Guidance on Prevention and Control of *Clostridium difficile* Infection (CDI) in health and social care settings in Scotland.

NHS National Services Scotland

Scottish Health Protection Network

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Document Amendment Log

Version No.	Date	Page No.	Amendment Summary
2.1	9/10/2014	26	Section 2.3.2: Updated to provide clarity on the use of fidaxomicin for first recurrences of CDI which are considered to be severe, and the strength of the evidence to support this.
2.1	9/10/2014	30	Section 2.3.3: Updated to include use of fidaxomicin for the treatment of severe first recurrence of CDI.
2.1	9/10/2014	30	Section 2.3.4: Strength of recommendation for use of fidaxomicin changed from IB to II.
2.1	9/10/2014	31	Section 2.3.4: Strength of recommendation for use of fidaxomicin changed from IB to II.
2.1	9/10/2014	36	Algorithm 2: 'Patient has no severity markers' section. Strength of recommendation for use of fidaxomicin changed from IB to II. Recommendation for use of vancomycin remains at IB. 'Patient has one severity marker' section. Updated to include use of fidaxomicin for the treatment of severe first recurrence of CDI.
2.1	9/10/2014	37	Algorithm 3: 'Patient has no severity markers' section. Strength of recommendation for use of fidaxomicin changed from IB to II.
3.0	14/08/2017	General	Amendments and revisions to provide clarity throughout document. Update of old links.
3.0	14/08/2017	5 and 7	Roles and responsibilities for GPs and Health Protection Teams clarified.
3.0	14/08/2017	8	Added section on CDI in children.
3.0	14/08/2017	28	Separated recommendation for patient assessment for CDI cases in care homes and those receiving care at home.
3.0	14/08/2017	33	Updated information on the use of faecal microbiota transplantation for the treatment of CDI.
3.0	14/08/2017	34-35	Footnote added for options for treatment of children with CDI.

The Scottish Health Protection Network (SHPN) is an obligate (jointly owned) network of existing professionals, organisations and groups in the health protection community across Scotland. The aims of the network are:

- To ensure Scotland has a Health Protection service of the highest quality and effectiveness that is able to respond to short term pressures and to long term challenges.
- To oversee the co-ordination of Scotland's health protection services under a network that promotes joint ownership and equitable access to a sustainable and consistent service.
- To minimise the risk and impact of communicable diseases and other (non-communicable) hazards on the population of Scotland and to derive long term public health benefits (outcomes) through the concerted efforts of health protection practitioners across Scotland.

In line with the above, SHPN supports the development, appraisal and adaptation of health protection guidance, seeking excellence in health protection practice.

Health Protection Scotland

Health Protection Scotland (HPS) is a non-profit, public sector organisation which is part of the Scottish National Health Service. It is dedicated to the protection of the public's health.

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Professionals involved in the implementation of recommendations proposed in this document are expected to take them fully into account when exercising their professional judgment. The document does not, however, override the individual responsibility of professionals to make decisions appropriate to the circumstances of the individual cases, in consultation with partner agencies and stakeholders. Professionals are also reminded that it is their responsibility to interpret and implement these recommendations in their local context, in light of their duties to avoid unlawful discrimination and to have regard to promoting equality of opportunity. Nothing in this document should be interpreted in a way which would be inconsistent with compliance with those duties.

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Comments on the published guidance

Comments on this guidance should be sent to the SHPN Guidance Group by emailing NSS.SHPN@nhs.net.

List of Abbreviations

AMT	Antimicrobial management team
CDI	*Clostridium difficile* infection
CDC	Centers for Disease Control and Prevention
ESCMID	European Society of Clinical Microbiology and Infectious Diseases
ESGCD	European Study Group on *Clostridium difficile*
GDG	Guidance Development Group
GDH	Glutamate dehydrogenase
HCAI	Healthcare Associated Infections
HICPAC	Healthcare Infection Control Practices Advisory Committee
HIIAT	Healthcare Infection Incident Assessment Tool
HPS	Health Protection Scotland
ICU	Intensive Care Unit
ITU	Intensive Treatment/Therapy Unit
IV	Intravenous
NES	NHS Education for Scotland
NIPCM	National Infection Prevention and Control Manual
PPM	Parts per million
PCR	Polymerase chain reaction
PHE	Public Health England
PMC	Pseudomembranous colitis
QoE	Quality of Evidence
RCA	Root cause analysis
RIDDOR	Reporting of Infections, Diseases and Dangerous Occurrences Regulations
SAPG	Scottish Antimicrobial Prescribing Group
SICPs	Standard Infection Control Precautions
SHPN	Scottish Health Protection Network
SIGN	Scottish Intercollegiate Guidelines Network
SoR	Strength of recommendation
SPC	Statistical Process Control
TBPs	Transmission Based Precautions
WBC	White blood cells

1. Introduction

This guidance is a revised version of the 'Guidance on Prevention and Control of *Clostridium difficile* Infection (CDI) in Healthcare Settings in Scotland' issued in October 2014, and provides easily accessible advice covering key aspects of prevention, control and treatment of CDI.

A multidisciplinary group (Appendix F on page 47) was convened in Scotland in 2016 for the purpose of reviewing current guidance. Under the auspices of the Scottish Health Protection Network (SHPN), the group followed a systematic development framework proposed by the SHPN, and adapted from the Scottish Intercollegiate Guidelines Network (SIGN): http://www.sign.ac.uk/methodology.html.

The recommendations that follow have been updated from the previous version which was based on a systematic literature review produced by the European Study Group on *Clostridium difficile* (ESGCD) in 2008 [1] and guidance on the treatment of CDI published by the European Society of Clinical Microbiology and Infectious Diseases (ESCMID) [2], Public Health England (PHE) [3] and practice guidelines published in the 'American Journal of Gastroenterology' [4] (see section 2.3).

For this version of the Scottish guidance (version 3.0), a systematic literature review was undertaken by HPS and NHSScotland colleagues to evaluate any new evidence published since 2014 within the areas of infection prevention and control, treatment and management of CDI patients, probiotics for the treatment and prevention of CDI, community CDI, and risk factors for CDI and its recurrence. Any recommendations on infection prevention and control have been aligned with the Scottish National Infection Prevention and Control Manual (NIPCM) (http://www.nipcm.scot.nhs.uk/), and the draft (2017) 'Updated ESCMID Guidelines for prevention of *Clostridium difficile* infection'. In areas where insufficient evidence exists, advice is based on expert consensus.

The level of evidence for the key recommendations has been graded in the literature review by the ESGCD or by HPS using the same approach. Categories for implementation in clinical practice were generated based on the Healthcare Infection Control Practices Advisory Committee (HICPAC) Guidelines (the Centers for Disease Control and Prevention (CDC)) (Appendix A on page 38). The recommendations listed in this document (as bullet points) are followed by categories for implementation in clinical practice (IA, IB, IC or II), where IA is the strongest recommendation.

This guidance is intended for use in acute and non-acute hospitals, care homes and care at home across Scotland. It is acknowledged that not all of the information/ recommendations contained in this guidance will apply to every care setting. The use of the word 'persons' can be used instead of 'patients' when using this document in a non-hospital setting.

The guidance should also be used alongside methods of the Scottish Patient Safety Programme of work (where applicable), which provide a standardised approach to implementation of the recommendations of this guidance.

1.1 Aims and scope

This guidance provides a standardised evidence-based approach to diagnosis, prevention and control, and treatment of CDI to enable staff to deliver safe care and support the reduction of CDI in their organisations.

Organisations and staff providing care have a key role in preventing and controlling CDI and other healthcare associated infections (HCAI).

The guidance aims to:

- Outline roles and responsibilities;
- Aid the application of knowledge in preventing transmission of *C. difficile* in all care settings;
- Share best practice on antimicrobial treatment of CDI;
- Improve patient safety in relation to the acquisition of CDI and management of patients with CDI; and
- Reduce morbidity, mortality and service disruption as a result of CDI.

The guidance should be used as a framework to ensure that the relevant policies are in place, to examine the currency of policy content where policies are already in place, or to inform local policy development.

1.2 Background

For a detailed overview of the epidemiology of CDI in Scotland (including quarterly and annual surveillance reports) please refer to the CDI website at: http://www.hps.scot.nhs.uk/haiic/sshaip/clostridiumdifficile.aspx.

Transmission of *C. difficile*

Since *C. difficile* is an anaerobic bacterium, viable bacteria will quickly die when exposed to air. However, *C. difficile* produces hardy spores that can tolerate air, heat and resist various detergents and disinfectants, giving them the ability to survive for extended periods in the environment.

C. difficile is transmitted via spores that are picked up either by direct contact with an infected (or colonised) person or by indirect contact with a contaminated surface and then swallowed. The ability of these spores to survive in the environment, even when disinfectants are used, has contributed to the wide spread of *C. difficile* in care facilities [5, 6].

Direct and indirect contact (i.e. with an infected person or contact with a contaminated surface) followed by swallowing represent the main routes of transmission of *C. difficile*.

Symptomatic CDI patients shed spores via their faeces into the environment at a high rate and these patients are considered the main source of contamination of the environment in care facilities [7].

Toilets, commodes and the environment of CDI patients (including frequently touched surfaces around toilets and beds) are likely to be contaminated. This is the reason why increased environmental cleaning is of paramount importance to reduce the risk of environmental cross contamination. The hands of care staff can easily become contaminated, and if hand hygiene is not optimal *C. difficile* can spread to other persons or the environment. Alcohol-based hand rubs are not effective in removing *C. difficile* spores from hands and should not be used alone when caring for patients with confirmed or suspected CDI – hand washing with liquid soap and water is necessary to remove spores and prevent their spread.

Asymptomatic carriage

Some people carry *C. difficile* in their gut without having any symptoms, and sometimes people who have been treated and recovered from CDI will still be carrying *C. difficile* in their gut. This asymptomatic carriage of toxigenic *C. difficile* is relatively common among healthcare patients and has been associated with transmission in the hospital setting [8, 9, 10]. One UK study has shown that the majority of CDI cases within an NHS Trust did not appear to be related to other symptomatic ward-based cases, with asymptomatic carriage suggested as a potential alternative source of transmission [11]. However, due to uncertainty with regards to the appropriate management of asymptomatic carriers of *C. difficile*, and which patients to target for screening, there is insufficient evidence on which to base any recommendations. Transmission Based Precautions (TBPs) (or other interventions) are not recommended for asymptomatic carriers.

2. Recommendations

The recommendations that follow (see section 2.2.1 to section 2.2.10) are adapted from a systematic review carried out by Vonberg et al. [1], which provides evidence-based guidance to limit the spread of *C. difficile* in care settings.

Prevention and control of CDI depends on ten key areas:

- early diagnosis (see section 2.2.1);
- implementation of surveillance (see section 2.2.2);
- education (see section 2.2.3);
- patient placement/isolation precautions (see section 2.2.4);
- hand hygiene (see section 2.2.5);
- personal protective equipment (see section 2.2.6);
- environmental decontamination (see section 2.2.7);
- management of care equipment (see section 2.2.8);
- antimicrobial stewardship (see section 2.2.9); and
- specific measures in outbreaks (see section 2.2.10).

Standard Infection Control Precautions (SICPs) are the basic infection prevention and control measures necessary to reduce the risk of transmission of microorganisms from recognised and unrecognised sources of infection. Transmission Based Precautions (TBPs) are used in addition to SICPs to prevent cross transmission of specific infectious agents such as *C. difficile*. SICPs and TBPs form the basis of the recommendations found in section 2.2.4 to section 2.2.8 and reference should also be made to the NIPCM: http://www.nipcm.scot.nhs.uk/

HPS 'Checklists for preventing and controlling CDI' is a useful tool to ensure that recommended practices are implemented: http://www.hps.scot.nhs.uk/haiic/sshaip/publicationsdetail.aspx?id=38848.

Short-guides for managing CDI in healthcare or community settings are provided in Appendix B and Appendix C, respectively, while the full list of documents referred to in the recommendations (e.g. CDI surveillance protocol, CDI Trigger Tool and the NIPCM) is included in Appendix D.

2.1 Roles and responsibilities to support the implementation of this guidance

The recommendations set out in this guidance are based on the assumption that care settings have infection prevention and control systems in place in line with existing national guidance (see Appendix D and links throughout this document).

Organisations should ensure:

- systems and resources are in place to facilitate implementation of national guidance and monitoring of compliance to support the reduction of CDI throughout the organisation; and
- effective local surveillance systems are in place to detect increasing incidence (or frequency) and/or severity of CDI and prompt rapid investigations and implementation of prevention and control interventions.

Infection Prevention and Control Teams should:

- provide expert advice on the application of CDI prevention and control measures in the care setting and on individual patient risk assessments;
- engage with staff to develop systems and processes that lead to sustainable and reliable improvements in relation to application of CDI prevention and control measures;
- ensure that senior managers are alerted to any issues including deficits in knowledge, resources, equipment and facilities, and incidents that may result in transmission of infection or changes in the incidence and/or severity of disease; and
- assist in the investigation of any CDI cases that result in severe disease or death.

Health Protection Teams should:

- provide expert advice on the application of CDI prevention and control measures in the care setting and on individual patient risk assessments as required;
- engage with staff to support implementation of infection prevention and control precautions described in this guidance as required; and
- support further investigations when there is an increased number of cases of CDI in care homes (see Triggers for action at local level) in collaboration with relevant staff and General Practitioners.

Managers should ensure that staff:

- are aware and have access to infection prevention and control guidance documents;
- have had instruction and education about the clinical features and routes of transmission, and the epidemiology of CDI; and
- have adequate support and resources available to implement, monitor and take corrective action to ensure compliance with CDI prevention and control policies and procedures.

Staff providing care should ensure that they:

- understand and apply the principles of CDI prevention and control, and antimicrobial stewardship as appropriate, as set out in this guidance;
- maintain competence, skills and knowledge in infection prevention and control through attendance at education and training events;
- communicate the infection prevention and control practices to be undertaken by colleagues, persons, patients, relatives and visitors without breaching confidentiality; and
- report to line managers and document any deficits in knowledge, resources, equipment and facilities or incidents that may result in transmission of infection.

Consultants in Microbiology should ensure:

- compliance with the protocol for the national mandatory CDI surveillance programme;
- diarrhoeal stool samples are tested and the results interpreted according to the national recommended protocol for testing for CDI;
- clinical staff are appropriately advised on testing, interpretation of results and treatment of CDI;
- diarrhoeal stool samples from all CDI cases are stored at -20°C for a period of three months to enable further investigations;
- infection prevention and control teams are advised and supported in relation to specific CDI issues, e.g. increased number of cases/incidence, outbreaks and changes in practice;
- Health Protection Teams are advised and supported if there are any implications regarding CDI in care homes;
- Antimicrobial Management Teams (AMTs) are advised and supported in relation to development and maintenance of local antimicrobial policies and stewardship programmes;
- senior managers are alerted to any issues including deficits in knowledge, resources, equipment and facilities, and incidents that may result in transmission of infection or changes in the incidence and/or severity of disease; and
- they assist in the investigation of any CDI cases that result in severe disease or death.

Antimicrobial Management Teams (AMTs) should:

- ensure implementation and compliance monitoring of local antimicrobial prescribing policies that minimise the use of agents associated with CDI; and
- support and advise clinical staff on antimicrobial prescribing and interpret local and national surveillance information on antimicrobial resistance and usage.

General Practitioners should:

- be aware of and follow local antimicrobial guidelines for primary care in the NHS board;
- be aware of major risk factors (see Major risk factors for CDI) and symptoms of CDI;
- obtain stool specimens from any person with diarrhoea in the community, aged 3 years and over, as early as possible and send the specimen to the local microbiology laboratory requesting testing for *C. difficile* toxin;
- ensure that the Health Protection Team (or Infection Prevention and Control Team) is alerted within the NHS board when there is an increased number of cases of CDI (see Triggers for action at local level) within a care home;
- advise CDI patients that are being cared for at home to contact the GP if symptoms (including fever, rigors, and bowel movements) worsen while on treatment;
- seek advice on appropriate infection prevention and control precautions from the Health Protection Team within the NHS board;
- use appropriate infection prevention and control measures as set out in this document when dealing with persons with diarrhoea;
- follow the CDI treatment protocols outlined in section 2.3, and seek advice from the local infection specialist if unsure of appropriate steps; and
- assist in the investigation of any community CDI cases that result in severe disease or death.

2.2 Infection prevention and control of CDI

2.2.1 Early diagnosis

Early diagnosis is essential for preventing and controlling CDI.

Symptoms of CDI

The main symptom of CDI is diarrhoea (Box 1). However, clinical disease comprises a range of toxin mediated symptoms that can result in more severe cases such as pseudomembranous colitis (PMC), toxic megacolon and peritonitis that can lead to death. Severe CDI is not always associated with diarrhoea (see Guidance on severity assessment of CDI and Table 1 and Table 2).

For mild disease, diarrhoea is usually the only symptom. Other clinical features consistent with more severe forms of CDI include abdominal cramps, fever and leukocytosis (raised WBC levels) [12].

Box 1

Definition of diarrhoea

Diarrhoea is defined as the passage of three or more loose or liquid stools per day, or more frequently than is normal for the individual [13].

NB: The frequent passing of formed stools is not diarrhoea.

CDI in children

CDI has increasingly been recognised in children, causing mild as well as life-threatening disease [14]. *C. difficile* carriage rates vary widely in newborns and infants younger than 2 years (2.5-90%), decreasing gradually in older children. Colonisation of neonates via maternal-infant transmission is suggested to be unlikely due to low vaginal colonisation with *C. difficile*, whereas acquisition via environmental transmission is consistent with evidence with similar ribotypes reported in neonates and their local environment [14].

Scottish guidance on the diagnosis of CDI recommends routine testing of symptomatic patients aged 3 years and above.The interpretation of positive results in children less than 3 years of age is problematic, and testing in this age group should be limited to samples with a clinician's request only [15]. In all cases, testing results must be carefully evaluated against the clinical background of the patient.

Major risk factors for CDI

Certain persons are at increased risk of acquiring CDI. The possibility of CDI should be considered when persons with diarrhoea also have:

- Current or recent (within the last three months) use of antimicrobial agents (especially those with a high risk for CDI, e.g. cephalosporins, broad spectrum penicillins, fluoroquinolones and clindamycin);
- Increased age (>65 years old);
- A previous diagnosis of CDI;
- Prolonged hospital stay;
- Serious underlying diseases;
- Surgical procedures (in particular bowel procedures);
- Immunosuppression (including HIV infection and transplant patients); and/or
- Use of proton pump inhibitors (PPI)/H2 antagonists (drugs which reduce the production of stomach acid).

Testing for *C. difficile* and diagnosis of CDI

Early diagnosis is essential for preventing and controlling CDI. Diarrhoeal stool samples from patients aged 3 years or older should be tested for CDI [15].

Specific recommendations for **testing and diagnosis**:

- Implementation of infection prevention and control measures should be started as soon as CDI is suspected (do not wait for the laboratory result to confirm diagnosis before initiating treatment and putting control measures in place) (IB).
- Stool specimens must be obtained and sent to the microbiology laboratory as soon as possible after onset of symptoms (i.e. diarrhoea) from persons in care settings and from persons admitted to care settings with diarrhoea (IB).
- CDI testing should only be performed on diarrhoeal stool specimens (a diarrhoeal specimen is a specimen of faeces that conforms to the shape of its container) (IB). Laboratory CDI testing using a two-step algorithm should be available 7 days a week.
- Stool specimens from all CDI cases should be stored by the laboratory at -20°C for a period of three months; in particular, from those with a) severe* CDI, or b) in suspected outbreak situations so that culture and typing can be performed retrospectively, if necessary (IB) (*see section 2.3 for definition of severe disease).
- Exclude other causes of diarrhoea before giving the diagnosis of CDI (following the case definition of CDI, Box 2). Seek advice from the Infectious Disease Doctor or Consultant Microbiologist (II).

- Norovirus infection is not a reason to exclude CDI as diagnosis, as co-infection with norovirus and *C. difficile* is possible [16, 17, 18]. When a person has tested positive for both *C. difficile* toxin and norovirus a clinical assessment is required to determine the most likely diagnosis/diagnoses (II).
- Repeated testing after a first confirmed positive sample during the same diarrhoeal episode is not recommended. Only when a recurrence (see Box 6) of CDI is suspected, repeat the CDI testing and exclude other potential causes of diarrhoea [15] (IB);
- Clearance testing (i.e. test of cure) should not be performed (IA).

Box 2

Definition of CDI

Someone whose stool has been confirmed positive for *C. difficile* infection in a two-step laboratory testing algorithm (using a glutamate dehydrogenase (GDH) or polymerase chain reaction (PCR) screening test followed by a confirmatory test using toxin immunoassay or cell-culture cytotoxicity assay) at the same time as they have experienced diarrhoea not attributable to any other cause, or patients from whose stool *C. difficile* has been cultured at the same time as they have been diagnosed with pseudomembranous colitis (PMC).

No single test or combination of tests should be considered infallible in establishing or excluding the diagnosis of CDI, and the clinical condition of the patient should always be considered when making management and treatment choices.

Symptomatic CDI patients are believed to be the major source of *C. difficile* transmission and are associated with high rates of environmental contamination.

- Testing of stool specimens from asymptomatic persons is not recommended (IB).
- Routine screening of asymptomatic persons for CDI is not recommended (no evidence supports screening).

Guidance on how to take faecal samples can be accessed from Appendix H and from: http://www.hps.scot.nhs.uk/haiic/sshaip/resourcedetail.aspx?id=177

Full details on laboratory testing (including how to deal with repeat testing and equivocal results) are covered in the 'Recommended Protocol for Testing for *Clostridium difficile* and Subsequent Culture (2016)': http://www.hps.scot.nhs.uk/haiic/sshaip/publicationsdetail.aspx?id=53536.

2.2.2 Surveillance

Surveillance is used to identify increases in CDI incidence and/or severity at an early stage. Increases should be investigated and, where necessary, changes in practice implemented to reduce the number of cases and/or severity.

- Surveillance is strongly recommended as a tool for monitoring CDI, and facilitating the prevention and control of CDI (IB).

Surveillance requirements

Surveillance of CDI is mandatory in Scotland in persons aged 15 years and over, presenting with diarrhoea in any care setting. Data should be reported to HPS by the diagnostic laboratories.

The Scottish protocol for national mandatory CDI surveillance is available at: http://www.hps.scot.nhs.uk/haiic/sshaip/guidelinedetail.aspx?id=40899.

National and local surveillance serve different purposes

National surveillance identifies overall trends for the 14 Scottish NHS boards and for Scotland overall (including community and hospital cases), and is intended to support the long-term planning and implementation of interventions and monitor their impact.

Local surveillance is intended to monitor the number of cases, and the number of severe cases, by ward, unit or other care setting, in real-time (i.e. daily or weekly at least) to prompt immediate action when an increased number of cases or severe cases has been observed (see also, Chapter 3 of the NIPCM: http://www.nipcm.hps.scot.nhs.uk/chapter-3-healthcare-infection-incidents-outbreaks-and-data-exceedance/).

Specific recommendations for **surveillance** are:

- All care settings should have local surveillance systems in place (IB).
- Ensure appropriate prompt diagnostic testing of persons with an acute diarrhoeal illness not otherwise explained (IB).
- Determine the ward-, unit- or other care setting-specific baseline incidence of CDI by reviewing cases of recent and previous periods (IB).
- Define a threshold incidence (or frequency) of CDI cases that would trigger implementation of additional infection prevention and control measures, and investigations (IB).
- Be alert to changes in the incidence (or frequency), complications (including recurrences) or severity that may indicate the introduction of new strains (II).
- Feedback of surveillance data and its interpretations to all relevant persons in the care organisation via the established communication system is essential for preventing and controlling CDI (IB).

From these specific recommendations, **local surveillance** should comprise the following elements:

1. The incidence (or frequency) of CDI should be monitored in all areas clearly defined by ward, unit or other care setting. The baseline incidence (or frequency) should be available for each area. Care homes should have, or create a system for recording all cases by date and location to aid recognition of an increased number of cases (i.e. incidence) of CDI [15].
2. The severity of each case of CDI should be categorised and the number of new severe cases monitored daily or weekly at least (see Severe CDI and death associated with CDI).
3. Risk factors (see section 2.2.1) should be identified for each case of CDI.
4. Deaths in which CDI is either the primary cause or contributory factor should be recorded and investigated (see Severe CDI and death associated with CDI).
5. A 'trigger for action' (see Box 4) should be set for each area. For care homes this should be set at two or more cases occurring within 28 days in the same area [15]. Each organisation should have an agreed action plan and communication plan in place for when a trigger occurs.
6. Each case of CDI should be assessed with regards to acquisition of disease (i.e. was CDI acquired in the community or other care setting – see CDI epidemiological definitions, Box 3 and Figure 1). Understanding the source and causes of CDI can help target efforts to reduce infections [15].

Box 3

Epidemiological definitions of CDI (adapted from Kuijper et al., 2006 [19])

Definition of community associated CDI

This is a CDI patient with onset of symptoms while outside a hospital and without discharge from a hospital within the previous 12 weeks – or with onset of symptoms within 48 hours following admission to a hospital without stay in a hospital within the previous 12 weeks.

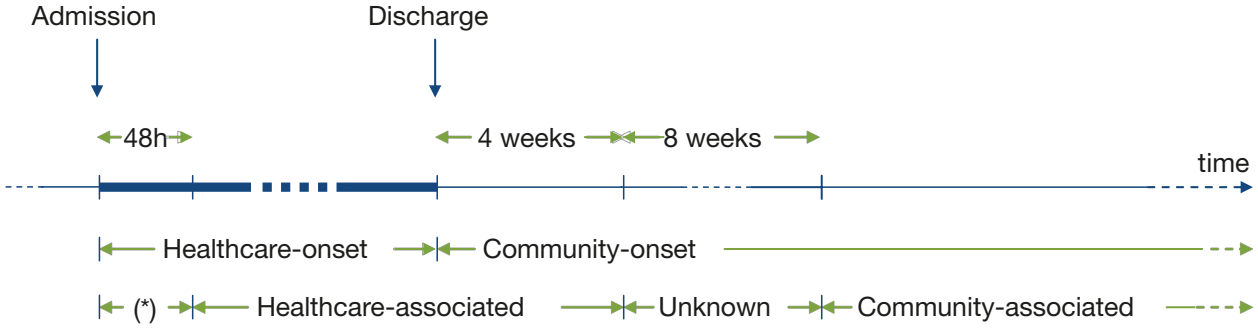
Definition of healthcare associated CDI

This is a CDI patient with onset of symptoms at least 48 hours following admission to a hospital or up to four weeks after discharge from a hospital.

Definition of unknown cases of CDI

This is a CDI patient who was discharged from a hospital 4-12 weeks before the onset of symptoms.

FIGURE 1: Relationships between epidemiological definitions (as in Kuijper et al., 2006 [19].



(*) : - maybe community- or healthcare-associated, depending on case's history.
- if healthcare-associated, may have been acquired in the same facility or imported from another.

Triggers for action at local level

The local surveillance system should have a trigger (i.e. a threshold) (Box 4) that prompts immediate actions and interventions to control CDI. The trigger should contain the incidence and severity of CDI.

Box 4

Definition of 'triggers for action':

When cases occur at a rate exceeding the normal number of cases for the unit, ward or other care setting during a specified period of time, or when the number of severe cases of CDI increases, immediate actions and interventions should be introduced.

There is not one trigger that will fit all care settings. For smaller care facilities (including care homes), it may be appropriate to set triggers based on the number of cases within a set time-period (e.g. two or more cases occurring within 28 days in the same area). For larger institutions, statistical process control (SPC) charts may form the basis of a trigger, particularly for wards and specialties with high numbers.

When a trigger has been reached or breached, this may indicate either natural variation in the number of cases or that there may be a developing problem within the care setting. An investigation should be initiated including assessment of cases and their management, infection prevention and control, and antimicrobial treatment to establish the cause.

The HPS 'CDI Trigger Tool' can assist in this process (http://www.hps.scot.nhs.uk/ haiic/ic/publicationsdetail.aspx?id=42508).

Severe CDI and death associated with CDI

The clinical team responsible for the care of a patient who develops severe CDI, or whose death is associated with CDI, should carry out an investigation into the reasons leading up to the infection (with assistance from GPs when occurring in the community). The investigation should use root cause analysis as outlined in the 'CDI Severe Case Investigation Tool': http://www.hps.scot.nhs.uk/haiic/sshaip/publicationsdetail.aspx?id=44042.

Severe CDI, and deaths associated with CDI, should be included as part of all morbidity and mortality reviews and other case reviews on a regular basis as a means of sharing lessons learned to reduce the risk of persons acquiring CDI in the future.

When assessing the severity of individual CDI cases it is recommended that the guidance in section 2.3 is adhered to.

For guidance on submission of isolates to the reference laboratory see: http://www.hps.scot.nhs.uk/haiic/sshaip/guidelinedetail.aspx?id=40899.

Laboratories should culture *C. difficile* from all severe cases and submit isolates to the reference laboratory.

Incident reporting

Following detection of a CDI infection incident or outbreak, as defined in chapter 3 of the NIPCM, The 'Healthcare Infection Incident Assessment Tool (HIIAT)' must be used by the IPCT or HPT to assess the initial impact and monitor ongoing impact (escalating and de-escalating where required). The HIIAT tool is available at: http://www.nipcm.scot.nhs.uk/appendices/appendix-14-nipcm-healthcare-infection-incident-assessment-tool-hiiat/.

Each organisation should have an agreed action plan and communication plan in place for when a trigger occurs. Where relevant, incidents which occur in the community should be reported to the Care Inspectorate.

For guidance on outbreaks see section 2.2.10.

2.2.3 Education

Education of healthcare staff is one of the most effective measures to limit the spread of *C. difficile* [1].

The key recommendation on **education** is:

- Everyone, including care staff and visitors, who enters a confirmed or suspected CDI case's environment should be informed about the clinical features and transmission of CDI (IA).

All care staff in care settings including hospitals, primary care and community based teams (care homes and care at home), support and auxiliary and non-medical staff, in particular those involved in cleaning, should receive education on all relevant aspects of CDI.

The information given should include as appropriate :

- basic pathogenic mechanisms of *C. difficile*;
- potential reservoirs;
- route of transmission;
- symptoms of CDI;
- risk factors for CDI;
- standard infection control precautions; and
- transmission based precautions for CDI.

Undertaking the NHS Education for Scotland (NES) Scottish Infection Prevention and Control Education Pathway (SIPCEP) provides a staged pathway of infection prevention and control education, with the Foundation Layer covering the underpinning knowledge of SICPs enabling staff to contribute to a healthcare culture in which patient safety related to infection prevention and control is of the highest priority.

http://www.nes.scot.nhs.uk/education-and-training/by-theme-initiative/healthcare-associated-infections/scottish-infection-prevention-and-control-education-pathway.aspx.

A variety of CDI training resources developed by NES can be found at: http://www.nes.scot.nhs.uk/education-and-training/by-theme-initiative/healthcare-associated-infections.aspx.

For visitors of CDI cases, this means basic information on what CDI is and what measures should be taken by them to prevent the spread of *C. difficile*.

HPS information leaflets on CDI for hospital patients and visitors; residents and visitors of care homes; and home laundering of patient items can be accessed at:

- http://www.hps.scot.nhs.uk/haiic/ic/guidelinedetail.aspx?id=38654 (Hospital patients and visitors);
- http://www.hps.scot.nhs.uk/haiic/ic/guidelinedetail.aspx?id=39108 (Residents and visitors of care homes); and
- http://www.hps.scot.nhs.uk/haiic/ic/guidelinedetail.aspx?id=39120 (Home laundering of patient items).

2.2.4 Patient Placement

The spread of hardy spores of *C. difficile* plays an important role in the transmission of CDI in care settings. Isolation of patients with confirmed or suspected CDI is a key step in preventing the transmission of *C. difficile*.

Specific recommendations for **placement of patients** with **confirmed** or **suspected** CDI are:

- Symptomatic patients should be nursed in single rooms (i.e. isolation) with en suite facilities, whenever possible (IB).
- If en suite is not available, a designated toilet or commode (transportable toilet) should be provided for each patient with CDI (IB).
- If isolation in single rooms is not possible, isolation in patient cohorts should be undertaken (IB).
- Cohorted patients should be managed by designated staff, where possible, to minimise the risk of infection to other patients (or staff) (IB).
- Isolation precautions may be discontinued when the patient has been symptom-free for 48 hrs and bowel movements have returned to normal (II).
- Symptomatic CDI patients should not be moved between wards for bed management reasons, or transferred to care homes or between care homes, to minimise the risk of cross-contamination [20] (IB).

2.2.5 Hand Hygiene

Specific recommendations for hand hygiene as a control measure to reduce the transmission of CDI are:

- Hand washing using liquid soap and running water and paper towels is recommended for all staff after contact with body substances or body fluids (including faeces), or after contact with the environment of a patient with an enteric illness, i.e. diarrhoea (and/or vomiting) including CDI (IB).
- Washing of hands using liquid soap, running water and paper towels is recommended after removal of gloves and aprons (IB).
- Alcohol-based hand rubs are not effective in removing *C. difficile* spores from hands and should therefore not be the only hand hygiene measure when caring for suspected or confirmed CDI patients (IB).
- Patients and visitors should be strongly encouraged to wash their hands with liquid soap and running water, especially before eating, after using the toilet [21], and when entering and leaving the environment of a patient with diarrhoea to minimise the risk of swallowing spores (II).

2.2.6 Personal protective equipment

Specific recommendations for **personal protective equipment** as a control measure to reduce the transmission of CDI are:

- All staff should wear disposable gloves for contact with patients who have diarrhoea; this includes contact with body substances and contaminated environment, including the immediate vicinity of the patient (IB).
- Disposable plastic aprons should always be used for managing patients who have diarrhoea (IB).
- Washing hands using liquid soap and running water and paper towels is required after removal of gloves and aprons (IB).

2.2.7 Environmental decontamination

There is good evidence that environmental contamination plays a role in the transmission of *C. difficile* [22, 23].

Environmental contamination occurs as a result of *C. difficile* spores being expelled into the environment when patients have diarrhoea with large amounts of liquid stools or faecal incontinence. Heavy contamination can be found on floors, toilets, commodes, beds and other frequently touched surfaces.

Specific recommendations for environmental decontamination (which includes cleaning and disinfection) as a control measure to reduce the transmission of CDI are:

- Environments (hospital wards and care homes, including the immediate vicinity around a CDI patient) should be cleaned and disinfected regularly (at least once a day) concentrating on frequently touched surfaces such as tables, chairs, telephones, door handles, flush and tap handles and hand-sets, e.g. call bells and bed controls (IB).
- When cleaning and disinfecting it is important to physically remove the spores, i.e. thoroughly wiping, rinsing and drying (II).
- Use a disinfectant with 1000 parts per million (ppm) available chlorine (IB).

  This may either be a standalone disinfectant (applied after cleaning) or a combined detergent/chlorine releasing solution. Reference should be made to the NIPCM: http://www.nipcm.scot.nhs.uk/.
- When environmental faecal contamination has occurred, staff who encounter this have the responsibility for cleaning and disinfecting. Cleaning and disinfecting needs to be undertaken as soon as possible (IB).
- Toilets, commodes and items which are likely to be contaminated with faeces should be cleaned meticulously and disinfected after use (IB).
- After transfer/discharge or once the CDI patient has been symptom free for 48 hours and bowel movements have returned to normal, the patient area/room (including the patient's bed) should be cleaned and disinfected thoroughly (i.e. terminal cleaning. See Section 2.3 of the NIPCM) (IB).
- Culture of *C. difficile* from environmental samples is not recommended for routine monitoring of environmental contamination (II).
- Any new products/technologies being considered for environmental decontamination should be formally assessed (e.g. cost, benefit, potential hazards, efficacy and user safety) before they are adopted for application in NHSScotland (i.e. reviewed and recommended by National Procurement/HAI Commodities Group).

2.2.8 Management of care equipment

Spores of *C. difficile* can be transmitted from patient to patient via contact with contaminated care equipment. Care equipment can in some instances be the single source of transmission of *C. difficile* within a unit.

Specific recommendations for management of care equipment as a control measure to reduce the transmission of CDI are:

- Care equipment (such as commodes, blood pressure cuffs and stethoscopes) should be dedicated to a single patient (IB).
- All care equipment should be carefully cleaned and disinfected using a disinfectant with 1000 ppm available chlorine immediately after use (IB).
- Single-use items (including thermometers and other care equipment) should be used when possible (IB).

2.2.9 Antimicrobial stewardship

Use of antimicrobial agents, for therapy or prophylaxis, is the most important predisposing factor for developing CDI.

Background

Exposure to antimicrobial agents leads to disturbance of the normal gut flora, allowing *C. difficile* to proliferate and reach high densities in the colon which may lead to CDI.

Recommendations for the development of institutional antimicrobial stewardship programs have been published by the Infectious Diseases Society of America and the Society of Healthcare Epidemiology of America in 2007 [24].

In principle any antimicrobial agent can predispose for CDI, but some agents have been more frequently implicated in CDI than others [25, 26].

Antimicrobial stewardship should always be promoted as standard in combination with infection prevention and control measures. Good antimicrobial stewardship minimises the antimicrobial exposure of patients in care settings (and elsewhere), and in particular ensures restriction of antimicrobials associated with a high risk of CDI (e.g. cephalosporins, broad spectrum penicillins, fluoroquinolones and clindamycin), thereby reducing the number of patients predisposed to CDI, even if *C. difficile* transmission occurs.

The general recommendations for good antimicrobial stewardship given in the 'The Scottish Management of Antimicrobial Resistance Action Plan 2014-2018' should be followed (http://www.gov.scot/Resource/0045/00456736.pdf).

Reference should also be made to the 'UK 5 Year AMR Strategy 2013 to 2018' (https://www.gov.uk/government/publications/uk-5-year-antimicrobial-resistance-strategy-2013-to-2018).

In addition, the more specific recommendations given in the 'Good Practice Recommendations for Hospital Antimicrobial Stewardship in NHS Scotland' and 'Management of Infection Guidance for Primary care for Consultation and Local Adaptation' should also be followed. The 'Start Smart then Focus' guidance produced by PHE is also a useful framework for optimisation of antimicrobial use in hospitals. These documents can be accessed at:

- http://www.scottishmedicines.org.uk/SAPG/Antibiotic_policies;
- https://www.gov.uk/government/publications/managing-common-infections-guidance-for-primary-care; and
- https://www.gov.uk/government/publications/antimicrobial-stewardship-start-smart-then-focus.

In particular, note should be taken of the role of AMTs and the Primary Care Team in promoting good antimicrobial practice and the responsibility of clinical staff to ensure that antimicrobials are used safely, rationally and effectively in all patients.

Specific recommendations on good **antimicrobial stewardship** to limit the spread of *C. difficile* include:

- Wherever possible stop any non-Clostridial antimicrobial treatment in patients with CDI as soon as possible, considering the risks and benefits of continued treatment (II).
- Ensure local antimicrobial policies are followed and any advice from infection specialists is clearly documented in patients' notes (II).
- Avoid the use of high-risk agents (e.g. cephalosporins, broad spectrum penicillins, fluoroquinolones and clindamycin) in patients at risk. Use these agents only when medically needed (IB).
- Ensure all antimicrobial prescriptions in care settings are reviewed and that duration of therapy or a stop date is clearly documented where possible (II).
- Audit and feedback are efficient tools in changing prescribing habits [24] (IA).
- Surgical prophylaxis should not be continued beyond 24 hours following an operative procedure, except in specific circumstances [27] (II).

The Scottish Intercollegiate Guidelines Network (SIGN) guideline on 'Antibiotic Prophylaxis in Surgery (SIGN 104)' can be accessed at: http://www.sign.ac.uk/guidelines/fulltext/104/index.html.

Improved use of antimicrobial agents in care settings can be achieved by defining 'alert antimicrobial agents' that require authorisation for use from either a pharmacist or microbiologist [28].

Surveillance of antimicrobial use in acute hospitals (as a minimum) of the high-risk agents, by pharmacists in close cooperation with microbiologists, is recommended [29, 30].

There is evidence that concurrent implementation of key infection control measures and antimicrobial stewardship can lead to a reduction in CDI incidence [31].

2.2.10 Specific measures in CDI outbreaks

The key to reducing risk of infection (or controlling an outbreak) is prevention of transmission of *C. difficile* in conjunction with reducing the number of susceptible persons by antimicrobial stewardship.

Specific recommendations on key measures during **outbreaks** are:

- Infection prevention and control teams and health protection teams should always be informed where there is an increased number (or severity) of CDI cases (IB).
- All infection prevention and control precautions should be reinforced (IB).
- Review standard of environmental cleaning to ensure high quality and frequency of decontamination (II).
- Antimicrobial prescribing (frequency, duration and type of drugs) should be reviewed as soon as possible with emphasis on avoiding the use of high-risk drugs (including 3rd generation cephalosporins, broad-spectrum penicillins, fluoroquinolones and clindamycin) (IB) (see section 2.2.9).
- Faecal samples should be stored at -20°C, so that they can be cultured and typed retrospectively if necessary (IB).
- In order to elucidate the epidemiology of *C. difficile*, molecular typing of isolates from CDI cases should be discussed with the reference laboratory (Scottish *Salmonella*, *Shigella* and *Clostridium difficile* Reference Laboratory) (IB).
- Implement interim policies for patient admission, placement and staffing as needed to prevent *C. difficile* transmission (IB).
- Consider closing the ward, unit or other care setting to new admissions (IB).
- Consider terminal cleaning and decontamination to eliminate all potential reservoirs of *C. difficile* (see section 2.3 of the NIPCM) (II).
- When transmission continues review all of the above measures (II).

The Scottish Government guidance on managing public health incidents outlines the roles and responsibilities of Incident Management Teams. This can be accessed at: http://www.gov.scot/Publications/2013/08/6455.

Reference should also be made to Chapter 3 of the NIPCM on Healthcare Infection Incidents, Outbreaks and Data Exceedance: http://www.nipcm.scot.nhs.uk/chapter-3-healthcare-infection-incidents-outbreaks-and-data-exceedance.

2.3 Best practice on antimicrobial treatment and management of CDI

Though not formally considered an element of infection prevention and control, advice on antimicrobial treatment and management of CDI is given in this guidance.

2.3.1 Treatment and management of CDI

Advice on treatment and management of CDI is based on a combination of evidence based recommendations and expert consensus.

Due to the complexity of CDI and its concurrence with other conditions, most clinical trials on CDI treatment are associated with many confounding factors, and unambiguous conclusions are therefore difficult to make. Furthermore, patient safety issues related to experimental treatment of an already very frail patient population makes randomised prospective clinical trials very difficult to conduct.

This section of the guidance has been updated following a systematic review of the literature since publication of the ESCMID and PHE documents: 'Update of the treatment guidance document for *Clostridium difficile* Infection (CDI)' [2] and 'Updated guidance on the management and treatment of CDI' [3], respectively, as well as the 'Practice guidelines for diagnosis, treatment, and prevention of CDI' by Surawicz et al., published in the 'American Journal of Gastroenterology' [4].

Guidance on severity assessment of CDI

Available evidence suggests that specific treatments determined by disease severity result in superior outcome [2]. When assessing the severity of individual CDI cases (for first and recurrent episodes) it is recommended that the following guidance is adhered to (Box 5).

Box 5

Mild CDI is not associated with a raised WBC count; it is typically associated with mild diarrhoea (three loose or liquid stools per day or more frequently than is normal for the person).

Moderate CDI is associated with a raised WBC count that is <15 cells x 10^9/L; it is typically associated with moderate diarrhoea (typically three or more loose or liquid stools per day or more frequently than is normal for the person).

Severe CDI is when a patient has at least one severity marker including temperature >38.5°C, or WBC >15 cells x 10^9/L, or acute rise in serum creatinine (>1.5 x baseline), or evidence of severe colitis in CT scan/abdominal X-ray examination, suspicion of pseudomembranous colitis (PMC), toxic megacolon or ileus.

Life-threatening CDI is when a patient has any of the following attributable to CDI: admission to ICU, hypotension with or without need for vasopressors, ileus or significant abdominal distension, mental status changes, WBC ≥35 cells x 10^9/L or <2 cells x 10^9/L, serum lactate >2.2 mmol/l, end organ failure (mechanical ventilation, renal failure).

Clinical studies indicate improved patient outcome (superiority) of specific treatment strategies depending on severity of disease. However, few prospective and validated studies have been done on clinical predictors of outcome, and results from studies assessing risk factors for severe disease are conflicting, which precludes the ability to set a clear list of markers for severity [2, 3]. The markers given in Box 5 are therefore based on consensus agreement of the available evidence and are not exhaustive. Further patient characteristics associated with severity and prognostic markers that can be used to determine increased risk of developing severe or life threatening disease are given in Table 1and Table 2 (adapted from [2]).

Severe CDI is not always associated with diarrhoea. Clinicians should therefore consider CDI in patients who show signs of ileus or have sepsis and some of the major risk factors (see Table 1and Table 2).

Table 1: Patient characteristics that could reasonably be assumed to correlate positively with severity of CDI in the absence of another explanation for these findings (adapted from Debast, S. B., et al., 2013 [2]).

Category	Signs/symptoms
Physical examination	• Fever (core body temperature >38.5°C). • Rigours (uncontrollable shaking and a feeling of cold followed by a rise in body temperature). • Haemodynamic instability including signs of distributive shock. • Respiratory failure requiring mechanical ventilation. • Signs and symptoms of peritonitis. • Signs and symptoms of colonic ileus. Blood in stools is rare in CDI and the correlation with severity of disease is uncertain.
Laboratory investigations	• Marked leucocytosis (WBC >15 cells x 10^9/L). • Marked left shift (band neutrophils >20% of leukocytes). • Rise in serum creatinine (>1.5 x baseline). • Elevated serum lactate (≥5 mmol/L). • Markedly reduced serum albumin (<30 g/l).
Colonoscopy or sigmoidoscopy	• Pseudomembranous colitis. There is insufficient knowledge on the correlation of endoscopic findings compatible with CDI, such as oedema, erythema, friability and ulceration, and the severity of disease.
Imaging (including CT)	• Distension of large intestine (>6 cm in transversal width of colon). • Colonic wall thickening including low-attenuation mural thickening. • Pericolonic fat stranding. • Ascites not explained by other causes. The correlation of haustral or mucosal thickening, including thumbprinting, pseudopolyps and plaques, with severity of disease is unclear.

Table 2: Prognostic markers that can be used to determine increased risk of developing severe or life threatening CDI (adapted from Debast, S. B., et al., 2013 [2]). References as numbered in the table are provided in this guidance.

Characteristics	SoR*	QoE**	Ref(s) not exhaustive	Comment(s)
Age (≥65 years)	A	IIr	[56,57, 58]	Large cohort study on CDI mortality at 30 days, and review of studies of factors associated with CDI outcome [57]. Systematic review of studies describing the derivation or validation of Clinical Prediction Rules for unfavourable outcomes of CDI [58]: in general methodological biases and weak validities.
Marked leukocytosis (WBC >15 cells x 10^9/L)	A	IIrht	[56, 58, 59, 60, 61, 62, 63]	Systematic review [58]: in general methodological biases and weak validities. Cohort study: severity score on malignancy, white blood cell count, blood albumin, and creatinine [59]. Retrospective cohort study on risk factors for severe CDI: death <30 days, ICU, colectomy or intestinal perforation [56].
Decreased blood albumin (<30 g/L)	A	IIr	[56, 58, 59, 64, 40,65]	Systematic review [58]: in general methodological biases and weak validities.
Rise in serum creatinine level (≥1.5 x baseline)	A	IIht	[56, 57, 59, 61]	Depending on the timing of measurement around CDI diagnosis [61].
Comorbidity (severe underlying disease and/or immunodeficiency)	B	IIht	[57, 59, 62, 66]	Comorbidity: wide variety of risk factors described/investigated, including cancer, cognitive impairment, cardiovascular, respiratory and kidney disease [57]. Chronic pulmonary disease, chronic renal disease and diabetes mellitus [66]. History of malignancy [59]. Prior operative therapy, inflammatory bowel disease and intravenous immunoglobulin treatment [62].

* SoR: strength of recommendation to use a (clinical) characteristic as a prognostic marker.
**QoE: quality of evidence (refer to [2]).

2.3.2 Treatment of first episode of CDI including mild, moderate and severe disease (Algorithm 1)

Treatment of first episode

Oral metronidazole (400-500 mg three times daily) is recommended for mild and moderate CDI as it is as effective as oral vancomycin and less costly. Oral vancomycin (125 mg four times daily) is preferred for treatment of severe disease as it is superior to metronidazole in severe cases [2, 3]. Although doses of up to 500 mg have been used, there is insufficient evidence to support this [2].

- Treatment should be started as soon as CDI is suspected (do not wait for laboratory result to confirm diagnosis before initiating treatment and putting control measures in place) (IB).
- Treatment of CDI should be initiated based on assessment of symptoms and severity of disease while taking into account individual risk factors of the patient (II) (see Algorithm 1: Treatment of first episode of CDI in adults).
- When the patient has no severity markers (i.e. mild to moderate disease) treat the first episode with oral metronidazole 400-500 mg three times per day for 10 days (IA).
- When the patient has one or more severity markers (i.e. severe disease) treat the first episode with oral vancomycin 125 mg four times per day for 10 days (IA).
- Fidaxomicin is not recommended for treatment of the first episode of CDI (II).
- For mild to moderate CDI in patients who are intolerant/allergic to metronidazole and for pregnant/breastfeeding woman (due to concerns of placental/breast milk transmission), vancomycin should be used at standard dosing (IA).
- Stop any non-Clostridial antimicrobial treatment in patients with CDI if possible (II).
- Stop any use of anti-motility agents and gastric acid suppressant agents (including proton pump inhibitors/H2 antagonists) if possible (II).
- It is essential that CDI patients are closely monitored until they are symptom free (II).
- There is insufficient evidence to support administration of probiotics, toxin binding resins and polymers, or monoclonal antibodies for treatment of CDI [2].
- Treatment, and infection prevention and control measures, are the same regardless of the *C. difficile* ribotype involved (IIB).

There are few specific guidelines for the treatment of CDI in children [32, 33]. Recommended doses for metronidazole and vancomycin are provided by the British National Formulary for Children:

- Metronidazole (for mild to moderate CDI): https://bnfc.nice.org.uk/drug/metronidazole.html#indicationsAndDoses.
- Vancomycin (for severe and life threatening CDI): https://bnfc.nice.org.uk/drug/vancomycin.html#indicationsAndDoses.

Patient assessment

Previous reports on the standard of care for CDI patients has identified the lack of regular review and lack of multidisciplinary assessment of patients prone to electrolyte imbalance, dehydration, malnutrition and pressure sores as factors leading to poor outcome.

- In the acute and non-acute setting, each patient should be reviewed daily regarding fluid balance, electrolyte replacement, nutrition, and monitoring for signs of increasing severity (including WBC count, temperature, findings of abdominal examination, bowel movements and overall clinical status of patients) (II).
- For CDI cases in a care home, daily assessment should involve monitoring for signs of increasing severity (including fever, rigors, and bowel movements (II).
- For CDI cases receiving care at home, advise the patient to contact GP if symptoms (including fever, rigors, and bowel movements) worsen while on treatment (II).

Treatment response and further patient management

Treatment response is present when either stool frequency decreases or stool consistency improves and parameters of disease severity (clinical, laboratory, radiological) improve and no new signs of severe disease develop. All other cases should be considered as having treatment failure. Treatment response should be observed daily and evaluated after at least three days, assuming the patient is not worsening [2]. Treatment with metronidazole, in particular, may only result in a clinical response after three to five days [2].

The usual duration of therapy is 10 days for patients who are responding to the treatment.

- CDI patients with mild to moderate disease who show improvement during initial metronidazole therapy, as evidenced by decreased number of bowel movements, improvement in WBC, fever and abdominal symptoms should continue to receive this regimen (II).
- For CDI patients with mild to moderate disease whose clinical condition worsens (at any time) or those who fail to improve after five days of metronidazole administration, treatment should be switched to oral vancomycin, 125 mg four times per day for 10 days (II).
- If after 10 days treatment, diarrhoea is still persisting, seek specialist advice and investigate other pathologies that could be responsible for diarrhoea (II).
- Supportive care should be delivered to all patients with severe CDI and includes intravenous fluid resuscitation, electrolyte replacement, and pharmacological venous thromboembolism prophylaxis. In the absence of ileus or significant abdominal distension, oral or enteral feeding should be continued (II).

Early surgery in patients with life-threatening CDI

Continued worsening of symptoms, especially an increase in WBC and hypotension, is an indication for surgical, gastroenterology and microbiology/infectious diseases consultations. The more negative prognostic signs a patient has, the earlier surgical consultation and surgical intervention should be considered.

Surgery is of benefit to patients with life-threatening CDI, and early surgical consultation has been associated with improved survival. Early surgical intervention before the development of shock and organ failure leads to improved survival [3].

- Surgical consultation should be obtained on all patients with life threatening CDI. Surgery should be considered in patients with any one of the following attributed to CDI:
    - admission to intensive care unit (ICU) for CDI;
    - hypotension with or without required use of vasopressors;
    - ileus or significant abdominal distension;
    - mental status changes;
    - WBC ≥35 cells x 10^9/L or <2 cells x 10^9/L;
    - serum lactate >2.2 mmol/l;
    - end organ failure (mechanical ventilation, renal failure, etc.) (IB).

Treatment when oral administration of antimicrobials is not possible

In patients whose gastrointestinal tract function is compromised, delivery of orally administered drugs to the colon is not reliable. When oral treatment is not possible, parenteral metronidazole is recommended, preferably combined with intracolonic or nasogastric administration of vancomycin [2].

- For patients with mild to moderate disease in whom oral treatment is not possible, treat with intravenous metronidazole 500 mg three times per day for 10 days [2] (IB).
- For patients with severe disease in whom oral treatment is not possible or ileus is present, treat with intravenous metronidazole 500 mg three times per day for 10 days plus intracolonic vancomycin retention enema 500 mg in 100 ml normal saline four times daily (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/321891/Clostridium_difficile_management_and_treatment.pdf); or treat with intravenous metronidazole 500 mg three times per day for 10 days plus nasogastric administration of vancomycin 500 mg four times per day [2] (II).
- Treatment should be switched to oral administration as soon this route for treatment becomes available again (II).
- Recommended treatments apply to both first and recurrent episodes of CDI.
- See Algorithm 1: Treatment of first episode of CDI in adults.

2.3.3 Treatment of first recurrence of CDI including mild, moderate and severe disease (Algorithm 2)

Treatment of first recurrence

Recurrent disease (Box 6) is caused by either reinfection from a contaminated environment or poor hand hygiene, or relapse from germinating spores in the gut [34]. Poor immune response and persistent disruption of the gut flora appear to be the most important factors in developing multiple episodes of CDI [35, 36]. A vicious cycle can be created when the antimicrobial drug prescribed for CDI disturbs the normal flora of the gut leaving the patient more vulnerable to recurrent infection [26].

Recurrent CDI is associated with significantly increased risk of death within 6 months after the initial episode of CDI compared with patients who do not develop recurrence. This suggests that recurrent CDI may precipitate a decline in patient function over time compared to patients who do not develop a recurrence [37]. Patients with recurrent CDI also have a higher risk of getting readmitted to hospital [38].

A wide variety of prognostic markers for severe or recurrent CDI have been suggested in the literature, which makes it difficult to set a rigid clinical prediction rule. However, results from individual studies, reviews and meta-analyses on prognostic markers for CDI have been evaluated by Debast et al. (2013) to reach a consensus on a selection of prognostic markers that may be useful in clinical practice to distinguish patients with increased risk for severe or life-threatening CDI (see Table 1and Table 2) and recurrences (See Table 3) [2]. A more recent systematic review and meta-analysis by Deshpande et al. (2015) confirmed the validity of modifiable risk factors for recurrent CDI to include continuous use of antibiotics and PPIs during follow up [39].

Box 6

Definition of recurrent disease

Recurrence is defined as CDI which re-occurs within two to eight weeks after onset of a previous episode, provided symptoms from the previous episode resolved after completion of initial treatment [40].

Oral vancomycin is recommended for treatment of first recurrence of CDI, even when the recurrence results in mild disease [2]. Fidaxomicin (Dificlir®) has demonstrated noninferiority to vancomycin in the clinical cure of CDI and superiority in reducing recurrence, and is accepted for restricted use within NHSScotland. However, treatment with fidaxomicin of a first recurrence, whether severe or non-severe, **should only be initiated following following consultation with local microbiologists or specialists in infectious diseases** (https://www.scottishmedicines.org.uk/SMC_Advice/Advice/791_12_fidaxomicin_dificlir/fidaxomicin_Dificlir).

Table 3: Prognostic markers that can be used to determine increased risk of recurrent CDI (adapted from Debast, S. B., et al., 2013 [2]). References as numbered in the table are provided in this guidance.

Characteristics	SoR*	QoE**	Ref(s) not exhaustive	Comment(s)
Age (≥65 years)	A	IIrh	[58, 67, 68, 69]	Meta-analysis: [68]. Systematic review: [58]. Prospective validation study of risk factor: [67].
Continued use of (non-CDI) antimicrobials after diagnosis of CDI and/or after CDI treatment	A	IIrh	[67, 68]	Meta-analysis: [68]. Prospective validation study of risk factor: [67].
Comorbidity (severe underlying disease) and/or renal failure	A	IIh	[61, 67, 70]	Prospective validation study of risk factor: comorbidity conditions rated by Horn's index (scoring system for underlying disease severity) [67].
A history of previous CDI (>1 recurrences)	A	IIt	[64, 71-74]	Data from randomised controlled trials: [71, 73]. Meta-analysis of pivotal randomized controlled trials [64].
Concomitant use of antacid medications (PPIs/H2 antagonists)	B	IIrh	[68, 75]	Meta-analysis on recurrent CDI: [68]. Meta-analysis on CDI:[75].
Initial disease severity	B	IIth	[67, 69]	Prospective validation study of risk factor [67]. Long-term population based cohort study [69].

*SoR: strength of recommendation to use a (clinical) characteristic as a prognostic marker.
**QoE: quality of evidence (refer to [2]).

- Treatment of CDI should be initiated based on assessment of (recurring) symptoms and a positive laboratory test or pending result of laboratory test result plus suspicion of CDI (IB).
- If a patient has a recurrence of CDI after apparently successful treatment of the first episode (i.e. the case has had symptom free days), anti-clostridial antimicrobial treatment should be based on severity assessment (II).
- If the recurrence is mild to moderate CDI, treat with oral vancomycin 125 mg four times per day for 10 days (IB).
- Oral fidaxomicin 200 mg two times per day for 10 days may be considered only on advice of local microbiologists or specialists in infectious diseases (II).
- If the recurrence is severe CDI, treat with oral vancomycin 125 mg four times per day for 10 days (IA) or as above when treatment with oral administration of antimicrobials is not possible (page 29) (II).
- Consider treating severe first recurrence with oral fidaxomicin 200 mg two times per day for 10 days only on advice of local microbiologists or specialists in infectious diseases (II).

2.3.4 Treatment of second and subsequent recurrences of CDI (Algorithm 3)

Treatment of second recurrence

In mild/moderate recurrences of CDI, oral vancomycin and fidaxomicin are equally effective in resolving CDI symptoms, but fidaxomicin has shown to be associated with a lower likelihood of CDI recurrence after a first recurrence [2].

Vancomycin is preferably administered using tapered and/or pulsed regimens. The background for this is that vancomycin is only effective against the vegetative form of *C. difficile* but not the spores. The periodical lower drug concentrations in tapered and pulsed dosing regimens are believed to allow the normal gut flora to recover while suppressing the growth of *C. difficile* vegetative forms [26].

- If the second recurrence is mild to moderate CDI, treat with a tapered and/or pulsed regimen of vancomycin such as 125 mg four times daily for one week, 125 mg three times daily for one week, 125 mg twice daily for one week, 125 mg once daily for one week, 125 mg on alternate days for one week, 125 mg every third day for one week (six weeks in total) [41] (IB).
- Oral fidaxomicin, 200 mg two times per day for 10 days, may be preferred on advice of local microbiologists or specialists in infectious diseases (II).
- At this stage, early consultation for faecal transplant may be considered through conversation with patient/relatives (II).

Treatment of third and subsequent recurrences

Faecal microbiota transplantation (FMT) is strongly recommended for multiple recurrent CDI by current European guidelines [2], though only one additional randomised controlled trial has been published since 2011 [42, 43]. In addition to this, further evidence has been published supporting the use of FMT for non–resolving severe CDI, although this is largely case series based [44-46].

As FMT has become more widely used, there is an increasing appreciation of potential adverse events. Although these would appear to be rare and the risks outweighed by the potential benefit in the majority of patients they should form part of the discussions to use FMT. Transient gastro-intestinal upset, aspiration pneumonia, bacteraemia and transient worsening of diverticular disease and inflammatory bowel disease have been reported [47-50].

FMT has been prepared and administered in different ways and efficacy would appear to be similar regardless of this variance [42, 51-55]. As such, the method of administering FMT will vary by site and depend upon local experience and patient preference. It is therefore beyond the scope of these guidelines to suggest any particular method.

Early consultation for FMT during a second recurrence will allow time to discuss and plan FMT if there are further recurrences. As yet, there is insufficient evidence to support the use of FMT for the initial treatment of CDI or for first recurrence.

If FMT is not possible, oral treatment with vancomycin using tapered and/or pulsed regimens (or a standard 10 day course of fidaxomicin if not give for an earlier recurrance) are recommended. Efficacy of fidaxomicin for multiple recurrences has not been investigated, although it may be considered based on lower likelihood of CDI recurrence after first recurrence [2].

- Consider treating third and subsequent recurrences with faecal transplantation (nasogastric/rectal infusion of donor faeces) following an initial treatment of vancomycin 500 mg four times per day for four days (IA) (see Algorithm 3: Treatment of second and subsequent recurrence of CDI in adults).
- If faecal transplant is not possible, treat third and subsequent mild/moderate recurrences with a tapered and/or pulsed regimen of vancomycin such as 125 mg four times daily for one week, 125 mg three times daily for one week, 125 mg twice daily for one week, 125 mg once daily for one week, 125 mg on alternate days for one week, 125 mg every third day for one week (six weeks in total) [41] (IB).
- Oral fidaxomicin, 200 mg two times per day for 10 days, may be preferred on advice of local microbiologists or specialists in infectious diseases (II).
- If any recurrence results in severe CDI, then treatment is as above for severe disease (see Algorithm 1: Treatment of first episode of CDI in adults).
- There is insufficient evidence to support the use of IV immunoglobulin or probiotics for the treatment of recurrent CDI [2].

Algorithm 1: Treatment of first episode of CDI in adults[i]

Treatment of CDI should be initiated based on **assessment of symptoms** and **severity of disease** while taking into account individual **risk factors** of the patient (II).

Severity markers:

- Temperature >38.5°C.
- Suspicion of PMC, toxic megacolon, ileus.
- Evidence of severe colitis in CT scan/Xray.
- WBC >15 cells x 10^9L.
- Acute rising serum creatinine >1.5 x baseline.

Patient has no severity markers:

- Treat with **oral metronidazole 400-500 mg three times a day for 10 days** (IA).
- Rehydrate patient.

Daily assessment of patient with mild to moderate disease:

- Observe bowel movement, symptoms (e.g. WBC, fever and hypotension), nutrition and fluid balance and for signs of increasing severity (II).
- If condition does not improve after five days of treatment with metronidazole or worsens at any time, patient should be switched to treatment with vancomycin (125 mg four times a day for 10 days) (II).
- If oral route not available: metronidazole i.v. 500 mg **three times a day** 10 days (IB).
- If after 10 days treatment, diarrhoea still persists, seek specialist advice (II).

Patient has one severity marker:

- Treat with **oral vancomycin 125 mg four times a day for 10 days** (IA).
- Rehydrate patient.
- **Surgical consultation** should be obtained on all patients with life threatening disease, i.e. if any one of the following: admission to ICU for CDI; hypotension with or without required use of vasopressors; ileus or significant abdominal distension; mental status changes, WBC ≥35 cells x 10^9/L or <2 cells x 10^9/L; serum lactate >2.2 mmol/l; end organ failure (mechanical ventilation, renal failure, etc (IB).
- If oral route is not available or ileus is detected, treat with 500 mg metronidazole i.v. **three times a day for 10 days** plus vancomycin 500 mg four times a day (intracolonic or nasogastric) until ileus is resolved (II).

Daily assessment of patient with severe disease:

- Observe bowel movement, symptoms (e.g. WBC and hypotension), nutrition and fluid balance and for signs of increasing severity (II).
- Supportive care: intravenous fluid resuscitation, electrolyte replacement, and pharmacological venous thromboembolism prophylaxis. In the absence of ileus or significant abdominal distension, oral or enteral feeding should be continued (II).
- Gastroenterology and microbiology consultations. CT scanning/abdominal X-ray; consider PMC, toxic megacolon, ileus or perforation.

i For treatment of mild to moderate CDI in children please refer to: https://bnfc.nice.org.uk/drug/metronidazole.html#indicationsAndDoses.

For treatment of severe and life threatening CDI in children please refer to: https://bnfc.nice.org.uk/drug/vancomycin.html#indicationsAndDoses.

Algorithm 2: Treatment of first recurrence of CDI in adults[ii]

Treatment of CDI should be initiated based on **assessment of symptoms** and **severity of disease** while taking into account individual **risk factors** of the patient (II).

Severity markers:

- Temperature >38.5°C.
- Suspicion of PMC, toxic megacolon, ileus.
- Colonic dilatation in CT scan/abdominal X-ray >6 cm.
- WBC >15 cells x 10^9L.
- Acute rising serum creatinine >1.5 x baseline.

Patient has no severity markers:

- Treat with **oral vancomycin 125 mg four times a day for 10 days (IB), or oral fidaxomicin 200 mg twice daily for 10 days** (on advice of local microbiologists or specialists in infectious diseases (II)).
- Rehydrate patient.

Daily assessment of patient with mild to moderate disease:

- Observe bowel movement, symptoms (e.g. WBC, fever and hypotension), nutrition and fluid balance.
- If condition does not improve after five days, seek specialist advice (II).

Patient has one severity marker:

- Treat with **oral vancomycin 125 mg four times a day for 10 days** (IA). Consider treating severe first recurrence with **oral fidaxomicin 200 mg two times per day for 10 days** only on advice of local microbiologists or specialists in infectious diseases (II).
- Rehydrate patient.
- **Surgical consultation** should be obtained on all patients with life threatening disease i.e. if any one of the following: admission to ICU for CDI; hypotension with or without required use of vasopressors; ileus or significant abdominal distension; mental status changes, WBC ≥35 cells x 10^9/L or <2 cells x 10^9/L; serum lactate >2.2 mmol/l; end organ failure (mechanical ventilation, renal failure, etc (IB).
- If oral route is not available or ileus is detected, treat with 500 mg metronidazole i.v. t**hree times a day for 10 days** plus vancomycin 500 mg four times a day (intracolonic or nasogastric) until ileus is resolved (II).

Daily assessment of patient with severe disease:

- Observe bowel movement, symptoms (e.g. WBC and hypotension), nutrition and fluid balance and for signs of increasing severity (II).
- Supportive care: intravenous fluid resuscitation, electrolyte replacement, and pharmacological venous thromboembolism prophylaxis. In the absence of ileus or significant abdominal distension, oral or enteral feeding should be continued (II).
- Gastroenterology and microbiology consultations. CT scanning/abdominal X-ray; consider PMC, toxic megacolon, ileus or perforation.

ii For treatment of mild to moderate CDI in children please refer to: https://bnfc.nice.org.uk/drug/metronidazole.html#indicationsAndDoses.

For treatment of severe and life threatening CDI in children please refer to: https://bnfc.nice.org.uk/drug/vancomycin.html#indicationsAndDoses.

Algorithm 3: Treatment of second and subsequent recurrence of CDI in adults[iii]

Treatment of CDI should be initiated based on **assessment of symptoms** and **severity of disease** while taking into account individual **risk factors** of the patient (II).

Severity markers:

- Temperature >38.5°C.
- Suspicion of PMC, toxic megacolon, ileus.
- Colonic dilatation in CT scan/abdominal X-ray >6 cm.
- WBC >15 cells x 10^9L.
- Acute rising serum creatinine >1.5 x baseline.

Patient has no severity markers:

- Treat with a **tapered and/or pulsed regimen of vancomycin such as 125 mg four times daily for one week, 125 mg three times daily for one week, 125 mg twice daily for one week, 125 mg once daily for one week, 125 mg on alternate days for one week, 125 mg every third day for one week** (IB).
- **Oral fidaxomicin 200 mg twice daily for 10 days** may be preferred (on advice of local microbiologists or specialists in infectious diseases (II)).
- If second recurrence, begin consultation with patient/relative on suitability for faecal transplantation (II).
- Multiple recurrent CDI (third and subsequent episodes) may then be treated with faecal transplantation (nasogastric infusion of faeces), including vancomycin 500 mg four times a day for four days (IA).
- If treatment with faecal transplant is not possible treat with vancomycin or fidaxomicin as above.
- Rehydrate patient.

Daily assessment of patient with mild to moderate disease:

- Observe bowel movement, symptoms (e.g. WBC, fever and hypotension), nutrition and fluid balance.
- If condition does not improve, seek specialist advice (II).

Patient has one severity marker:

- Treat with **oral vancomycin 125 mg four times a day for 10 days** (IA).
- Rehydrate patient.
- **Surgical consultation** should be obtained on all patients with life threatening disease i.e. if any one of the following: admission to ICU for CDI; hypotension with or without required use of vasopressors; ileus or significant abdominal distension; mental status changes, WBC ≥35 cells x 10^9/L or <2 cells x 10^9/L; serum lactate >2.2 mmol/l; end organ failure (mechanical ventilation, renal failure, etc (IB).
- If oral route is not available or ileus is detected, treat with 500 mg metronidazole i.v. t**hree times a day for 10 days** plus vancomycin 500 mg four times a day (intracolonic or nasogastric) until ileus is resolved (II).

Daily assessment of patient with severe disease:

- Observe bowel movement, symptoms (e.g. WBC and hypotension), nutrition and fluid balance and for signs of increasing severity (II). If patient no longer shows any more severity markers treat as in left-hand box of this algorithm).
- Supportive care: intravenous fluid resuscitation, electrolyte replacement, and pharmacological venous thromboembolism prophylaxis. In the absence of ileus or significant abdominal distension, oral or enteral feeding should be continued (II).
- Gastroenterology and microbiology consultations. CT scanning/abdominal X-ray; consider PMC, toxic megacolon, ileus or perforation.

iii For treatment of mild to moderate CDI in children please refer to: https://bnfc.nice.org.uk/drug/metronidazole.html#indicationsAndDoses.

For treatment of severe and life threatening CDI in children please refer to: https://bnfc.nice.org.uk/drug/vancomycin.html#indicationsAndDoses.

2.4 Advice for members of staff with diarrhoea and/or confirmed CDI[iv]

Advice for care staff with diarrhoea and/or confirmed CDI:

As care staff could potentially infect vulnerable patients (and co-workers and visitors), staff who have diarrhoea should not work, and if CDI is confirmed and treated, should not return to work until treatment is completed and symptoms (i.e. diarrhoea) have been absent for at least 48 hours and bowel movement have returned to normal.

If a member of staff is diagnosed with CDI, this should be reported to Occupational Health (or equivalent arrangement for ill health).

If diagnosed with CDI which was acquired at work the incident should be reported by the employing care facility/care home to the Health and Safety Executive under RIDDOR.

See link for instructions: http://www.hse.gov.uk/riddor/report.htm.

iv These recommendations are not evidence-based but should be implemented to protect the health of staff members, patients and visitors.

Appendix A: Grading of evidence and categories for implementation in clinical practice

Grading of evidence

The level of evidence for the key recommendations in this guidance was graded in the systematic literature review by the ESGCD [1], or HPS according to the approach described in the review by ESGCD (and in this appendix).

The quality of each study (i.e. level of evidence) was determined according to standards of the Oxford Centre for Evidence Based Medicine.

Levels	Levels of evidence
1a	Systematic review (with homogeneity) of randomised controlled trials.
1b	Individual randomised controlled trial (with narrow confidence interval).
1c	Studies with the outcome 'all or none'.
2a	Systematic review (with homogeneity) of cohort studies.
2b	Individual cohort study (including low-quality randomised controlled trials; e.g.<80% follow-up).
2c	Outcomes research, ecological studies.
3a	Systematic review (with homogeneity) of case-control studies.
3b	Individual case-control study.
4	Case series (and poor quality cohort and case-control studies).
5	Expert opinion without explicit appraisal, or based on physiology, bench research or 'first principles'.

Grades of recommendation:

A is given when consistent with level 1 studies.

B is given when consistent with level 2 or 3 or extrapolations from level 1.

C is given when consistent with level 4 or extrapolations from level 2 or 3.

D (or II) is given when consistent with level 5 or where there are troubling inconsistent or inconclusive studies of any level.

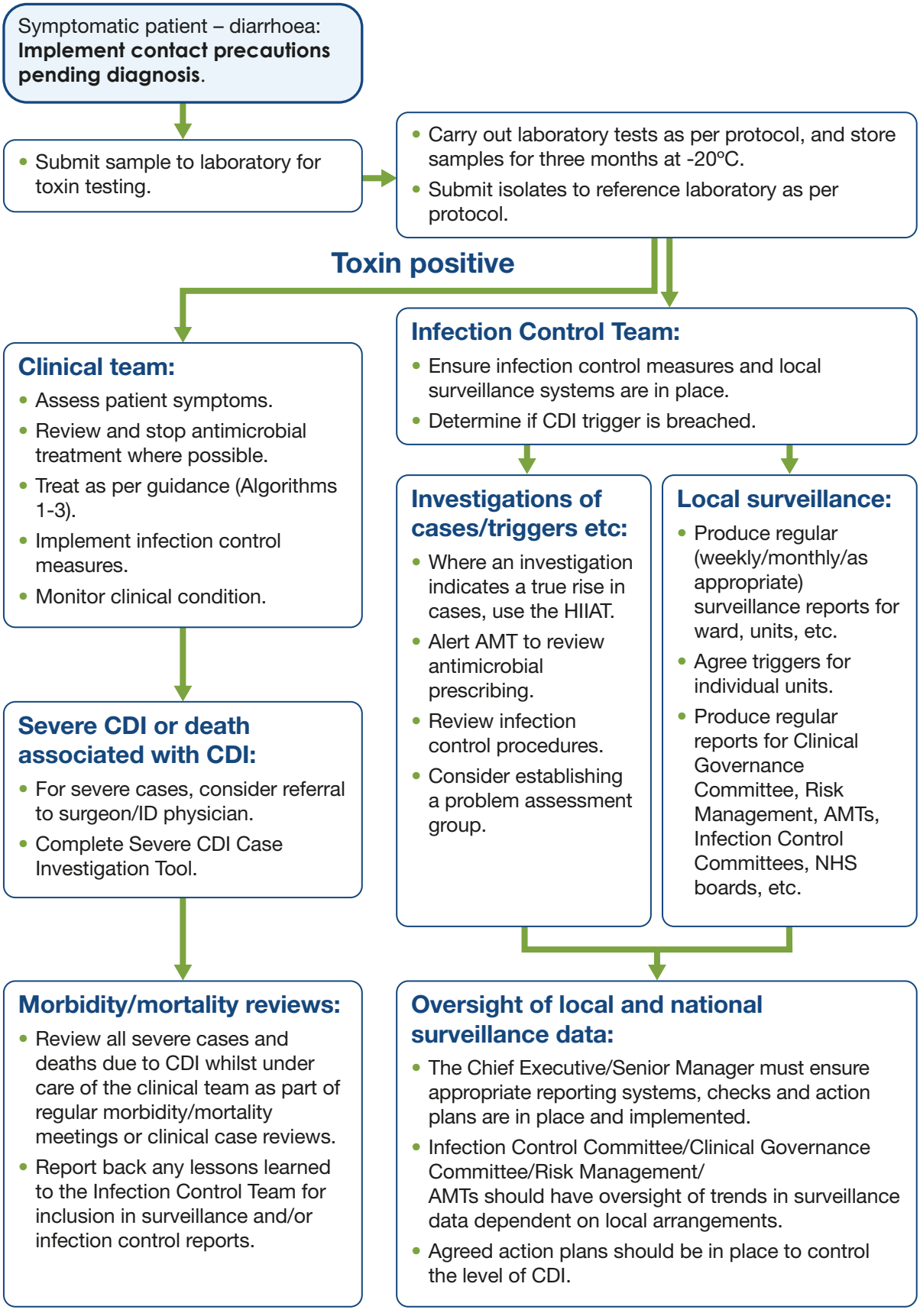
Further explanations of this grading system can be accessed at: http://www. cebm.net/index.aspx?o=1025.

Categories for implementation in clinical practice

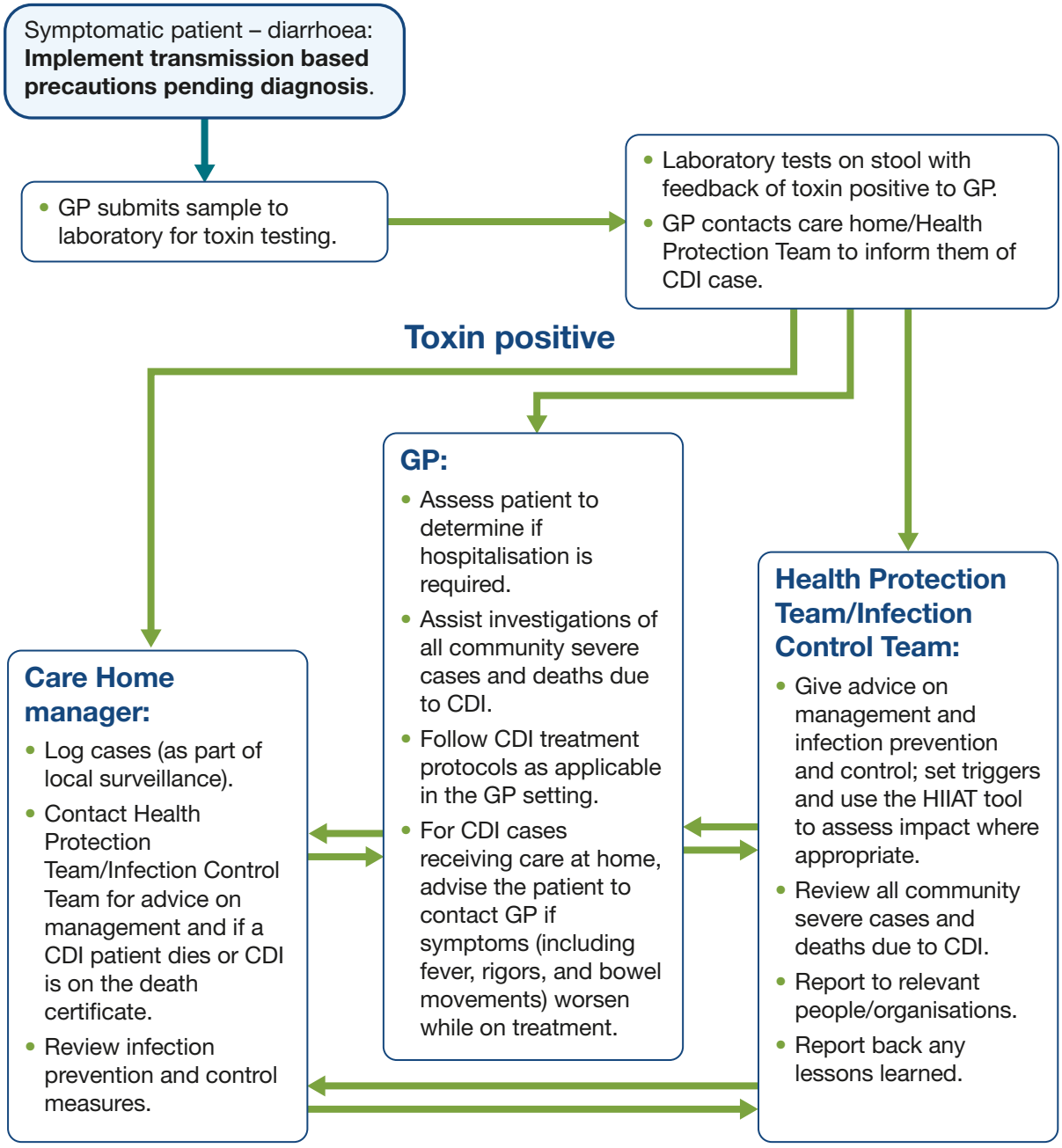
Categories for implementation in clinical practice were (in the review by ESGCD [1]) generated based on the HICPAC guidelines.

Catergories	HICPAC Categories for implementation in clinical practice
IA	Strongly recommended for implementation and strongly supported by well-designed experimental, clinical or epidemiological studies.
IB	Strongly recommended for implementation and strongly supported by some experimental, clinical or epidemiological studies and a strong theoretical rationale.
IC	Required for implementation, as mandated by state regulation or standard (may vary among different states/countries).
II	Suggested for implementation and supported by suggestive clinical or epidemiological studies or a theoretical rationale.
Unresolved issue	Practices for which insufficient evidence exists or no consensus regarding efficacy exists (no recommendation).

Appendix B: Short guide to managing CDI in healthcare settings



Appendix C: Short guide to managing CDI in the community



Appendix D: Links to associated documents

Testing for *C. difficile*

Recommended Protocol for Testing for *Clostridium difficile* and Subsequent Culture (2016): http://www.hps.scot.nhs.uk/haiic/sshaip/publicationsdetail.aspx?id=53536.

CDI surveillance

Protocol for the Scottish surveillance programme for CDI: http://www.hps.scot.nhs.uk/haiic/sshaip/guidelinedetail.aspx?id=40899.

How to collect stool specimens

For healthcare staff, patients/residents, or carers at home: http://www.hps.scot.nhs.uk/haiic/sshaip/resourcedetail.aspx?id=177.

Reporting

Hospital Infection Incident Assessment Tool (HIIAT): http://www.nipcm.scot.nhs.uk/appendices/appendix-14-nipcm-healthcare-infection-incident-assessment-tool-hiiat/.

RIDDOR reporting of illness among staff members: http://www.hse.gov.uk/riddor/ report.htm.

Infection prevention and control

HPS National Infection Prevention and Control Manual: http://www.nipcm.scot.nhs.uk/

CDI Trigger Tool: http://www.hps.scot.nhs.uk/haiic/ic/publicationsdetail.aspx?id=42508.

Patient leaflets:

http://www.hps.scot.nhs.uk/haiic/ic/guidelinedetail.aspx?id=38654
(Hospital patients and visitors);

http://www.hps.scot.nhs.uk/haiic/ic/guidelinedetail.aspx?id=39108
(Residents and visitors of care homes); and

http://www.hps.scot.nhs.uk/haiic/ic/guidelinedetail.aspx?id=39120
(Home laundering of patient items).

Infection prevention and control supporting documents:

CDI Severe Case Investigation Tool: http://www.hps.scot.nhs.uk/haiic/sshaip/publicationsdetail.aspx?id=44042.

Checklists for preventing and controlling CDI: http://www.hps.scot.nhs.uk/haiic/ sshaip/publicationsdetail.aspx?id=38848.

Antimicrobial management

Scottish Management of Antimicrobial Resistance Action Plan: http://www.gov.scot/Resource/0045/00456736.pdf.

UK 5 Year AMR Strategy 2013 to 2018: https://www.gov.uk/government/publications/uk-5-year-antimicrobial-resistance-strategy-2013-to-2018.

Good Practice Recommendations for Hospital Antimicrobial Stewardship in NHS Scotland: http://www.scottishmedicines.org.uk/SAPG/Antibiotic_policies.

Management of Infection Guidance for Primary care for Consultation and Local Adaptation: https://www.gov.uk/government/publications/managing-common-infections-guidance-for-primary-care.

Start Smart then Focus: https://www.gov.uk/government/publications/antimicrobial-stewardship-start-smart-then-focus.

SIGN guideline on Antibiotic Prophylaxis in Surgery (SIGN 104): http://www.sign.ac.uk/guidelines/fulltext/104/index.html.

Education

NHS Education for Scotland (NES) Scottish Infection Prevention and Control Education Pathway (SIPCEP): http://www.nes.scot.nhs.uk/education-and-training/by-theme-initiative/healthcare-associated-infections/scottish-infection-prevention-and-control-education-pathway.aspx.

CDI training resources developed by NHS Education for Scotland: http://www.nes.scot.nhs.uk/education-and-training/by-theme-initiative/healthcare-associated-infections.aspx.

Outbreaks

Scottish Government guidance on managing public health incidents: http://www.scotland.gov.uk/Resource/0039/00392132.pdf.

Treatment

Scottish Medicines Consortium advice on use of fidaxomicin in adults with CDI: https://www.scottishmedicines.org.uk/SMC_Advice/Advice/791_12_fidaxomicin_dificlir/fidaxomicin_Dificlir.

Recommended doses for metronidazole and vancomycin provided by the British National Formulary for Children:

- Metronidazole (for mild to moderate CDI): https://bnfc.nice.org.uk/drug/metronidazole.html#indicationsAndDoses.
- Vancomycin (for severe and life threatening CDI): https://bnfc.nice.org.uk/drug/vancomycin.html#indicationsAndDoses.

Appendix E: Glossary

Anaerobic

Living or active in the absence of free oxygen.

Antimicrobial

A substance that kills or inhibits the growth of microorganisms such as bacteria, viruses, fungi, or protozoans. This includes antibiotics, antivirals, antifungals and antiparasitics.

Antimicrobial (antibiotic) prescribing policy

A set of guidance for the careful and sensible use of antibiotics and other antimicrobial drugs.

Cohort

A group of individuals with some characteristics in common (in this case, infection with CDI).

Endemic

The constant presence of an agent or health condition (such as CDI) in a particular geographical location or population.

Endoscope

A medical instrument for examining the interior of a hollow body organ or for minor surgery.

Epidemiology

The study of the determinants and distribution of health related events in a population and the application of that study in the prevention and control of health problems.

Hypochlorite

A chemical compound containing chlorine; used for disinfection.

Immunocompromised

Any condition in which the body is unable to develop a normal immune response.

Incidence

A measure of the frequency with which new cases of illness, injury or other health condition occurs among a population during a specified period.

Normal gut flora (microflora)

The microorganisms that normally live inside the digestive tract of animals.

Peritonitis

Inflammation of the membrane (peritoneum) that lines the abdominal cavity.

Polymerase chain reaction

A molecular technique for amplifying and creating multiple copies of nucleic acids (such as DNA and RNA) from a sample.

Primary care

A term for health services provided at the local community level, including GPs, pharmacists, dentists and midwives. Primary care is usually the first point of contact with the healthcare system by a patient.

Proton pump inhibitor

A group of drugs whose main action is to reduce the production of stomach acid.

Pseudomembranous colitis (PMC)

Inflammation of the large intestine (colon) characterised by the presence of pseudomembranes, which are raised yellow plaques on the intestinal surface.

Ribotype

A term used to describe different strains of an organism based on molecular methods which examine differences in the nucleic acid of the ribosome (the protein making machinery of the cell).

Risk factor

An aspect of personal behaviour or lifestyle, an environmental exposure, or a hereditary characteristic that is associated with an increase in the occurrence of a particular disease, injury, or other health condition.

Root cause analysis

A process for identifying the basic or causal factor(s) that underlie a problem.

Spores

A highly resistant, resting phase displayed by some types of bacteria.

Sporicidal

The ability to kill bacterial spores.

Toxic megacolon

Acute, severe inflammation of the colonic wall accompanied by extreme dilatation of the colon.

Appendix F: Guidance development group

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Appendix G: List of consultees version 3.0 (2017)

Name of group / organisation	Profession
NHS Education for Scotland	National education
Scottish Health Protection Nurse Specialists	Health Protection Nurses
Local Medical Committee/GP Sub-Committee	General Practitioners
Scottish Antimicrobial Prescribing Group	Multidisciplinary group
Infection Control Managers Group	Infection Control Managers
Infection Prevention and Control Nurses Group	Infection Prevention and Control Nurses
Infection Prevention and Control Doctors Group	Infection Prevention and Control Doctors
Scottish Microbiology and Virology Network	Microbiologists, virologists, others
Health Protection Teams	Public Health specialists
Scottish Government HAI Policy Unit	Scottish Government Health Department

Appendix H: Guidance on how to take faecal samples

Available at: http://www.hps.scot.nhs.uk/haiic/ic/guidelinedetail.aspx?id=40383 and http://www.hps.scot.nhs.uk/haiic/ic/guidelinedetail.aspx?id=40382.

Health Protection Scotland

NHS National Services Scotland

How to collect a faecal specimen at home

Information for Patients or Carers

The doctor or nurse will explain why a stool (faecal) specimen is required, how this should be obtained and when your results will be available. You will be supplied with the correctly labelled specimen container and laboratory form. The information in this sheet may help if you have to provide a stool (faecal) specimen at home.

Examples of specimen containers.

How to collect a stool specimen at home:

Step 1. Place a clean wide mouth container (for example empty plastic food container/one-litre ice cream carton, or a potty) in the toilet bowl or place a clean newspaper or plastic wrap over the toilet seat opening (If the stool is very watery this may not be possible).

Step 2. Pass the stool into the potty, plastic container or onto newspaper or plastic wrap.

Step 3. Place small scoopfuls of the stool into the specimen container using the spoon built into the lid of the specimen container (or the wooden stick, if supplied). Try to make sure that any parts of the stool which appear bloody, slimy or watery are put into the specimen container. If possible try not to mix urine with the stool sample – do not worry if this not possible.

Step 4. Do not overfill the specimen container (the fill line indicates the required amount). Try not to spill the stool on the outside of the specimen container. If this happens clean the outside of the specimen container with soap and warm water, then wash your hands thoroughly with soap and warm running water and dry.

Step 5. Put on the specimen container lid and screw on tightly. Wash your hands thoroughly with soap and warm running water and dry.

Step 6. Dispose of the remaining stool in the potty, plastic container or newspaper into the toilet.

Step 7. If you have used a reusable container such as a potty, clean with your usual toilet cleaner. Ensure the potty is clean and dry before reuse. If you have used plastic wrap, newspaper or a disposable container, wrap these in newspaper then put into a disposable bag and place in your outside bin.

Step 8. Place the specimen container in the plastic bag attached to the specimen request form (or the envelope provided if for posting) and make sure the bag/envelope is properly sealed.

Step 9. Wash your hands thoroughly with soap and warm running water and dry.

Step 10. Deliver to the doctor's surgery or post it as soon as possible (preferably the same day).

HPS. Version 1.0. February 2009

Health Protection Scotland

NHS National Services Scotland

When and how to obtain a faecal specimen from a patient

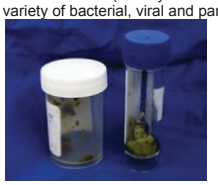
Information for Healthcare Staff

A faecal specimen (single) should be obtained as soon as possible following onset of symptoms of diarrhoea.

Definition of diarrhoea:
Diarrhoea is defined as the passage of 3 or more loose or liquid stools per day, or more frequently than is normal for the individual (usually at least 3 times in a 24 hour period). Diarrhoea is usually a symptom of gastrointestinal infection, which can be caused by a variety of bacterial, viral and parasitic organisms. The frequent passing of formed stools is not diarrhoea.

Preparation for faecal specimen collection:
Gather all relevant equipment:

- Clean, disposable/reusable bedpan or similar container.
- Leak proof sterile specimen container preferably with attached spoon or a clean disposable spatula. (Complete patient details on the specimen container before obtaining the specimen - see Additional Information).
- Leak proof sealable bag (with separate compartment for the specimen).
- Laboratory request form (if possible complete patient details before obtaining the specimen).



Examples of specimen containers

NB Use Standard Infection Control Precautions and Contact Precautions throughout this procedure. For further information please refer to the Guidance for obtaining faecal specimens from patients with diarrhoea (Background Information).

Procedure:

1. Explain the need for the procedure to the patient including the reason for the test (e.g. symptoms of diarrhoea), when and how the results will be given.
2. Ask the patient to pass faeces into the bedpan or container avoiding if possible passing urine at the same time.
3. Put on gloves and aprons to receive the bedpan.
4. Transfer faeces into a leak proof sterile specimen container using the spoon built into the container or a clean spatula to the fill line of the specimen container (or as a minimum covering the cone shape of the container). If the specimen contains blood, pus or mucus try to get these into the container.
5. Put on the container lid and secure. Avoid contaminating the outside of the container.
6. Discard bedpan and contents as usual. Discard other healthcare waste as defined in local policy.
7. Remove gloves and apron and wash and dry hands.
8. Place the specimen container directly into the leak proof sealable bag (The outside of this bag must not be visibly contaminated).
9. Wash and dry hands.
10. Ensure the transport of specimen within 2 hours of collection (If necessary specimens can be refrigerated for up to 24 hours at 4°C in a designated non-food fridge).

Additional Information:

- **A negative test result does not necessarily exclude infection especially if clinical symptoms are highly suggestive**. These cases should be discussed with the Consultant Medical Microbiologist or Infection Control Doctor.
- Normally only 1 faecal specimen is required per patient. There are exceptions to this and your Infection Control/Health Protection Team will advise.
- Larger amounts of faeces may be required for food borne pathogens.
- If a faecal specimen cannot be obtained from a neonate then a rectal swab is usually sufficient.
- Document in the medical and nursing notes when the faecal specimen was taken and the reason(s) this was required.
- Stool charts should be used to monitor bowel pattern when patients have diarrhoea.
- Consultation with the Infection Control Doctor or Microbiologist may be required where additional stool sampling is necessary to perform specific types of diagnostic tests.
- The laboratory request form should contain relevant clinical information. Which may include:
    - Name.
    - CHI no or Date of Birth (if CHI not known).
    - Ward details/GP Practice.
    - Name and contact details of Clinician requesting the test.
    - Test required such as culture and sensitivity/virology.
    - Date/time faecal specimen was obtained.
    - Date of onset of symptoms.
    - Nature of symptoms.
    - Duration of symptoms.
    - Any current or recent antibiotic history (up to 3 months previously).
    - Relevant medical history and or diagnosis.
    - Travel history.
    - If the faecal specimen has been contaminated with urine or obtained from an incontinence product.

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