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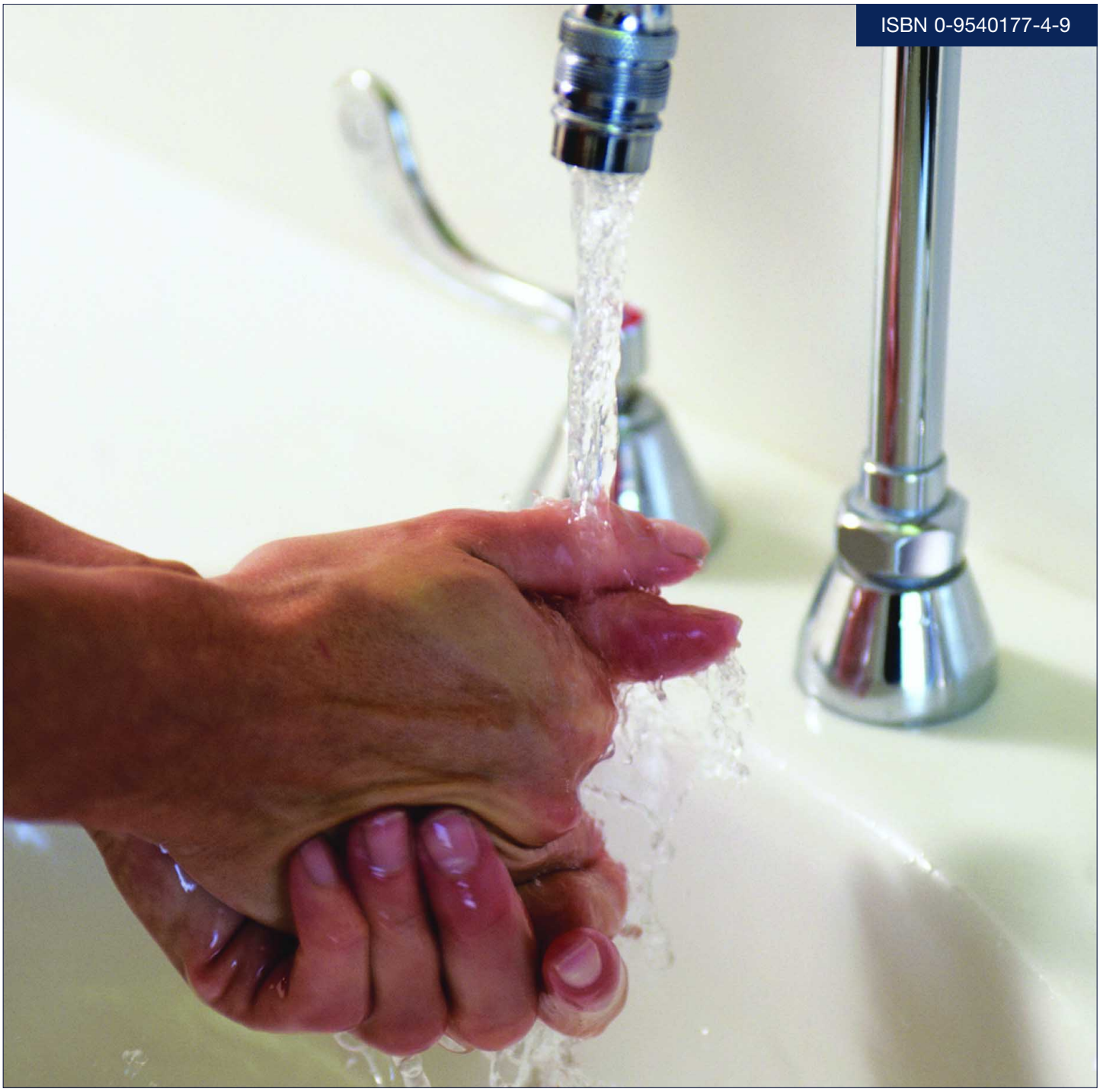

NATIONAL GUIDELINES ON
THE MANAGEMENT OF OUTBREAKS OF NOROVIRUS INFECTION IN HEALTHCARE SETTINGS

Prepared by the
Viral Gastroenteritis Subcommittee of the Scientific Advisory Committee of the
National Disease Surveillance Centre

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TERMS OF REFERENCE OF THE VIRAL GASTROENTERITIS SUBCOMMITTEE

The Viral Gastroenteritis Subcommittee was established to develop guidance on a range of issues. These guidelines are the first to be produced by this Subcommittee and deal specifically with the issue of norovirus outbreaks in healthcare settings.

1. **To develop national guidelines to assist Specialists in Public Health Medicine, Environmental Health Professionals, Microbiologists, Hospital Clinicians, General Practitioners and Infection Control Professionals in surveillance, diagnosis, definitive laboratory identification, management, prevention and control of illness caused by human enteric calicivirus, rotavirus, astrovirus and human enteric adenovirus in humans.**

2. **To review current surveillance of these viruses in Ireland and to make recommendations for its improvement.**

3. **To identify the requirements in relation to the use of diagnostic and reference facilities.**

FOREWORD

Infection due to norovirus (also known as NLV, SRSV or "Winter Vomiting Disease") is extremely common – hospitals have been particularly affected during recent outbreaks of illness due to this virus.

While it is not possible to prevent completely outbreaks due to norovirus, simple interventions can minimise its effects. Rapid, systematic management of outbreaks following an agreed outbreak plan and supported by detailed outbreak investigation are important ways of reducing the impact of this virus in hospitals and residential institutions.

Prompt establishment of an outbreak control team coupled with early communication and the rapid institution of early control measures are the most effective ways of restricting the extent of outbreaks. A multidisciplinary approach to preventing and managing outbreaks is recognised as being the most effective way of focussing resources where they are most needed. Immediate cleaning and decontamination, frequent handwashing, cohorting of ill patients and exclusion of ill staff are necessary first steps.

Senior hospital management can do much to control the spread of norovirus. Ensuring that ill staff do not work and guaranteeing that hospital cleaning remains a priority are two of the foremost. Excluding staff from duty as soon as they become ill and for 48 hours after their last episode of vomiting and/or diarrhoea is crucial to prevent staff-borne spread of infection.

Thorough hospital cleaning is vital in preventing and controlling outbreaks of illness due to norovirus as well as many other infectious agents. There should be provision by hospitals and health boards to ensure that regular cleaning schedules and protocols agreed with infection control professionals are guaranteed and safeguarded. During outbreaks, these should be enhanced to meet the increased need for cleansing and decontamination.

This Guidance was developed at the request of the Minister for Health and Children, Mr Micheál Martin and provides a framework to address the challenge of outbreaks of illness due to norovirus. It is intended for use and adaptation in hospitals and other healthcare settings. A multidisciplinary Working Group has developed this Guidance with the valuable assistance of the professionals who deal with these outbreaks on a daily basis. I am very grateful to all those who have contributed so much of their time, effort and expertise to its development.

Dr Paul McKeown
Chairman of the Viral Gastroenteritis Subcommittee
December 2003

EXECUTIVE SUMMARY

Infection due to norovirus is extremely common in the community with as many as one in one hundred people becoming ill each year. Noroviruses are highly infectious agents, capable of being spread directly from person-to-person, by food and water and through the air. The virus is very resilient and can survive for long periods in the environment and on surfaces such as door handles or worktops. Because of these features, noroviruses can cause widespread and intractable outbreaks especially where people are gathered closely together. Since it is a community infection, outbreaks in congregate settings such as hospitals are simply a reflection and a gauge of what is happening in the community.

Hospitals and residential institutions are common locations for outbreaks of infection by noroviruses and can cause extensive disruption to a very vulnerable group of individuals. The number of outbreaks and their extent within the acute and residential healthcare sectors can place a considerable burden on the health system. Despite this, the illness caused by the virus is relatively mild, with more severe cases appearing only occasionally.

Outbreaks due to norovirus are not eradicable, but they are controllable. There is a growing body of international evidence that indicates interventions that will minimise the effects of the virus. Within hospitals and other healthcare settings, an early, rapid response to an outbreak due to norovirus is the key to its control. Having an agreed hospital/residential home outbreak plan in place is the best method for ensuring uniformity and effectiveness of response.

Prompt establishment of an outbreak control team that is responsible for controlling the spread of infection and coordinating the investigation of and responses to an outbreak is essential. Early communication and the rapid institution of early control measures will aid this.

The essential early steps in control of an outbreak will include immediate cleaning and environmental decontamination of soiled areas, frequent hand washing with warm water and soap for all staff and patients, segregation of those who are ill from those who are not (cohorting), limitation of movement of staff and patients, exclusion of ill staff from work for 48 hours after their last episode of vomiting and/or diarrhoea and sensible management of hospital visiting.

Increased hospital attendance is a factor in the development and sustaining of outbreaks of illness due to norovirus. The effects of noroviral infection, however, can be minimised by reduction of the susceptible pool of patients (particularly elderly patients) by their discharge or transfer to step-down facilities. This will also provide increased capacity within hospitals to allow more effective cohorting of patients.

Given its ability to be shed by convalescing cases for a minimum of 48 hours after symptoms subside, effective control will involve ensuring that affected staff leave the ward and go off duty immediately they develop gastrointestinal symptoms and remain off work for a minimum of 48 hours after their last episode of vomiting or diarrhoea. There must be the provision by agencies to ensure that ill staff can remain off duty for the necessary time period, otherwise infection will be reintroduced.

Hospital cleaning is essential in preventing and controlling of outbreaks of illness due to norovirus. There should be provision by agencies to ensure that regular cleaning schedules and protocols agreed with infection control professionals should be guaranteed and safeguarded. And during outbreaks these should be enhanced to meet the increased need for cleansing.

This guidance is intended for use and adaptation in all healthcare settings. Local arrangements can be put in place to match local needs, but the above principles should guide decision making in all circumstances.

Guidelines on the Management of Outbreaks of Norovirus Infection in Healthcare Settings

1. Introduction

Acute gastroenteritis is a very common illness. A recently published study into the problem in Ireland North and South showed that 4.5% of Irish people are affected by gastroenteritis every month.[1] Norovirus (Winter Vomiting Disease) is the commonest cause of outbreaks of acute gastroenteritis in the community; international evidence suggests that between one and three percent of people can expect to become infected with norovirus each year. [2,3]

Key Message

Norovirus is the commonest cause of outbreaks of acute gastroenteritis in the community

Since norovirus is a community infection, outbreaks in settings where people congregate such as hospitals are simply a reflection of circulation of the virus in the wider community. Hospitals and residential institutions are common locations for outbreaks of infection, particularly during winter. The extent of these outbreaks can place a considerable burden on the health system.

Key Message

Hospitals and residential institutions are common locations for outbreaks of infection with noroviruses which can cause extensive disruption

The virus was first identified retrospectively, in 1972 from an outbreak of non-bacterial gastroenteritis in a school in the town of Norwalk, Ohio.[4]

2. Epidemiology

In Ireland, systematic surveillance of outbreaks of gastroenteritis or infectious intestinal disease (IID) commenced in 1998. From 1998 to 2000, there were 100 IID outbreaks reported of which 61 were considered to be foodborne (61%). This trend changed in Ireland in 2001 when 33 of 56 reported outbreaks of IID (59%) were either confirmed or suspected to be viral in origin, most likely norovirus. In 2002 this figure has risen to 154 of 171 reported outbreaks of IID (90%) either confirmed or suspected to be caused by norovirus.[5] In 2002, about 70% of norovirus outbreaks occurred in hospitals and other healthcare settings in Ireland. A similar proportion of outbreaks occur in healthcare settings in the United Kingdom and across the rest of Europe.[6] Their management and control in hospitals can be extremely difficult.

The National Disease Surveillance Centre (NDSC) collects and collates information on all reported outbreaks of infectious disease. It should be emphasised that there is a degree of under-reporting so figures quoted are likely to be underestimated. Figure 1 shows outbreaks of IID, illustrating the relative proportions of those with a viral or suspected viral aetiology, in Ireland: 1998-2002. The data clearly demonstrated the relative constancy in the number of outbreaks of non-viral causes of IID from year to year and the marked increase in the number of outbreaks of viral or suspected viral IID, particularly in 2002.

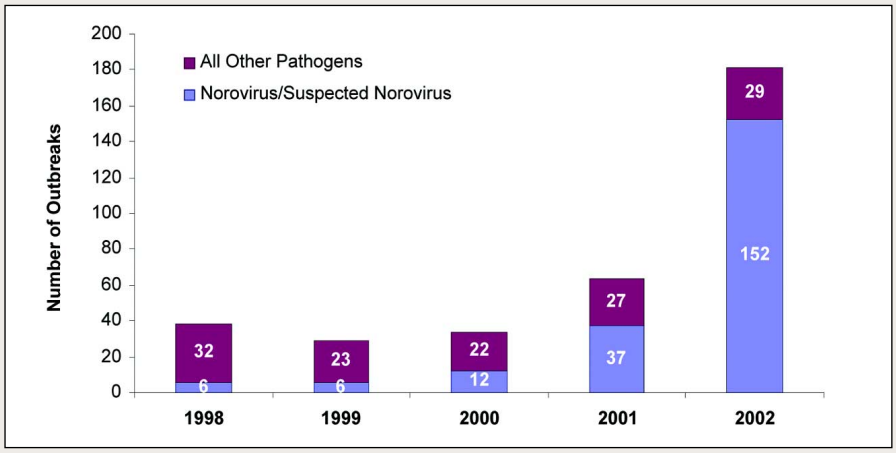

Figure 1. Outbreaks of IID, and the relative proportions due to a viral or suspected viral aetiology, in Ireland: 1998-2002 *(Source: FSAI, NDSC)*

2.1 Modes of Transmission

Noroviruses are non-enveloped RNA viruses belonging to the virus family Caliciviridae. They can survive for long periods in the environment.

- **Person-to-person:** This is the primary mode of transmission of infection due to noroviruses. These viruses may be spread from person to person by the faecal–oral route and by vomiting (air–oral/mucous membrane spread), probably by causing widespread aerosol dissemination of virus particles, environmental contamination and subsequent indirect person-to-person spread. In some situations, particularly hospitals, transmission via vomiting may be more important than the established faecal–oral route of infection associated with other enteric pathogens. In addition, fomites have been shown to be another important method of transmission.[7]

- **Foodborne:** Foods that are handled and are not subjected to further cooking such as cold meats, salads or sandwiches are commonly implicated in foodborne norovirus infection.[8] Bivalve molluscan shellfish such as oysters can harbour the viruses due to filter feeding in sewage-contaminated water.[7] However any food item can potentially transmit norovirus if it is handled or comes in contact with an infected food handler or is exposed to environmental contamination.

- **Waterborne:** Water and ice are being increasingly recognised as vehicles for transmission of norovirus.[9]

The factors that may promote transmission of norovirus within healthcare settings include:

- Frequent, close **patient-staff contact**
- **Susceptible pool of hosts** (elderly, small children)
- **Movement of patients** (transfers from ward to ward and to other departments, such as Radiology, Physiotherapy or the Laboratory)
- **Movement of staff** (normal [esp. medical], locums, agency nurses)
- **Staff hygiene** if sub-optimal (handwashing etc)
- **Environmental hygiene** if sub-optimal
- **High occupancy rates** may leave no surge ward capacity to allow more effective cohorting
- **Throughput of visitors and other staff** (catering, ancillary, retail)

2.2 Clinical Features

Illness due to norovirus is characterised by acute, rapid onset of nausea, vomiting and abdominal cramps. There may be little prodrome. Vomiting is generally the principal symptom (although it may be reduced or absent). It is usually of sudden onset and may be projectile resulting in widespread soiling. Prolonged diarrhoea can also be a feature, especially in children.[7] Recently in Ireland, cases in which diarrhoea has been the sole gastrointestinal symptom have been reported with increasing frequency. The patient may complain of other symptoms including headache, muscle aches, chills and fever. [10]

Symptoms generally last between one and three days and recovery is usually rapid. The severity of the vomiting may result in dehydration, especially in the elderly and very young. Occasionally, the illness may be quite severe with prostration, marked systemic upset and a reduced level of consciousness.[11] It appears that only a limited short-term immunity is conferred by norovirus infection, but to date our understanding about human immunity to infection and disease due to norovirus remains limited. [10]

Key Message

Projectile vomiting is a very common symptom, although it may be absent. Diarrhoea can also be prominent.

3. Outbreaks

3.1 Introduction

An outbreak is defined as an episode in which two or more people, thought to have a common exposure, experience a similar illness or proven infection. Outbreak investigation aims to control the outbreak, prevent additional cases of disease, identify the source and learn lessons for the future.

In Ireland information on reported outbreaks is collated by the regional Director of Public Health (DPH) and a summary report sent to NDSC for surveillance at national level. These reports are based on the epidemiological, microbiological and environmental investigation and the control measures which are put in place.

Outbreaks can occur in various settings, the community, hospitals, across geographical and political boundaries. While the principles of response remain the same, procedures vary depending on setting and size of outbreak.

An early, rapid response to an outbreak due to norovirus, with the establishment of an **Outbreak Control Team (OCT)** (see 3.4) is the key to its control.

3.2 Steps in Outbreak Investigation

Managing outbreaks involves a logical series of steps to identify risk factors and put control measures in place.

Key Message

While it is not possible to completely prevent outbreaks due to norovirus, simple interventions can minimise its effects.

All large acute hospitals should have an outbreak plan drawn up and agreed by the Infection Control Committee of the hospital. In smaller hospitals and nursing homes, outbreak plans should be agreed between senior clinicians, senior health board managers and the Director of Public Health.

The components of an outbreak investigation include: preliminary investigation, clear communication and early control measures, descriptive epidemiology, environmental health investigation, microbiological investigation, analytical studies (where indicated), analysis and interpretation, declaring the outbreak over, and production of a summary outbreak report (as outlined below).

- **Preliminary Investigation:** confirming whether an outbreak is actually taking place and if cases have a common cause
- **Early control measures:** Isolation, cohorting and cleaning
- **Clear communication:** to alert other staff and patients
- **Descriptive epidemiology:** to develop a case definition and identify as many cases as possible in order to

quantify the extent of the outbreak. This should be done by means of a properly constructed questionnaire. The outbreak should be described in terms of time, place and person to ensure that its full extent is recognised. Epidemiological assistance may be required for this.

- **Environmental health investigation:** to ensure food safety is protected and the kitchen/ food and food workers are not either at risk of contamination or a source of contamination and hence prevent further cases. If a point source is suspected, epidemiological and environmental investigations should be undertaken to identify or exclude a contaminated food or water source.
- **Microbiological investigation:** to identify definitively and document the causative pathogen.
- **Analytical studies:** more complex analytical studies may be necessary to determine possible exposures and methods of transmission.
- **Declaration that the outbreak is over.**
- **Production of a final report.**

3.3 Identification of an Outbreak of Norovirus

Key Message

An early, rapid response to an outbreak due to norovirus within hospitals and other healthcare settings is the key to its control

The first person that becomes aware of or suspects an outbreak, should inform a known member of Infection Control staff in their area. In each hospital or residential home, a **lead person** should be designated to manage the outbreak. In hospitals the preliminary investigation should be led by the Consultant Microbiologist and/ or Infection Control Nurse and/or designated clinician. Senior management in all hospitals should be responsible for producing outbreak plans.

The designated lead person should:

- Decide whether or not the cases are likely to have the same illness and establish a tentative diagnosis.
- Decide on whether to convene an Outbreak Control Team.
- If norovirus is suspected, ensure that control measures are put in place immediately.
- Report the suspected outbreak at an early stage to senior hospital management and to the regional Director of Public Health.
- Form a preliminary hypothesis as to the cause.

Infection due to norovirus can usually be diagnosed on the basis of typical clinical and outbreak characteristics. Characteristic clinical features with sudden onset of projectile vomiting and simultaneous involvement of patients and staff is highly suggestive of an outbreak of illness due to norovirus.

Gastrointestinal symptoms are very common in healthcare settings especially among the elderly and children. A clinical case definition for gastroenteritis has been proposed to identify possible cases of gastroenteritis.[12] This includes:

- Three or more loose stools in 24 hours and/ or
- Vomiting three or more times in 24 hours and/ or
- Loose stools or vomiting with two additional symptoms, such as nausea, fever, abdominal pain, abdominal cramps, and blood or mucus in stool.

Box 1 –Criteria for suspecting an outbreak is due to norovirus (amended from Kaplan et al. 1982) [13]

- **Vomiting (often projectile) in ≥ 50% of cases**
- **Duration of illness 12–60 h**
- **Incubation period of 15–48 h**
- **Staff and patients affected**
- **Stools negative for bacteria (including C. difficile) and other viruses**

Once a patient is suspected of having symptoms of gastroenteritis, a decision must be made as to whether the symptoms could be due to norovirus.

A combination of the following criteria (Box 1) are a warning that an outbreak of illness might be due to norovirus and that immediate control measures need to be put in place.

Virological confirmation should then be sought.

3.4 Outbreak Control Team

Controlling suspected or established outbreaks of illness due to norovirus in hospital requires the rapid establishment of an OCT as soon as an outbreak is suspected or recognised.

In any healthcare setting gastrointestinal symptoms are common. Determining whether an outbreak is occurring will involve local judgement, but the Working Group suggest that the trigger to call an outbreak should be **if at least 2 or more people (patients or staff) have symptoms suggestive of norovirus infection in a unit, ward or other defined area, within a period of 48 hours.**

In healthcare settings the consultant microbiologist or designated clinician or specialist in public health medicine (SPHM) should convene an outbreak control team when:

- there are a significant number of cases or
- the disease is severe or
- there is potential for spread or
- the cases are in high-risk areas e.g. ICU.

3.4.1 Membership of the Outbreak Control Team

Members of this team should be invited at the outset. The composition of the team may vary depending on the setting and the extent of the outbreak. Senior professionals from relevant disciplines/ senior decision makers should be represented. Suggested members could include: a consultant microbiologist (or other senior medical staff member with relevant expertise in the absence of a microbiologist), an infection control nurse, a specialist in public health medicine, a CEO/ representative, representation of the consultant medical staff and non-consultant hospital doctors, an environmental health officer, an occupational health physician, a clinical nurse manager, a domestic services manager, a communications/ press officer and other relevant staff considered necessary.

3.4.2 Role of the Outbreak Control Team

Key Message

The OCT should be made up of senior professionals and decision makers

The role of the OCT is that of an advisory body working closely with relevant staff members to advise on and co-ordinate in the following areas:

- Controlling the spread of infection.
- Co-ordinating the investigation of and responses to an outbreak.
- Declaring an outbreak and assigning a unique outbreak code (this is generally an alpha-numeric code which identifies region/ hospital, year and specific outbreak).
- Designating a senior member of the OCT as nominated spokesperson for the team, in communications with staff and patients.
- Co-ordinating how cohorting and isolation of patients will take place.
- Recommending appropriate facilities and equipment for cleaning and decontamination.
- Advising on ways to minimise the movement of staff into and out of the affected areas.
- Undertaking epidemiological investigation of the outbreak.
- Co-ordinating investigation of illness through effective sampling and ensuring adequate support for laboratory services.
- Alerting the National Virus Reference Laboratory and NDSC of the outbreak.
- Provision of information for staff, patients, visitors, media of the outbreak with alert notices/posters around the hospital, staff guidance and updates, visitor information.
- Press releases / media briefings (via the Communications Department).
- Declaring the outbreak at an end.
- Agreeing an Outbreak Report.

3.5 Response to an Outbreak

3.5.1. Early Communication

Early communication is vital in controlling the spread of infection (see section 5). The following should be notified as soon as possible:

- Senior staff (Consultant Medical Staff, Senior Nursing personnel, Paramedical staff).
- CEO/ Health Board/General Manager.
- Regional DPH.
- Press/ communications officer of the Health Board.

3.5.2. Early Control Measures

A. Immediate cleaning and environmental decontamination
B. Scrupulous handwashing
C. Segregation of those who are ill from those who are not
D. Limitation of movement of staff and patients
E. Exclusion of any ill staff from work for 48 hours after their last episode of vomiting or diarrhoea
F. Sensible management of visiting

A. Immediate cleaning and environmental decontamination

Immediate cleaning and decontamination of soiling due to vomiting and diarrhoea is vital in controlling the spread of norovirus infection. In addition, as soon as an area or unit has an outbreak, the frequency of cleaning of the affected area must be increased to **twice daily**. Senior hospital management should ensure that this policy is enforced. The longer this cleaning is delayed, the greater is the danger that the virus may spread and infect other patients and staff. It is essential that those responsible for cleaning and decontamination have adequate protective clothing and equipment in order to minimise the possibility of spread amongst themselves and other members of staff (Box 3). They must not be food handlers.

B. Handwashing

Currently, the intervention that has been shown to be most effective at controlling infectious intestinal disease is **scrupulous handwashing**. Frequent hand washing with warm water and soap for at least 10 seconds is the most effective way of limiting person-to-person spread of infection.

There should be a written handwashing policy in all healthcare settings/facilities – reinforcing this will be central to preventing and controlling outbreaks. Emphasis should be placed upon the need for staff to wash their hands, particularly after using the toilet, before preparing or eating food and prior to and following all patient and specimen contact.

C. Segregation of those who are ill from those who are not

Considerable evidence exists to indicate that segregating those who are ill from those who are not can be effective at reducing the risk of spread of infection to other areas of the hospital. Where possible symptomatic patients should be nursed in isolation, otherwise they should be cohorted.

D. Limitation of movement of staff and patients

Similarly, restricting the movement of those who are ill, or those who may be incubating illness can reduce the likelihood of spread. It is important to minimise the circulation of staff between affected and unaffected areas. Unaffected patients or convalescing patients (those who have not vomited or had diarrhoea in the

previous 72 hours) from non-affected areas can be discharged directly to a long stay unit or residential institution without the need for microbiological clearance.

E. Exclusion of any ill staff from work for 48 hours after their last episode of vomiting or diarrhoea
Staff who become ill on duty with gastrointestinal symptoms should leave work immediately. No staff member that has been ill should return to work for a full 48 hours after his or her last episode of vomiting or diarrhoea. There is increasing evidence that people recuperating from illness due to norovirus can continue to excrete the virus for a number of weeks following cessation of their symptoms[7] and therefore the absolute importance of hand hygiene must be reinforced when staff return to work.

F. Sensible Management of Visiting
Sensible and sympathetic management of hospital/ nursing home visiting can assist in the control of norovirus outbreaks:

- During an outbreak, all visiting should be minimised.
- Children should, where possible, not visit during an outbreak.
- Visitors with a history of vomiting or diarrhoea at home should not visit a hospital or nursing home (whether during an outbreak or otherwise) until at least 48 hours after their last episode of vomiting and/or diarrhoea.

Key Message

Control measures include immediate cleaning and decontamination, frequent handwashing, cohorting of ill patients and exclusion of ill staff

4. Specific Prevention and Control Measures

There are two principal areas in which norovirus transmission in a hospital may be controlled:

1. The point at which noroviruses may be introduced into hospital
2. Containment at individual ward level and prevention of spread to other wards

4.1 The Point at which Noroviruses may be Introduced into Hospital

Increased hospital attendance is a factor in the development and sustaining of outbreaks of illness due to norovirus. If an outbreak of illness due to norovirus is suspected, it is important that contingencies are available to minimise hospital numbers. The effects of noroviral infection can be minimised by reduction of the susceptible pool of patients (particularly elderly patients) by their discharge or transfer to step-down facilities. This will also provide increased capacity within hospitals to allow more effective cohorting of patients.

4.2 Containment at Individual Ward Level

The principal methods to minimise spread at individual ward level are (see box 2):[15]

1. **Isolation and cohorting of affected patients**
2. **Scrupulous hand hygiene and**
3. **Rapid cleansing and decontamination following episodes of vomiting and diarrhoea.**

Box 2 – Control Measures Checklist

1. Cohort nurse or isolate symptomatic individuals in a designated ward if possible.
2. Take faecal specimens (not vomitus) if at least 2 or more people (patients or staff) have suggestive symptoms in a unit, ward or defined area.
3. Immediate placing of Alert Notices around the hospital and emphasise hand hygiene by use of large posters in all toilet areas.
4. Sensible management of visiting.
5. As soon as an area or unit has an outbreak, the frequency of cleaning of the affected area must be increased to **twice daily**.
6. Wear gloves and apron for contact with an affected patient or environment.
7. Wash hands with soap and water and dry thoroughly after contact with an affected patient or environment, after removing gloves and apron.
8. Staff should be advised that if they become unwell on duty that they should go off duty immediately.
9. Exclude affected staff from duty immediately and until 48 hours after their last episode of vomiting or diarrhoea.
10. Close the ward to prevent the introduction of new susceptible individuals.
11. Avoid transfer to unaffected wards/departments (unless medically urgent and after consultation with infection control staff) or to residential/nursing institutions. Patients can be discharged home providing that they are medically fit for discharge. The priority is to stop spread of the virus to other vulnerable areas.
12. It is important to minimise the circulation of staff between affected and unaffected areas.
13. Remove any exposed food, such as fruit.
14. Clean and disinfect vomit and faeces spillages promptly (See Box 3 – General Guidance on Cleaning).
15. Regular cleaning of key areas such as communal toilets and the kitchen areas with increased frequency if norovirus is suspected or confirmed.
16. Increase the frequency of routine ward, bathroom and toilet cleaning to a minimum of twice daily, and provide adequate hand-drying facilities.
17. Use freshly prepared 0.1% (1000 ppm) hypochlorite to disinfect hard surfaces after cleaning (for additional specific measures on cleaning, see Box 3).
18. Other measures as determined necessary by the OCT.
19. The ward should not be re-opened until 72 h after the last episode of vomiting and/ or diarrhoea.

Box 3 – General Guidance on Cleaning

1. Wear disposable gloves and apron.
2. Use paper towels to soak up excess liquid. Transfer these and any solid matter directly into a healthcare risk waste bag.
3. Clean the soiled area with detergent and hot water, using a disposable cloth.
4. Disinfect the contaminated area with freshly made 0.1% hypochlorite solution. Note that some hypochlorites are corrosive and may bleach furnishings and fabrics.
5. Dispose of gloves, apron and cloths into the healthcare risk waste bag.
6. Wash hands thoroughly using soap and water and dry thoroughly with paper towels.
7. Contaminated linen and bed curtains should be placed carefully into laundry bags (as per guidelines for infected linen) without generating further aerosols.
8. Contaminated pillows should also be laundered as infected linen unless they are covered with an impermeable cover, in which case they should be disinfected with 0.1% hypochlorite solution.
9. Contaminated carpets should be cleaned with detergent and hot water, then disinfected with hypochlorite (if bleach-resistant) or steam cleaned.
10. Contaminated hard surfaces should be washed with detergent and hot water, using a disposable cloth, then disinfected with 0.1% hypochlorite solution. Cloths should be disposed of as healthcare risk waste. Non-disposable mop heads should be discarded.
11. Horizontal surfaces, furniture and soft furnishings in the vicinity of the soiled area should be cleaned with detergent and hot water, using a disposable cloth.
12. Fixtures and fittings in toilet areas should be cleaned with detergent and hot water using a disposable cloth, then disinfected with 0.1% hypochlorite solution.
13. Use freshly prepared 0.1% hypochlorite to disinfect hard surfaces after cleaning.
14. Thoroughly clean the ward and change all curtains before re-opening.
15. Vacuum cleaning is not recommended.
16. In food preparation areas, destroy any exposed food, food that may have been contaminated and food that has been handled by an infected person.

5. Communications

Early, effective communication is essential in the control of norovirus infections in hospitals and particularly so during outbreaks. During an outbreak, the levels at which communication is necessary are outlined below.

5.1 Wards

- At any time in a hospital, wards should inform the infection control team immediately whenever there are two or more cases of unexplained vomiting/ diarrhoea in any common location, (e.g. ward, unit) among patients or staff. This will allow rapid institution of control measures if appropriate after assessment by the team.
- During an outbreak, the OCT should ensure that ward staff and hospital management are informed about the extent of infection, control measures and the need to alert the OCT of further suspect cases.

5.2 Hospital

- Other areas in the hospital should be warned of the problem early so that all staff are vigilant and can give notice of spread of infection to new areas. This alert should extend to services such as radiology, physiotherapy, phlebotomy and portering where staff and patient movements can potentially allow rapid spread of infection to all areas of the hospital.
- Notices alerting staff, patients and visitors of the presence of infection, existence of an outbreak and necessary control measures should be displayed prominently in all areas of the hospital. Education and information should be provided for staff, patients and visitors during an outbreak as handouts and as ward door posters. These should provide a brief explanation of the nature of the illness, routes of transmission and basic infection control precautions.

5.3 Regional

- All outbreaks should be reported to the regional DPH.
- Information on the extent of the outbreak should be distributed to local GPs and public health nurses.

5.4 National

- All outbreaks should be reported to the NDSC.

5.5 Media

- Media updates should be provided regularly as required. This method is very effective at alerting, informing and updating the public on outbreaks.
- There should be close liaison with the hospital/ regional Communications Department.

6. Laboratory Diagnosis

Diagnosis of norovirus is based on molecular virology (reverse transcription polymerase chain reaction [RT-PCR]), and electron microscopy (EM) techniques. Use of these technologies ensures rapid identification of expected and novel strains of the virus.

A faecal specimen (formed or otherwise) is the specimen of choice for these diagnostic methods. The specimen should be collected from symptomatic individuals as early as possible in the illness, preferably not longer than 24 to 48 hours after the onset of symptoms. If several wards or units are involved in an outbreak, each ward or unit should be treated as a potentially separate outbreak until the bacteriology and virology results from each are available.

For small numbers of specimens, EM is a rapid, but relatively insensitive diagnostic method when compared with molecular diagnostic techniques. Therefore molecular diagnostics are the first line methods of choice.

Complete genome sequence data for several noroviruses and partial sequence data from many others is now available, and this has allowed the application of RT-PCR for epidemiological study and clinical diagnosis of norovirus. The added sensitivity of RT-PCR over EM extends the diagnostic window for clinically late specimens beyond 48 hours.

Use of sequence analysis allows monitoring of the current circulating strains and the emergence and disappearance of strains over time. In suspected point source outbreaks, RT-PCR can complement epidemiological investigations.

The national diagnostic service for norovirus, provided by the National Virus Reference Laboratory (NVRL) includes both molecular and EM diagnostic services (see Box 4).

Box 4 – Submitting stool specimens to the National Virus Reference Laboratory

- Preferably only early acute stool specimens (<24-48 hrs post presentation) should be submitted for examination. No vomitus specimens should be submitted.
- The laboratory request form should be fully completed and contain full name, address, DOB, date of onset of symptoms, symptoms, whether a case or contact and the outbreak code.
- Samples should be split; one portion to be sent to NVRL for virological examination, the other to be retained for bacteriological and, if appropriate, parasitological examination
- An initial batch of **up to 6** specimens will be examined from any outbreak.
- A further batch of 4 - 6 specimens will be examined if less than 2 are positive.
- There is no need to examine all specimens from an outbreak. After two positive results from a single unit or ward, or long stay unit or residential institution, no further samples will be examined from the same unit or ward unless as part of a subsequent outbreak.
- Specimens from Special or Intensive Care units, surgical or transplant wards and other critical areas will be examined without limit, on request.
- Direct communication with NVRL at the numbers below is essential to ensure most efficient use of services.
- It is preferred that all specimens being sent from an outbreak ward etc, on a given day, be batched and sent together along with outbreak codes.
- Any type of stool (formed or otherwise) is the specimen of choice.

Address for correspondence:

National Virus Reference Laboratory,

University College Dublin, Belfield, Dublin 4.

Telephone:

Main Office; 01-716 1323 / 1324 / 1356
(Fax: 01-2697611)

Molecular Virology; 01-7161341
Electron Microscopy; 01-7161338

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