

# Standard Infection Control Precautions Literature Review: Routine cleaning of the care environment

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3.1	April 2017	<b>3.2 Implications for research.</b> Taking out of reference to the 2015 HPS technologies literature review and recommendations	
3.0	October 2016	Changes made to list of high and very high risk areas in accordance with the updated NHSScotland National Cleaning Services Specification, 2016.	
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<b>HPS ICT Document Information Grid</b>	
<b>Purpose:</b>	To inform the Standard Infection Control Precautions (SICP) section on routine cleaning of the environment in the National Infection Prevention and Control Manual in order to facilitate the prevention and control of healthcare associated infections in NHS Scotland hospital settings.
<b>Description:</b>	This literature review examines the available professional literature on routine cleaning of the environment.
<b>Target audience:</b>	All NHS staff involved in the prevention and control of infection in NHSScotland.
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## 1. Objectives

The aim of this review is to examine the extant professional literature regarding the routine cleaning of the environment in the care setting. The specific objectives of the review are to determine:

- What is the definition of routine environmental cleaning?
- What is the definition of the care environment for the purpose of routine environmental cleaning?
- What is the risk of Healthcare Associated Infection (HAI) from the care environment?
- What methods are recommended for cleaning the care environment?
- What is the correct use of detergent in the decontamination of the care environment?
- What is the correct use of disinfectant in the decontamination of the care environment?
- What is the recommended frequency of routine cleaning for the care environment?
- How should cleaning equipment be managed?
- Who is responsible for ensuring the care environment is clean?
- How should contamination of the care environment be monitored?
- When should new technologies be used for routine environmental cleaning?

NB. Management of the care environment in response to suspected or known infections is considered as part of Transmission Based Precautions (TBPs) and is not within the scope of this review.

Recommendations relating to the safe management of environmental contamination with blood and body fluids are outline in the [Safe Management of Blood and Body Fluid Spillages](#) literature review.

## 2. Methodology

This targeted literature review was produced using a defined methodology as described in the [National Infection Prevention and Control Manual: Development Process](#).

### 3. Recommendations

This review makes the following recommendations based on an assessment of the extant professional literature on the routine cleaning of the care environment.

#### **What is the definition of routine environmental cleaning?**

Routine environmental cleaning is regular cleaning which is carried out on a scheduled basis, not on an ad hoc basis and not in response to an outbreak. The NHSScotland National Cleaning Services Specification details cleaning tasks to be carried out routinely in identified areas. Cleaning performance is audited against the NHSScotland National Cleaning Services Specification.

**(Mandatory)**

#### **What is the definition of the care environment for the purpose of routine environmental cleaning?**

The NHSScotland National Cleaning Services Specification categorises routine environmental cleaning operations into a series of tasks to be carried out in particular patient accommodation categories. The patient accommodation categories define the care environment for the purpose of routine environmental cleaning.

**(Mandatory)**

The WHO define the 'patient zone' as 'all inanimate surfaces that are touched by or in direct physical contact with the patient such as the bed rails, bedside table, bed linen, infusion tubing and other medical equipment' as well as 'surfaces frequently touched by healthcare workers (HCWs) while caring for the patient such as monitors, knobs and buttons as well as other high frequency touch surfaces'.

**(AGREE rating: Recommend)**

**What is the risk of Healthcare Associated Infection from the care environment?**

The risk of HAI from the care environment is ever-present.

Within the clinical area of the care environment, sites close to the patient (the patient zone) and frequently touched surfaces have been identified as areas of increased contamination. Environmental cleaning should focus on these areas.

**(Grade D recommendation)**

**(Agree rating: recommend)**

High risk and very high risk areas have been identified in the NHSScotland National Cleaning Services Specification. These are areas where the patient is particularly vulnerable to Healthcare Associated Infection (HAI).

Local risk assessments should identify increased risk of HAI and local cleaning schedules should be adapted accordingly. This must be documented.

**(Mandatory)**

### **What methods are recommended for routine cleaning of clinical areas in the care environment?**

The NHSScotland National Cleaning Services Specification outlines specific cleaning methods for each task group in each patient area in the care environment.

#### **(Mandatory)**

Personal Protective Equipment (PPE) should be worn for carrying out environmental cleaning tasks as indicated in the NHSScotland National Cleaning Services Specification.

#### **(Mandatory)**

Single use-disposable gloves that meet the standard EN374-2 (and EN74-3 if exposure to chemical agents is anticipated) should be worn for environmental cleaning. If household ('marigold'-type) gloves are worn for environmental cleaning these must be treated as single-use disposable items.

#### **(Good Practice Point (GPP))**

### **What is the correct use of detergent for routine cleaning of the care environment?**

A fresh solution of neutral pH detergent in hand hot water should be used for routine cleaning tasks. Cleaning solutions should be changed: when dirty; at least every 15 minutes; and prior to moving to a new location. Paper or disposable cloths should be wrung as dry as possible before use.

#### **(Mandatory)**

Only cleaning products supplied by employers should be used. Cleaning products should be used in accordance with Control of Substances Hazardous to Health (COSHH) Regulations and manufacturer's instructions.

#### **(Mandatory)**

**What is the correct use of disinfectants for routine cleaning of the care environment?**

Disinfectants should be used routinely on sanitary fittings. Sanitary fittings include toilets, sinks, basins, baths, taps and fixtures. Sanitary fittings should be cleaned with detergent prior to disinfection; alternatively a combined detergent/disinfectant may be used. Sanitary fittings should be rinsed and dried after the application of disinfectant.

**(Agree rating: recommend)**

Only disinfectant products supplied by employers should be used. Disinfectant products should be used in accordance with Control of Substances Hazardous to Health (COSHH) Regulations and manufacturer's instructions.

**(Mandatory)**

**What is the recommended frequency for routine cleaning of the care environment?**

The NHSScotland National Cleaning Services Specification outlines the minimum required frequencies for the cleaning tasks in particular room types and patient accommodation categories.

**(Mandatory)**

Sites of increased contamination such as high risk sites, frequently touched surfaces and the near patient zone require more frequent cleaning than other sites in the healthcare setting.

**(Grade D recommendation)**

**(AGREE rating: recommend)**

Recommended cleaning frequencies can be altered in response to local risk assessment. Deviation from the recommended frequency on the basis of risk assessment should be documented.

**(Mandatory)**

### How should cleaning equipment be managed?

Re-usable cleaning materials and equipment should be colour coded in accordance with the coding scheme outlined in the NHSScotland National Cleaning Services Specification.

Cleaning equipment should only be used in the area indicated by the colour scheme. The colour scheme is:

**Red:** Bathrooms, washrooms, showers, toilets, basins and bathroom floors.

**Blue:** General areas including wards, departments, offices and basins in public areas

**Green:** Ward kitchen areas and patient food service at ward level

**Yellow:** Isolation areas

Colour coding is not required for single-use micro fibre mopping systems or for single-use disposable PPE.

#### **(Mandatory)**

Disposable cleaning equipment should be disposed of in accordance with local waste management policy. Non-disposable cleaning equipment which is no longer fit for purpose should be disposed of in accordance with local waste management policy.

#### **(Good Practice Point (GPP))**

Separate purpose built Domestic Services Rooms should be used for storage of cleaning equipment. These areas should have sufficient space and facilities to enable cleaning equipment to be thoroughly cleaned following use and for the disposal of cleaning solutions.

#### **(Mandatory)**

### Who is responsible for ensuring the care environment is clean?

A named person or persons e.g. charge nurses should be responsible for ensuring safe working conditions within their clinical area. This includes all aspects of environmental cleanliness. Charge Nurses have the authority to require local cleaning services to act on any problems identified.

#### **(Mandatory)**

Staff groups must be aware of their local environmental cleaning schedules and be clear on their specific responsibilities and should be trained accordingly.

#### **(Mandatory)**

In general, cleaning staff are responsible for cleaning the built environment and fixtures and fittings, while nursing staff are responsible for cleaning patient care equipment. Note, this is division of cleaning responsibilities is not absolute, and is subject to local/organisational policy.

#### **(Good Practice Point (GPP))**

### How should contamination of the care environment be monitored?

Cleanliness of the care environment should be monitored by visual observational inspection.

#### **(Mandatory)**

### When should new technologies be used for routine environmental cleaning?

The decision to adopt new technologies locally for routine environmental cleaning should be based on an assessment of the evidence for effectiveness.

#### **(Good Practice Point (GPP))**

Any technologies that are adopted for routine cleaning of the care environment should be used in accordance with manufacturer's instructions, after risk assessment and after appropriate training for users.

#### **(Good Practice Point (GPP))**

## 4. Discussion

### 4.1 Implications for practice

#### **What is the definition of routine environmental cleaning?**

Cleaning is defined as ‘a process which physically removes infectious agents and the organic matter on which they thrive but does not necessarily destroy infectious agents’. The reduction of microbial contamination depends upon many factors, including the effectiveness of the cleaning process and the initial bioburden. Cleaning is an essential prerequisite to ensure effective disinfection or sterilisation.<sup>1</sup> Routine cleaning is regular cleaning which is carried out on a scheduled basis, not on an ad hoc basis and not in response to an outbreak.<sup>2</sup>

**(Mandatory)**

#### **What is the definition of the care environment for the purpose of routine environmental cleaning?**

The NHSScotland National Cleaning Services Specification (NCSS) is intended to be followed wherever care is delivered in NHSScotland.<sup>3</sup> The NHSScotland NCSS defines and categorises all areas (environments) covering both clinical and non-clinical areas (including residential areas) into patient accommodation categories. The patient accommodation categories define the healthcare environment for the purpose of routine environmental cleaning.<sup>3</sup>

**(Mandatory)**

The WHO guidelines on hand hygiene in healthcare also provide a definition of the environment immediately surrounding the patient, known as the ‘patient zone’.<sup>4</sup> The patient zone is described in the guidelines as “all inanimate surfaces that are touched by or in direct physical contact with the patient such as the bed rails, bedside table, bed linen, infusion tubing and other medical equipment” as well as “surfaces frequently touched by healthcare workers (HCWs) while caring for the patient such as monitors, knobs and buttons as well as other high frequency touch surfaces”.<sup>4</sup>

**(Agree rating: Recommend)**

## What is the risk of healthcare associated infection from the care environment?

The care environment is associated with transmission of HAI via contact (direct or indirect) with contaminated surfaces.<sup>5</sup> Within the clinical area of the care environment, sites close to the patient (the patient zone) and “frequently touched” surfaces have been identified as areas of increased contamination.<sup>5-11</sup>

Frequently touched surfaces include bed rails, bed surface, supply carts, overbed tables and intravenous pumps<sup>6</sup> as well as door handles, computer keyboards, soap dispensers and taps<sup>8</sup> and switches.<sup>10</sup> It has been suggested that cleaning specifications do not sufficiently address frequently touched surfaces, and should focus more on these areas.<sup>9;10;12</sup>

### (Grade D recommendation)

The NHSScotland NCSS patient accommodation categories refer to high-risk and very high-risk areas.<sup>3</sup> These categories are designed to inform the recommendations on the frequency and methods of cleaning, and to enable auditing.

**High-risk** in-patient areas include:

- Intensive care units, cardiac care units, renal, high dependency units, oncology, haematology, orthopaedics, cardiothoracics, neurosurgery, infectious disease units, A&E, admission units and neonatal and special care baby units.

Areas described as **very high-risk** include:

- Theatres, transplant and bone marrow units, day surgery.

The areas within these categories are deemed high-risk or very high-risk settings as the patient is more vulnerable to infection.<sup>3</sup>

### (Mandatory)

An Audit Scotland report on hospital cleaning advises that any adjustment (increase) to the cleaning frequencies should be based on a formal risk assessment with reasons for variation documented.<sup>13</sup> The NHSScotland NCSS requires that all cleaning tasks outlined are subject to local risk assessments and provides risk assessment templates for each task.<sup>3</sup> Assessment of risk is based on infection risk versus public perception risk. Where higher risk is identified, deviation from recommendations is permitted.<sup>3</sup>

**(Mandatory)****What methods are recommended for routine cleaning of the care environment?**

The NHSScotland NCSS arranges routine environmental cleaning operations into a series of tasks to be carried out in particular patient accommodation categories; specific methods and minimum required frequencies are detailed for each task group.<sup>3</sup>

**(Mandatory)**

Personal Protective Equipment (PPE) should be worn for carrying out environmental cleaning tasks as indicated in the NHSScotland NCSS.<sup>3</sup>

**(Mandatory)**

Single use-disposable gloves that meet the standard EN374-2 (and EN374-3 if exposure to chemical agents is anticipated) should be worn for environmental cleaning.<sup>15</sup> If household ('marigold'-type) gloves are worn for environmental cleaning these must be treated as single-use disposable items.<sup>15</sup> Single use gloves must never be decontaminated and re-used (see [Standard Infection Control Precautions Literature Review: Personal Protective Equipment \(PPE\) Gloves](#) and [SBAR: Glove use for environmental cleaning](#)).

**(Good Practice Point (GPP))**

Gloves should be changed:

- After each use.
- If a puncture is suspected or identified.
- After contact with cleaning chemicals that may compromise the integrity of the glove.

**(Grade D recommendation)****(AGREE rating: recommend)****What is the correct use of detergent in the decontamination of the care environment?**

A detergent is a cleaning agent that removes organic material, but does not have antimicrobial properties.<sup>11</sup> The NHSScotland NCSS states that a fresh solution of pH neutral detergent in hand hot water should be used for specific cleaning tasks.<sup>3</sup> The specific product used should be a local policy decision.

**(Mandatory)**

Cleaning solutions should be changed when dirty, at least every 15 minutes and prior to moving to a new location.<sup>3</sup> When using disposable cloths or paper towels the cloths or paper towels should be 'wrung' as dry as possible before application.<sup>3</sup>

**(Mandatory)**

Only cleaning products supplied by employers should be used. Cleaning products should be used in accordance with Control of Substances Hazardous to Health (COSHH) Regulations, and manufacturer's instructions should be followed.<sup>2</sup>

**(Mandatory)****What is the correct use of disinfectant in the decontamination of the care environment?**

Disinfectants are chemical (or sometimes physical) agents that destroy pathogens or other harmful microorganisms but not necessarily all microbial forms (e.g. bacterial spores).<sup>11</sup> For disinfectants to be effective any organic material must first be removed by cleaning.<sup>11</sup>

The CDC recommends that disinfectants/sanitiser should be used routinely on sanitary fittings.<sup>15</sup> Sanitary fittings include toilets, sinks, basins, baths, taps and fixtures.<sup>3</sup> The importance of prior cleaning with detergent and rinsing and drying after application of the disinfectant/sanitiser is highlighted.<sup>15</sup>

**(AGREE rating: recommend)**

The routine use of disinfectants is subject to debate, with some authors arguing for their routine use,<sup>16</sup> while others advocate the targeted use of disinfectants, for example only for cases of infection or for the environment of immunocompromised patients.<sup>17</sup> Routine, targeted use of disinfectant on high touch surfaces as been shown to reduce HAI rates in one study.<sup>18</sup> Other aspects of the debate centre on the potential for microorganisms to become resistant to disinfectants and the potentially hazardous nature of disinfectants to staff, patients and the environment.

The NPSA Cleaning Manual does not recommend the use of dual function detergent/disinfectant products for routine cleaning, but recognises that they are in widespread use in UK healthcare premises, including being used for routine cleaning.<sup>2</sup> CDC guidelines

acknowledge that the use of disinfectants in the routine cleaning of the patient (clinical) area of the hospital environment is controversial, but recommend using 'hospital' disinfectant for routine cleaning.<sup>11</sup> The CDC defines hospital disinfectant as disinfectant that has been registered for use by the Environmental Protection Agency (EPA). Note that this only applies in the USA. The epic3 guidelines do not recommend the routine use of disinfectants, except in the case of known or suspected infection and/or colonisation.<sup>8</sup>

See [SICP Literature Review: Management of Blood and Body Fluid spillages](#) for recommendations on the use of disinfectant in that context.

**(AGREE rating: Recommend)**

Only disinfectant products supplied by employers should be used. Cleaning products should be used in accordance with Control of Substances Hazardous to Health (COSHH) Regulations, and manufacturer's instructions should be followed.<sup>2</sup>

**(Mandatory)**

**What is the recommended frequency for routine cleaning of the care environment?**

The NHSScotland NCSS details the minimum required frequencies for the cleaning tasks in particular room types and patient accommodation categories.<sup>3</sup> Compliance with the cleaning frequencies outlined in the NHSScotland NCSS is a requirement of the NHSScotland Healthcare Improvement Scotland HAI standards (2015).<sup>14</sup>

**(Mandatory)**

The frequency of cleaning should reflect the risk of HAI. High risk sites, frequently touched surfaces and the near patient zone have been identified as providing a greater potential risk of HAI and it has been proposed that cleaning efforts should be reinforced in these areas.<sup>19-21</sup>

**(Grade D recommendation)**

**(AGREE rating: recommend)**

Recommended cleaning frequencies can be altered in response to local risk assessment. Deviation from the recommended frequency on the basis of risk assessment must be documented.<sup>3</sup>

**(Mandatory)****How should cleaning equipment be managed?**

The NHSScotland NCSS recommends that the colour coding of reusable cleaning materials and equipment should follow the NPSA Colour Coding Scheme.<sup>22</sup> This stipulates that cleaning items should be used exclusively in one area to reduce cross infection and that equipment should be coded to comply with the following recommendations:

**Red:** Bathrooms, washrooms, showers, toilets, basins and bathroom floors

**Blue:** General areas including wards, departments, offices and basins in public areas

**Green:** Ward kitchen areas and patient food service at ward level

**Yellow:** Isolation areas<sup>3</sup>

Health Facilities Scotland reviewed the Colour Coding Scheme in 2012, and issued a letter stating that while colour coding is required for flat or conventional mopping systems, colour coding is not required for micro fibre mopping systems because they are single use systems.<sup>23</sup> The letter also states that colour coding is not required for single use disposable PPE (i.e. aprons, gloves).<sup>23</sup>

**(Mandatory)**

After use, disposable cleaning equipment should be dealt with in accordance with local waste management policy<sup>2</sup> (see [SICP Literature Review: The safe management of waste](#)).

**(Good Practice Point (GPP))**

Non-disposable cleaning equipment which is no longer fit for purpose should be disposed of in accordance with local waste management policy.<sup>2</sup>

**(Good Practice Point (GPP))**

Scottish Health Facilities Note (SHFN) 30 states that domestic cleaning equipment must be stored in a fit for purpose, dedicated Domestic Services Room with sufficient space and facilities to allow non-disposable cleaning equipment to be cleaned after use and for the disposal of cleaning solutions.<sup>24</sup> Detailed requirements are outlined in Scottish Health Facilities Note 30 and

detailed cleaning requirements for Domestic Services Rooms are outlined in the NHSScotland NCSS.<sup>3</sup>

**(Mandatory)**

**Who is responsible for ensuring the care environment is clean?**

HDL(2005)07 establishes that sisters/charge nurses are responsible for ensuring safe working conditions within their clinical area, including all aspects of environmental cleanliness. This includes authority to require local cleaning services to act on any problems identified.<sup>25</sup>

**(Mandatory)**

Local cleaning specifications should outline the allocation of cleaning duties.<sup>14</sup> Staff should be clear on their specific responsibilities in line with the local cleaning specification and should be trained accordingly.<sup>26</sup>

**(Mandatory)**

The NPSA Revised Healthcare Cleaning Manual for NHS England has generic advice on work schedules for cleaning and nursing staff.<sup>2</sup> As a generalisation, cleaning staff are responsible for the built environment and fixtures and fittings, and nursing staff are responsible for patient care equipment. The National Infection Prevention and Control Manual (NIPCM) emphasises that this is general advice, this division of responsibility for cleaning tasks is not absolute, and is subject to local policy.

**(Good Practice Point (GPP))**

**How should contamination of the care environment be monitored?**

NHSScotland Health Boards are audited on their compliance with the tasks outlined in the NHSScotland NCSS; with individual wards, facilities and Boards collecting statistics that are collated quarterly by Health Facilities Scotland (HFS). Guidance on the monitoring process is outlined in the Monitoring Framework for NHS Scotland NCSS.<sup>26</sup>

The Monitoring Framework for the NHSScotland NCSS states that monitoring is the on-going assessment of the outcome of cleaning processes, and outlines a framework for assessment.<sup>26</sup> Visual observational assessment is the method advocated in the NHSScotland NCSS, and this

is supported by the Monitoring Framework, which requires observational assessment monitoring.<sup>3;26</sup>

Visual inspections should be carried out as part of the physical monitoring of the care environment to identify damage to surfaces and accumulations of dust.<sup>24;27</sup>

### **(Mandatory)**

#### **When should new technologies be used for routine environmental cleaning?**

There is some low level evidence indicating that microfibre cloths,<sup>28;29</sup> steam cleaners,<sup>29;30</sup> hydrogen peroxide vapour fumigation<sup>2;31</sup> and antimicrobial environmental surfaces<sup>28</sup> decontaminate or provide resistance against contamination but this does not prove that they are effective in the prevention and control of healthcare associated infection.

The use of microfibre systems is permitted by the NHSScotland NCSS.<sup>3</sup> The task definition/quality standards section gives the option of using a microfibre system for various aspects of cleaning as a decision to be made locally.<sup>3</sup> This is mirrored in the NPSA Cleaning Services manual which recommends that NHS organisations in England consider adoption of these technologies as part of a managed cleaning regimen.<sup>2</sup>

The situation with steam cleaning is similar. The NPSA recommend that it can be adopted as part of a managed cleaning regimen.<sup>2</sup> In 2009, Scottish Government funding was made available to NHSScotland to support the purchase of steam cleaners for use on beds and curtains.<sup>2</sup> The NPSA cleaning manual states that steam cleaning, in combination with microfibre cloths is effective against *C. difficile* and may take place in accordance with local requirements.<sup>2</sup> However, some authors have argued that further research is needed before steam cleaning can be advocated for routine cleaning of the care environment.<sup>32</sup>

The CDC guidelines (USA) specifically recommend that hydrogen peroxide vapour fumigation (disinfectant fogging) is not used for routine cleaning in patient care areas.<sup>11</sup> The NPSA Manual states that it may be appropriate against specific pathogens but that there is insufficient evidence for use in routine cleaning.<sup>2</sup>

The use of new technologies is discussed in the NPSA manual.<sup>2</sup> The general recommendation is that new technologies require a robust evidence base before introduction to routine cleaning in the care environment. The NPSA Manual highlights that, although new technologies may be

effective, routine cleaning is also effective at reducing contamination, and re-contamination of the care environment will occur as the environment is used regardless of the effectiveness of the cleaning.<sup>2</sup> The NPSA Manual suggests that new technologies may have a role in outbreak response or to remove a particular pathogen (MRSA or *C. difficile*) from the care environment and that this should only be considered in consultation with local infection control teams.<sup>2</sup>

**(Good Practice Point (GPP))**

Any technologies that are adopted for routine cleaning of the care environment should be used in accordance with manufacturer's instructions, after risk assessment and appropriate training for users.<sup>2</sup>

**(Good Practice Point (GPP))**

## 4.2 Implications for research

Much of the evidence base on the safe management of the environment in the care setting is composed of experimental microbiological investigations, the results of which may not be readily extrapolated; and reports of responses to outbreaks, where isolating the effect of cleaning is challenging, and often based on expert opinion.<sup>17</sup> It has been said that “we simply do not know how to clean our hospitals in order to create the safest environment for patient care”.<sup>10</sup>

There remains a need for high quality primary studies on many aspects of the safe management of the care environment. Well designed primary research studies that can isolate the effect of routine cleaning on HAIs would be a valuable contribution to the evidence-base.

Despite the recognised difficulties associated with conducting such research, there is a need to research the routine use of disinfectants in cleaning of the care environment. The use of dual function detergent/disinfectant products should be considered alongside research on the use of detergents alone or detergents followed by disinfectants. This would address the reality of the clinical environment where these products are already in use.

The use of new technologies for routine cleaning of the healthcare environment is also an area where further research is required. The NPSA cleaning manual highlights that a robust evidence base is needed to support the use of new technologies in routine cleaning, including steam cleaners, microfibre cloths, hydrogen peroxide vapour fumigation and antimicrobial environmental surfaces.<sup>2</sup>

Observational methods for monitoring and assessing the cleanliness of the healthcare environment have been criticised as being subjective<sup>2;32</sup> and for over-estimating the effects of cleaning.<sup>33</sup> The NPSA Manual mentions “an appetite” for the development of more objective monitoring tools.<sup>2</sup> There is some evidence that alternative methods such as aerobic colony counts (ACC) and other microbiological evaluation, adenosine tri-phosphate (ATP) bioluminescence methodology and fluorescence are more accurate indicators of cleanliness than visual inspection.<sup>32-36</sup> However, such methods require a standardised level of microbial contamination that correlates with acceptable cleaning performance, and this has yet to be established.<sup>34;37</sup> There is scope for developing monitoring tools and standards to work in tandem with visual inspection.<sup>2;30;33;38</sup>

## References

- (1) Medicines and Healthcare products Regulatory Agency. Sterilization, disinfection and cleaning of medical equipment: guidance on decontamination from the Microbiology Advisory Committee (the MAC manual): Part 1 principles. London: MHRA; 2010
- (2) National Patient Safety Agency (NPSA). The Revised Healthcare Cleaning Manual. 2009
- (3) Health Facilities Scotland. The NHSScotland national cleaning services specification. Edinburgh: NHS National Services Scotland; 2016.
- (4) World Health Organization. WHO guidelines on hand hygiene in health care: first global patient safety challenge clean care is safer care. Geneva: WHO; 2009.
- (5) Otter JA, Yezli S, Salkeld JAG, French GL. Evidence that contaminated surfaces contribute to the transmission of hospital pathogens and an overview of strategies to address contaminated surfaces in hospital settings. *Am J Infect Control* 2013;41(5 SUPPL.):May.
- (6) Huslage K, Rutala WA, Sickbert-Bennett E, Weber DJ. A quantitative approach to defining "high-touch" surfaces in hospitals. *Infection Control & Hospital Epidemiology* 2010 Aug;31(8):850-3.
- (7) Weber DJ, Rutala WA, Miller MB, Huslage K, Sickbert-Bennett E. Role of hospital surfaces in the transmission of emerging health care-associated pathogens: norovirus, *Clostridium difficile*, and *Acinetobacter* species. *Am J Infect Control* 2010 Jun;38(5:Suppl 1):Suppl-33.
- (8) Loveday HP, Wilson JA, Pratt RJ, Golsorkhi M, Tingle A, Bak A, et al. epic3: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England. *Journal of Hospital Infection* 2014 Jan;86:Suppl-S70.
- (9) Dancer SJ. Importance of the environment in meticillin-resistant *Staphylococcus aureus* acquisition: the case for hospital cleaning. *Lancet Infect Dis* 2008 Feb;8(2):101-13.
- (10) Dancer SJ. The role of environmental cleaning in the control of hospital-acquired infection. [Review] [59 refs]. *Journal of Hospital Infection* 2009 Dec;73(4):378-85.
- (11) Rutala WA, Weber DJ, Healthcare Infection Control Practices Advisory Committee (HICPAC). Guideline for disinfection and sterilization in healthcare facilities. Atlanta, GA: Centers for Disease Control and Prevention; 2008.
- (12) Siegel, J. D., Rhinehart, E., Jackson, M., Chiarello, L., and Healthcare Infection Control Practices Advisory Committee. Management of multidrug-resistant organisms in healthcare settings. Atlanta, GA: Centers for Disease Control and Prevention; 2006
- (13) Audit Scotland. Hospital cleaning. Edinburgh: Audit Scotland; 2003

- (14) Healthcare Improvement Scotland. Healthcare Improvement Scotland Healthcare Associated Infection (HAI) standards. 2015
- (15) Health Protection Scotland. SBAR: Use of gloves for environmental cleaning. 30-5-2013. Ref Type: Unpublished Work
- (16) Rutala WA, Weber DJ. The benefits of surface disinfection. *Am J Infect Control* 2004 Jun;32(4):226-31.
- (17) Dettenkofer M, Wenzler S, Amthor S, Antes G, Motschall E, Daschner FD. Does disinfection of environmental surfaces influence nosocomial infection rates? A systematic review. *Am J Infect Control* 2004 Apr;32(2):84-9.
- (18) Alfa MJ, Lo E, Olson N, MacRae M, Buelow-Smith L. Use of a daily disinfectant cleaner instead of a daily cleaner reduced hospital-acquired infection rates. *Am J Infect Control* 2015 Feb;43(2):141-6.
- (19) Dancer SJ, White LF, Lamb J, Girvan EK, Robertson C. Measuring the effect of enhanced cleaning in a UK hospital: a prospective cross-over study. *BMC Medicine* 2009;7:28.
- (20) Sehulster L.M., Chinn R.Y.W., Arduino M.J., Carpenter J., Donlan R., Ashford D., et al. Guidelines for environmental infection control in health-care facilities. Recommendations from CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Chicago, IL: American Society for Healthcare Engineering/American Hospital Association; 2003.
- (21) Bogusz A, Stewart M, Hunter J, Yip B, Reid D, Robertson C, et al. How quickly do hospital surfaces become contaminated after detergent cleaning? *Healthcare Infection* 2013;18(1):3-9.
- (22) National Patient Safety Agency (NPSA). Colour coding hospital cleaning materials and equipment. 2007
- (23) Kingsmore P. Re: Review of the Colour Coding Scheme (letter). 30-3-2012. Health Facilities Scotland.
- (24) Health Facilities Scotland. Scottish Health Facilities Note 30 (Version 3): Infection Control in the Built Environment. 2014
- (25) Scottish Executive Health Department. Infection control and cleaning: nursing issues HDL(2005)7. Edinburgh: Scottish Executive. 2005
- (26) Health Facilities Scotland. Monitoring framework for NHSScotland national cleaning services specification: guide for managers. Edinburgh: NHS National Services Scotland; 2016.
- (27) Ling ML, Apisarnthanarak A, Thu LTA, Villanueva V, Pandjaitan C, Yusof MY. APSIC Guidelines for environmental cleaning and decontamination. *Antimicrob Resist Infect Control* 2015 Dec 29;4:58.

- (28) Sattar SA. Promises and pitfalls of recent advances in chemical means of preventing the spread of nosocomial infections by environmental surfaces. *Am J Infect Control* 2010 Jun;38(5, Supplement 1):S34-S40.
- (29) Department of Health. *An Integrated Approach to Hospital Cleaning: Microfibre Cloth and Steam Cleaning Technology*. 2007
- (30) White LF, Dancer SJ, Robertson C. A microbiological evaluation of hospital cleaning methods. *International Journal of Environmental Health Research* 2007 Aug;17(4):285-95.
- (31) Pottage T, Richardson C, Parks S, Walker JT, Bennett AM. Evaluation of hydrogen peroxide gaseous disinfection systems to decontaminate viruses. *Journal of Hospital Infection* 2010 Jan;74(1):55-61.
- (32) Sherlock O, O'Connell N, Creamer E, Humphreys H. Is it really clean? An evaluation of the efficacy of four methods for determining hospital cleanliness. *J Hosp Infect* 2009 Jun;72(2):140-6.
- (33) Cooper RA, Griffith CJ, Malik RE, Obee P, Looker N. Monitoring the effectiveness of cleaning in four British hospitals. *Am J Infect Control* 2007 Jun;35(5):338-41.
- (34) Dancer SJ. How do we assess hospital cleaning? A proposal for microbiological standards for surface hygiene in hospitals. [Review] [59 refs]. *Journal of Hospital Infection* 2004 Jan;56(1):10-5.
- (35) Willis C, Morley R, Westbury J, Greenwood M, Pallett A. Evaluation of ATP bioluminescence swabbing as a monitoring and training tool for effective hospital cleaning. *British Journal of Infection Control* 2007 Oct;8(5):17-21.
- (36) Mulvey D, Redding P, Robertson C, Woodall C, Kingsmore P, Bedwell D, et al. Finding a benchmark for monitoring hospital cleanliness. *Journal of Hospital Infection* 2011;77(1):25-30.
- (37) Carling PC, Bartley JM. Evaluating hygienic cleaning in health care settings: what you do not know can harm your patients. *Am J Infect Control* 2010 Jun;38(5 Suppl 1):S41-S50.
- (38) Griffith CJ, Cooper RA, Gilmore J, Davies C, Lewis M. An evaluation of hospital cleaning regimes and standards. *Journal of Hospital Infection* 2000 May;45(1):19-28.