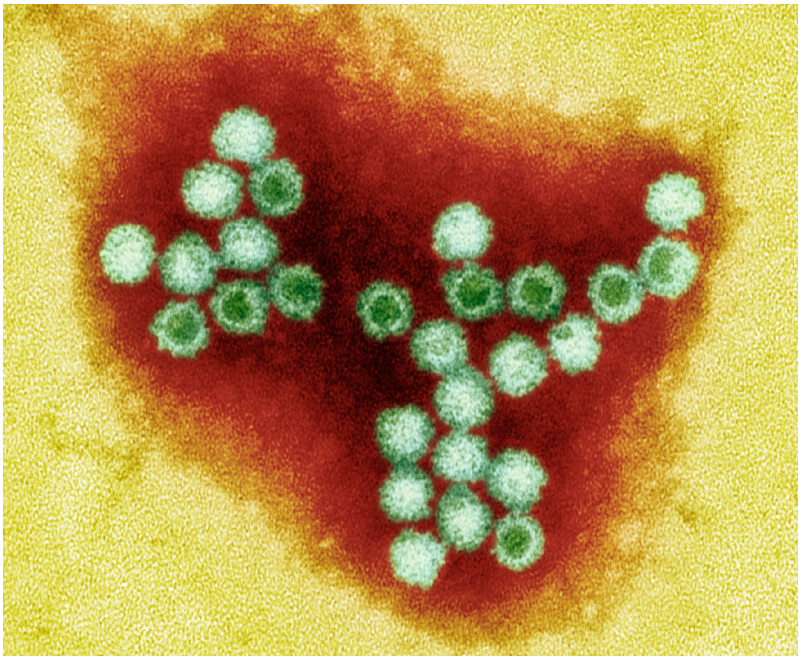
Guidelines for the management of norovirus outbreaks in acute and community health and social care settings



Produced by the Norovirus Working Party: an equal partnership of professional organisations

Contents

Scope

This guidance gives recommendations on the management of outbreaks of vomiting and/or diarrhoea in hospitals and community health and social care settings, including nursing and residential homes. They are not specifically intended to cover schools, colleges, prisons, military establishments, hotels or shipping although there will be some generalisable principles that will be of use in managing outbreaks in those institutions.

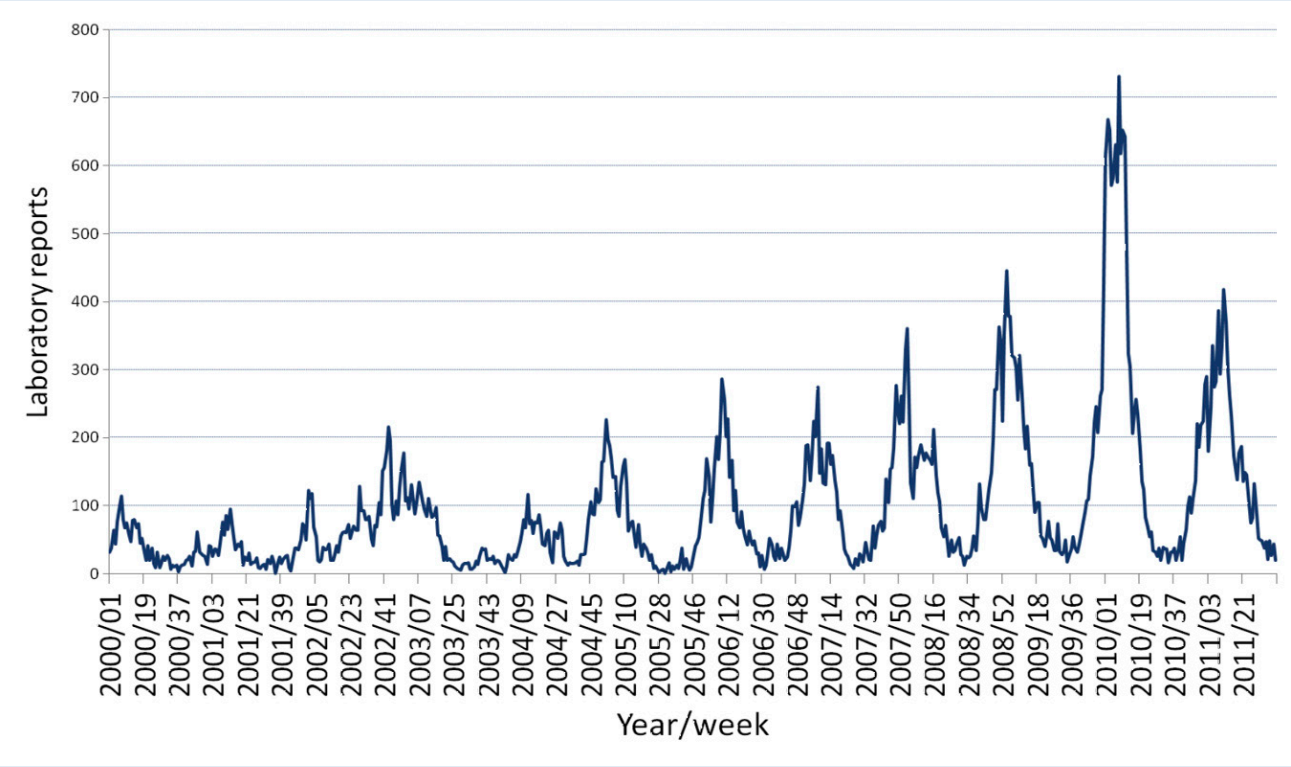
There are other causes of vomiting and/or diarrhoea outbreaks and the guidance will apply to all viral gastroenteritides. However, the principal and most common cause of such outbreaks is norovirus which is one of the most infective agents seen in health and social care establishments [1] and the title reflects this. Food borne norovirus outbreaks require investigation and management according to other appropriate guidance and procedures.

The scope is derived from the outcome of a Department of Health workshop held on 16 July 2010 and attended by representatives from a wide range of stakeholders including the partner organisations involved in the production of these guidelines.

Introduction

Norovirus is estimated to cost the NHS in excess of £100 million per annum (2002-2003 figures) in years of high incidence [2]. Approximately 3000 people a year are admitted to hospital with norovirus in England [3] and the incidence in the community is thought to be about 16.5% of the 17 million cases of Infectious Intestinal Disease in England per year. and there is evidence that this burden has increased over the past decade [4].

Figure 1. Laboratory reports of norovirus 2000 - 2011. England and Wales



There are two main factors that underpin the need for new guidance:

- The large burden of norovirus disease that the NHS and other organisations have experienced recently. Figure 1 shows laboratory reports which have also increased, although this is at least partly attributable to wider usage of norovirus testing [5].
- The organisational and operational systems in the modern NHS and the need for the efficient and safe care of patients within a safe environment.

This guidance is based on a principle of minimising the disruption to important and essential services and maximising the ability of organisations to deliver appropriate care to patients safely and effectively. There is a shift of focus towards a balance between the prevention of spread of infection and maintaining organisational activity. In effect, this means a move away from the traditional approach of complete ward closure and an adoption of a pragmatic, escalatory system of isolation using single rooms and cohort

nursing without compromising patient care both for norovirus itself and other essential healthcare. This is a key difference to previous guidance of the Public Health Laboratory Service Working Party published in 2000 [6]

The PHLS guidance was supported by the subsequent work of Lopman which showed an approximate halving of the duration of outbreaks if wards were closed within 3 days of the start of an outbreak when compared to those which were closed after greater than 3 days [2]. However, the Working Party noted that the number of outbreaks which led to closures within 3 days was only 7 (compared to 76 after 3 days) and at least one of those 7 outbreaks could be described as atypical. A more recent meta-analysis by Harris, Lopman and O'Brien of 72 outbreaks internationally, showed that there was no evidence for the effectiveness of any particular Infection Prevention and Control (IPC) interventions in the management of outbreaks [7].

In addition to much anecdotal evidence that closure of smaller clinical areas can succeed in controlling outbreaks, there is one recent study which also supports this strategy [8]. In this study, 41 confirmed outbreaks in 2007-2008 were managed by ward closures and 19 outbreaks in 2009-2010 were managed by closure of bays with doors. There were statistically significant differences in the frequency of outbreaks, numbers of bed days lost per outbreak (42.2 v 17.4) and the duration of outbreaks (9.6d v 6.7d).

These new guidelines also emphasise the importance of organisational preparedness for outbreaks.

The epidemiology of norovirus changes over time and geography. The emergence of new strains will continue to challenge us as populations at risk, including employees of affected organisations, will also change. Meeting these challenges will require robust surveillance of outbreaks and sentinel surveillance of norovirus activity in organisations and the wider community even though there is presently only very low quality evidence that surveillance prevents symptomatic norovirus infection and no evidence that it either prevents or shortens outbreaks [9].

The role of the laboratory is of considerable interest to those involved in the investigation and management of outbreaks and guidance is included on the appropriate use of norovirus testing.

Methodology

The guidance has been written by a multi-agency Working Party the members of which acted as representatives of their respective organisations. An important factor was the full involvement of NHS management representation through the NHS Confederation. It is anticipated that joint ownership of this guidance between IPC practitioners and the managerial sector will reduce conflicts of interest and tensions within organisations. Differing patterns and dynamics of outbreaks will require different, tailored, IPC responses which may be misconstrued as inconsistency of approach and it is, therefore, important that the underlying principles are understood by all sections and levels of an affected organisation.

Patient involvement was achieved through the inclusion of the National Concern for Healthcare Infections.

The partner organisations and their representatives are listed in Appendix 1. The councils or boards of partner organisations participated in a first consultation (Consultation 1) which set the foundations for the development of a draft document which was then sent to the partner organisation memberships and all stakeholder organisations for their comments (Consultation 2).

Detailed involvement of representatives of the community sector took place after Consultation 1 and they were fully involved in the writing of the draft document for Consultation 2 and in the production of the final guidelines.

The Working Party also included the Director of the Sowerby Centre for Health Informatics at Newcastle (SCHIN) who advised on literature searches and the evaluation of the evidence base. SCHIN was also commissioned to undertake the literature searches. These were carried out in August and September 2010. It is important to note that high quality evidence is lacking for most aspects of norovirus outbreak management. The recommendations of the Working Party are based as far as possible on available evidence and, where there is little or no evidence, the guidance is written according to the underlying principle of a pragmatic approach to the delivery of IPC in a modern NHS, based upon practical experience, and by using an informal Delphi process to achieve consensus [10].

The guidance has been developed according to standards set by NHS Evidence and will be submitted for consideration by NHS Evidence for accreditation as a standalone project [11].

Finally, after the completion of the Working Party guideline production process and immediately before the web-based publication of this guidance, The Healthcare Infection Control Practices Advisory Committee (HICPAC) of the Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, USA published a Guideline on the Prevention and Control of Norovirus Gastroenteritis Outbreaks in Healthcare Settings [9]. There is a large degree of concordance between the CDC guidelines and our guidelines which were developed entirely independent of each other.

The Guidelines

Hospital design

It has been shown that larger clinical units and those with a higher throughput of patients have increased rates of gastroenteritis outbreaks [12]. Every opportunity should be taken within plans for new builds and plans for refurbishment or renovation to maximise the ability to control outbreaks through the inclusion of clinical areas that can be easily segregated, including adequate provision of single occupancy rooms and bays with doors.

Organisational preparedness

Outbreaks of norovirus can disrupt delivery of services to patients considerably. This can vary from closure/restriction of hospital wards to admissions to closure of nursing and residential homes, subsequently delaying the transfer of patients from acute hospitals or the community. Even the closure of schools, in addition to the implications for local authorities, impacts on the ability for health and social service delivery because many staff may need to take time off work for emergency childcare.

Each year norovirus affects the health and social care systems to a greater or lesser degree. This may vary from outbreaks within schools and communities to single or multiple ward closures in acute hospitals.

All services registered under the Health and Social Care Act 2008 [13] are expected to have a policy for the control of outbreaks of communicable infections (governed in England by the Care Quality Commission) and these are often developed through the Infection Prevention and Control Team (IPCT). In today's health and social care settings there is a need to ensure minimal disruption to services and maximise the ability of organisations to deliver safe and effective services based on local risk assessment.

Organisations must develop systematic business continuity plans for use in outbreak situations. The plan should include actions for safe environments, staffing, information, surveillance, communications and leadership.

- **Environment** – plans must be clear about the policy for segregation and protection of patients. Before an outbreak occurs, organisations need to be clear about what escalation system will be used at the onset and throughout the course of the outbreak. A policy on the movement of patients and staff needs to be fully understood by the workforce.
- **Staffing** – business continuity plans will already contain actions for staff arrangements. During an outbreak organisations will need to have a clear policy for the management of staff who are affected by the virus and their return to work. Consideration will need to be given to those who can't work due to family care needs. Escalation measures for the redeployment of staff from other departments to deliver front line services should also be included. These plans should consider arrangements with other organisations for potential staff movement (e.g. acute to community and *vice versa*, use of voluntary sector).
- **Information** – organisations will need to have in place information systems for the dissemination of information to staff, patients and the public as the outbreak escalates and then returns to normal status. A suite of information material should be part of the continuity plan and be ready for use

on day 1 of the outbreak (e.g. laminated signs for use at ward or department entrances, signs at entrances of organisations to inform the public, guidance signs at any on-site food outlets).

a. **Staff** information needs to include infection prevention practice, occupational health support and processes, and health messages to patients and visitors.
b. **Patient** information needs to include protection of their own wellbeing and environment, advice to their family and friends who visit, and the organisational policy for movement around the environment.
c. **Public** information should include general advice on the prevention and spread of the infection, avoiding visiting patients if they, their family or other contacts have been unwell, and the restriction of food items being brought in during an outbreak.

A key element of information in an outbreak is accurate data around both patient and staff incidence. Organisations need to have systems in place, preferably electronic, to aid decision making for patient and staff placement and movement. Information needs to be timely and accurate.

- **Communication** – information availability and needs change rapidly during an outbreak especially in the early phases of escalation. Increased awareness through effective communication may favourably alter the dynamics of an outbreak although the evidence is low quality [14]**.** Plans must include clear systems of two way communication between outbreak meetings and the rest of an organisation and communication with other health and social care organisations. Involvement of communication teams should be at the early phase of an outbreak to enable up to date and accurate press releases to be prepared should they be required. Communication between organisations to inform planning and update the local picture of the development of the outbreak is important although, again, the evidence that such an infrastructure prevents or shortens norovirus outbreaks is very low [9]. Health protection organisations (e.g. Health Protection Units), local authorities and other healthcare providers must be involved as stakeholders within an outbreak situation.
- **Leadership** – strong and visible leadership is essential during times of duress in any organisation. During an outbreak, effective business continuity planning provides staff with assurance of a clear plan of action. Senior leadership involvement should include the Director of Infection Prevention and Control (DIPC) in England to ensure that both Infection Prevention and Control and service provision are integral to the plan. The participation of the Chief Executive in outbreak management within an organisation sends out a clear message to staff. Part of the business continuity plan and outbreak policy will include clarification of roles including the authority to make decisions. For smaller, community-based organisations such as some nursing and residential homes, this management model may not apply. In such situations, appropriate operational director involvement will be required.

Whilst plans need to be clear, succinct, and have lines of accountability and decision making stated, every outbreak is different and an element of flexibility will be required to enable an organisation and health and social care economy to manage the outbreak effectively to enable a return to normal business as soon as possible.

Following each outbreak a multidisciplinary or organisational evaluation should take place to review the outbreak and learn lessons in order to strengthen future plans. These lessons need to be shared across organisations in order to improve future outbreak management.

Defining the start of an outbreak and Period of Increased Incidence (PII)

This section deals with outbreaks within hospitals and other health and social care facilities such as nursing and residential homes and does not cover outbreaks in the wider community.

Defining the start of an outbreak serves two purposes and it is not necessary to apply the same definition to both:

a. *Declaration of an outbreak for Infection Prevention and Control (IPC)*. Definitions for this purpose establish trigger points for the activation of organisational responses. This may not require a rigid definition and can be tailored to suit the prevailing circumstances both permanent (e.g. type of organisation) and temporary (e.g. bed state, resource limitations). Initial IPC management of cases of possible or confirmed infective vomiting and/or diarrhoea should be based on the isolation of each case as it arises. Isolation of a patient is not dependent on the declaration of an outbreak but is an essential immediate action for any case of likely infectious diarrhoea and/or vomiting.

b. *Epidemiological surveillance*. This requires a clear and unambiguous definition so that data collection for surveillance is standardised and comparative analysis enabled. The definition to be applied for this purpose is two or more cases linked in time and place which is the basis for reporting to national surveillance bodies [15].

Furthermore, the occurrence of multiple cases may not require the declaration of an outbreak before appropriate isolation (e.g. cohort nursing) is imposed. However, the instigation of organisational outbreak control measures does require a declaration and should be at a point in the evolution of an outbreak at which there is a significant risk of IPC demands outstripping available resources. The IPCT is best placed to assess when this point is reached in any given circumstances. For nursing and residential homes not presently covered by an IPCT, this decision should be taken by the operations team with support from the multidisciplinary team.

Laboratory confirmation is not a pre-requisite to either the definition of the start of an outbreak or to declaring an outbreak. However, it is of value for epidemiological surveillance to establish the cause of outbreaks and to exclude aetiological agents for which sensitive tests are available in clinically or epidemiologically equivocal outbreaks.

Responses to the consultations revealed considerable disquiet with regard to dual definitions of the start of an outbreak. The Working Party believes that pragmatism requires the acceptance of a preliminary period before the instigation of full organisational outbreak control measures, such as outbreak control meetings. It is the declaration of an outbreak by the IPCT that should lead to those measures. Prior to that, there is often a period of uncertainty when a small number of symptomatic patients who may or may not herald a norovirus outbreak will be dealt with through the IPCT's surveillance procedures, increased interactions between the team and the affected clinical area, and informal communication of the situation to the area's relevant managers and clinicians. One consultation respondent had already formalised this locally by introducing the term 'Period of Increased Incidence (PII)' for clusters of as yet undiagnosed vomiting and/or diarrhoea. There is also precedent for this in the Department of Health and Health Protection Agency guidance document on *Clostridium difficile* which uses the concept of PII [16]. The Working Party proposes that this be adopted as part of local norovirus outbreak control plans.

Defining the start of an outbreak for epidemiological purposes requires a standardised approach and will be determined by the health protection and epidemiological surveillance organizations that collect and analyse the data.

Defining the end of an outbreak

This also serves two purposes which, again, may have two different approaches:

a. *Declaration of the end of an outbreak for Infection Prevention and Control (IPC)*. The definition is usually set, on the basis of experience, as 48h after the resolution of vomiting and/or diarrhoea in the last known case and at least 72h after the initial onset of the last new case. This is also the point at which terminal cleaning has been completed. Often, there is a small number of patients with persistent symptoms and it is advisable to segregate those patients in order to facilitate a return to normal activity. Symptomatic patients may be moved into single rooms or otherwise within a cohort away from the area to be cleaned. There is thought to be little risk of prolonged airborne persistence of virus and terminal cleaning of an area such as a ward can commence immediately after removal of symptomatic patients.

b. *Epidemiological surveillance*. The same rigour of unambiguous standardisation is applied to the end of an outbreak as to its start. Here, the end of an outbreak is defined as no new cases recognised within the previous 7 days [15].

Laboratory detection of virus is of no use in defining the end of an outbreak because viral shedding often continues for many days or weeks after symptom resolution [17].

Actions to be taken during a Period of Increased Incidence (PII)

Careful clinical assessment of the causes of vomiting or diarrhoea is important. Even in an outbreak there will be patients who have diarrhoea and/or vomiting due to other underlying pathologies.

During a PII of diarrhoea and/or vomiting, depending on available resources, affected patients should be isolated in single rooms (as should happen for single cases) or cohort nursed in bays (see below).

At this stage, there is no need to call a formal outbreak control meeting although the IPCT should alert appropriate managers and clinicians to the potential outbreak. IPC surveillance, interventions and communications with the ward staff should be intensified during this period.

The IPCT should ensure that faeces specimens from cases are collected without delay for norovirus detection, bacterial culture and, if appropriate, *Clostridium difficile* tests. All microbiological analysis of stool specimens associated with potential outbreaks must be available on a seven days a week, including holidays, basis. The turnaround time for non-culture analysis as measured from specimen production to provision of a telephoned or electronically-transmitted result should be within the same day or, at most, 24h in order to minimize bed closures. Up to a maximum of six specimens of faeces from the group of affected patients should be submitted for norovirus detection in the first instance.

Actions to be taken when an outbreak is declared

The declaration of an outbreak may follow laboratory confirmation or unequivocal clinical and epidemiological characteristics.

The CDC guideline advocates the use of the Kaplan criteria [18] and assesses the evidence base as of the highest category. The Working Party has considered the Kaplan criteria for the definition of cases and

has rejected their use on the basis that many norovirus outbreaks are predominately diarrhoeal and the calculation of the median or mean incubation time and duration of illness suggests that the criteria can only be used retrospectively.

The IPCT should inform the wider managerial team and the local health protection organisations of the declared outbreak and it is at this point that formal norovirus outbreak control measures should be introduced (Box 1). All of the control measures listed in Box 1 are supported by very low or low quality evidence in terms of prevention or shortening of norovirus outbreaks [9]. However, they are accepted practices, common sense, and the Working Party recommendation for their use is strong.

Box 1: Outbreak Control Measures (text based on Health Protection Scotland guidelines)[19]

Ward
- Close affected bay(s) to admissions and transfers
- Keep doors to single-occupancy room(s) and bay(s) closed
- Place signage on the door(s) informing all visitors of the closed status and restricting visits to essential staff and essential social visitors only
- Place patients within the ward for the optimal safety of all patients
- Prepare for reopening by planning the earliest date for a terminal clean

Healthcare Workers (HCWs)
- Ensure all staff are aware of the norovirus situation and how norovirus is transmitted
- Ensure all staff are aware of the work exclusion policy and the need to go off duty at first symptoms
- Allocate staff to duties in either affected or non-affected areas of the ward but not both unless unavoidable (eg therapists)

Patient and Relative information
- Provide all affected patients and visitors with information on the outbreak and the control measures they should adopt
- Advise visitors of the personal risk and how they might reduce this risk

Continuous monitoring and communications
- Maintain an up to date record of all patients and staff with symptoms
- Monitor all affected patients for signs of dehydration and correct as necessary
- Maintain a regular briefing to the organisational management, public health organisations and media office

Personal Protective Equipment (PPE)
- Use gloves and apron to prevent personal contamination with faeces or vomitus
- Consider use of face protection with a mask only if there is a risk of droplets or aerosols

Hand hygiene
- Use liquid soap and warm water as per WHO 5 moments [20]
- Encourage and assist patients with hand hygiene

Environment
- Remove exposed foods, e.g. fruit bowls, and prohibit eating and drinking by staff within clinical areas
- Intensify cleaning ensuring affected areas are cleaned and disinfected. Toilets used by affected patients must be included
- Decontaminate frequently-touched surfaces with detergent and disinfectant containing 1000ppm available chlorine*

Equipment
- Use single-patient use equipment wherever possible
- Decontaminate all other equipment immediately after use

Linen
- Whilst clinical area is closed, discard linen from the closed area in a water soluble (alginate) bag and then a secondary bag

Spillages
- Wearing PPE, decontaminate all faecal and vomit spillages
- Remove spillages with paper towels, and then decontaminate the area with an agent containing 1000 ppm available chlorine*. Discard all waste as healthcare waste. Remove PPE and wash hands with liquid soap and warm water

*See note on page 41

Actions to be taken when an outbreak is over

It is the completion of terminal cleaning that serves as the definition of the end of the outbreak for IPC purposes.

There is often uncertainty at this stage also. A small number of patients may have persistent symptoms (especially diarrhoea) and it may be difficult to ascribe those symptoms to norovirus with any confidence. Such patients should be removed to single-occupancy rooms if possible and terminal cleaning of bays and general ward areas may then be undertaken.

The IPCT should inform the wider managerial team and the local health protection organisations of the successful completion of terminal cleaning and unrestricted activity may then resume.

Norovirus can be detected in patients for days or weeks after initial infection [17]. There is no requirement for laboratory testing of faeces for norovirus in defining viral clearance in patients who have formed stools.

Vigilance should be maintained during the immediate period following the recommencement of unrestricted activity because there is a risk of re-emergence of the outbreak at that time [17].

The IPC management of suspected and confirmed cases

The evidence in support of the Working Party recommendations for this section is of very low quality [9].

In order to maintain clinical services the Working Party recommends that healthcare provider organisations undertake a risk-assessed approach to the closure of entire areas to admissions during outbreaks. In areas (e.g. wards) where symptomatic persons can be physically segregated from the non-symptomatic it will not be necessary to close the entire clinical area or unit, allowing some parts of the unit to continue to be used whilst the outbreak is on-going. Organisations should have clearly defined procedures for escalating the process of closure in the event of any extension of the outbreak, coupled with an effective monitoring process for early detection of further infectious cases. Organisations should also ensure that the staff working in closed and adjacent non-closed areas have been trained on the importance of preserving efficient segregation of these areas for patients staff and visitors. Staff should be educated to enable their understanding that different circumstances will require different actions and that such differences are not a consequence of indecision or poor outbreak control.

The Working Party recommends that healthcare provider organisations undertake risk assessments that relate specifically to the physical structure of the service user accommodation and the organisation's ability to physically segregate the infected from the non-infected. In hospitals, open plan, Nightingale-style wards are unlikely to be suitable for this approach without full ward closure.

The Working Party considered the use of temporary screens and zipped plastic sheeting to compartmentalise Nightingale wards and to act as barriers to the entrance of bays without doors. Such equipment is available commercially but the Consultations evoked a consistently negative response to this idea. The Working Party does not at present recommend the use of such methods but would encourage further research so that future guidance can reassess their role in outbreak control.

Every effort should be made to ensure that staff involved in hands-on care of infected patients do not also work closely with non-infected patients. If a bay closure policy is implemented, organisations should ensure that the staff team are trained in this approach and observation of the non-affected areas should be heightened in order to detect any escalation of the outbreak at the earliest possible opportunity.

If a clinical area or unit has both closed and non-closed areas within it, the non-closed areas will remain open to admissions but a risk assessment should be made as to whether patient transfers from the non-closed areas to other clinical areas should be delayed until the risk of the outbreak emerging within the non-closed area is sufficiently low. This risk assessment will take account of the behaviour of the outbreak, the provision of estate and resources to maximise containment of the outbreak, the prevalence within the local community and other local factors. If there is a significant risk that patients in the non-closed areas might be incubating norovirus infection, then it would be prudent to restrict their transfers to other clinical areas for 48h after their most recent possible contact with a symptomatic case.

The isolation of cases within single rooms and bays as opposed to the early closure of complete wards allows flexibility of response and the early terminal cleaning and re-opening of affected sub-ward areas. Only when there is evidence of a failure of containment within all available single-occupancy rooms and bays should whole ward closure be considered. This is an important change to previous guidance which advised the early closure of whole wards.

If a patient can be safely discharged home, they should be provided with appropriate patient information to enable their clinical well-being and to minimize the risk of spread within the household.

a. **Single-occupancy room nursing**. This should be carried out according to local IPC policies with reference to norovirus control measures.
b. **Single cases without available single-occupancy room provision**. When single-occupancy rooms are not available, a symptomatic patient should be nursed wherever they are at the time they become symptomatic. Other patients in the immediate vicinity of a symptomatic case are considered as exposed contacts. If the patient is in a bay, then that bay should be closed and all patients in it should be managed as potential cases. Early use of PCR testing for the single case will assist the IPC measures here.
c. **Multiple cases in excess of available single-occupancy room provision**. Those cases who cannot be placed in single-occupancy rooms should be cohort nursed in bays. Sometimes there may be individual cases scattered through multiple bays with a larger number of asymptomatic exposed patients in adjacent beds. In such situations, each bay containing a case should be closed and managed as a separate IPC unit.
d. **Open plan (e.g. Nightingale) wards**. The presence of even a single case on an open plan ward can be problematic. Such wards have no physical barriers between patients and additional attention needs to be given to the distance between beds for optimal prevention of transmission of infection. Moving cases to the end of the ward furthest from the entrance would allow some degree of physical segregation of that end but is often thwarted by the occurrence of secondary cases in the immediate vicinity of the original bed space of the moved patient. Further difficulties may be caused by the positioning of toilet facilities and sluices. Also, attention will need to be given to the requirements of single sex accommodation. In such circumstances, there may be no alternative to whole ward closure. However, local solutions should be sought whereby a degree of physical segregation may be made possible. Also, there are in development, temporary screens which may prove effective in some situations but which require further evaluation before a recommendation can be made concerning their use.

e. **Norovirus isolation wards**. The creation of short term norovirus isolation wards is not recommended because, unless these wards are part of the routine configuration of the hospital, there may be an unacceptable safety risk to patients as a result of suboptimal management of their other medical conditions. The routine transfer of patients into an isolation ward does not prevent (or even perhaps reduce) the continuing outbreak on the original wards. Also, norovirus illness is of short duration. There may however, be a role for such a ward in hospitals experiencing prolonged outbreaks but careful selection of patients will be required in order to avoid compromising patient safety.

f. **Decant wards.** If two or more wards are affected by a norovirus outbreak, in the later stages of the outbreak there may be value in moving all infected patients and recovered patients to one ward to allow earlier cleaning and re-opening of an empty ward.

g. **Multiple ward closures.** Organisations should recognise the risk of multiple wards being affected by norovirus outbreaks and they should consider, during their preparedness or winter pressures planning, the impact of such a situation on their overall activity.

Box 2. The definition of closure

This definition applies to single-occupancy rooms, bays, wards and other unit areas capable of segregation.

- Closure refers to the restriction of incoming and outgoing personnel, equipment, materials (including patient notes) to an unavoidable minimum. The fewer times that the portal of a closed area is crossed, the less is the risk of transmission of virus and further spread to other areas
- Patients should only be transferred for investigations and interventions that cannot be safely delayed
- There should be an obvious boundary between open and closed areas to signal to everyone that restricted access is in place. This boundary should consist of doors and high visibility signage. There should be provision of handwashing facilities at each boundary. These may be mobile units if permanent facilities are not available
- All non-essential personnel should be prohibited from entering the closed area. This includes non-essential social visitors of patients
- Admissions to a closed area should be restricted to patients who are known to have been exposed to norovirus, whether potentially incubating, symptomatic, recovered or deemed unlikely to develop disease (e.g. patient with definite exposure who fails to develop symptoms)
- Closed areas should, ideally, be self-contained with hand washing facilities and *en suite* toilet facilities. The use of commodes and communal toilets may increase the risk of spread in an outbreak and this should be mitigated by the implementation of an intensive and frequent cleaning schedule (see below)
- Dedicated nursing and auxiliary staff should be assigned to closed areas for each work shift. If this is not possible, thorough application of personal IPC measures as described in local policies are essential. These measures would normally include the use of PPE such as plastic aprons (colour-coded if preferred), gloves and rigorous attention to hand hygiene with soap and warm water. Staff should also have access to eye and face protection if there is a risk of a body fluid splash into the face. Staff should be reminded that gloved hands that have been used to clean up spillages of body fluids can themselves be a vehicle for further contamination and that these items should be disposed of as clinical waste and the hands cleansed with soap and warm water at the earliest opportunity

The role of the laboratory

Noroviruses are a genus of the Caliciviridae family of viruses. They are very diverse and are divided into at least five genogroups (GI-GV) with the majority of strains causing human disease belonging to genogroups GI and GII. There are 32 distinct genotypes currently recognized [21]

The two main types of laboratory tests available are enzyme-linked immunosorbent assays (EIA) to detect norovirus antigens [22] and polymerase chain reaction (PCR) tests to detect norovirus nucleic acid. The gold standard test at present is PCR [23, 24]. The sensitivity and resultant predictive value of EIA is low (50% for one case and 80% for six cases in an outbreak) in the population studied [25]. PCR is not always specific for attributing illness since it also detects asymptomatic virus shedding with low viral loads [26]. There are also immunochromographic assays available commercially and, although relatively insensitive, these have sometimes been used in outbreaks where multiple specimens are available [27]. The local availability of PCR-based tests for the detection of norovirus has the potential to revolutionise norovirus outbreak prevention and management. Commercially available tests in the form of kits can be offered from local laboratories and immediacy of result availability with consequent substantial potential savings to hospitals are likely to outweigh the not insignificant costs of the test. It must be recognised that there are several causes of viral gastroenteritis, and some circulating strains may not necessarily be detected by commercially available kits. In the context of circulating strains of norovirus in the wider community or in a health care environment known to be detectable by the locally available test method, laboratory testing should be considered in the following settings:

- Testing of patients admitted with diarrhoea and/or vomiting where alternative, non-infectious causes cannot be confidently diagnosed. Such patients should be admitted into isolation pending the result. In the context of hospitals with a shortage of isolation areas, negative results will facilitate optimal use of this scarce resource
- Testing of in-patients who develop sporadic diarrhoea. It is estimated that as many as two or three patients in a 24 bed-ward have diarrhoea at any time and consequently pseudo-outbreaks of two or more cases within a single epidemiological unit are frequently observed by chance alone. Mostly symptoms settle spontaneously within a few days and ideally, if non-infectious causes cannot be attributed, such patients should be isolated. But at times of high norovirus activity, negative test results allow lifting of restrictions more rapidly. In the context of a PII or an established outbreak, the recommendation of the National Standard for a maximum of 6 specimens to be tested should be followed [28] and testing for the purpose of confirming the cause of an outbreak should be stopped once a positive result is obtained
- In the context of an established outbreak, PCR testing of suspected new cases or atypical to inform IPC decisions may be useful. The declaration of the end of the outbreak can be easily delayed due to non-specific cases of diarrhoea. Testing can exclude such cases and facilitate earlier lifting of restrictions

It is important to emphasise that decisions to send specimens for norovirus testing in the above situations should be instigated only under the instruction of the IPCT and laboratories should not process specimens that are not part of an IPCT-led investigation. Local protocols should be developed so as to minimise inappropriate testing.

Avoidance of admission

A rise in the incidence of cases and outbreaks of norovirus in institutions often reflects a similar increased incidence in the wider community. It is important to keep the numbers of patients admitted to hospital with norovirus to an absolute minimum. The considerations which should form part of a local, multi-agency plan, involving local health protection organisations, Primary Care, Ambulance Service, Nursing and Residential Homes and Local Authorities, to ensure the avoidance of unnecessary admissions to hospital are set out in Box 3

Box 3: The avoidance of admission: measures should include

- A sensitive surveillance system to alert all agencies to any increase in norovirus activity and daily sitreps at times of significantly increased activity
- Robust local communication channels between agencies
- A possible role for NHS Direct or successor organisation [29]
- Timely advice to General Practitioners about the diagnosis and management in the community of norovirus patients including the provision of outreach services for rehydration therapy
- The implementation of a hospital norovirus admissions policy to include:
  a. Immediate triaging of patients with vomiting and/or diarrhoea to a segregated area close to the relevant hospital portal (e.g. A&E, Admissions Unit)
  b. Rapid clinical assessment of the patient by a doctor with full competence to decide on the destination of the patient. Preliminary assessment by more junior doctors should be avoided
  c. The deployment of outreach services to the patient's home to manage rehydration in those cases for which simple discharge home is not sufficiently safe
  d. The admission of patients to be restricted only to situations in which the diagnosis is significantly uncertain or complications are a risk and in which simple rehydration is unlikely to suffice

Clinical treatment of norovirus

The mainstay of the clinical treatment of norovirus is the avoidance or correction of dehydration [30]. This may be achieved through any standard oral rehydration regimen in patients who can tolerate oral fluids. For those who cannot, subcutaneous or intravenous administration of appropriate fluids is indicated. These measures are particularly important in the elderly and in those who have underlying conditions or illnesses which render them more vulnerable to the effects of dehydration. Rehydration therapy should be carried out in the community if appropriate. Specialist outreach teams should be established to administer this treatment and thereby avoid admission of the patient to hospital solely for this purpose.

Antiemetic drugs

These are not recommended routinely although some doctors find them useful. There is no evidence for the efficacy of these drugs in adults and conflicting evidence for their use in children for whom side-effects may be an issue [31, 32]. There is also the risk of compromising IPC measures through masking the infectivity of patients. For example, their use in children may lead to a premature return to school [34].

Antidiarrhoeal drugs

These are not recommended routinely but some doctors find them useful in cases where other causes of diarrhoea have been excluded. They can be dangerous in some conditions such as *Clostridium difficile* disease [33, 34] and may also mask the infectivity of patients.

Patient discharge

Patients should be discharged from hospital as soon as their health permits. Box 4 details the recommendations on discharge.

Box 4: Patient discharge

- ***Discharge to own home***. This can take place at any time irrespective of the stage of the patient's norovirus illness. It is not necessary to delay the discharge of symptomatic patients or those who may be incubating norovirus
- ***Discharge to nursing or residential homes***. Discharge to a home known not to be affected by an outbreak of vomiting and/or diarrhoea should not occur until the patient has been asymptomatic for at least 48h. However, discharge to a home known to be affected by an outbreak at the time of discharge should not be delayed providing the home can safely meet the individual's care needs. Those who have been exposed but asymptomatic patients may be discharged only on the advice of the local health protection organisation and IPCT. These recommendations should be formally agreed between hospitals and homes in a discharge policy
- ***Discharge or transfer to other hospitals or community-based institutions (e.g. prisons)***. This should be delayed until the patient has been asymptomatic for at least 48h. Urgent transfers to other hospitals or within hospitals need an individual risk assessment

Environmental decontamination

A clean and safe environment is essential for effective IPC [35, 36]. Routine environmental cleaning in accordance with extant national standards and specifications should be enhanced during an outbreak of norovirus. Key control measures include increased frequency of cleaning, environmental disinfection and prompt clearance of soiling caused by vomit or faeces.

Increased frequency of decontamination

The frequency of cleaning and disinfection of patient care areas, shared equipment and frequently touched surfaces should be increased during outbreaks of norovirus. Contaminated fingers can transfer norovirus sequentially to up to seven clean surfaces [37]. Frequently touched surfaces include bed tables, bed rails, the arms of bedside chairs, taps, call bells, door handles and push plates. The frequency of cleaning and disinfection of toilet facilities should also be increased including flush handles, toilet seats, taps, light switches and door handles.

The use of shared equipment should be avoided wherever possible through the use of disposables and reusable equipment dedicated for single patient use for the duration of the outbreak.

Disinfection

Effective cleaning and removal of organic soiling prior to disinfection is essential to maximise the effectiveness of surface disinfectants. Disinfection should be carried out with a solution of 0.1% sodium hypochlorite (1000 ppm available chlorine*) taking into account manufacturer's guidance with regards to preparation, usage, contact times, storage and disposal of unused solution. Staff should wear appropriate protective clothing and follow standard infection control precautions.

Sodium hypochlorite has a bleaching effect and will degrade environmental surfaces with repeated use. It should not be prepared or used in poorly ventilated areas because of the risk of respiratory problems in exposed individuals. It is essential that appropriate training of staff occurs and they have the knowledge to handle and use these products safely.

Box 5: Environmental decontamination during an outbreak

- Increase frequency of cleaning using dedicated domestic staff where possible and avoiding transfer of domestic staff to other areas
- Clean from unaffected to affected areas, and within affected areas from least likely-contaminated areas to most highly contaminated areas
- Use disposable cleaning materials including mops and cloths
- Where reusable microfibre cloths suitable for use with chlorine releasing disinfectants are in use, the system must be supported by a robust laundry service and adherence to manufacturer's instructions
- Dedicate reusable cleaning equipment to affected areas and thoroughly decontaminate between uses e.g. mop handles and buckets
- After cleaning, disinfect with 0.1% sodium hypochlorite (1000ppm available chlorine*)
- Pay particular attention to frequently touched surfaces such as bed tables, door handles, toilet flush handles and taps
- Cleaning staff and other staff who undertake cleaning tasks should follow standard infection control precautions and wear appropriate personal protective equipment (PPE) including disposable gloves and apron
- National and local colour coding for PPE and cleaning equipment should be adhered to, in order to avoid cross contamination

*See note on page 41

Prompt clearance of soiling and spillages

The vomit and faeces of a symptomatic norovirus patient are highly infectious. To prevent exposure to the virus and minimise the likelihood of transmission, environmental contamination with vomit and faeces should be cleared immediately whilst using appropriate PPE (Box 6).

Spillages should be cleaned with paper towels. Steam cleaning is highly effective in the removal of organic matter [38] but may not inactivate norovirus. Therefore hypochlorite disinfection is still required for areas which have been previously steam cleaned. Disposable single-use cloths should be used for each bed space.

Box 6: Prompt decontamination of soiling and spillages

1. Wear appropriate PPE including disposable gloves and apron
2. Clear up bulk of spillage using paper towel and discard immediately into dedicated waste bag
3. Use fresh paper towel/disposable cloth to clean the area with neutral detergent and hot water. Dry the area
4. Then disinfect the area using a solution of 0.1% sodium hypochlorite (1000ppm available chlorine*) in accordance with manufacturer's instructions
5. Dry the area thoroughly
6. Discard all PPE and disposable materials into the dedicated waste bag
7. Wash hands with liquid soap and warm water

Laundry

The Department of Health is producing new guidance on laundry decontamination, HTM 01-04, which is anticipated to be published by March 2012 and this must be referred to when available.

Linen should be segregated into a standard or enhanced laundry process. All linen from a norovirus outbreak should be dealt with by the enhanced process (Box 7).

Washing machines should not be overloaded. Heavily-soiled items should also undergo a pre-wash/sluice cycle. All items should go through a drying process (if the item is compatible) and stored in a clean area away from the laundry area and above floor level.

*See note on page 41

BOX 7: enhanced laundry process

To achieve best practice outcomes, an enhanced process should use a washing cycle that has either:

- A thermal disinfection cycle that reaches 71 ˚C for at least three minutes or 65 ˚C for at least ten minutes; or
- A chemical disinfection process that has been validated to ensure that the entire process (including washing, dilution and disinfection, should be capable of reducing the viable count of artificially contaminated fabric swatches by 5 log [10]

The conditions of time, temperature and chemical disinfection concentration should be those specified, under the conditions of use, by the disinfectant manufacturer.

Staff should follow standard infection control precautions including the use of PPE when handling used and soiled linen to minimise the risk of personal exposure to the virus. Linen and other items of laundry should not be held close to the chest to prevent contamination of the uniform (an apron must be worn).

Staff should carefully handle used and soiled linen from symptomatic patients or residents avoiding unnecessary agitation of sheets during bed making to avoid dispersal of the virus into the environment.

Any segregation required prior to washing should be carried out before transport to the laundry area, precluding the need for additional handling within the laundry. Staff should never empty bags of linen onto the floor in order to sort the linen into categories as this increases the risk of virus transmission.

If clothing from symptomatic patients or residents is returned to relatives or carers for laundering, they should be given verbal and/or written instruction on how to safely launder the items in the home setting.

Unused linen stored in an affected area e.g. isolation room or cohort bay, should be laundered before use by another patient or resident.

Terminal cleaning following discharge or transfer of patient, or resolution of symptoms for 48 hours

This can take place in the presence of recovered asymptomatic patients although it is preferable to empty a clinical area of patients beforehand. The principles of terminal cleaning cover the rigour of cleaning, the disposal of materials where possible, the disinfection of equipment and surfaces, the removal of curtains and the precise order in which individual tasks are carried out. Local policies and cleaning schedules should make explicit who is responsible for cleaning particular equipment. As far as possible, ill-defined boundaries for responsibilities, such as cleaning above and below shoulder height, should be avoided. See Box 8.

The use of ultra heated dry steam vapour cleaning has been found to be effective for removing organic matter [38] and, particularly when used in conjunction with microfibre materials as part of an integrated cleaning programme, can raise levels of microbiological cleanliness as well as aesthetic cleanliness [39].

Box 8: Terminal cleaning

1. Discard unused disposable patient-care items
2. If items cannot be appropriately cleaned, consider discarding these items
3. Remove window and privacy curtains avoiding unnecessary agitation and send for laundering
4. Remove bed linen and unused linen and send for laundering
5. Decontaminate all equipment in accordance with manufacturer's instructions
6. Thoroughly clean all surfaces with a neutral detergent or consider the use of ultra heated dry steam vapour cleaning
7. Steam cleaning of upholstered furniture and bed mattresses present in rooms upon patient discharge is suggested
8. After cleaning, disinfect with 0.1% sodium hypochlorite (1000 ppm available chlorine*)

In addition:

- The use of upholstered furniture (unless manufactured with cleanable surfaces which can also be disinfected) and rugs or carpets in patient care areas is to be avoided as these objects are difficult to clean and disinfect effectively. Where they are in use such as in care homes then contamination with vomit or faeces should be cleaned immediately with a suitable cleaning/disinfecting product in accordance with manufacturer's instructions. The use of 0.1% sodium hypochlorite will have a bleaching effect and should be avoided unless the fabric or carpet is compatible with chlorine The use of steam cleaning is recommended.
- Reusable microfibre cloths and mops are used widely across the health service in the UK. During an outbreak of norovirus their continued use is dependent on compatibility with chlorine. Alternative chlorine compatible disposable microfibre or traditional cloths and mops should be used where microfibre materials in general use are not compatible with chlorine.
  It is recognised that further research is necessary to fully evaluate the effectiveness of alternative disinfecting agents to sodium hypochlorite and other technologies such as hydrogen peroxide vapour decontamination systems and UV irradiation.

*See note on page 41

Visitors

The visitor who has norovirus is a transmission risk and the visitor who does not have norovirus is at risk of contracting it during a visit. The first is an obvious infection prevention and control hazard but the second is usually not, although there are exceptions (e.g. children who may introduce it to their school). Restrictions on visiting (other than by symptomatic persons) are mainly intended to assist ward staff in outbreak control by reducing the distractions caused by having to attend to visitors.

- *Visitors who have vomiting and/or diarrhoea*. Visitors who are symptomatic should not visit until at least 48h after the resolution of their symptoms.
- *All other, non-infected, visitors*. Visits by children of school age should be discouraged for the duration of an outbreak because of the risk of sudden symptoms developing without warning in school. This risk should be included in information leaflets. Adult visitors should be warned of the risk of contracting norovirus and given advice in the form of an information leaflet. They should be discouraged from visiting other patients outside the outbreak restricted area unless the closed area is visited last. For example, ministers of religion should arrange visits in this way.
- *Extenuating circumstances*. Visitors should be allowed in extenuating circumstances on the decision of the senior manager in the ward or home. Terminally ill patients, children, vulnerable adults and those for whom visiting is an essential part of recovery should be allowed visitors at the discretion of the senior manager. Clinical and social judgment needs to be applied sensitively and compassionately whilst recognising the duty of care for the health and well being of all patients, staff and visitors. Those who have travelled a long distance, taken time off work, or in other ways have been significantly inconvenienced, may be allowed to visit patients on outbreak restricted areas provided that they observe IPC measures.
- *Non-essential visitors*. Visits from newspaper vendors, hairdressers, mobile libraries and similar should not be allowed to an outbreak restricted area until the outbreak is declared over and terminal cleaning successfully completed. However, provision of reading materials such as newspapers can be an important part of recovery and can be provided to patients in other ways which do not jeopardise outbreak control. Used reading materials should be disposed of as clinical waste.
- *Contractors*. Appropriate instructions should be given to contractors before they enter a closed area. However, only work that cannot be postponed until after re-opening of the closed area should be allowed.

Staff considerations

- *Exclusion of symptomatic staff*. Much of the evidence supporting exclusion comes from studies of food handlers [40]. The Working Party recommends the exclusion of staff until they have been symptom free for 48h. A minority of respondents to the consultation preferred a 72h symptom-free exclusion period but the evidence base for this is not clear and a 72h period will have a greater adverse effect on service continuity. The Working Party recommends 48h as a pragmatic approach.
- *Earlier return to work with deployment to affected areas*. The Working Party considered the possibility of an earlier than 48h return to work with deployment of the staff member to a norovirus affected area. This was considered to be impractical because it is difficult to recognize periods of less than 48h as being truly symptom free and staff will not be working at their optimal capacity or efficiency whilst infected or convalescing. There will also be a greater risk of virus shedding and transmission during social interactions whilst outside the restricted area.

- *Bank and agency staff*. The use of these in outbreak-restricted areas should be kept to a minimum. Such staff working in affected areas should be advised of the risk of norovirus transmission, the specific precautions that must be adhered to, and the importance of reporting any symptoms. Staff who have worked in an affected area may work in other areas if they have no symptoms of infection but not during the same shift.
- *Colour coded scrubs*. The use of colour coded scrubs by those staff who work on an outbreak restricted area that clearly indicate the staff working in that area only, could be viewed as good practice. However, the use of colour-coded aprons is a less resource-dependant method of achieving the same objective. Whether to use these items or not is a matter for local policy.

Communications

There is evidence from mathematical modelling that increased awareness of communicable disease in a community may lead to smaller outbreaks or even prevent them [14].

Effective communications should be established and include the following:

- Regular communication between agencies at times of low norovirus activity. This is to ensure that all agencies are aware of background surveillance data within their local health and social care communities
- More frequent and regular communication between agencies during periods of increasing or increased norovirus activity. This should be with the intention of regularly updating all agencies about the pressures on activity and facilitating cross-boundary management of norovirus including admission and discharge of patients to hospital and the clinical management of norovirus patients in the community by outreach services
- A written policy for communications would be helpful in ensuring successful implementation and should involve primary and secondary care agencies, residential and nursing homes, local authorities, and local health protection organisations

Surveillance

Continuous surveillance is important. The following programmes are currently in place:

- Early warning through monitoring of calls to NHS Direct. A significant increase in relevant symptoms can indicate the beginning of the norovirus 'season' and tends to precede hospital outbreaks [29]
- Laboratory-based reports presented weekly through the HPA website [5]
- Hospital outbreak reports presented weekly through the HPA website [5]
- Surveillance of strains in early season outbreaks to identify the evolution of new strains. This is a predictor of potential impact of outbreaks and the results are disseminated by e-mail [5]
- There are a number of local and regionally developed surveillance systems in place which are of variable quality and do not always fully link into the national surveillance programmes

Also, the following are to be developed:

- Reporting and monitoring of norovirus activity in care homes through HPZone when this becomes available
- A pilot sentinel surveillance scheme to assess the economic impact [2]
- Organisations should ensure that they participate in robust surveillance schemes so that high quality information is available to enable early warnings of increased norovirus activity and predictions of impact

Local systems for recognizing early increased activity in schools should be developed.

There should be timely feedback of surveillance results to participating organizations and to others who may benefit from the information.

The management of outbreaks in nursing and residential homes

Importance of environment

Nursing and residential homes should be safe but homely. During outbreaks of viral gastroenteritis, residents should be managed effectively whilst maintaining the comfortable and pleasant environment that they usually enjoy. The basic principles of Infection Prevention and Control (IPC) apply to nursing and residential homes in exactly the same way as to hospitals but there are significant differences in the detailed approach to the management of outbreaks which are a consequence of the different environment.

Defining the start and the end of an outbreak

These are the same as for the secondary care sector and serve the same epidemiological and IPC purposes.

Actions to be taken when an outbreak is suspected

Any resident with possible infectious diarrhoea and/or vomiting needs to be segregated from other, asymptomatic residents. This may be easier in nursing and residential homes because residents usually live in their own rooms and only share communal areas for socialising and eating. If an affected resident is sharing a room and there is a vacant room available, temporary use of that room by the affected person should be made unless the separation of the room-sharing residents causes distress (in which case they should be segregated together). If a vacant room is not available, reliance will need to be placed on rigorous IPC procedures including an increased frequency of a thorough cleaning regimen. Symptomatic residents should be advised not to attend communal areas, including shared lavatories and bathrooms, until they are recovered and have been symptom-free for 48h. If possible, affected residents should be provided with sole use of a designated toilet or commode until they have been free of symptoms for 48h.

The manager of the home should inform the local health protection organisation of the suspected outbreak.

Actions to be taken when an outbreak is declared

Advice on the management of an outbreak should be given by the local health protection organisation. The principle of the rapid IPC isolation of affected residents in the smallest available unit area applies. In practice, this means asking residents to confine themselves to their rooms until recovered and 48h symptom-free. The specific difficulties associated with the management of residents with dementia are recognised. Such residents should be supported but encouraged to remain in their own room or within a limited area of the care home.

The home manager should contact the General Practitioners of affected residents and ensure that faeces specimens from cases are collected without delay for norovirus detection, bacterial culture and, if appropriate, *Clostridium difficile* tests. Specimen containers should be ordered from the local GP practice or the laboratory, according to local practice.

As is the case for hospitals, microbiological analysis of stool specimens associated with potential outbreaks in nursing and residential homes must be available on a seven-days-a-week basis, including holidays.

Actions to be taken when an outbreak is over

The completion of terminal cleaning serves as the definition of the end of the outbreak for IPC purposes.

There is often uncertainty at this stage also. A small number of residents may have persistent symptoms (especially diarrhoea) and it may be difficult to ascribe those symptoms to norovirus with any confidence. Such cases should remain in their rooms until they are either 48h symptom-free or an alternative, non-infectious cause is suspected.

The home manager should inform the local health protection organisation of the successful completion of terminal cleaning and unrestricted activity may then resume.

There is no requirement for laboratory testing of faeces for norovirus in defining viral clearance in patients with formed stools.

Vigilance should be maintained during the immediate period following the recommencement of unrestricted activity because there is a risk of re-emergence of the outbreak at that time.

The IPC management of suspected and confirmed cases

The same principles of IPC apply to hospitals and care homes. The Department of Health is producing a guidance document *'Care home resource on infection prevention and control'*[41] and users of these norovirus guidelines must read them in conjunction with the DH document.

The management of residents who are infected with norovirus should be planned following a risk assessment, which should consider continence, personal hygiene, overall health, likelihood of physical contact with other residents or their food, the facilities available and the vulnerability of other residents. Local health protection organisations can advise on this process.

The role of the laboratory

Stool specimens should be submitted only on IPC advice in order to confirm an outbreak in situations where an outbreak is suspected. Testing is also useful in excluding patients with diarrhoea and/or vomiting due to other causes when IPC restrictions are being applied and there is a need to consider lifting them and commence terminal cleaning.

Cleaning of the environment

Nursing and residential homes present some challenges to effective outbreak-associated cleaning because of the necessity for a homely environment. They do have carpeted floors and soft furnishings. Consideration should be given at the point of purchase to the ability to successfully clean and decontaminate such items. Penetrative cleaning methods such as steam should be used during outbreaks and in terminal cleaning schedules.

Lavatories and bathrooms are similarly more homely. The importance of regular, frequent cleaning of such areas (even when not shared) should be stressed. The same cleaning materials and principles that apply to hospitals also apply to care homes

Routine, enhanced and terminal cleaning needs to be undertaken by staff who are specifically trained for the tasks. The use of contracted cleaners will need to be covered by appropriate terms within the contract that ensure the competent cleaning of the environment during and at the end of an outbreak and contract monitoring arrangements should be included.

Cleaning equipment and materials for lavatory and bathroom areas should be kept separate from those used in other, especially catering, areas both routinely and during outbreaks.

Particular attention will need to be given to care workers who may have multiple roles which may compromise adequate IPC, both during an outbreak and at other times. In particular, care workers may be expected to help with the feeding of residents as well as clean the environment, including lavatory areas. Meticulous application of IPC principles, including handwashing with soap and water, must be ensured through appropriate training and audit.

Handwashing facilities

The use of tablets of soap is often valued by residents. These may be allowed but should not be shared. Only liquid soap should be used in communal areas.

Handwashing by staff must occur before and after care-giving procedures. The use of residents' handwashing facilities is acceptable. However, all staff should use only liquid soap and paper towels for handwashing.

The use of alcohol hand rub preparations by staff in nursing and residential homes should be considered as part of a general IPC approach (norovirus is not fully susceptible to alcohol) but this will require a risk assessment by the home manager to ensure the safety of residents.

Laundry

The new guidance in preparation by the Department of Health, HTM 01-04 [42], also applies to the handling of laundry in care homes and these must be referred to.

All linen should be handled with care and attention paid to the potential spread of infection. Personal protective equipment (PPE) such as plastic aprons and suitable gloves should be worn for handling contaminated clothing and linen. Linen should be removed from a resident's bed with care, and placed in an appropriate bag.

Personal clothing should also be removed with care and placed in the bag, not placed upon the floor. Linen and other laundry should not be held close to the chest to prevent contamination of the uniform (an apron should be worn).

Any segregation required prior to washing should be carried out before transport to the laundry area, negating the need for additional handling within the laundry. Staff should never empty bags of linen onto the floor to sort the linen into categories – this presents an unnecessary risk of infection. Many

care homes currently use water-soluble bags within cotton sacks in a wheeled trolley to facilitate this separation, keeping linen off the floor before taking the bags to the laundry.

The laundry staff should never open any inner water-soluble bags. Instead, the bags should be transferred to the washing machine for decontamination.

After handling linen, hands should be washed thoroughly as per the guidance found elsewhere in this document.

If linen is sent to an off-site laundry, the laundry should be made aware of its nature and written guidelines should be agreed and followed regarding its transportation and handling. The care home manager and laundry staff should be satisfied that the laundering of items sent will meet the necessary decontamination requirements.

As for hospital laundry, all linen from norovirus outbreaks in care homes should be handled using the enhanced process (Box 7)

Visitors

As is the case for hospitals, it is important to balance the rights and needs of residents to have visitors with the duty of care to other residents and visitors. It is important that symptomatic visitors should be discouraged from visiting until 48h symptom-free. Asymptomatic visitors of both symptomatic and asymptomatic residents should be advised that they may be exposed to infection. However, the hospital practice of high-visibility notices and other warning devices may be less applicable to nursing and residential homes because, again, such an approach detracts from a homely environment. If it is felt to be too intrusive to have notices, then alternative methods of effective communication, such as speaking with visitors on arrival and providing information sheets or leaflets must be substituted. To fail to alert any visitor to the risk of infection would be unacceptable.

Children of school age and non-essential visitors should be discouraged from visiting in the same way as for hospitals.

Terminally ill residents, vulnerable adults and those for whom visiting is an essential part of recovery should be allowed visitors at the discretion of the home manager. Clinical and social judgment needs to be applied sensitively and compassionately whilst recognising the duty of care for the health and well being of all residents, staff and visitors. Those who have travelled a long distance, taken time off work, or in other ways have been significantly inconvenienced, should be allowed to visit residents on outbreak restricted areas. Visits to multiple residents (e.g. by ministers of religion) should be planned so that those under isolation are visited last.

Staff considerations

Staff who become ill at work should be excluded immediately. Symptomatic staff should be excluded until recovered and they have been symptom-free for 48h.

One study has suggested that whether norovirus-infected staff in care homes are excluded for 48h or 72h has no effect on the mean number of cases or the attack rate in residents although the former period may be associated with increased cases among staff [43].

The Working Party believes that a 48h exclusion period is pragmatic.

Prevention of hospital admissions

The admission of residents with norovirus to hospital can lead to severe disruption of services. Wherever possible, symptomatic residents should be managed in the home and hospital admission should only be contemplated for those who are at serious risk of complications. Rehydration strategies should be employed and these should usually suffice. In the event of a referral to hospital, the hospital should be informed of the possibility of norovirus in the resident before the transfer occurs. The ambulance crew who transport the resident should also be informed.

Residents discharged from hospital

Residents who have been affected by norovirus whilst in hospital can be discharged to nursing or residential homes when they have recovered and have been symptom-free for 48h.

Residents who have been exposed to norovirus whilst in hospital but who have not developed symptoms may be discharged to nursing or residential homes only on the advice of the local health protection organisation who will liaise with the hospital IPCT.

In the event that a resident is discharged within the 48h period after cessation of symptoms, or if they may be within the incubation period following exposure to a case, efforts should be made to accommodate them, if possible, within a single room with a dedicated toilet and appropriate precautions until significant risk of norovirus has passed.

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Appendix 1

Members of the Working Party

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David Jenkins BSc MBBS MSc FRCPath (Secretary)	British Infection Association
Albert Mifsud MBBS MSc FRCPath MBA MD	British Infection Association
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Ms Carole Fry	DH England
Ms Tracey Gauci	DH Wales
Dr Philip Donaghue	DH Northern Ireland

Observer for Scottish Government Health Department:

Dr Evonne Curran	Health Protection Scotland

Representatives of the Community Care Sector

Mr Frank Ursell, Chief Executive Officer, Registered Nursing Home Association
Ms Ginny Storey, Head of Care and Clinical Governance, Anchor Trust
Mrs Frances Gibson, Director of Nursing, Clinical Care Governance, Care U.K.
Ms Tracy Payne, National Care Forum

Appendix 2 List of Stakeholder Respondents

In addition to the councils and members of the Partner Organisations, responses to consultation were invited from 52 external stakeholder organizations. Responses were received from the following:

Partner Organisations:

British Infection Association

Healthcare Infection Society

Health Protection Agency

Infection Prevention Society

National Concern for Healthcare Infections

NHS Confederation

External Stakeholders:

Advisory Committee on Antimicrobial Resistance & Healthcare-associated Infection (ARHAI), Department of Health

Aspen Healthcare

CLS Care Services

Health Protection Service, Scotland

Micro Pathology Limited

National Care Forum

NHS London

NHS Outer North East London

NHS Somerset

NHS Southwest

NHS West Midlands

Public Health Wales

Royal College of General Practitioners

Royal College of Nursing

Royal College of Pathologists

Royal College of Physicians

Social Care & Social Work Improvement Scotland (SCSWIS)

Somerset Community Health

South Central Strategic Health Authority

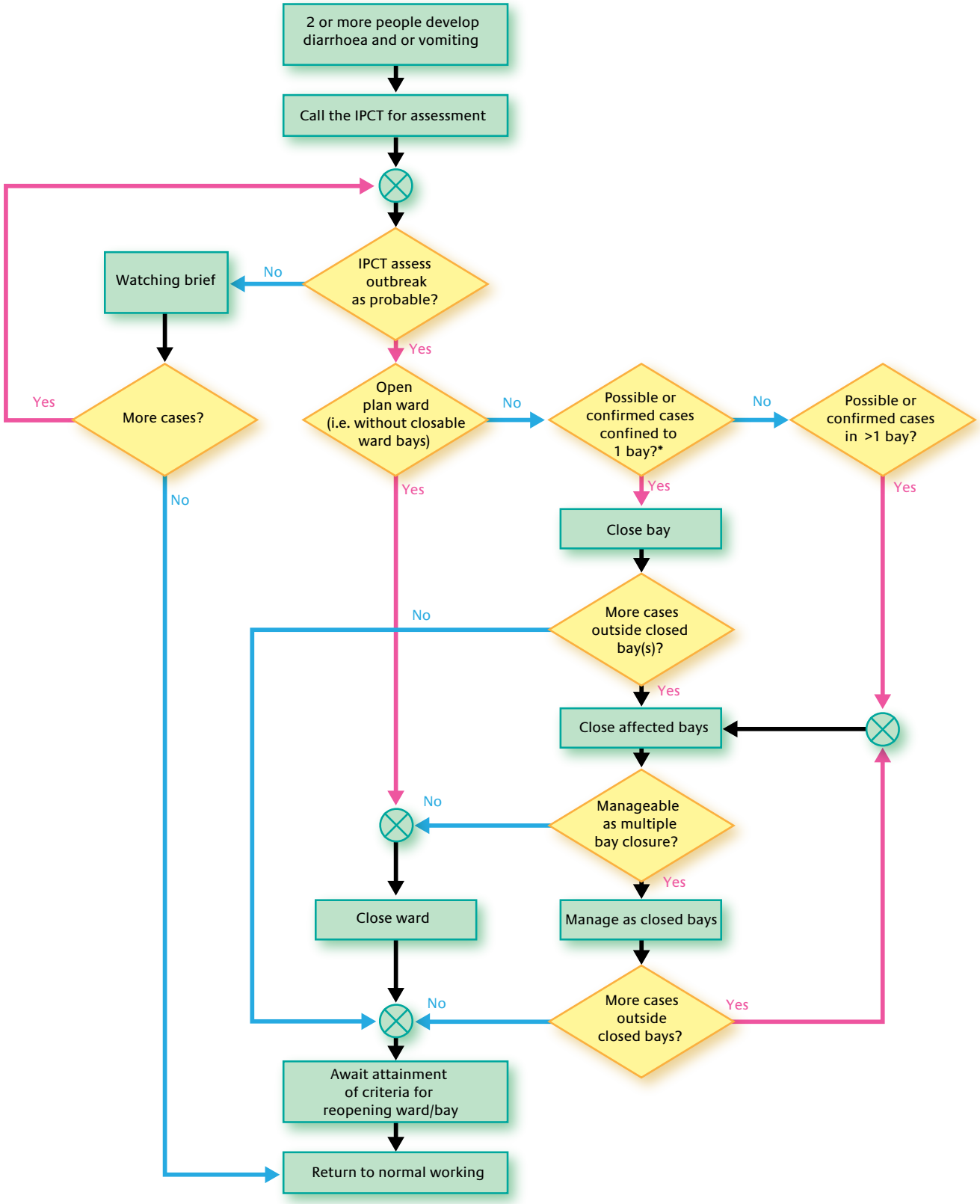
UK Specialist Hospitals (UKSH)

United Kingdom Homecare Association

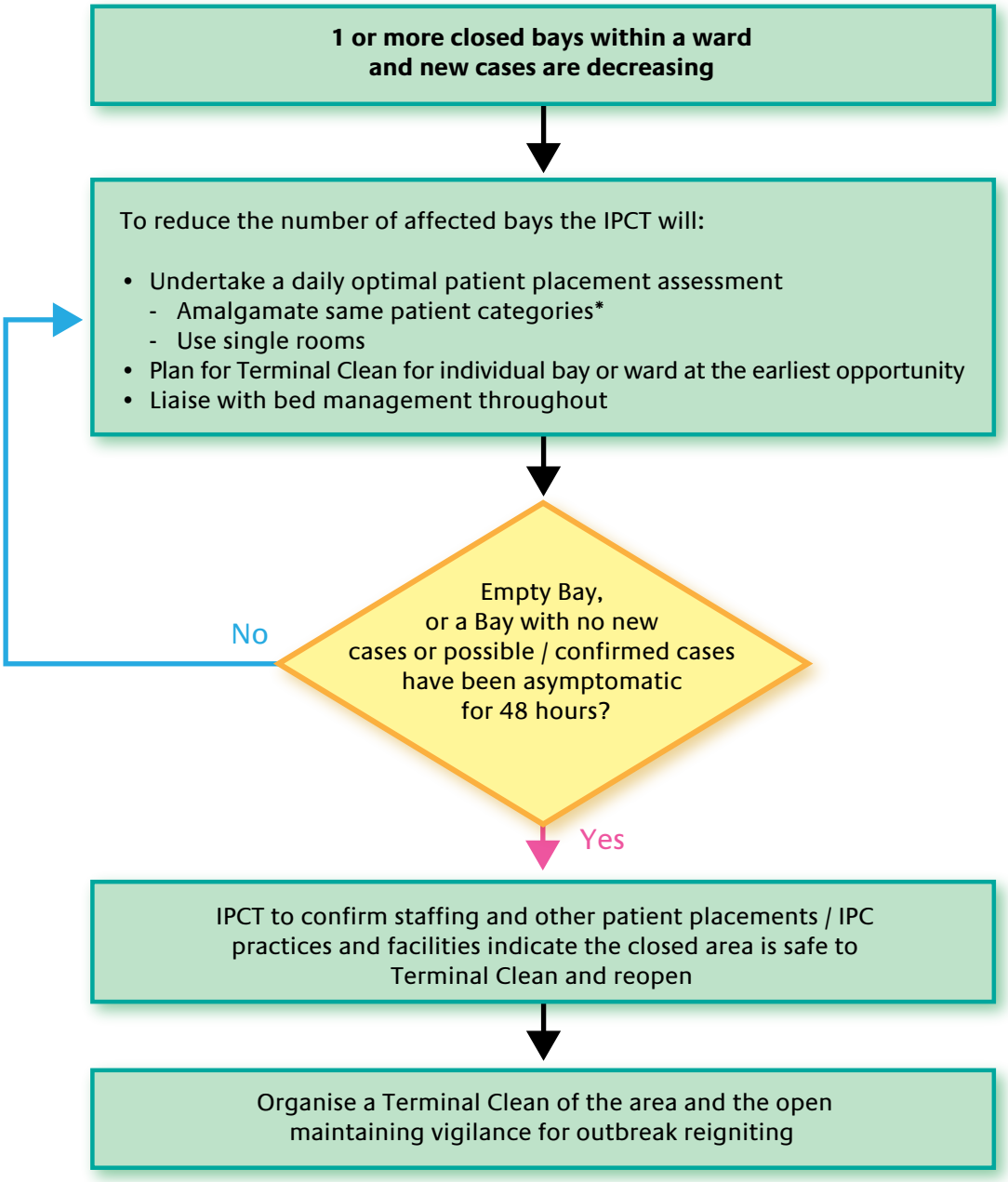
Appendix 3

Algorithms outlining outbreak management in hospitals (by kind permission of Health Potection Scotland) [19]

1. Algorithm for closure of bays or other clinical areas



2. Reopening of closed bays or other closed areas



* Amalgamating the same category patients means caring for patients that are: *All symptomatic possible or confirmed cases together* or, *all exposed asymptomatic*** patients together, or *all non-exposed* patients (non-exposure in the ward, or within the past 48 hours anywhere) together.

- Do not amalgamate exposed asymptomatic patients with non-exposed patients **unless** it is 48 hours after their last exposure, and of course, they have remained asymptomatic
- ***Exposed asymptomatic patients*** can remain in the same bay where exposure to the possible or confirmed norovirus cases occurred, i.e. with possible or confirmed cases, but should not be exposed to new cases

** Confirm ongoing decontamination of exposed asymptomatic patients' environments prior to sharing accommodation with non-exposed patients.

Appendix 4: Key recommendations

Grading for Strength of Recommendations (based on HICPAC categories)[9]

GRADE IA
Strongly recommended and supported by systematic review of randomised controlled trials (RCTs) or individual RCTs

GRADE IB
Strongly recommended and supported by low-quality studies suggesting net clinical benefits or harms, or a widely accepted practice (e.g. aseptic technique) supported by low to very low quality studies

GRADE IC
Strongly recommended and required by legislation, code of practice or national standard

GRADE ID
Strongly recommended and supported by expert opinion and wide acceptance as good practice but with no study evidence

GRADE II
Weakly recommended and supported by group consensus, ad hoc experience or custom and practice with no significant evidence base

1. Hospital design

Plans for new build, renovation or refurbishment of hospitals should include provision for maximal ability to control outbreaks through the inclusion of clinical areas that can be easily segregated, including adequate provision of single rooms and bays with doors. **GRADE ID**

2. Organisational preparedness

Organisations must develop systematic business continuity plans for use in outbreak situations. The plan should include actions for safe environments, staffing, information, surveillance, communications and leadership. **GRADE IC**

3. Defining the start of an outbreak and Period of Increased Incidence (PII)

a. Organisations should take a pragmatic approach at the start of outbreaks when there may be diagnostic uncertainty. They should adopt the concept of a 'Period of Increased Incidence' (PII) for use in these initial stages. PIIs will require increased monitoring, interventional and communication activities by the Infection Prevention and Control Team (IPCT) but will not require a full organisational outbreak response (e.g. outbreak control meetings). **GRADE II**

b. Laboratory-confirmed outbreaks or clusters of cases of vomiting and/or diarrhoea which are typical of norovirus outbreaks despite lack of laboratory confirmation should be defined as outbreaks by the IPCT and should trigger the local organisational outbreak control plan. **GRADE ID**

c. A different definition of a norovirus outbreak may be required for epidemiological surveillance purposes and organisations should also report outbreaks to any national and regional surveillance programmes according to the epidemiological definition provided by those programmes. This is important for the assurance of comparability of data geographically and temporally. **GRADE IB**

4. Defining the end of an outbreak

a. A similar pragmatic approach should be taken at the end of outbreaks when a closed clinical area is reopened. The definition of the end of an outbreak for IPC purposes is when terminal cleaning has been completed successfully. Patients with continuing symptoms should be moved into side rooms or other affected areas if it helps to expedite terminal cleaning. **GRADE IB**

b. The definition of the end of an outbreak for epidemiological surveillance purposes may be different and those definitions provided by national and regional surveillance programmes should be applied. **GRADE IB**

5. Actions to be taken during a period of increased incidence (PII)

a. All symptomatic patients should be isolated in the smallest available clinical area commensurate with patient safety and dignity. This should be through the use of side rooms for individuals, bays with doors for cohorts (the number of bays closed will depend on the number of patients affected) and whole wards only when control of the outbreak through such compartmentalisation has failed. **GRADE IB**

b. Specimens of faeces should be collected from affected patients and staff in order to establish the existence and cause of an outbreak. Up to six specimens only should be submitted from affected areas for norovirus detection but Microbiological analysis of specimens for other pathogens should be submitted as usual for each patient. **GRADE IC**

c. IPCT surveillance, interventions and communications with the ward staff should be intensified and relevant managerial and clinical staff informed although formal local outbreak control plans do not need to be implemented at this stage. **GRADE II**

6. Actions to be taken when an outbreak is declared

a. The IPCT should formally declare the outbreak and implement the local outbreak control plan. This should include informing of local health protection organisations. **GRADE IC**

b. The same principle of isolation of affected patients in the smallest possible area commensurate with patient safety and dignity should be applied. **GRADE IB**

c. The outbreak control measures set out in Box 1 should be followed. **GRADE ID**

7. Actions to be taken when an outbreak is over

a. Patients who are persistently symptomatic should be moved to a side room or cohort-nursed in an affected clinical area (e.g. bay) in order to facilitate terminal cleaning of a closed area. Once this cleaning has been successfully completed, the area can be re-opened and normal activity resumed. **GRADE II**

b. The IPCT is responsible for declaring the outbreak over and ensuring all relevant agencies are informed **GRADE IC**

c. Increased vigilance is required after re-opening because of the risk of re-emergence of the outbreak **GRADE IB**

8. The role of the laboratory

a. The preferred diagnostic test is PCR. This should be made available 7 days a week, including holidays, with a turnaround time from specimen production to provision of result of 24h or less. **GRADE IB**

b. Testing for IPC purposes should be considered for patients admitted with, or developing, diarrhoea in whom non-infective causes cannot be established or who may have atypical presentations. Local protocols should be developed so as to minimise inappropriate testing **GRADE II**

c. Up to only six faecal specimens between all affected patients should be tested for norovirus in a PII for the purpose of confirming the cause of an outbreak. **GRADE IC**

d. Testing of patients who have continuing symptoms at the end of an outbreak may help to achieve the optimal use of isolation facilities and expedite terminal cleaning and re-opening **GRADE ID**

9. The avoidance of admission

a. A local multi-agency plan should be developed to minimise the admission to hospital of patients with norovirus **GRADE ID**

b. Local surveillance and inter-agency communication systems should be set up to enable early warning of and timely response to increased norovirus activity **GRADE IC**

c. Triage of patients at hospital portals using designated clinical areas and effective medical assessment should be established **GRADE ID**

d. Use should be made of outreach teams to prevent admissions through the management of dehydration in the community **GRADE II**

10. The clinical treatment of norovirus

a. Attention to any underlying or coincidental illness or condition must be maintained **GRADE IB**

b. Rehydration and the avoidance of dehydration are the mainstay treatments of norovirus **GRADE IB**

c. The use of anti-emetic agents and anti-diarrhoeal agents is discouraged although it is recognised that some clinicians find them useful in norovirus outbreaks. Care must be taken to avoid adverse consequences of their use in other infective gastroenteritides (e.g. *Clostridium difficile*) **GRADE IB**

11. Patient discharge

a. Patients can be discharged to their own homes as soon as it is safe to do so **GRADE ID**

b. Patients can be discharged to care homes which are affected by a norovirus outbreak as soon as it is safe to do so **GRADE ID**

c. Patients can be discharged to care homes which are unaffected by norovirus when they have been symptom-free for 48h **GRADE ID**

d. Patients can be transferred within hospitals, between hospitals or to other community-based institutions (e.g. prisons) when they are 48h symptom-free. An exception to this will be the transfer of patients between affected clinical areas (e.g. by use of a decant ward) in order to manage an outbreak **GRADE ID**

12. Cleaning and decontamination

a. Routine environmental cleaning in accordance with extant national standards and specifications must be enhanced during an outbreak of norovirus **GRADE IC**

b. Cleaning must precede disinfection and follow the instructions contained in Box 5. The preferred disinfectant is 0.1% sodium hypochlorite (1000 ppm available chlorine*) **GRADE IC**

c. Spillages of vomit and faeces must be cleared immediately whilst using Personal Protective Equipment (PPE) as set out in Box 6 **GRADE IC**

d. Terminal cleaning must be carried out according to the instructions in Box 8 **GRADE IC**
The Working Party is aware of cleaning materials other than liquid preparations (in particular, wipes) which may have a higher concentration of available chlorine. Our recommendations on concentrations are based on the latest Department of Health guidelines and we make no specific recommendations on concentrations in other cleaning materials. For these, manufacturer's instructions must be followed.

* The Working Party is aware of cleaning materials other than liquid preparations (in particular, wipes) which may have a higher concentration of available chlorine. Our recommendations on concentrations are based on the latest Department of Health guidelines and we make no specific recommendations on concentrations in other cleaning materials. For these, manufacturer's instructions must be followed.

13. Laundry

a. The handling of laundry in an outbreak of norovirus must be in accordance with extant national guidance. This includes segregation of linen into a standard laundry process where not involved in an outbreak of norovirus and an enhanced process when it is. The enhanced process is set out in Box 7 **GRADE IC**

*See note on page 41

14. Visitors

a. Social visitors should be discouraged for reasons of operational expedience **GRADE ID**

b. Visits may be allowed at the discretion of the Ward Manager who will take account of operational needs, compassionate considerations, and any inconvenience to the visitor **GRADE ID**

c. Visitors should be provided with adequate information about risks of norovirus at the start of their visit **GRADE IC**

d. Visitors who have had diarrhoea and/or vomiting should be asked not to visit until they have been symptom-free for at least 48h. **GRADE ID**

e. Those who wish to visit more than one person should visit closed areas last **GRADE ID**

15. Staff considerations

a. Staff who develop symptoms should be excluded from work immediately and until they have been symptom-free for 48h. **GRADE IC**

b. Bank and agency staff should work on affected wards only if necessary. They can work anywhere else afterwards but must be excluded if they develop symptoms. They should not, however, be deployed elsewhere within the same shift **GRADE II**

16. Communications

a. Robust channels of communications should be set up between agencies across health and social care boundaries. These should ensure the sharing of intelligence during periods of low activity in order to be alert to any early rise in activity. Local communication plans should be drawn up which include more frequent communications during periods of high activity **GRADE IB**

b. At times of increasing activity General Practitioners should be reminded of the ways of avoiding unnecessary hospital admissions **GRADE ID**

17. Surveillance

a. All organisations that are intended to be targets for norovirus surveillance should participate fully in such surveillance whether they are national, regional or local programmes **GRADE IC**

18. Evaluation and Review of Guidelines

a. The implementation of these guidelines should be evaluated in order to inform future revisions **GRADE IC**

b. An early review of the guidelines is recommended in the light of appropriate evaluation. This should be at a minimum of 3 years and a maximum of 5 years after publication **GRADE IC**

c. This web-based document will be superceded at the latest on 31 December 2016