

Norwalk-like virus outbreak in Canberra: implications for infection control in aged care facilities

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Abstract

This paper reports on an outbreak of viral gastroenteritis in three institutions (two aged care facilities and one hospital) in Canberra during the winter of 2002. Norwalk-like virus genotype II was detected in samples from staff and/or residents in all three institutions. A case series investigation was conducted amongst both staff and residents. It is likely that the outbreaks in the three institutions were linked due to transfers of infected residents from one institution to another, early in the outbreak. A total of 281 cases were identified during the outbreak, which lasted 32 days. Attack rates in the three institutions were 46.3 per cent, 52.7 per cent and 55.2 per cent respectively. Person-to-person spread and/or airborne transmission were postulated as modes of transmission in all three institutions. Infection control practices in each of the aged care institutions were of an acceptable standard for accreditation, but were inadequate to control further spread of the outbreak within and between institutions. Outbreak management plans should be a part of the infection control standards for accreditation of aged care facilities. *Commun Dis Intell* 2002;26:555–561.

Keywords: Norwalk-like virus, outbreak, gastroenteritis, aged care facilities, hospitals, infection control

Introduction

Norwalk-like viruses (NLV), now also known as human caliciviruses, are a genetically diverse group of RNA viruses that are classified in the family *Caliciviridae*. There are three distinct genogroups of NLV, of which only genogroups I and II are pathogenic to humans.¹ The epidemiological characteristics of NLV illness include: incubation period of 24–48 hours; duration of illness between 12–60 hours; and greater than 50 per cent of cases reporting vomiting.² Other symptoms of NLV gastroenteritis include nausea, abdominal pain and diarrhoea.³ The main modes of transmission of NLV are person-to-person, foodborne and waterborne. Fankhauser *et al.*⁴ found that of the 233 outbreaks of confirmed NLV gastroenteritis investigated in the United States of America between July 1997 and June 2000, 57 per cent were foodborne, 16 per cent were person-to-person spread, 3 per cent were waterborne and 24 per cent had unknown modes of transmission. Airborne transmission of NLV has also been documented.^{5,6}

Nursing homes and hospitals have been common settings for outbreaks of NLV,^{7,8} due to the closed nature of these institutions and also because of the infectious nature of NLV. Attack rates from outbreaks of NLV in aged care facilities have been reported to be as high as 62 per cent in elderly residents in the Netherlands.⁹ Augustin *et al.*¹⁰ reported attack rates of 9 per cent and 11 per cent in outbreaks in two aged care facilities in Canada. Both facilities implemented infection control procedures such as increased surveillance, reinforcement of hand washing, keeping symptomatic residents in their rooms and relieving sick staff from their duties until 48 hours after the resolution of symptoms. Given these control measures, the outbreaks still lasted for 24–29 days. Outbreaks of NLV in aged care facilities in Australia have also been reported. The attack rates of three nursing home outbreaks of NLV reported in Brisbane ranged from 9 per cent to 58 per cent.⁷

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This paper details the public health response and describes the epidemiology of an outbreak of Norwalk-like virus, which occurred in two aged care facilities and a hospital in the Australian Capital Territory. The purpose of this investigation was to stop the spread of gastroenteritis in the three institutions, to identify the causative agent and identify the likely mode of transmission.

Methods

The outbreak occurred in three institutions. The environmental, epidemiological and microbiological investigation methods used in this outbreak are detailed below.

Environmental investigation

The kitchens and food handling practices in Institutions A and B (aged care facilities) were examined by Environmental Health Officers from the Australian Capital Territory Health Protection Service (ACT HPS). An infection control audit of these institutions was conducted separately by infection control officers from the ACT HPS. Institution C was a hospital with two dedicated infection control practitioners, who liaised with the ACT HPS to manage the outbreak.

Epidemiological investigation

An epidemiological investigation was conducted in each of the aged care facilities by the ACT HPS, starting at Institution A on 24 June 2002. A case was defined as a person who lived or worked at either Institution A or B and developed vomiting or diarrhoea after 1 June 2002. Staff were contacted by phone and asked to complete a standard questionnaire if they met the case definition. All staff were advised to contact the ACT HPS if they developed symptoms. The questionnaire collected information such as the date of onset, symptoms (diarrhoea, vomiting, nausea, stomach pain and fever), exposure details, food history and other locations of work. All staff who had gastrointestinal symptoms were asked to submit a stool sample for microbiological investigation.

Residents in Institutions A and B, who met the case definition were identified by staff. A questionnaire detailing symptoms and onset date was completed by senior nursing staff on behalf of each sick resident. Staff were also requested to collect stool samples from residents, where possible. Case notes of each resident were examined for evidence of vomiting or diarrhoea after 1 June 2002.

The case definition used in Institution C was a person who had vomiting or diarrhoea after 25 June for staff members who worked in any of the affected wards and after 1 June for patients admitted to any of the affected wards. The case definition was modified for staff as the number of people who had worked in the affected wards was too numerous and staff members were difficult to trace for interviews. Cases (staff and current patients) were identified in the affected wards by the infection control practitioners and details of onset date of illness and symptoms were provided. Stool samples were collected from some of the patients who met the case definition. Patients who had been in any of the affected wards since 1 June and had been discharged were followed up via telephone interviews for case ascertainment.

Microbiological investigation

Stool samples were collected from cases in each of the three institutions and were examined for parasites (*Cryptosporidium*, *Giardia*) and bacteria (*Salmonella*, *Shigella*, *Campylobacter* and *Yersinia*). Some of the stool samples were also tested for rotavirus. Samples collected within the first 24–48 hours of onset of illness were sent to the Institute of Clinical Pathology and Medical Research (ICPMR) or the Victorian Infectious Diseases Reference Laboratory (VIDRL) for testing of Norwalk-like viruses using reverse transcriptase polymerase chain reaction (RT-PCR).

Results

Description of facilities

The outbreak occurred in two aged care facilities and a hospital. Institution A was an aged care facility, where most of the residents required considerable contact with staff ('high care'). Showers and toilets were shared amongst residents and some rooms contained two beds. There was a shared dining room and several courtyards for use by all of the residents.

Institution B was an aged care hostel, where only half of the residents required a high level of care. One end of the hostel was designated for the residents who required a high level of care and the other end of the hostel was for residents who were largely independent and required minimal contact with staff ('low care'). There were two separate dining rooms, one for low care and the other for high care residents, however, residents mixed together regularly. Each resident had his or her own room and there was an ensuite bathroom in each of the rooms.

Institution C was a large public hospital. The outbreak was contained to the aged care ward and the oncology ward. Table 1 provides a summary of the institutions.

Description of investigations

The ACT HPS was notified on 24 June 2002 that 17 residents and 8 staff were sick with gastrointestinal illness at Institution A. An immediate environmental inspection was conducted but there was no evidence to suggest that the

kitchen was the source of the outbreak. The food hygiene and storage and food handling inspections were satisfactory. Before ACT HPS had conducted an infection control audit, a resident from Institution A was transferred to Institution B (on 24 June) and a sick resident who met the case definition of this outbreak was sent to Institution C (hospital) via an ambulance on 27 June. The epidemiological investigation revealed a total of 93 cases at Institution A, as shown in the epidemic curve in the Figure, of which, 52 cases were staff and 41 cases were residents. The overall attack rate in Institution A was 46.3 per cent, with a resident attack rate of 51.3 per cent and a staff attack rate of 43.0 per cent.

Figure. Number of cases of gastrointestinal illness by date of onset in three institutions, Australian Capital Territory, June to July 2002

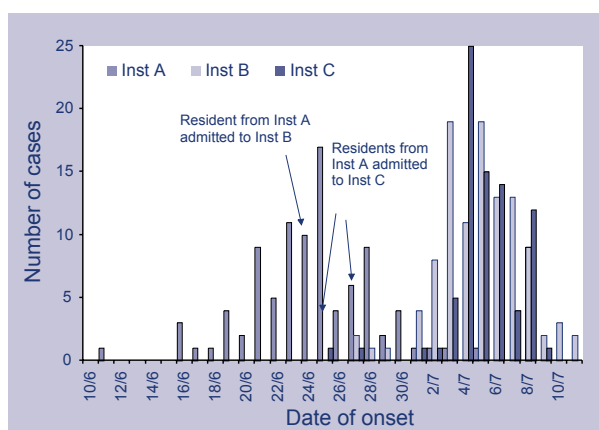


Table 1. Description of the three institutions involved in the outbreak

| Institution | Level of care | No. of beds | Shared rooms | Shared toilet/ bathroom facilities | Shared dining areas |
|-------------|----------------|-------------|--------------|---------------------------------------|---------------------|
| A | High care | 92 | Yes | Yes | Yes |
| B | High care | 48 | No | No | Yes |
| | Hostel | 53 | No | No | Yes |
| C | Aged care ward | 21 | Yes | Yes | Yes |
| | Oncology ward | 23 | Yes | Yes | Yes |

As a result of the outbreak in Institution A, the ACT HPS contacted other aged care facilities in the Australian Capital Territory to determine if other facilities were experiencing elevated levels of gastrointestinal illness amongst residents or staff. On 3 July 2002, the Director at Institution B contacted ACT HPS to notify 8 cases of gastroenteritis overnight. Inspections of the sanitary condition of the kitchen and food hygiene practices were deemed satisfactory during a routine inspection on 1 July.

The resident who was transferred from Institution A on 24 June developed symptoms in Institution B on 27 June, which marked the beginning of the outbreak in Institution B (Figure). A staff member also developed symptoms on 27 June, however, this staff member was on work experience and was only present at Institution B on 24 and 25 June. This staff member had contact with the residents but was not a carer. A total of 108 cases were identified during the investigation with 56 residents and 52 staff members becoming ill with gastrointestinal illness in Institution B. The attack rate in staff (48.6%) was lower than in the residents (57.1%).

On investigation, a total of 80 cases were identified in Institution C and patients had a higher attack rate (66.1%) than staff (48.3%). As mentioned above, a sick resident from Institution A, who met the case definition, was transferred to the hospital via ambulance on 27 June. The ambulance officer developed symptoms on 29 June. The resident was admitted to the aged care ward and on 1 July another patient in this ward became ill (Figure).

Infection control audits

Infection control audits of Institution A and Institution B were conducted by infection control practitioners from the ACT HPS within one day of the outbreak being reported in Institution A and on the day of first report in Institution B. The infection control programs in Institutions A and B were of a standard to achieve Commonwealth accreditation in 2000. This accreditation process requires facilities to have an effective infection control program. The results of the audits suggest that some infection control measures were not in alignment with best practice, which is detailed in the National Health and Medical Research Council's *National Infection Control Guidelines*.¹¹ A summary of the results from the infection control audits in Institutions A and B are shown in Table 2.

Control measures were taken to address the issues identified in Table 2. The use of personal protective equipment for staff when working with sick residents, strict hand washing between contact with each resident, no new admissions or transfers to other aged care facilities and grouping sick residents away from well residents were among the infection control measures put in place. Follow-up audits found both facilities adhering to the recommendations.

One of the main issues that prolonged the outbreak within institutions A and B was the return to work of sick staff before they had recovered from the infection. At least 14 staff were identified who returned to work within the 48 hours period after cessation of symptoms.

Table 2. Summary of infection control issues identified in Institutions A and B

| Infection control processes | Institution A | Institution B |
|--|---------------|---------------|
| High pressure hoses in pan room | Yes | Yes |
| Protective apparel in hose room | No | No |
| Knowledge on body fluid spills | No | No |
| Access to spill kits | Limited | Limited |
| Procedure for cleaning shower chairs | No | NA |
| Appropriate use of protective apparel when working with sick residents | No | No |
| Adherence to staff sickness procedures | No | No |
| Transfers between institutions during outbreak | Yes | Yes |

NA Not applicable

Institution C had its own transmission-based infection control practices in place and a hospital wide infection control program. The two wards affected at the hospital were isolated immediately after the outbreak was identified and no new patients were admitted to either ward. The ACT HPS liaised with the infection control practitioners at the hospital to ensure that outbreak management procedures were being adhered to.

Patient outcomes

The characteristics of the outbreak and the cases are given in Table 3. The median duration of illness was not calculated as most cases were interviewed whilst they were still symptomatic. In addition, case notes for residents did not detail onset times nor duration of illness.

A total of four residents were hospitalised (in Institution C) during the outbreak, three from Institution A and one from Institution B. One resident from Institution A, with a history of a chronic neurological condition, died on 25 June 2002. There was a total of 49 GP consultations

for both staff and residents in both Institutions A and B.

Some secondary transmission of the virus to household members was also observed. From interviews with staff members, 6 cases were identified amongst family members of staff from Institution A. Secondary transmission to household contacts of staff from Institution B was observed and a total of 7 secondary cases were identified from staff interviews. In addition, anecdotal reports from sentinel GP practices in the Australian Capital Territory reported a higher number of consultations for gastrointestinal illness during the period of the outbreak, which may suggest that there was a high level of illness in the community at the time of the outbreak.

Forty-two stool samples were collected and all were negative for protozoal and bacterial pathogens. Of the 42 samples, 14 tested positive for Norwalk-like virus genotype II. As shown in Table 3, NLV genotype II was detected in each of the institutions, with the virus detected in 12 residents' samples and two staff samples.

Table 3. Characteristics of gastroenteritis outbreaks in three institutions, June to July 2002, Australian Capital Territory

| Outbreak characteristics | Institution | | |
|---|-----------------|-----------|-------|
| | A | B | C |
| Duration of outbreak (days)* | 25 | 16 | 15 |
| Number of cases | | | |
| Staff | 52 [†] | 52 | 43 |
| Residents | 41 | 56 | 37 |
| Symptoms (%) | | | |
| Vomiting | 68.8 | 75.0 | 66.7 |
| Diarrhoea | 78.5 | 83.0 | 86.3 |
| Attack rate (%) | | | |
| Staff | 43.0 | 48.6 | 48.3 |
| Residents | 51.3 | 57.1 | 66.1 |
| Total | 46.3 | 52.7 | 55.2 |
| Number of stool samples tested | 23 | 13 | 6 |
| Number of NLV samples positive | 2 | 8 | 4 |
| Male:female ratio | 1:3.9 | 1:5.4 | NO |
| Median age (years) | | | |
| Staff | 47.0 | 45.0 | NO |
| Residents | 84.0 | 87.5 | NO |
| Outcomes | | | |
| GP consultation (% total cases) | 27 (29.0) | 22 (20.4) | NA |
| Hospitalised [‡] (% total cases) | 3 (3.2) | 1 (0.9) | NA |
| Died (% total cases) | 1 (1.1) | 0 (0) | 0 (0) |

* Duration of outbreak from day of first case to day of last case.

† Includes an ambulance officer who transported a resident from Institution A to Institution C.

‡ All hospital admissions were residents who were transferred to Institution C.

NO Information not obtained in questionnaire.

NA Not applicable.

Discussion

This investigation identified a widespread outbreak of gastrointestinal illness due to Norwalk-like virus in three institutions, probably as a result of a breakdown in infection control procedures or the transfer of ill residents to other facilities. Evidence suggestive of a link between the institutions includes: (a) identification of NLV genotype II from each institution; and (b) transfers from Institution A to Institutions B and C corresponding to the index cases in these institutions. The identification of NLV genotype II was observed in both staff and residents in both aged care facilities and in the patients from the hospital. However, NLV genotype II encompasses 10 distinct genetic clusters¹² and more specific genotyping data were not available to prove that the causative agents were genetically identical in each institution.

The environmental investigation conducted by Environmental Health Officers in the aged care facilities did not find deficiencies in kitchen hygiene or practices. The epidemic curve for each institution was not suggestive of a point source outbreak. The likely mode of transmission was person-to-person via faecal-oral route or by airborne transmission. Interviews with staff members identified several cases where person-to-person transmission could have occurred. For example, the staff who cared for the first sick residents at Institution B reported cleaning up vomit and diarrhoea and then became ill themselves 2 days later. Also, the resident transferred from Institution A to the hospital vomited in the ambulance on the way. The ambulance officer became sick with gastroenteritis 2 days later.

Outbreaks of gastroenteritis caused by NLV have been recorded throughout the world^{13,14} and in Australia.¹⁵ Genotype II NLV is the genetic group most commonly associated with outbreaks of gastroenteritis in nursing homes¹⁶ and hospitals⁹ and was found in all three institutions in the current investigation. Norwalk-like viruses can have a large detrimental impact on aged care facilities due to the highly susceptible population. The results from this investigation suggest that limitations in the infection control programs assisted in the spread of the illness within facilities and resident transfer between institutions led to the spread of NLV.

Infection control policies and practices were sub-optimal in the two aged care facilities. Some of the breakdowns in infection control include, the lack of protective apparel or improper use of protective apparel when present, improper use of spill kits and lack of policies for cleaning shower chairs between bathing each of the residents. It is therefore, imperative that aged care facilities have sound infection control policies and practices and it is recommended that outbreak management plans be incorporated into existing aged care accreditation standards. Outbreak management plans should include:

- (a) notification of hospitals where ill residents may be sent (so the hospital can implement infection control procedures);
- (b) provision to stop the transfer of residents between aged care facilities once an outbreak management plan has been activated; and
- (c) exclusion of sick staff from work duties until 48 hours after the cessation of symptoms.

Some broad principles of infection control used in public health care settings, including the use of Standard Precautions and strategies to educate staff and monitor compliance, should also be part of the framework to assess the effectiveness of infection control programs in residential care facilities.

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