Targeted literature review:

What are the key infection prevention and control recommendations to inform a Clostridium difficile infection (CDI) cross transmission prevention quality improvement tool?

Part of HAI Delivery Plan 2011-2012:

Task 6.1: Review of existing infection prevention and control care bundles to ensure ongoing need and fitness for purpose

V1.0 April 2012
### HPS ICT Document Information Grid

| **Purpose:** | To present a review of the evidence to inform the content of HAI related quality improvement tools for NHSScotland. This supports the functions of HPS in developing effective guidance, good practice and a competent workforce and translating knowledge to improve health outcomes. |
| **Target audience:** | All NHSScotland staff involved in patient care activities where interventions can lead to HAI, particularly those interventions that can cause bloodstream infections such as line insertion. Infection prevention and control teams in NHS boards and other settings. Partner organisations particularly Healthcare Improvement Scotland and National Education for Scotland to ensure consistent information across similar improvement documentation. |
| **Description:** | Literature critique summary and presentation of key recommendations to inform HAI quality improvement tools, based around a framework that evaluates these against the health impact contribution and expert opinion/practical application. |
| **Update/review schedule:** | Every three years; however if significant new evidence or other implications for practice are published updates will be undertaken. |
| **Cross reference:** | Standard Infection Control Precautions Policies in the National Infection Prevention and Control Manual. Data on HAI incidence and prevalence and process compliance data. Implementation support from Healthcare Improvement Scotland and/or others, education and training support from National Education Scotland. |
| **Update level:** | Practice – some change to practice, described throughout the document particularly the key recommendations.  
Procurement – any implications will be presented on a separate summary sheet.  
Research – broad recommendations are given where gaps were identified. |
Targeted literature review: What are the key infection prevention and control recommendations to inform a *Clostridium difficile* infection (CDI) cross transmission prevention quality improvement tool?

Contents

1. Executive summary ........................................................................................................... 4
2. Aim of the review ............................................................................................................. 6
3. Background ....................................................................................................................... 6
   3.1 The problem .................................................................................................................. 6
   3.2 How cross transmission of CDI can be prevented ...................................................... 6
   3.3 Out of scope for this review ....................................................................................... 7
   3.4 Assumptions – to ensure successful application of recommendations into practice .... 7
4. Results .................................................................................................................................. 8
   4.1 Review of the evidence base ....................................................................................... 8
      4.1.1 Final recommendation - Ensure that patients with *Clostridium difficile* Infection (CDI) are isolated in a single room with en suite facilities or an allocated commode, until they are at least 48 hours symptom free and bowel movements have returned to patient’s normal (Category 1B/Category II) ................................................................. 8
      4.1.2 Final recommendation - Ensure that unnecessary antibiotics are stopped where this is indicated by local antimicrobial policy and that the antibiotic regimens of the patient with *Clostridium difficile* Infection (CDI) is reviewed on a daily basis (Category 1B) ................. 9
      4.1.3 Final recommendation - Ensure that personal protective equipment (PPE) (i.e. gloves and aprons) is donned prior to, and subsequently removed, following each period of care activity for a patient with *Clostridium difficile* Infection (CDI) (Category 1B) ............ 9
      4.1.4 Final recommendation - Ensure that the patient with *Clostridium difficile* infection (CDI) immediate environment has been cleaned at least daily using neutral detergent followed by a disinfectant containing 1000 parts per million (ppm) available chlorine (av cl) (or a combined detergent/disinfectant (1000ppm av cl) (Category 1B) .................................. 10
      4.1.5 Final recommendation - Ensure that hand washing is performed after body fluid exposure during patient care and after touching a patient’s surroundings following a period of care activity (WHO Moments 3 and 5) (Category 1A) ..................................... 10
      4.1.6 Final recommendation - Ensure that care equipment e.g. blood pressure cuffs, thermometers and stethoscopes is dedicated to a single patient with *Clostridium difficile* infection (CDI) whenever possible (Category1B) ... 10
      4.2 Review of additional evidence based on initial search findings .............................. 12
         4.2.1 Cohorting (Category II) ....................................................................................... 12
         4.2.2 Terminal cleaning (Category II) .......................................................................... 12
5. Implications for research .................................................................................................. 13
6. References ......................................................................................................................... 14

Appendix 1: Previous criteria under review ....................................................................... 17
Appendix 2: Framework – tool to evaluate evidence based recommendations alongside the health impact contribution & expert opinion (based on the target group covered by this review) .......................... 18
Appendix 3: Literature review methodology ....................................................................... 26
Appendix 4: Search Strategy ............................................................................................... 28
Appendix 5: Summary of key recommendations for prevention of *Clostridium difficile* infection (CDI) cross transmission ................................................................. 29
1. Executive summary

*Clostridium difficile* infection (CDI) is the most common cause of intestinal infections associated with antimicrobial treatments given to treat other infections. *Clostridium difficile* was reported to be one of the most frequently occurring healthcare associated infection (HAI) causative organisms in acute settings in NHSScotland within the HAI Prevalence Survey 2007.\(^1\)

Overall incidence rates of CDI in Scotland remain at low levels, but there is a continued need to prevent and control the disease.\(^2\) Underlying risk factors associated with development of CDI include increased age and length of stay in healthcare settings.\(^3,4\) The *C. difficile* organism also produces spores which are able to survive in the environment for long periods of time and are resistant to cleaning with detergent and some decontamination processes. Additionally other aspects of concern within healthcare include; use of antimicrobial agents and poor infection prevention and control practices which can lead to cross transmission.\(^3,4\)

Key interventions for infection control practice therefore focus on isolation of the symptomatic patient, use of personal protective equipment (PPE), environmental cleaning and decontamination, effective hand hygiene and use of dedicated communal care equipment where possible. In addition, review of the patient’s antimicrobial therapy is vital, which includes ensuring the use of broad spectrum antibiotics is minimised and that antibiotic prescribing policies are adhered to.\(^3-7\) This review aims to focus on the key interventions which will prevent or minimise cross transmission and consequently CDI in other individuals.

The key recommendations result from background intelligence from HPS colleagues on this topic, the review of scientific evidence, the process of scoring the resulting recommendations using a health impact & expert opinion framework, and a process of consultation. The key recommendations for the CDI prevention of cross transmission now are:

- Ensure that patients with CDI are isolated in a single room with en suite facilities or an allocated commode, until they are at least 48 hours symptom free and bowel movements have returned to patient’s normal (Category 1B/Category II)
- Ensure that unnecessary antibiotics are stopped where this is indicated by local antimicrobial policy and that the antibiotic regimens of the patient with CDI is reviewed on a daily basis (Category 1B)
- Ensure that PPE (i.e. gloves and aprons) is donned prior to, and subsequently removed following, each period of care activity for an patient with CDI (Category 1B)
- Ensure that the patient with CDI’s immediate environment has been cleaned at least daily using neutral detergent followed by a disinfectant containing 1000 parts per million (ppm) available chlorine (av cl) (or a combined detergent/disinfectant (1000ppm av cl) (Category 1B)
- Ensure that hand washing is performed after body fluid exposure during patient care and after touching a patient’s surroundings following a period of care activity (WHO Moments 3 and 5) (Category 1A)
• Ensure that care equipment e.g. blood pressure cuffs, thermometers and stethoscopes is dedicated to a single individual with CDI whenever possible (Category 1B)

* to find out more information on the categories of these recommendations see Appendix 3

**Note:** this review identifies the resulting key evidence based recommendations and does not aim to identify all the elements of a checklist or standard operating procedure covering management of patients with CDI. Other locally available procedures and tools should address all steps related to care of a patient with CDI.

**In conclusion:** It is now advised that the key recommendations listed as a result of this review here and summarised in Appendix 5 are considered for application into practice as supported by quality improvement tools including care bundles. These activities can also be supported by national patient safety /quality improvement work (as directed by Healthcare Improvement Scotland).
2. **Aim of the review**

To review the previous HPS CDI minimisation quality improvement tool content, alongside the currently available guidelines and evidence to ensure that the key recommendations are still the most critical for preventing cross transmission of CDI and therefore protecting the safety of patients. The CDI care bundle and associated tools were first published on the HPS website in 2008.

3. **Background**

3.1 **The problem**

CDI is the most common cause of intestinal infections associated with antimicrobial treatments which have been given to treat other infection and is recognised as an important cause of HAI.\(^1\)\(^3\)\(^4\)\(^6\)\(^8\) Presentation ranges in severity from mild diarrhoea to pseudomembranous colitis and toxic megacolon and CDI can result in death.\(^3\)\(^4\)

Overall incidence rates of CDI in Scotland have remained at low levels since 2009, but there is a continued need to prevent and control the disease.\(^3\) Despite the levelling of the overall incidence rates in recent time, the occurrence of localised outbreaks show that CDI remains a burden of disease within NHSScotland and therefore has the potential to re-emerge within vulnerable patient groups if vigilance is not maintained.

*C. difficile* is found in the intestines of approximately 3% of healthy adults, with this figure increasing to approximately 20% of hospital patients; with figures of up to 50% of residents in long term care facilities reported.\(^3\)\(^4\) Infection can occur after courses of antibiotics, even following prophylactic or short term doses in individuals already colonised with *C. difficile*. The mode of person to person spread is mainly by the faecal-oral route and within healthcare the ‘contact route’ is the main concern for the interaction between healthcare workers and patients. The organism produces spores which are disseminated in the environment in large quantities by symptomatic patients and can result in widespread contamination particularly of the toilet areas and/or commode and on frequently touched surfaces.\(^3\)\(^4\) Spores are able to survive in the environment for long periods of time and are resistant to routine cleaning methods and some decontamination processes.\(^3\)\(^4\) Ingestion of *Clostridium difficile* spores can result in a patient becoming colonised and can be followed by germination of the spores within the intestine and ultimately disease.\(^3\)\(^4\)\(^9\)

Full details of the disease and its prevention are included within the HPS Guidance on Prevention and Control of CDI in Healthcare Settings in Scotland (2009).\(^3\)

3.2 **How cross transmission of CDI can be prevented**

Prevention of cross transmission of CDI concentrates on instigation of contact precautions, which are a set of infection control measures designed to be added to standard infection control precautions aimed at controlling transmission of microorganisms spread by direct and indirect contact routes during provision of care.\(^10\)

The key interventions therefore focus on isolation of the symptomatic patient, effective hand washing, use of PPE, environmental cleaning and decontamination and the use of dedicated communal care equipment.
where possible. In addition, review of the patient's antimicrobial therapy is vital, which includes ensuring the use of broad spectrum antibiotics is minimised and that antibiotic prescribing policies are adhered to.\textsuperscript{3-7}

3.3 Out of scope for this review

This literature review does not address any issues specific to:

- Paediatric settings
- Outbreaks of \textit{Clostridium difficile} Infection (CDI)
- Clinical management of patients with CDI
- Items of equipment within the wider patient area not classed as care equipment e.g. fans

3.4 Assumptions – to ensure successful application of recommendations into practice

There are a number of aspects related to healthcare delivery that were not within the remit of this review as it is clear that they are the responsibility of other professionals. These include that:

- Staff are appropriately trained and competent in all aspects of the management of CDI preferably using an approved educational package
- The overall approach to the delivery of healthcare is supported by patient safety and improvement approaches and organisational readiness.
4. Results

The recommendations presented are based on a review of the current evidence. The previous recommended criteria within the HPS bundles and checklists were used as a basis for the question set see Appendix 1. To further aid the process of deciding what final key recommendations to be included, all the recommendations resulting from the review of the evidence were assessed using the ‘health impact and expert opinion framework’ seen in Appendix 2. The final key recommendations were identified as a result of this evaluation as well as being informed by the process of wider consultation.

The methodology for this is described within Appendix 3; the specific search strategy in Appendix 4 and finally a summary page of the resulting recommendations can be found in Appendix 5.

4.1 Review of the evidence base

4.1.1 Final recommendation - Ensure that patients with Clostridium difficile Infection (CDI) are isolated in a single room with en suite facilities or an allocated commode, until they are at least 48 hours symptom free and bowel movements have returned to patient’s normal (Category 1B/Category II)

_Clostridium difficile_ is an anaerobic bacterium and although this means that the organism itself will not remain viable in the environment, it is a spore former and once produced and disseminated the spores are then resistant to being killed off by many detergents and disinfectants and are known to survive for extended periods of time (months or years). Once patients are symptomatic, i.e. have diarrhoea, spores can be disseminated in large numbers and result in high levels of contamination particularly in toilets, commodes and frequently touched surfaces such as toilet handles and bed rails, which can result in cross transmission. The recommendation that patients with diarrhoea who are known or suspected to be infected with an infectious agent such as _C. difficile_ should be isolated forms part of the measures that will prevent contamination and spread of spores, and are part of contact precautions guidance, which is already widely acknowledged within infection control literature. Contact precautions are those which are used in addition to standard infection control precautions to prevent spread of microorganisms by contact with the environment or via contaminated hands.

This recommendation to isolate CDI patients in a single room with en suite facilities or with an allocated commode is clearly based on a considerable consensus of evidence.

The duration of the contact precautions including isolation of the patients for specific organisms is crucial; however there is not always specific evidence to quantify this. There is broad consensus of expert opinion within the main sources of evidence based guidance that patients should remain in isolation until they are at least 48 hours symptom free.

However many current evidence based guidelines include further detail that bowel movements should be back to normal i.e. as referred to in the Bristol Stool Chart. Therefore the inclusion of such a phrase may help to guide practice although it must be considered against clinical judgement and practicalities. The
recommendation given results from all evidence considerations and after applying the framework described in Appendix 2.

4.1.2 Final recommendation - Ensure that unnecessary antibiotics are stopped where this is indicated by local antimicrobial policy and that the antibiotic regimens of the patient with Clostridium difficile Infection (CDI) is reviewed on a daily basis (Category 1B)

Evidence shows that one of the main risk factors for the development of CDI is exposure to antimicrobials.\(^4\,12\,13\) Antimicrobial therapy can form a crucial part of patient treatment for many infections, however changes to the gut microflora can result from their use, which can allow the *Clostridium difficile* to proliferate if present, and go on to produce toxins and cause disease.\(^4\,6\) Prudent antimicrobial stewardship is therefore a key infection prevention and control measure.\(^3\,6\,9\,14\) The Department of Health (DH) guidelines\(^6\) recommend that ‘all antibiotics that are clearly not required should be stopped, as should other drugs that might cause diarrhoea’. The need to review antibiotic regimens is a key evidence based and good clinical practice activity. As such national and local antimicrobial prescribing policies should be referred to, including advice to avoid broad spectrum antibiotics and long duration of treatment where possible.\(^7\) Interventions aimed at methods of improving prescribing practice within acute settings have been shown to be successful in reducing antimicrobial resistance and HAI such as CDI.\(^14\) This has been further emphasised in a DH best practice statement which states the importance of embedding a culture of daily antibiotic review with the aim to move from intravenous to oral therapy if possible and a recommendation to look at setting a maximum duration of treatment unless there is a specific clinical indication.\(^5\)

The current recommendation does not specifically include a timeframe for review of antibiotic therapy however DH best practice document for antimicrobial prescribing recommends that this review be carried out daily.\(^5\,9\) The recommendation given results from all evidence considerations and after applying the framework described in Appendix 2.

4.1.3 Final recommendation - Ensure that personal protective equipment (PPE) (i.e. gloves and aprons) is donned prior to, and subsequently removed, following each period of care activity for a patient with Clostridium difficile Infection (CDI) (Category 1B)

The term PPE refers to equipment that can be used as barrier to prevent exposure to potentially hazardous microorganisms and is designed to protect both the healthcare worker and patient.\(^11\) The use of PPE forms part of standard infection control precautions and also contact precautions.\(^3\) The DH guidelines\(^6\,7\) recommend that all staff in an isolation room should use disposable gloves and aprons for all contact with the patient and the patient’s environment. However PPE such as gloves, aprons and even uniforms can become a vector in the transmission of infectious agents if not properly changed and disposed of between patient care activities.\(^11\) Microorganisms have been shown to survive on the surface of gloves and aprons and although there is no definitive evidence that this has contributed to an outbreak of infection, it should be considered as a potential route of transmission.\(^11\)
Therefore in order to prevent or minimise potential cross transmission of CDI the key action is that the PPE is removed and disposed of after each patient care activity.\textsuperscript{15}

The recommendation given results from all evidence considerations and after applying the framework described in Appendix 2.

4.1.4 Final recommendation - Ensure that the patient with Clostridium difficile infection (CDI) immediate environment has been cleaned at least daily using neutral detergent followed by a disinfectant containing 1000 parts per million (ppm) available chlorine (av cl) (or a combined detergent/disinfectant (1000ppm av cl) (Category 1B)

CDI in an individual with symptoms can result in widespread environmental contamination with spores. This is particularly notable in the areas near the toilet and on commodes as well as generally on the floor and bed frames.\textsuperscript{3,4,6} Spores can remain viable in the environment for long periods of time due to their resistance to normal environmental conditions and there is evidence that environmental contamination is associated with transmission of CDI.\textsuperscript{3,4,6} Standard environmental cleaning methods using neutral detergent alone are known to be relatively effective for general cleaning of the patient environment, however there is a consensus of evidence that chlorine containing agents at a concentration of at least 1,000 parts-per-million (ppm) available chlorine (1000ppm av cl) is required when there is environmental contamination in order to inactivate C. difficile spores.\textsuperscript{3,4,6,7} This is consistent with EPIC2\textsuperscript{15} which recommends consideration of the use of detergent and hypochlorite in outbreaks of infection when ‘the pathogen concerned survives in the environment and environmental contamination may be contributing to spread.’ The Centers for Disease Control and prevention (CDC) isolation guidelines\textsuperscript{11} recommend that; ‘rooms of patients on Contact Precautions are prioritized for frequent cleaning and disinfection (e.g. at least daily) with a focus on frequently-touched surfaces (e.g. bed rails, over bed table, bedside commode, lavatory surfaces in patient bathrooms, doorknobs) and equipment in the immediate vicinity of the patient.’ Further elaboration has been provided by the DH to include ‘environmental cleaning of rooms, bed spaces, commodes, bedpans, slipper pans and disposable bedpan holders, toilets and bathroom areas of patients with CDI.’\textsuperscript{6,7}

Therefore daily cleaning using neutral detergent followed by a chlorine-based disinfectant 1000 ppm av cl is recommended or using a combined detergent/disinfectant (1000ppm av cl). The recommendation given results from all evidence considerations and after applying the framework described in Appendix 2.

4.1.5 Final recommendation - Ensure that hand washing is performed after body fluid exposure during patient care and after touching a patient’s surroundings following a period of care activity (WHO Moments 3 and 5) (Category 1A)

Clostridial spores are known to be resistant to the action of alcohols and all current evidence based guidelines include consistent recommendations that liquid soap and water and the physical action of rubbing and rinsing the hands should be used in situations where CDI is known or suspected. Furthermore, alcohol based hand rub (ABHR) should not be used as an alternative to soap.\textsuperscript{3,4,6,7,9}

This is also consistent with the advice included in the CDC Isolation guidelines and the World Health Organization (WHO) Guidelines on Hand Hygiene in Health Care (2009) which recommend that if exposure
to potential spore-forming pathogens is strongly suspected or proven then hand washing with soap and water should be undertaken.\textsuperscript{11,16}

The type of soap to use (i.e. non-antimicrobial/antimicrobial) is an unresolved issue in relation to the prevention of CDI with many guidelines recommending either can be used.\textsuperscript{4} The use of alcohol based hand rub products is not recommended as the primary source of hand hygiene.

This recommendation, and the importance of hand hygiene performance, is consistent with all current evidence, guidelines and the Department of Health (DH) high impact intervention.\textsuperscript{6,7,15,16} The WHO Guidelines clearly describe the indications for hand hygiene and present these within the WHO ‘My 5 Moments for Hand Hygiene’ approach, including emphasising the importance of performing hand hygiene after body fluid exposure and after touching patient surroundings to prevent HAI, which fits with the times when the spread of \textit{C. difficile} spores might be of greatest concern.\textsuperscript{16} These 5 Moments have been widely promoted within NHSScotland for a number of years and hand hygiene performance is measured against these Moments. This tool now provides two opportunities: to identify the hand hygiene Moment when risk is highest in relation to minimising transmission of CDI rather than attempting to use this quality improvement tool as a means of general hand hygiene promotion; and to allow for monitoring of hand hygiene practices to be consistent across all hand hygiene audits and quality improvement tool monitoring.

In summary, in relation to the risk associated with cross transmission of CDI, the clearest indications for hand hygiene is Moment 3 ‘after body fluid exposure’ and Moment 5 ‘after touching patient’s surroundings.’

The recommendation given results from all evidence considerations and after applying the framework described in \textit{Appendix 2}.

4.1.6 Final recommendation - Ensure that care equipment e.g. blood pressure cuffs, thermometers and stethoscopes is dedicated to a single patient with \textit{Clostridium difficile} infection (CDI) whenever possible (Category1B)

There is a consistent evidence based recommendation across all the main guidelines that patients are isolated to a single room with en suite facilities or with an allocated commode.\textsuperscript{3,4,6,7} Contaminated care equipment in particular rectal thermometers, blood pressure cuffs and stethoscopes has been implicated in cross transmission of CDI.\textsuperscript{4} The use of dedicated or single use care equipment for each CDI patient is therefore recommended and if not possible then adequate decontamination of reusable care equipment between uses should be undertaken.\textsuperscript{4,6,7,9,11} (\textit{HPS’ National Infection Prevention and Control Manual} and local policies should be referred to for further guidance).

In summary, given the evidence with regards to known microbiological contamination of care equipment and potential for cross transmission to occur it is vital that dedicated or single use equipment should be provided for each individual with CDI if possible.

The use of dedicated care equipment (e.g. disposable thermometers) is a key recommendation and should be included.\textsuperscript{17} The recommendation given results from all evidence considerations and after applying the framework described in \textit{Appendix 2}.
4.2 Review of additional evidence based on initial search findings

The second part of this review focuses on the further examination of additional recommendations which have resulted from the initial review.

4.2.1 Cohorting (Category II)

Patient cohorting is defined as the grouping of patients in the same bay/ward that have the same infection.\textsuperscript{11} The effectiveness of the use of cohorting as opposed to isolation is difficult to fully evaluate as the evidence tends to come from outbreak reports where multifactorial interventions have been instigated.\textsuperscript{4,11,18-24} This method of isolating infectious patients is normally used if single rooms are in short supply.\textsuperscript{4,11,25,26} Cohorting can form part of an effective control measure so long as it is combined with other basic infection control measures such as hand hygiene and appropriate PPE.\textsuperscript{4,11,18-21}

A number of studies have reported that on comparison of the use of isolating in single rooms and cohorting, there was a significant difference in the infection rates for specific organisms with cohorting showing higher infection rates. Despite this all the authors concluded that large scale studies on which to firmly base a recommendation were required.\textsuperscript{27-29}

Isolating patients with CDI in a single room remains the gold standard. Factors such as the prevalence of CDI within a healthcare facility can affect the decision making with regards to isolation, and during an outbreak, cohorting may be considered the best option available, however outbreaks are not included within this review. Therefore despite the lack of evidence there is some information that cohorting is effective, however it should not be considered initially and should not be considered at this stage as a key recommendation for a quality improvement tool.

In summary, it is concluded that this should not be included as a key recommendation however should be included within the supporting documentation e.g. cause and effect chart, to guide when single rooms are not yet available.

4.2.2 Terminal cleaning (Category II)

A definition of terminal cleaning is included in the NHSScotland cleaning specification\textsuperscript{30} which is applicable to NHSScotland ‘a terminal clean is defined as a procedure required to ensure that an area has been cleaned/decontaminated following discharge of a patient with an infection (i.e. alert organism or communicable disease) in order to ensure a safe environment for the next patient.’

The use of terminal cleaning to reduce the risk of further infection is not included within the current quality improvement tool key recommendations, however there is some evidence that this is an important factor in reducing the cross transmission of CDI.\textsuperscript{4,6,7,11} Despite this, it would be difficult to measure as part of the daily actions for all patients with CDI as it would only be applicable on discharge of the patient. Therefore, despite the evidence base and the importance of cleaning in healthcare, it is concluded that a description of the requirement for terminal cleaning would fit more within supporting documentation.

In summary, it is concluded that this should not be included as a key recommendation but it should be included within the supporting documentation e.g. cause and effect chart.
In conclusion: It is now advised that the key recommendations listed as a result of this review here and summarised in Appendix 5 are considered for application into practice as supported by quality improvement tools including care bundles. These activities can also be supported by national patient safety /quality improvement work (as directed by Healthcare Improvement Scotland).

5. Implications for research

A number of gaps in current evidence have been identified as a result of this review, which may have implications for future research priorities. These are summarised below:

- Further research is needed to define the “patient's immediate environment” and the role of frequently touched surfaces may be useful in defining areas at risk of Clostridium difficile contamination.
- Further research to compare the effectiveness of non-microbial and antimicrobial soap is needed.
6. References


(2) Health Protection Scotland. Quarterly report on the surveillance of Clostridium difficile infection (CDI) in Scotland, July - September 2011. HPS 2012 [cited 12 A.D. Jan 12];


Targeted literature review: What are the key infection prevention and control recommendations to inform a *Clostridium difficile* infection (CDI) cross transmission prevention quality improvement tool?


**Note:** A number of references listed above are cited within the literature review methodology which has been placed in **Appendix 3** for ease of reading of this document.
Appendix 1: Previous criteria under review

The CDI cross transmission care bundle and associated tools were first published on the HPS website in 2008. The criteria below were used as the question set to frame this review of the evidence base

- Isolating CDI patients in a single room with either en suite facilities, or an allocated commode, until they are at least 48 hours symptom free.
- Reviewing antibiotic regimens and stopping inappropriate antibiotics.
- Checking all HCWs remove PPE (gloves and aprons) after each CDI patient care activity.
- Checking that the CDI patient’s immediate environment has been cleaned today with a chlorine based solution.
- Ensuring HCWs perform hand hygiene with liquid soap and water after leaving a CDI patient’s room.
### Appendix 2: Framework – tool to evaluate evidence based recommendations alongside the health impact contribution & expert opinion (based on the target group covered by this review)

<table>
<thead>
<tr>
<th>Recommendation for review</th>
<th>Ensure that patients with Clostridium difficile Infection (CDI) are isolated in a single room with en suite facilities or an allocated commode, until they are at least 48 hours symptom free and bowel movements have returned to patient’s normal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade of recommendation</td>
<td>Isolation in single room (Category 1B) At least 48 hour symptom free (Category II)</td>
</tr>
</tbody>
</table>
| Health impact contribution (based on Healthcare Quality Strategy for NHSScotland) | **Safe:** Not implementing this may result in cross transmission of *C difficile* to other patients  
**Effective:** This recommendation reduces the risk of cross transmission to other patients  
**Efficient:** This recommendation reduces the risk of onward transmission and therefore associated patient and NHS cost  
**Equitable:** This recommendation promotes a standard of care for all patients, that may result in a reduction in avoidable personal and NHS costs, which is beneficial for all  
**Timely:** This recommendation should form an integral part of infection control precautions |
| Person Centred: | This recommendation is intended to reduce risk to other patients. However the potential effect of isolation of the CDI patient should be considered and action taken to prevent unintended psychological consequences and should allow for targeted communications regarding this action |

<table>
<thead>
<tr>
<th>Expert opinion/consultation and practical considerations</th>
<th>Measurement and feedback (Y/N/?). Feasibility and sustainability (Y/N/?). Applicability and reach (Y/N/?). Training and informing (Y/N/?).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential for measurement through e.g. observation</td>
<td>Easily implemented within current culture and will improve the quality of care now.</td>
</tr>
<tr>
<td>Potential for measurement through e.g. observation</td>
<td>Y</td>
</tr>
</tbody>
</table>

<p>| Is this a key recommendation? | Yes |</p>
<table>
<thead>
<tr>
<th>Recommendation for review</th>
<th>Ensure that unnecessary antibiotics are stopped where this is indicated by local antimicrobial policy and that the antibiotic regimens of the patient with Clostridium difficile Infection (CDI) is reviewed on a daily basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade of recommendation</td>
<td>Category 1B</td>
</tr>
</tbody>
</table>
| Health impact contribution (based on Healthcare Quality Strategy for NHSScotland) | **Safe:** Not implementing this recommendation may put the patient at risk of harm and may increase the risk of cross transmission  
**Effective:** This recommendation is an evidence based measure which may reduces the risk of cross transmission to other patients  
**Efficient:** This recommendation reduces the risk of onward transmission and therefore associated patient and NHS cost.  
**Equitable:** This recommendation promotes a standard of care for all patients, that may result in a reduction in avoidable personal and NHS costs, which is beneficial for all  
**Timely:** This recommendation combines both infection prevention and control strategies, patient and clinical management and therefore will fit well with the patient care routine and should facilitate efficient use of time  
**Person Centred:** This is a patient centred action to reduce harm caused in every patient with CDI |
| Expert opinion/consultation and practical considerations | Measurement and feedback (Y/N/?): Potential for measurement through e.g. observation  
Feasibility and sustainability (Y/N/?): Easily implemented within current culture and will improve the quality of care now  
Applicability and reach (Y/N?): Stealth integration into natural workflow/logical clarity of concept (also see Cause & Effect Chart)  
Training and informing (Y/N?): Unambiguous  
| | Potential for measurement through e.g. observation: Y  
Easily implemented within current culture and will improve the quality of care now: Y  
Potential for consistent delivery: N  
Easily implemented based on reliably available resources/products/prompts: ?  
Stealth integration into natural workflow/logical clarity of concept (also see Cause & Effect Chart): Y  
Unambiguous: ?  
Potential for applicability to a wide range of settings: N  
Avoids unintended consequences/perverse behaviour: ?  
Potential for congruency in design and meaning, with HCW, trainer and observer training and education: Y |
| Is this a key recommendation? | Yes |
**Recommendation for review**

Ensure that personal protective equipment (PPE) (i.e. gloves and aprons) is donned prior to, and subsequently removed, following each period of care activity for a patient with Clostridium difficile Infection (CDI)

**Grade of recommendation**

Category 1B

**Health impact contribution (based on Healthcare Quality Strategy for NHSScotland)**

**Safe:** Not implementing this recommendation may put the patient at risk of harm and may increase the risk of cross transmission

**Effective:** This recommendation is an evidence based measure which may reduce the risk of cross transmission to other patients

**Efficient:** This recommendation reduces the risk of onward transmission and therefore associated patient and NHS cost.

**Equitable:** This recommendation promotes a standard of care for all patients, that may result in a reduction in avoidable personal and NHS costs, which is beneficial for all

**Timely:** This recommendation should form an integral part of infection control precautions.

**Person Centred:** This is a patient centred action to reduce harm caused in every patient with CDI and allows for targeted communication / explanation with/to the patient

**Expert opinion/consultation and practical considerations**

<table>
<thead>
<tr>
<th>Measurement and feedback (Y/N/?</th>
<th>Feasibility and sustainability (Y/N/?</th>
<th>Applicability and reach (Y/N/?</th>
<th>Training and informing (Y/N/?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential for measurement through e.g. observation</td>
<td>Easily implemented within current culture and will improve the quality of care now</td>
<td>Potential for consistent delivery</td>
<td>Stealth integration into natural workflow/logical clarity of concept (also see Cause &amp; Effect Chart)</td>
</tr>
<tr>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
</tbody>
</table>

**Is this a key recommendation?**

Yes
**Recommendation for review**

Ensure that the patient with Clostridium difficile infection (CDI) immediate environment has been cleaned at least daily using neutral detergent followed by a disinfectant containing 1000 parts per million (ppm) available chlorine (av cl) (or a combined detergent/disinfectant (1000ppm av cl)

**Grade of recommendation**

Category 1B

<table>
<thead>
<tr>
<th>Health impact contribution (based on Healthcare Quality Strategy for NHSScotland)</th>
<th>Safe: Not implementing this recommendation may put the patient at risk of harm and may increase the risk of cross transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective: This recommendation is an evidence based measure which may reduce the risk of cross transmission to other patients</td>
<td></td>
</tr>
</tbody>
</table>
| Efficient: This recommendation reduces the risk of onward transmission and therefore associated patient and NHS cost.

**Equitable:** This recommendation promotes a standard of care for all patients, that may result in a reduction in avoidable personal and NHS costs, which is beneficial for all

**Timely:** This recommendation should form an integral part of infection control precautions.

**Person Centred:** This is a patient centred action to reduce harm caused in every patient with CDI

**Expert opinion/consultation and practical considerations**

**Measurement and feedback (Y/N/?)**

<table>
<thead>
<tr>
<th>Potential for measurement through e.g. observation</th>
<th>Easily implemented within current culture and will improve the quality of care now</th>
<th>Potential for consistent delivery</th>
<th>Easily implemented based on reliably available resources/products/prompts</th>
<th>Stealth integration into natural workflow/logical clarity of concept (also see Cause &amp; Effect Chart)</th>
<th>Unambiguous</th>
<th>Potential for applicability to a wide range of settings</th>
<th>Avoids unintended consequences/perverse behaviour</th>
<th>Potential for congruency in design and meaning, with HCW, trainer and observer training and education</th>
</tr>
</thead>
</table>

**Is this a key recommendation?**

Yes
Ensure that hand washing is performed after body fluid exposure during patient care and after touching a patient’s surroundings following a period of care activity (WHO Moments 3 and 5)

<table>
<thead>
<tr>
<th>Recommendation for review</th>
<th>Ensure that hand washing is performed after body fluid exposure during patient care and after touching a patient’s surroundings following a period of care activity (WHO Moments 3 and 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade of recommendation</td>
<td>Category 1A</td>
</tr>
</tbody>
</table>
| Health impact contribution (based on Healthcare Quality Strategy for NHSScotland) | Safe: Not implementing this recommendation may put the patient at risk of harm and may increase the risk of cross transmission  
Effective: This recommendation is an evidence based measure to reduce the risk of cross transmission to other patients  
Efficient: This recommendation reduces the risk of onward transmission and therefore associated patient and NHS cost.  
Equitable: This recommendation promotes a standard of care for all patients, that may result in a reduction in avoidable personal and NHS costs, which is beneficial for all  
Timely: This recommendation should form an integral part of infection control precautions  
Person Centred: This is a patient centred action to reduce harm in every patient with CDI and allows for patients/individuals to be aware of the importance of hand hygiene and their role in this |
| Expert opinion/consultation and practical considerations | Measurement and feedback (Y/N/?) | Feasibility and sustainability (Y/N/?) | Applicability and reach (Y/N/?) | Training and informing (Y/N/?) |
| Potential for measurement through e.g. observation | Easily implemented within current culture and will improve the quality of care now | Easily implemented based on reliably available resources/products/prompts | Stealth integration into natural workflow/logical clarity of concept (also see Cause & Effect Chart) | Unambiguous |
| Y | Y | Y | Y | ? | Y | Y | Y | Y |
| Is this a key recommendation? | Yes |
Targeted literature review: What are the key infection prevention and control recommendations to inform a *Clostridium difficile* infection (CDI) cross transmission prevention quality improvement tool?

<table>
<thead>
<tr>
<th>Recommendation for review</th>
<th>Ensure that care equipment e.g. blood pressure cuffs, thermometers and stethoscopes is dedicated to a single patient with <em>Clostridium difficile</em> infection (CDI) whenever possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade of recommendation</td>
<td>Category 1B</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health impact contribution (based on Healthcare Quality Strategy for NHSScotland)</th>
<th>Safe: Not implementing this recommendation may put the patient at risk of harm and may increase the risk of cross transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Effective: This recommendation is an evidence based measure which may reduce the risk of cross transmission to other patients</td>
</tr>
<tr>
<td></td>
<td>Efficient: This recommendation reduces the risk of onward transmission and therefore associated patient and NHS cost.</td>
</tr>
<tr>
<td></td>
<td>Equitable: This recommendation promotes a standard of care for all patients, that may result in a reduction in avoidable personal and NHS costs, which is beneficial for all</td>
</tr>
<tr>
<td></td>
<td>Timely: This recommendation should form an integral part of infection control precautions.</td>
</tr>
<tr>
<td></td>
<td>Person Centred: This is a patient centred action to reduce harm in every patient with CDI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expert opinion/consultation and practical considerations</th>
<th>Measurement and feedback (Y/N/?)</th>
<th>Feasibility and sustainability (Y/N/?)</th>
<th>Applicability and reach (Y/N/?)</th>
<th>Training and informing (Y/N/?)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Potential for measurement through e.g. observation</td>
<td>Easily implemented within current culture and will improve the quality of care now</td>
<td>Potential for consistent delivery</td>
<td>Stealth integration into natural workflow/logical clarity of concept (also see Cause &amp; Effect Chart)</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

| Is this a key recommendation? | Yes |

Health Protection Scotland v1.0 April 2012
<table>
<thead>
<tr>
<th>Recommendation for review</th>
<th>Patient cohorting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade of recommendation</td>
<td>Category II</td>
</tr>
</tbody>
</table>

**Health impact contribution (based on Healthcare Quality Strategy for NHSScotland)**

- **Safe:** There is some evidence available which supports the benefits of cohorting but the gold standard in terms of infection prevention and control remains isolation.
- **Effective:** If a ward has several patients with CDI this may be an effective way to manage patients and reduce the risk of cross contamination to others.
- **Efficient:** This recommendation may prove more efficient in the circumstances of an outbreak of CDI however this review does not cover outbreaks.
- **Equitable:** N/A
- **Timely:** N/A
- **Person Centred:** N/A

**Expert opinion/consultation and practical considerations**

<table>
<thead>
<tr>
<th>Measurement and feedback (Y/N/?</th>
<th>Feasibility and sustainability (Y/N/?</th>
<th>Applicability and reach (Y/N/?</th>
<th>Training and informing (Y/N/?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential for measurement through e.g. observation</td>
<td>Easily implemented within current culture and will improve the quality of care now</td>
<td>Potential for consistent delivery</td>
<td>Easily implemented based on reliably available resources/products/prompts</td>
</tr>
</tbody>
</table>

- ?
- ?
- N
- N
- N
- N
- ?
- ?
- ?
- ?

**Is this a key recommendation?** No but could form part of other supporting tools
Targeted literature review: What are the key infection prevention and control recommendations to inform a *Clostridium difficile* infection (CDI) cross transmission prevention quality improvement tool?

<table>
<thead>
<tr>
<th>Recommendation for review</th>
<th>Terminal cleaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade of recommendation</td>
<td>Category 1B</td>
</tr>
</tbody>
</table>

**Health impact contribution (based on Healthcare Quality Strategy for NHSScotland)**

- **Safe:** Not implementing this would put the patient at risk of harm
- **Effective:** There is substantial consensus of evidence to support the efficacy of terminal cleaning before placement of another patient in the area.
- **Efficient:** Effective terminal cleaning of a patient area following discharge with reduce NHS costs associated with HAI and reduce cross transmission.
- **Equitable:** All adults receiving care can have safer care supported by this recommendation.
- **Timely:** This recommendation should form an integral part of discharge of a patient
- **Person Centred:** This action may reduce the risk of cross transmission.

<table>
<thead>
<tr>
<th>Expert opinion/consultation and practical considerations</th>
<th>Measurement and feedback (Y/N/?)</th>
<th>Feasibility and sustainability (Y/N/?)</th>
<th>Applicability and reach (Y/N/?)</th>
<th>Training and informing (Y/N/?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential for measurement through e.g. observation</td>
<td>Easily implemented within current culture and will improve the quality of care now</td>
<td>Potential for consistent delivery</td>
<td>Stealth integration into natural workflow/logical clarity of concept (also see Cause &amp; Effect Chart)</td>
<td>Unambiguous</td>
</tr>
<tr>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

**Is this a key recommendation?**

No but could form part of other supporting tools
Appendix 3: Literature review methodology

The evidence underpinning the criteria for a quality improvement tool was reviewed using a targeted systematic approach to enable input and resource to be concentrated where needed. This methodology is fully described within a separate HPS paper ‘Rapid method for development of evidence based/expert opinion key recommendations, based on health protection network guidelines’.

Initial rapid search and review

The initial search rapid literature search was carried out to identify mandatory guidance, or recent national or international evidence based guidance which either agrees or refutes that the current key recommendations are the most important to ensure optimal PVC care:

- The main public health websites were searched to source any existing quality improvement tools
- Relevant guidance and quality improvement tools e.g. Department of Health (DH), Centers for Disease Control and Prevention (CDC) etc were reviewed
- Additional literature identified and sourced e.g. from the relevant Cochrane reviews.

The quality of evidence based guidance was assessed using the AGREE instrument and only guidance which achieved either a strongly recommend or recommend rating was included.

Targeted systematic review

As a result of initial rapid search and review, recommendations requiring a more in depth review were identified. This involved searching of relevant databases including OVID Medline, CINAHL, EMBASE. All literature pertaining to recommendations where evidence was either conflicting or where new evidence was available were critically appraised using SIGN checklists and a ‘considered judgement’ process used to formulate recommendations based on the current evidence for presentation and discussion with the National HAI Quality Improvement Tools Group in Scotland.

Grading of recommendations

Grading of the evidence is using the Healthcare Infection Control Practices Advisory Committee (HICPAC) method. In addition to the overall assessment of the evidence underpinning the recommendation, other factors are considered which affect the overall strength of the recommendation such as the health impact and expert opinion on the potential critical outcomes.

The HICPAC categories are as follows:

| Category 1A – strong recommendation based on high to moderate quality evidence |
| Category 1B – strong recommendation based on low quality of evidence which suggest net clinical benefits |
or harms or an accepted practice (e.g. aseptic technique)

<table>
<thead>
<tr>
<th>Category 1C – a mandatory recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category II – a weak recommendation which shows evidence of clinical benefit over harm</td>
</tr>
<tr>
<td>No recommendation – not sufficient evidence to recommend one way or another</td>
</tr>
</tbody>
</table>

**Framework for identifying final key recommendations**

One way of improving implementation of evidence based guidance is by the identification of key recommendations which if applied will improve practice and outcome.\(^{33-39}\) This is the foundation of ‘care bundles’ and other quality improvement tools which rely on the identification of key evidence based recommendations to ensure application in practice.\(^ {40}\)

A method has been developed which aims to reflect graded recommendations in line with ensuring healthcare quality, attention to cost and practical application. It combines approaches used by the Institute of Healthcare Improvement (IHI) and World Health Organisation, among others, in identifying the critical factors from the evidence to ensure patient safety in a range of fields.\(^ {39,41}\) The method considers the current NHSScotland Quality Strategy dimensions and finally expert opinion applied within a formal framework. This framework includes a range of practical considerations under the headings measurement and feedback, feasibility and sustainability, applicability and reach, training and informing.

Ultimately, HPS key recommendations are presented taking all of these factors into account, with the aim of improving practice and outcome.
Appendix 4: Search Strategy

Database: Ovid MEDLINE(R) <1948 to November Week 3 2011>

Search Strategy:

--------------------------------------------------------------------------------
1 exp Clostridium difficile/ or exp Clostridium Infections/ or exp Spores, Bacterial/ or Diarrhea/ (65137)
2 exp Patient Isolation/ or exp Hospitals, Isolation/ (2983)
3 exp Disinfection/ or exp Decontamination/ (11758)
4 exp Anti-Bacterial Agents/ (481743)
5 exp Protective Clothing/ or exp Infection Control/ (54153)
6 exp Chlorine Compounds/ or exp Disinfectants/ or exp Disinfection/ (213562)
7 2 or 3 or 4 or 5 or 6 (729843)
8 exp Cross Infection/ (42299)
9 1 and 7 and 8 (626)
10 limit 9 to (english language and humans and yr="2008 -Current") (188)

***************************
Preventing cross transmission when an individual has known or suspected CDI

If a patient* has a known or suspected CDI

Ensure that:

- patients with CDI are isolated in a single room with en suite facilities or an allocated commode, until they are at least 48 hours symptom free and bowel movements have returned to patient’s normal
- unnecessary antibiotics are stopped where this is indicated by local antimicrobial policy and that the antibiotic regimens of the patient with CDI is reviewed on a daily basis
- personal protective equipment (PPE) (i.e. gloves and aprons) is donned prior to, and subsequently removed, following each period of care activity for a patient with CDI
- the patient with CDI’s immediate environment is cleaned at least daily using neutral detergent followed by a disinfectant containing 1000 parts per million (ppm) available chlorine (av cl) or a combined detergent/disinfectant (1000ppm av cl))
- hand washing is performed after body fluid exposure during patient care and after touching a patient’s surroundings following a period of care activity (WHO Moments 3 and 5)
- care equipment e.g. blood pressure cuffs, thermometers and stethoscopes is dedicated to a single patient with CDI whenever possible

Practice points

The use of personal protective equipment (PPE) including gloves is important in all procedures where blood and body fluid risk exists.

The featured recommendation on hand hygiene does not detract from other times when hand hygiene is recommended and will be monitored against (namely the 5 Moments for Hand Hygiene).

The featured recommendations do not aim to cover emergency situations, which require clinical judgement for patient care actions.

Further information (Click on highlighted text in the box(es) above to link to evidence underpinning each recommendation)

For further information on the background to these recommendations and the literature reviews that informed these please visit http://www.hps.scot.nhs.uk as well as referring to your local teams and policies.