicinity of the soiled area): clean with detergent and hot water then disinfect with an effective virucide[1] or with 1000 ppm chlorine bleach** solution.
Fixtures and fittings in toilet areas areas: clean with detergent and hot water; disinfect with 1000 ppm chlorine bleach** solution or an effective virucide[1].

Cleaning up vomit in the kitchen*

Carefully remove all vomit and clean the area using the general principles above.
Food preparation area (including vertical surfaces): disinfect all kitchen surfaces with 1000 ppm chlorine bleach** solution or an effective virucide approved for food contact surfaces[1]. Thoroughly rinse all areas and sanitize using routine kitchen sanitizer according to manufacturer's recommendations.
Food: destroy any exposed food, food that may have been contaminated and food that was handled by an infected person.
Work restrictions: furlough anyone with vomiting and diarrhea who works in the kitchen until 72 hours *after* the symptoms stop.
Report any incident of vomiting to the infection control team and appropriate managers.

****It is recommended that persons who clean areas substantially contaminated by feces and/or vomitus wear masks because spattering or aerosols of infectious material might be involved in disease transmission.***

***** Use chlorine bleach that is registered by the EPA as a disinfectant.***

[1] Effective virucides are those effective against feline calicivirus (FCV). A complete list of EPA-registered effective products can be found at http://www.epa.gov/oppad001/list_g_norovirus.pdf

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