Health Protection Scotland

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Literature Review and Practice Recommendations: Existing and emerging technologies used for decontamination of the healthcare environment

Wipes

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Contents

Topic....3
Background....3
Aim....4
Objectives....4
Research questions....5
Methodology....6
Search Strategy....6
Exclusion criteria....6
Screening....7
Critical appraisal....7
Results....8
Discussion....23
Recommendations for practice....26
Implications for research....28
Appendix 1: Medline Search....29
Appendix 2: Disinfectant wipe active ingredients....30
Appendix 3: Wipes available via the National Procurement Distribution Centre Supply List 32
Appendix 4: NPSA National Specifications for Cleanliness in the NHS cleaning framework for detergent wipe use within the healthcare environment....33
References....34

Topic

The use of pre-prepared wipes for decontamination of the healthcare environment and reusable non-invasive patient care equipment. Pre-prepared wipes will be referred to as 'wipes' for the purpose of this review.

Background

There is strong scientific evidence that contaminated environmental surfaces contribute to the transmission of pathogens in healthcare settings. As such, environmental decontamination has an important role to play in the prevention and control of healthcare associated infection.[1-4]

Appendix 7 within the National Infection Prevention and Control (IP&C) Manual[1] for NHSScotland outlines the recommendations for the decontamination of reusable non-invasive patient care equipment.

The National Infection Prevention and Control (IP&C) Manual[1] for NHSScotland currently outlines the following recommendations on agents for **routine environmental decontamination** within the Standard Infection Control Precautions (SICPs chapter 1), which are the basic measures intended to be applied by all staff, in all care settings, at all times, for all patients:

> *A fresh solution of general purpose neutral detergent in warm water is recommended for routine cleaning. This should be changed when dirty or at 15 minutes intervals or when changing tasks.*
>
> *Routine disinfection of the environment is not recommended. However, 1,000 ppm available chlorine should be used routinely on sanitary fittings.*[1]

The National IP&C Manual also makes recommendations on agents for environmental decontamination in the chapter outlining Transmission Based Precautions (TBPs), which are intended to be applied when caring for patients who are known to have or are suspected of having an infection.[1] The following recommendations are made in relation to **routine environmental decontamination** when applying TBPs:

*Patient isolation/cohort rooms/area must be decontaminated **at least daily** using either:*

- *a combined detergent/disinfectant solution at a dilution of 1,000 parts per million available chlorine (ppm available chlorine (av.cl.)); or*
- *a general purpose neutral detergent in a solution of warm water followed by disinfection solution of 1,000ppm av.cl.*[1]

In addition, the following recommendations are made in relation to **terminal cleaning** when applying TBPs:

> *The room should be decontaminated using either:*
>
> - *a combined detergent disinfectant solution at a dilution (1,000ppm av.cl.); or*
> - *a general purpose neutral detergent in a solution of warm water followed by disinfection solution of 1,000ppm av.cl.*[1]

Chlorine releasing agents are recommended for decontamination of sanitary fittings and for environmental decontamination under TBPs based on substantial evidence of their effectiveness against pathogens of HAI significance including norovirus and *Clostridium difficile.*[5]

However, several issues and problems associated with the use of chlorine releasing agents such as corrosion of equipment and furnishings, release of toxic gas and respiratory irritation, has encouraged interest in alternative methods of decontamination.[6] There are numerous other existing technologies such as steam cleaners, and a growing list of novel technologies becoming available for decontamination of the healthcare environment.[7-9] Currently, these technologies have not been sufficiently assessed to advocate their use for environmental decontamination in NHSScotland. A review is required to assess the effectiveness of technologies of interest to the infection control community, to consider any practical and safety considerations related to their, and to explore the associated costs.

Aim

To review the evidence for using detergent and disinfectant wipes for decontamination of the healthcare environment and reusable non-invasive patient care equipment.

Objectives

- To provide a generic description of wipes, including the proposed or actual mechanism of action and the procedure for use.
- To assess the scientific evidence for effectiveness of wipes.
- To explore practical and safety considerations related to the use of wipes.
- To explore the costs associated with use of wipes.

- To produce an evidence sheet for wipes to assist the Environmental Decontamination Steering Group in making practical recommendations on the use of wipes for NHSScotland.

Research questions

The following research questions will be addressed for wipes:

1. Are wipes currently in use in UK healthcare settings?
2. What is the actual or proposed mechanism of action of wipes?
3. What is the procedure for using wipes?
4. What is the scientific evidence for effectiveness of wipes for decontamination of the healthcare environment?
5. Are there any safety considerations associated with using wipes in the healthcare setting?
6. Are there any practical or logistical considerations associated with using wipes in the healthcare setting?
7. What costs are associated with using wipes in the healthcare setting?
8. Have wipes been assessed by the Rapid Review Panel?

Methodology

Search Strategy

The following databases and websites were searched to identify relevant academic and grey literature:

- MEDLINE
- CINAHL
- EMBASE
- NHS Evidence (http://www.evidence.nhs.uk/)
- Health Technology Assessment (HTA) Database (http://www.crd.york.ac.uk/CRDWeb/)
- Database of Abstracts of Reviews of Effects (DARE) (http://www.crd.york.ac.uk/CRDWeb/)
- National Patient Safety Agency (http://www.npsa.nhs.uk/)
- NICE (http://www.nice.org.uk/)
- MHRA (http://www.mhra.gov.uk/)
- Rapid Review Panel Reports Archive (http://www.hpa.org.uk/ProductsServices/MicrobiologyPathology/RapidReviewPanel/ReportsArchive/)

Search terms were developed and adapted to suit each database/website. Literature searches were run on 11/12/15. See Appendix 1 for an example search run in the Medline database.

Exclusion criteria

Academic and grey literature was excluded from the review on the basis of the following exclusion criteria:

- Item was published before 2005
- Item was not in English
- Item does not concern wipes (off topic)
- Item is an opinion piece or non-systematic review

- Item does not present evidence compatible with the McDonald-Arduino evidentiary hierarchy[10]
- Study did not have a comparison in the form of a standard cleaning methods

  N.B. If the study has used rigorous methodology and includes comparisons in the form of positive and negative controls or has been conducted as a before and after study it may be considered for inclusion. If these studies are included, then these limitations must be highlighted in the report.

Screening

There was a two-stage process for screening the items returned from the literature searches. In the first stage, the title/abstract was screened against the exclusion criteria by the lead reviewer. Items that were not excluded at the screening stage progressed to the second screening stage. In the second stage of the screening process, the full text of remaining items was screened against the exclusion criteria by the lead reviewer. Items that were not excluded at the second screening stage were included in the review.

Critical appraisal

Critical appraisal of the studies included in this review and considered judgement of the evidence was carried out by the lead reviewer using SIGN methodology.[11] The McDonald-Arduino evidentiary hierarchy[10] was used as the framework for assessing the evidence, and was integrated into the critical appraisal process.

Results

The search strategy found 1365 articles. After the first and second stage screening 14 articles were critically appraised. 11 articles were experimental studies, two were observational studies and one was a randomised control trial (RCT). **The RCT constituted level 1+ evidence** (well conducted meta analyses, systematic reviews of RCTs, or RCTs with a low risk of bias), while **experimental and observational studies constituted level 3 evidence** (experimental or observational analytic studies)**.**

One study investigated the efficacy of detergent wipes, one study compared the efficacy of a detergent wipe and disinfectant wipe and the remainder of studies investigated effectiveness of disinfectant wipes. The majority of studies concentrated on pathogen removal and pathogen transfer between surfaces. Tested surfaces ranged from laboratory manufactured surrogate materials to machinery/equipment used within the healthcare setting. Both observational studies and one RCT considered general environmental cleaning of various surfaces within the healthcare setting. All studies included a comparison to another cleaning method, with the majority of studies comparing various wipe types only. The majority of studies evaluated the killing/removal of bacteria (species particularly attributed to causing healthcare associated infections), with one study also considering *Candida albicans*.

Detergent wipes

- One study[12] demonstrated that the efficacy of detergent wipes in removing bacteria and spores from a surface varied considerably, depending on both wipe type and organism. In addition, the majority of wipes were found to repeatedly remove and transfer large amounts of bacteria and spores between surfaces. As expected, none of the wipes exhibited a bactericidal effect.

Detergent/disinfectant wipes

- One study[13] demonstrated that both a disinfectant wipe (containing two quaternary ammonium compounds (QACs) and a biguanide as active ingredients) and a detergent wipe removed and transferred large amounts of bacteria, although, as expected the disinfectant wipe exhibited a significant bactericidal activity in comparison to the detergent wipe.

Disinfectant wipes

- The majority of disinfectant wipe studies make comparisons to negative control wipes formulated as part of each study. Negative control wipes were either composed of a dry sterile cloth or a dry sterile cloth soaked in sterile water/saline. Appendix 2 summarises

wipe active ingredients for each study. It should be noted that some studies specified the wipe name and manufacturer only, meaning that active ingredients had to be obtained from manufacturer websites/data sheets.

- Although many of the disinfectant wipe studies evaluated wipes containing isopropanol,[14-20] for a significant antimicrobial effect to be exhibited against a variety of pathogens, there is consensus within the literature that alcohol concentrations need to exceed 50%.[21] Only wipes within two studies met this criterion and contained 70% isopropanol.[15;20]

- Four studies[14;18-20] demonstrated that wipes containing one or more QACs were either *as effective* or *more effective* than negative control wipes or wipes containing other active ingredients. In addition, four further studies[15-17;22] demonstrated that wipes containing one or more QACs were *less effective* than negative control wipes or wipes containing other active ingredients.

- Two studies[19;22] demonstrated that wipes containing biguanides were either *as effective* or *more effective* than negative control wipes or wipes containing other active ingredients. Two further studies[15;20] also demonstrated the effectiveness of biguanide containing wipes, specifically those containing chlorhexadine. It should be noted that chlorhexadine wipes also contained 70% isopropanol[20] or both hydrogen peroxide and 70% isopropanol[15] as additional active ingredients.

  Interpretation of the results should take into consideration that the majority of disinfectant wipes containing QACs also contained biguanides and vice versa.

- Two studies[17;19] demonstrated that wipes containing sodium hypochlorite were either *as effective* or *more effective* than negative control wipes or wipes containing other active ingredients. In a further study[16] wipes containing 0.55% sodium hypochlorite were the most effective and those containing 0.94% sodium hypochlorite were the least effective wipes, when comparing 6 wipes containing various active ingredients. An observational study[23] also demonstrated that sodium hypochlorite containing wipes were more effective than use of a QAC liquid disinfectant, although this was not a direct head-to- head comparison. One study[24] demonstrated that wipes containing sodium hypochlorite were *no more effective* than a negative control wipe.

- Four studies[14;16;17;19] demonstrated that wipes containing hydrogen peroxide were either *as effective* or *more effective* than negative control wipes or wipes containing other

active ingredients. An additional study[15] also demonstrated that hydrogen peroxide wipes were more effective than QAC/biguanide wipes, but it should be noted that hydrogen peroxide wipes within this study also contained a biguanide and 70% isopropanol as active ingredients. One study[24] demonstrated that wipes containing hydrogen peroxide were *no more effective* than a negative control wipe.

- One study[22] demonstrated that wipes containing a combination of sodium percarbonate, citric acid and tetra acetyl ethylene diamine (generate peracetic acid upon activation with water) were either *as effective* or *more effective* than wipes containing other active ingredients. One experimental study[25] and one observational study[26] also found that peracetic acid wipes were either *as effective* or *more effective* than chlorine based products. One further study[19] demonstrated that peracetic acid wipes were *less effective* than wipes containing other active ingredients.

- Two studies[16;17] demonstrated that wipes containing citric acid alone as an active ingredient were *less effective* than negative control wipes or wipes containing other active ingredients.

- Two studies[16;17] demonstrated that wipes containing phenol compounds were either *as effective* or *less effective* than negative control wipes or wipes containing other active ingredients.

- One study[20] demonstrated that a chlorine dioxide containing wipe was *more effective* than a negative control wipe.

Some of the studies took place outside of the UK. There were five studies that took place in the USA, one in Canada and one in Israel. A number of wipe manufacturers provided wipes or wider study funding and in some instances contributing authors provided consultation to wipe manufacturing companies. It is worth considering this when assessing the results.

Research Questions

1. Are wipes currently in use in UK healthcare settings?

Detergent wipes are mentioned in HPS' National Infection Prevention and Control Manual, [1] in specific relation to use in the Scottish National Blood Transfusion Service and Scottish Ambulance Service. In addition, the HPS Standard Infection Control Precautions Literature review 'Management of patient care equipment'[27] briefly discusses wipes, with the primary focus being the active ingredients used within wipes rather than wipe effectiveness or utility. Detergent wipes therefore are widely used within NHSScotland for the decontamination of the healthcare environment and reusable non-invasive patient care equipment.

The National Patient Safety Agency (NPSA) National Specifications for Cleanliness in the NHS[28] and the NPSA Revised Healthcare Cleaning Manual[29] also mention use of detergent wipes and disinfectant wipes, recommending wipe use for a variety of cleaning procedures.

Various detergent and disinfectant wipe products are currently available via the Scottish National Procurement Distribution Centre Supply List (See Appendix 3).The NHS Supply Chain also provides a more extensive list of available wipe products in England.

A number of UK Trusts have also described successful implementation of disinfectant wipe use for standard cleaning, specifically peracetic acid wipes and combined chlorhexadine/70% isopropanol wipes. [26;30]

2. What is the actual or proposed mechanism of action of wipes?

Detergent wipes are formulated to remove contamination from surfaces. Disinfectant wipes contain a specific antimicrobial agent/s and are also often combined with detergent agents for dual action; the removal of bioburden and destruction of any microorganisms contained within it.[31;32]

Detergent wipes

The major ingredients of detergent wipes are surfactants, which are commonly combined with additional compounds including preservatives, enzymes and perfume.[12] Contamination (including microorganisms) is removed and retained by the wipe. Microorganisms not removed should remain inactivated but may still be transferred to other surfaces.[32]

Disinfectant wipes

Disinfectant wipes without detergent properties have a limited cleaning activity and use of a detergent cleaning agent is therefore necessary prior to wipe use.[32] For disinfectant wipes containing a detergent, the relationship between detergent and microbicidal composition

needs to be exact, as the wrong formulation may lead to inefficient removal of the microbial bioburden from surfaces as well as the potential for pathogens to be released during wiping.[22] The (wet) contact time in combination with the surface drying time needs to be considered when assessing wipe use.[32] If a product has a rapid drying time combined with a long contact time, it must be re-applied until the recommended contact time is achieved. Temperature, humidity and pH are also important considerations.[33]

The mechanism of action of disinfectant wipes is largely dependent on the active ingredient/s within the formulation. Active ingredients within disinfectants have been discussed in several reviews and international guidelines, [21;31;34] although there is little agreement regarding the concentrations at which these are effective against a variety of microorganisms:

- Alcohols exceeding a concentration of approximately 50%, including ethanol and isopropanol are considered to exhibit broad-spectrum antimicrobial activity against bacteria, viruses and fungi. They are not considered to have sporicidal activity. The proposed mechanism of action causes membrane damage and rapid denaturation of proteins. Low concentrations of alcohols are often included in wipe formulations for solvent/drying properties rather than antimicrobial action.

- QACs, biguanides and phenols all act on the bacterial cell membrane with various degrees of activity depending on concentrations utilised within disinfectants. In addition, a level of virucidal activity is also exhibited, specifically against lipid containing viruses e.g. Herpesviruses, Paramyxoviruses and Orthomyxoviruses. QACs are also known to be sporostatic and exhibit activity against yeasts. Phenols also possess antifungal properties. In terms of biguanides; chlorhexadine is known to be active against yeasts but has minimal activity against spores.

- Chlorine dioxide and sodium hypochlorite are oxidizing agents and therefore destroy cellular proteins. Activity is also exhibited against both lipid and non-lipid viruses and spores.

- Hydrogen peroxide acts an oxidant by producing hydroxyl free-radicals which damage lipids, protein and DNA. It demonstrates broad-spectrum efficacy against viruses (both lipid and non-lipid), bacteria (including spores) and yeasts.

- Peracetic acid is considered to be bactericidal, sporicidal, virucidal and fungicidal. In terms of bacteria and fungi, its activity leads to protein denaturation and increases cell wall permeability.

3. What is the procedure for using wipes?

See Appendix 4 for an amended version of the NPSA National Specifications for Cleanliness in the NHS[28] cleaning framework, specific for detergent wipe use within the healthcare environment. This is provided to guide cleaning schedules but should not replace local infection control policy or manufacturer instructions, as indicated.

As previously outlined; detergent wipes are formulated to remove contamination from surfaces (i.e. to physically clean). Disinfectant wipes contain specific antimicrobial agent/s and are used to inactivate bioburden on surfaces, which may contain infectious microorganisms and blood/bodily fluids.

Due to the variety of detergent and disinfectant wipes available, it is advisable that manufacturer instructions are followed regarding correct use. In summary, instructions for use of detergent wipes are as follows:

1) Use one or more wipes to clean the surface of gross debris/heavy soil.
2) Allow the surface to air-dry or rinse if this is a specific requirement for the cleaned surface/ equipment.

Depending on disinfectant wipe type, a number of manufacturers' recommend that disinfectant wipes can be used in place of a detergent for the removal of contamination. Instructions for use of disinfectant wipes are as follows:[16]

1) Use one or more wipes to initially clean the surface of gross debris/heavy soil.
2) To disinfect, use enough wipes to ensure that the surface remains visibly wet for the allocated contact time.
3) Allow the surface to air-dry or rinse if this is a specific requirement for the cleaned surface/ equipment.

Contact times generally range from 30 seconds to 10 minutes, depending on the target pathogen.[13;16;23;31] Various authors have highlighted that manufacturer contact times are unrealistically long for adoption in clinical practice.[19;22;31;33] The authors of one study[23] describe that a contact time of 10 minutes was achievable in practice but stated that this may not be possible for low humidity environments. Wipes have also been shown to have a shorter drying time than spray disinfectants.[24]

Manufacturers typically do not specify the desired frequency of wipe use. One study[14] compared wiping frequencies of one, three and five 'swipes'. The results indicated that an increase in wiping frequency was associated with an improved removal of microbial

contamination. In addition, a number of authors advocate a '1 wipe, 1 surface, 1 direction approach' which is considered to be applicable for use in practice.[12;13;22]

4. What is the scientific evidence for effectiveness of wipes for decontamination of the healthcare environment?

Although various efficacy tests are used to infer disinfectant wipe effectiveness, there is currently no mandatory UK standard. These standards are generic to liquid disinfectants and rely on proxy test methods which typically do not account for physical wiping action or the application of practice relevant contact times. Disinfectant wipes typically conform to standards from the British Standards Institution (BSI), a member of the wider European Comité Européen de Normalisation (CEN). In brief, standardised methods are conducted in three phases of testing: [32;33;35]

- Phase 1- quantitative suspension tests used to establish that substances/products under development have antimicrobial activity. Results from these tests should not be used for any product claims. Examples include BS EN 1040 (demonstration of bactericidal activity and a microbial reduction > 1 x 10^5) and BS EN 13624 (demonstration of antifungal activity and a microbial reduction > 1 x 10^4).

- Phase 2- comprises of two tests:
    - Phase 2, Step 1 tests are quantitative suspension tests to establish that a product has antimicrobial activity under simulated practical conditions appropriate to its intended use. Examples specific to the medical industry include BS EN 13727 (demonstration of bactericidal activity and a microbial reduction > 1 x 10^5), BS EN 14348 (demonstration of mycobactericidal activity and a microbial reduction > 1 x 10^4), BS EN 13624 (demonstration of antifungal activity and a microbial reduction > 1 x 10^4) and BS EN 14476 (demonstration of virucidal activity and a microbial reduction > 1 x 10^4).
    - Phase 2, Step 2 tests are quantitative laboratory tests to establish that a product has antimicrobial activity when applied to a surface under simulated practical conditions. Examples specific to the medical industry include BS EN 14561 (demonstration of bactericidal activity and a microbial reduction > 1 x 10^5) and BS EN 14562 (demonstration of antifungal activity and a microbial reduction > 1 x 10^4).
- Phase 3- field tests under practical conditions which are currently under development.

Detergent wipes are not considered to exhibit 'cidal' properties and therefore do not conform to the above standards.

A study[36] by Williams *et al*., first described a three step method considered to be more specific for testing wipe effectiveness, in comparison to the described BS EN Standards. The method is considered to reproducibly test the efficiency of wipes in a manner which reflects use in practice. This method has since been adopted within a number of studies and assesses wipe removal of microorganisms from surfaces, the transfer of microorganisms from wipes and the direct antimicrobial activity of wipes.[12;13;19;22]

As detailed in the protocol, the McDonald-Arduino evidentiary hierarchy[10] was used as the framework for assessing the evidence, and has been integrated into the critical appraisal process.

Level V – Demonstration of reduced microbial pathogen acquisition (colonisation or infection) by patients via *non-outbreak* surveillance testing and clinical incidence:

An observational study[26] conducted within a UK Trust evaluated *Clostridium difficile* rates across a whole hospital site, following the implementation of disinfection with peracetic acid wipes. Prior to the wipe intervention, wards were cleaned with a chlorine releasing agent. A significant reduction in *C. difficile* rates was demonstrated following implementation of the wipe intervention. The results of this study should be interpreted with caution due to various limiting factors, including that only partial information was provided on the cleaning regimen used prior to wipe implementation (use of 'chlorine based products'). In addition, during the introduction of peracetic acid wipes, other interventions were also initiated, including dedicated Infection Prevention ward rounds and focused training for use of the wipes.

Level IV – Demonstration of reduced microbial pathogen acquisition (colonisation or infection) by patients via outbreak surveillance testing and clinical incidence:

An observational study[23] conducted in the USA evaluated *C. difficile* rates in two wards with a high incidence of infection, following the implementation of disinfection with sodium hypochlorite wipes. Prior to the wipe use intervention, wards were cleaned with a QAC solution. The intervention reduced *C. difficile* infection (CDI) incidence by 85%. The authors stipulate that 27 cases of hospital-acquired CDI were prevented by implementation of wipes. The main limitations of this study relate to the targeted approach utilised; areas disinfected were associated with high CDI rates, the implication being that the results may not be generalisable to general healthcare settings.

Level III – Demonstration of in-use bioburden reduction that may be clinically relevant:

An RCT[15] compared the efficacy of two **disinfectant wipes** (one wipe containing isopropanol, chlorhexidine and hydrogen peroxide as active ingredients and the second containing two QACs and a biguanide) for the removal of microorganisms from computer keyboards and computer mice used within general medical and intensive care wards. Both wipe types reduced microbial contamination significantly in comparison to baseline measurements obtained prior to disinfection, but the wipe containing isopropanol, chlorhexidine and hydrogen peroxide was significantly more effective than the QAC/biguanide containing wipe. As keyboards and mice were not artificially contaminated prior to disinfection, the results from this RCT have the potential to be clinically relevant. A key limitation of the RCT was that it was conducted in Israel, with the authors not specifying which microorganisms were investigated, stating only that microorganisms were classified into '3 groups: high-, moderate-, and minimal-risk groups based on pathogenicity and clinical risk for hospital-acquired infection.' This adds ambiguity to the relevance of the results for consideration of specific healthcare associated organisms within UK healthcare settings.

Level II – Demonstration of in-use bioburden reduction effectiveness:

An experimental study[16] assessed the efficacy of **disinfectant wipes** for the removal of *Streptococcus pneumoniae* and artificial coagulated blood test soil from an anaesthesia machine. All tested wipes were equivalent in removing bacterial contamination from the device surface. In addition, although all wipes left a considerable amount of blood test soil on the anaesthesia machine; a wipe containing sodium hypochlorite (0.55%) was most effective at removing this. Interestingly, the least effective wipe also contained sodium hypochlorite but at a higher concentration (0.94%). The authors stipulate that the difference observed was due to wipe composition rather than any differences in terms of the active ingredient. A wipe containing hydrogen peroxide also performed favourably, demonstrating a comparable effectiveness with the 0.55% sodium hypochlorite wipe at removal of the blood test soil. The remaining three wipes (containing either phenols, a QAC or citric acid as active ingredients) resulted in similarly low levels of test soil removal.

An experimental study[17] assessed the efficacy of **disinfectant wipes** for the removal of *Staphylococcus aureus, Bacillus atrophaeus* spores and *Clostridium sporogenes* spores from the surface of an anaesthesia machine and flat/ridged caps. All wipes (including positive ((5% sodium hypochlorite)) and negative control wipes) significantly lowered the colony forming units (CFU) for the tested organisms following wiping in a horizontal motion

three times. There was no significant difference in the removal of *S. aureus* from the anaesthesia machine between any of the wipes. The QAC containing wipe performed least favourably; it was the only wipe found to be no better than the negative control wipe at removing *S. aureus* from the flat/ridged caps. Two other wipes (containing either phenols or citric acid as active ingredients) were also found to have limited effectiveness. The two wipes, containing either sodium hypochlorite or hydrogen peroxide as the only active ingredients were the most effective. The sodium hypochlorite wipe was significantly better than other wipes at removing both *B. atrophaeus* and *C. sporogenes* spores from the anaesthesia machine. The hydrogen peroxide wipe was significantly better than other wipes at removing *S. aureus* from caps. It was also the only wipe significantly better at removing *B. atrophaeus* spores only from the anaesthesia machine surface.

An experimental study[18] assessed the efficacy of **disinfectant wipes** for the removal of *S. aureus*, Vancomycin Resistant Enterococci (VRE) and *Pseudomonas aeruginosa* from the surface of computer keyboards. All wipes (including a negative control wipe) were highly effective at removing and/or inactivating tested bacteria (> 99%) from keyboards. All commercial wipes tested contained QACs. A number of 'wipes' were also designed as part of this study, results from which were excluded from discussion. The study also assessed the residual antibacterial activity of wipes. All wipes demonstrated excellent (100%) sustained activity against VRE and moderate (32-86%) sustained activity against *P. aeruginosa* for up to 48 hours after application, unlike the negative control wipe. A key limitation of the study is that statistical significance was not calculated; therefore assumptions relating to true wipe efficacy have to be made.

An experimental study[20] assessed the efficacy of **disinfectant wipes** for the removal of *C. difficile*, Meticillin Resistant *Staphylococcus aureus* (MRSA) and VRE from the surface of tablet devices. All wipes were statistically better at removing bacteria from tablet computers in comparison with the lint free cloth negative control. Three wipes (containing either a QAC, isopropanol and chlorhexadine or chlorine dioxide as active ingredients) were most effective, with the chlorine dioxide wipe leading to the most apparent reduction in *C. difficile,* although this was not significant. A wipe containing a biguanide and two QACs performed least favourably. The wipe containing isopropanol and chlorhexadine was the only wipe found to exhibit a residual antibacterial effect (no growth after recontamination of the surface with bacteria) for MRSA and VRE. No wipes exhibited a residual effect on *C. difficile*. It should be noted that active ingredients were not disclosed within the study and had to be obtained from manufacturer websites/data sheets.

An experimental study[25] assessed several methods of disinfection (hydrogen peroxide vapour, dry ozone, a chlorine-releasing agent used at 1000ppm, microfibre cloths used with or without the chlorine releasing agent, high temperature over heated dry atomized steam cleaning, steam cleaning and **peracetic acid wipes**) for *C. difficile* contaminated rooms. Peracetic acid wipes were as effective as use of the chlorine releasing agent, at 1000ppm available chlorine, which is currently recommended[1] as part of routine environmental decontamination in NHSScotland. Limitations of the study include that disinfected rooms had different baseline counts of *C. difficile*, potentially impacting on the apparent effectiveness of the cleaning techniques. Each room was also a different size and temperature which may have unknown effects on bacterial growth/sporulation.

Level I – Laboratory demonstration of bioburden reduction efficacy:

An experimental study[12] compared the efficacy of **detergent wipes** for the removal of *Acinetobacter baumannii, S. aureus* and *C. difficile* spores from stainless steel discs. Wipe efficacy varied considerably, depending on both wipe type and organism. In general, wipes which removed the most bacteria from discs were also associated with high levels of bacterial transfer between surfaces. This was most apparent with *S. aureus* and *C. difficile*. *A. baumannii* was removed most efficiently by all wipes and was associated with the lowest level of transfer. As expected, none of the detergent wipes exhibited direct bactericidal activity.

An experimental study[13] compared the efficacy a **detergent wipe** and **disinfectant wipe** (containing two QACs and a biguanide as active ingredients) for the removal of *S. aureus* from steel discs. There was no significant difference between the two wipes in microorganism removal, in the presence or absence of an organic load. In addition, significant viable counts were obtained from both wipes, indicating that wipes have the potential to release and transfer organisms between surfaces. The disinfectant wipe was found to exhibit this to a lesser extent. In addition, as expected, only the disinfectant wipe exhibited bactericidal activity.

An experimental study[19] assessed the efficacy of **disinfectant wipes** for the removal of *S. aureus* and *A. baumannii* from stainless steel discs. All tested wipes produced a significant reduction in the bacterial bioburden on surfaces compared with a negative control wipe. Wipes containing hydrogen peroxide and sodium hypochlorite were most effective in reducing both bacterial species. The remaining three wipes (containing either two QACs and a biguanide, peracetic acid or a QAC alone as active ingredients) produced a more considerable reduction in *A. baumannii* than *S. aureus*. The study also assessed potential

bacterial transfer from wipes. Only use of the hydrogen peroxide wipe resulted in no detectable bacterial transfer, with the remaining wipes transferring at least one bacterial species.

An experimental study[14] assessed the efficacy of **disinfectant wipes** for the removal of VRE, MRSA, *P. aeruginosa* and *C. albicans* from a plastic surface. All wipes (including a negative control wipe) were found to reduce the microbial bioburden on surfaces. Wipes containing a QAC or hydrogen peroxide performed most favourably. The only other comparator wipe contained 5% ethanol as a listed active ingredient which is unlikely to be bactericidal at this concentration.

An experimental study[22] assessed the efficacy of 'sporicidal' **disinfectant wipes** for the removal of *C. difficile* from stainless steel discs. A peracetic acid wipe removed significantly more spores than other tested wipes. A QAC containing wipe and a QAC and biguanide containing wipe also performed favourably. The remaining wipes (except one where the active ingredients were unclear) also contained a QAC or QAC and biguanide; therefore the varying wipe efficiency cannot be explained by active ingredient/s alone. The study also assessed potential bacterial transfer from wipes. Only use of the peracetic acid wipe prevented bacterial transfer, while all other wipes were associated with the release of spores.

An experimental study[24] assessed the efficacy of various disinfecting agents (a QAC solution, a sodium hypochlorite solution, a hypochlorous acid solution, a **hydrogen peroxide and peracetic acid wipe** and a **sodium hypochlorite wipe**) for the removal of *C. difficile* from plastic sheets. Both wipes were effective in removing and inactivating *C. difficile* spores to a higher degree than the negative control wipe, although the difference was not significant. Wiping with a disinfectant wipe was not associated with increased removal of *C. difficile* in comparison to use of a disinfectant solution followed by wiping with a cloth.

5. Are there any safety considerations associated with using wipes in the healthcare setting?

In terms of general infection prevention precautions; improper use of wipes can spread contamination between surfaces.[13;22] Wipes also need to be properly discarded after use.[33]

In addition, some disinfectants used in wipes may damage hands; therefore manufacturers generally provide instructions for gloves to be worn when using wipes.[33]

The safety profiles of disinfectants within wipes vary. It should be also be noted that in general, the low concentrations used within wipes are unlikely to cause the detrimental effects described: [31;35]

- Sodium hypochlorite is suitable for use on large surfaces and does not have significant toxic side effects. High concentrations can produce ocular irritation or oropharyngeal, esophageal, and gastric burns.
- Phenols are considered to have a low toxicity and mutagenicity. Inhalation of vapours has been documented to cause irritation of the airways and eyes. Long-term exposure has also been associated with reproductive toxicity.
- QACs have limited toxicity, although benzalkonium chloride has been shown to induce inflammatory irritation, including asthma and eczema.
- Hydrogen peroxide and peracetic acid have been associated with serious eye damage, following direct contact.
- Alcohols are not associated with significant safety risks other than flammability, and consequently must be stored in a cool, well-ventilated area.

6. Are there any practical or logistical considerations associated with using wipes in the healthcare setting?

Use of wipes has been associated with increased compliance due to perceived ease of use.[25;26;37] In addition, time saving benefits in comparison to other methods have also been reported.[25;30;37]

The majority of wipes are provided in a 'ready-to-use' formulation. Exceptions include peracetic acid wipes which require the addition of water[26] and chlorine dioxide wipes which are generally part of a three step system, requiring initial activation and rinsing after use.[20]

Due to the variety of wipes currently available, various wipe characteristics should be considered alongside manufacturer claims of effectiveness. These include size, thickness and material composition, which ultimately determine the quantities of detergent or disinfectant released and retained by the wipe.[33] The degree of wipe wetness also impacts on cleaning efficacy; with one study reporting a moderate wipe moisture content (approximately 0.6 g/cm^3) was most effective at removing microorganisms from surfaces[17] and a further study[16] stipulating that wipes which are too wet lose effectiveness in terms of the physical removal of debris. Furthermore, the area of the surface requiring cleaning also

requires consideration, as wipes lose efficacy during use due to gradual drying and contamination with debris.[33]

A number of studies evaluating potential damage to surfaces due to disinfectant wipe use reported that no visible damage or decrease in functionality was observed after prolonged cleaning (300[18] or 480[20] cleaning episodes), indicating that long-term use of wipes may be viable for disinfection of various surfaces.

7. What costs are associated with using wipes in the healthcare setting?

Limited information is available on costs associated with wipe use. Two studies[25;26] evaluating peracetic acid wipes concluded that cost benefits could be made with implementation of these. One study[26] stated that an annual supply of peracetic acid wipes cost £6,566. When the cost per patient with CDI (the approximate cost per patient with CDI was quoted as £4,000) was multiplied by the reduction in cases during the wipe use intervention, the cost saving was £660,000. It should be noted that the authors within this study did not consider additional factors which could have contributed to the reduction in CDI rates. In addition, an experimental study[25] comparing eight disinfection methods for *C. difficile* found the cost per clean using peracetic acid wipes was £23.01. As a comparison; the cost per use of the most expensive methods evaluated within the study; dry ozone and hydrogen peroxide exceeded £100.

A study[23] from the USA evaluating sodium hypochlorite wipes in comparison to a QAC based liquid disinfectant, stipulated that a 7-fold reduction in CDI due to the implementation of wipe use, as observed in the study, would equate to an annual cost saving between $122,316 and $203,316.

A further study[37] from the USA evaluating hydrogen peroxide wipes in comparison to a hydrogen peroxide bucket based system calculated time-related cost savings. This was achieved by calculating the time difference between the two methods and multiplying it by an average employee wage. Cost savings related to wipe use were $38.58 per employee per day. This figure does not account for total cost savings, which may be dependent on the contract pricing of the product, the number of wipes used per room and the number of rooms disinfected per day.

8. Have wipes been assessed by the Rapid Review Panel?

The Rapid Review Panel (RRP) is a panel of UK experts established by the Department of Health to review technologies with potential to help in the prevention and control of HAI.[38]

A number of wipe products have been assessed by the RRP:

- Impy Wipes (December 2004) were awarded a level 4 recommendation- '*No evidence of a significant improvement on equipment/materials/products already available; no further consideration needed'*.
- Clinell Wipes/Hand Scrub (May 2005) were awarded a level 3 recommendation- '*A potentially useful new concept but insufficiently validated; more research and development is required before it is ready for evaluation in practice'*. No further information was provided on the type of Clinell wipe evaluated.
- Active8 Sanitation Wipes (September 2007) were awarded a level 5 recommendation- '*Insufficient clarity/evidence presented to enable full review of the product*'.
- Enduro Sporicidal Wipes (April 2009) were awarded a level 5 recommendation- '*Insufficient clarity/evidence presented to enable full review of the product*'.
- KIMTECH One-Step Germicide Wipes (September 2009) were awarded a level 4a recommendation- '*Not a significant improvement on equipment/materials/products already available which claim to contribute to reducing health care associated infection; no further consideration needed'*.
- AzoMaxActive Wipes (September 2009) were awarded a level 5 recommendation- '*Insufficient clarity/evidence presented to enable full review of the product*'.

Discussion

Based on an assessment of the extant professional literature; 14 publications were identified, eleven of which were experimental studies, two were observational studies and one was an RCT. **The RCT constituted level 1+ evidence, while experimental and observational studies constituted level 3 evidence.**

Pre-prepared wipes are currently used for cleaning/disinfection within UK healthcare settings, although specific information relating to wipe type and indicated use is generally limited.[1;26-30] Wipes are often chosen instead of an alternative cleaning method due to perceived ease of use,[25;26;37] in addition to time saving benefits.[25;30;37] A number of studies also report cost saving benefits attributed to wipe use.[23;25;26]

The evidence identified as part of this literature review was very limited. There was insufficient evidence to formulate any conclusions regarding the effectiveness of detergent wipes. The only identified study[12] demonstrated that detergent wipes have the potential to transfer microorganisms between surfaces. This is unlikely to occur in practice, due to local guidance and manufacturer instructions generally discouraging the use of one wipe for the cleaning of multiple surfaces.

A number of studies assessed the efficacy of disinfectant wipes.[14-20;22-26] There was a lack of consistency between studies, impeding a detailed evaluation of the evidence. Namely, active ingredients within wipes and specifically the use of multiple active ingredients and differing concentrations of these, varied widely between studies. In addition, several studies compared wipe use alone while others compared wipe use to other methods of disinfection. Furthermore, studies evaluated a number of microorganisms and surface types. The study outcomes also varied significantly, with wiping frequency, wiping time, contact time, drying time and direct/residual antimicrobial effect being assessed by different studies.

It should also be noted that several experimental studies[12;13;16] failed to include a negative wipe control, therefore not accounting for the physical removal of contamination associated with wiping action alone.

Nonetheless based on the identified evidence, a number of disinfectant wipes were associated with greater decontamination efficacy:

Peracetic acid

Based on the results from three studies[22;25;26], peracetic acid wipes were found to be effective against *C. difficile*. In contrast, an experimental study[19] found that although peracetic acid wipes reduced bacterial loads of both *S. aureus* and *A. baumannii* on

surfaces, use of all other tested wipes resulted in larger reductions. The concentrations of sodium percarbonate, citric acid and tetra acetyl ethylene diamine in peracetic wipes within all four studies were identical (40-50/5-10/10-35%, respectively), allowing a direct comparison to be made.

Sodium hypochlorite

The results of four out of five studies identified as part of this literature review demonstrated efficacy of sodium hypochlorite wipes. Two studies[17;19] demonstrated that wipes containing sodium hypochlorite were effective against a variety of bacteria including *B. atrophaeus* and *C. sporogenes* spores (surrogate organisms for *C. difficile* and *B. anthracis*, respectively). In a further study[16] wipes containing 0.55% sodium hypochlorite were the most effective at removing artificial blood debris from surfaces and those containing 0.94% sodium hypochlorite were least effective, when comparing 6 wipes containing various active ingredients. The authors concluded that the difference in wipe performance was due to differences in formulation, specifically an increased wipe wetness within the 0.94% wipe, which was considered to significantly alter the efficacy of sodium hypochlorite. An observational study[23] also found that use of sodium hypochlorite wipes resulted in a decrease in CDI rates in comparison to prior use of a QAC based disinfectant, although due to this being a 'before and after' study, a direct head-to-head comparison was not performed. In contrast, an experimental study[24] found that wipes containing sodium hypochlorite were no more effective than a negative control wipe at removing/inactivating *C. difficile.* The concentration of sodium hypochlorite in wipes was 0.55% within the majority of studies, other than the 0.94% as described above. One of the studies[19] also only specified that the sodium hypochlorite was < 3% within wipes.

Hydrogen peroxide

The results from four[14;16;17;19] out of six studies demonstrated the efficacy of hydrogen peroxide wipes against a variety of bacteria including *B. atrophaeus* spores. The concentration of hydrogen peroxide was 0.5% within all wipes within these studies allowing direct comparison. An RCT[15] also demonstrated that hydrogen peroxide wipes were more effective than QAC/biguanide wipes, but it should be noted that hydrogen peroxide wipes within this study also contained a biguanide and 70% isopropanol as active ingredients, therefore no conclusions on the action of hydrogen peroxide alone can be made. One further study[24] evaluating hydrogen peroxide wipes for efficacy against *C. difficile*, found these wipes to be no more effective than negative control wipes. Again, it should be noted that these wipes contained peracetic acid and acetic acid as listed active ingredients. Some

hydrogen peroxide wipes are claimed by manufacturers to demonstrate virucidal activity against enveloped viruses, including hepatitis B virus, hepatitis C virus and human immunodeficiency virus. This is based upon unpublished laboratory studies showing efficacy against the surrogate enveloped viruses vaccinia virus and bovine viral diarrhoea virus (BVDV).

The effectiveness of other wipes was largely inconclusive, these included QAC and biguanide wipes or wipes containing a mixture of both of these active ingredients, in addition to citric acid, chlorine dioxide or phenol containing wipes. There were no studies included within the literature review which looked specifically at alcohol wipes, although there were two studies in which alcohol was an active ingredient at 70%. However, the CDC Guidelines for Disinfection and Sterilization in Healthcare Facilities states alcohol wipes containing 60-90% of alcohol as the active ingredient can be used for the disinfection of hard surfaces.[31] In addition; they refer to unpublished laboratory evidence that ethyl alcohol and isopropyl alcohol, at concentrations of 60-80%, are effective at inactivating HBV and HIV.

Various studies have demonstrated that wipes have the potential to spread bacterial contamination between surfaces.[12;13;19;22] A number of authors therefore advocate a '1 wipe, 1 surface, 1 direction approach' which is considered to be applicable for use in practice, to limit the potential spread of contamination.[12;13;22]

It is reasonable to infer that the results from these studies are applicable in Scotland. The majority of studies investigated commercially available wipes which are commonly used in UK healthcare settings. It is important to note that the majority of the studies were undertaken in a laboratory environment which may not adequately represent use in clinical practice.

Although the RRP evaluated several wipe products, none of the recommendations were strong enough to advocate wipe use. The majority of these recommendations are now also potentially out-dated.

Recommendations for practice

This review makes the following recommendations based on an assessment of the extant scientific literature on detergent and disinfectant wipes.

If NHS boards use wipe products, the following must be considered:

Practice

- Regardless of the wipe being used, an approach of one wipe, one surface and one direction is recommended. This should be cross referenced against the manufacturer's instructions for use.
  (Grade D recommendation)
- Detergent wipes are currently used within NHSScotland for general cleaning and it is advised that manufacturer instructions are followed regarding their use. Where detergent wipes are used, this should follow the principle of: one wipe, one surface and one direction.
  (Grade D recommendation)
- For all types of wipe, it is recommended that surfaces are wiped more than once (using different wipes) to increase the removal of microbial contamination.
  (Grade D recommendation)
- Where manufacturers produce wipes with a multi folding action to achieve a similar action to one wipe, one surface, one direction then education and training should be provided for staff to ensure optimal use of the product.
  (Grade D recommendation)
- Detergent wipes do not have disinfecting properties and should not be used as a method of disinfection.
  (Good Practice Point)
- The choice of disinfectant wipe should always be cross checked with the manufacturer's instructions to determine if a detergent wipe is required pre disinfection.
  (Grade D recommendation)
- Manufacturer instructions should be followed regarding wipe contact times. If a range of contact times is provided, it is advisable that the longer specified contact time is applied.
  (Grade D recommendation)

Bactericidal/Sporicidal

- There was consensus in the evidence regarding effectiveness of:
    - peracetic acid
    - hydrogen peroxide, and
    - sodium hypochlorite disinfectant wipes.

  Wipes containing these active ingredients, or a combination of these active ingredients, were found to be effective against a range of bacteria and spores. When considering the implementation of disinfectant wipes, the active ingredients should include sodium hypochlorite singularly or in combination with peracetic acid or hydrogen peroxide.
  (Grade D recommendation)

- Peracetic acid wipes can be used as a method of disinfection for terminal cleaning and isolation cleaning. Peracetic acid wipes were found to be equally effective or more effective than chlorine based products at 1000ppm.
  (Grade D recommendation)

- There was insufficient evidence to advocate use of disinfectant wipe products containing QAC, biguanide, citric acid, phenol and chlorine dioxide.
  (Grade D recommendation)

Virucidal

- Alcohol wipes containing 60-90% alcohol as the active ingredient can be used for the disinfection of hard surfaces.* Alcohol wipes should be cross referenced against the manufacturer's instructions for use and efficacy for intended use, e.g. BBVs and spores, before being approved.
  (Grade D recommendation)

- There was insufficient published evidence within the scientific literature to support the use of any of the wipes included in the studies for the purpose of decontamination of blood and/or body fluids. However, a number of manufacturers claim that their products are effective under laboratory conditions against viruses used as surrogate markers for BBVs in unpublished studies.*
  (Grade D recommendation)

*Wipes should not be used for the decontamination of blood spills. Staff should use 10,000ppm hypochlorite solution as stated in the NIPCM. However alcohol wipes and those recommended by manufacturers may be used for the removal of minor blood splatter on surfaces and reusable communal patient equipment.

Implications for research

The limited evidence on this topic may reflect the fact that it is challenging to undertake well-designed studies to explore the effectiveness of different cleaning methodologies in the healthcare setting, due to both practical and ethical considerations. It may also reflect the fact that decontamination of the environment and surfaces in healthcare settings has not been considered a priority area for research.

Future studies assessing the clinical effectiveness of pre-prepared wipes should include suitable comparisons to allow the results to be transferable into clinical practice. In addition, well designed studies evaluating wipes with one active ingredient would be beneficial to aid in the formulation of conclusions. Furthermore, none of the identified studies investigated wipe efficacy against viruses, therefore dedicated research into this topic would be useful, particularly in relation to blood-borne viruses (BBV) and norovirus.

Although standardisation of disinfectant efficacy is currently utilised by manufacturers to support product claims, the development of a UK standard for disinfectant wipe efficacy testing would also be particularly useful and aid in decision making relating to wipe implementation within healthcare settings.

Appendix 1: Medline Search

Initial Search

Ovid MEDLINE(R) 1946 to present with daily update

AND

Ovid MEDLINE(R) In-process & other non-indexed citations (December 10, 2015)

Search date

11.12.15

1 (all "OR")		1 (all "OR")
Wipes.mp Wipe$.mp Cloth.mp	AND	Sterilization/ Decontamination/ Disinfection/ Housekeeping, Hospital/ Clean*.mp Equipment Contamination/ Hospital ward/ Healthcare.mp Disinfectant/ Detergent/

Limits

English Language

Publication Year 2005 – Current

Results: 488

Appendix 2: Disinfectant wipe active ingredients

Active ingredient/s	Percentage of active ingredient/s	Reference
Benzethonium chloride/isopropanol	0.28/17.2	17
Citric acid	0.6	
Sodium hypochlorite	0.55	
Hydrogen peroxide	0.5	
o-phenylphenol/o-benzyl-p-chlorophenol	0.28/0.03	
o-phenylphenol/o-benzyl-p-chlorophenol	0.28/0.03	16
Benzethonium chloride/isopropanol	0.28/17.2	
Citric acid	0.6	
Sodium hypochlorite	0.55	
Sodium hypochlorite	0.94	
Hydrogen peroxide	0.5	
Benzalkonium chloride/didecyl dimethyl ammonium chloride/polyhexanide	0.45/0.4/0.1	13
Hydrogen peroxide	0.5	19
Benzalkonium chloride/didecyl dimethyl ammonium chloride/polyhexanide	0.45/0.4/0.1	
Sodium percarbonate/citric acid/tetra acetyl ethylene diamine	40-50/5-10/10-35	
Sodium hypochlorite	<3	
Benzalkonium chloride/isopropanol	<0.125/10-20	
Sodium percarbonate/citric acid/tetra acetyl ethylene diamine	40-50/5-10/10-35	22
‘‘Impregnated with low-level biocides’’, 5% cationic surfactant, amphoteric surfactant, EDTA	?	
Benzalkonium chloride/didecyl dimethyl ammonium chloride/polyhexanide	< 1	
Benzalkonium chloride	<1	
Didecyl dimethyl ammonium chloride	0.45	
Didecyl dimethyl ammonium chloride/laurakonium chloride/polyaminoporopyl biguanide	?	

Sodium percarbonate/citric acid/tetra acetyl ethylene diamine	40-50/5-10/10-35	25
Sodium percarbonate/citric acid/tetra acetyl ethylene diamine	40-50/5-10/10-35	26
Hydrogen peroxide/peracetic acid/acetic acid	4.4/0.23/4.9	24
Sodium hypochlorite	0.55	
Sodium hypochlorite	0.55	23
Ethanol	5	14
Benzethonium chloride/isopropanol	0.23/14.3	
Hydrogen peroxide	0.5	
Chlorhexadine/hydrogen peroxide/isopropanol	0.5/0.45/70	15
Benzalkonium chloride/didecyl dimethyl ammonium chloride/polyhexanide	<1	
Benzalkonium chloride	0.184	20
Chlorhexadine/isopropanol	2/70	
Benzalkonium chloride/didecyl dimethyl ammonium chloride/polyhexanide	<1	
Chlorine dioxide	0.1-0.12	
Dimethyl ethylbenzyl ammonium chloride/ benzalkonium chloride/isopropanol	0.125/0.125/14.85	18
Benzethonium chloride/isopropanol	0.23/14.3	
Dimethyl ethylbenzyl ammonium chloride/ benzalkonium chloride	0.145/0.145	

Appendix 3: Wipes available via the National Procurement Distribution Centre Supply List

Detergent wipes	Disinfectant wipes
Uniwipe Pro Blue Zone Detergent Wipes	Uniwipe Pro Red Sanitazing Wipes
Clinitex Detergent Wipes	Clinitex Hard Surface Alcohol Wipes
	Clinitex Target Multi Surface Disinfection Wipes
	Cleanisept Disinfectant Wipes

Appendix 4: NPSA National Specifications for Cleanliness in the NHS cleaning framework for detergent wipe use within the healthcare environment

Item	Cleaning frequency	Type of wipe
IV stands including wheels	Weekly	Detergent
Trolleys (dressing, linen, notes, tea, drugs etc)	Weekly	Detergent
Blood pressure cuffs	Daily and after use	Alcohol
Cushions	After use	Detergent
Oxygen saturation probes	After use	Detergent
Hoist slings	After use	Detergent
Oxygen/suction equipment	Daily and after use	Detergent
Wall humidifiers	After use	Detergent
Portable nebulisers	After use	Detergent
Ventilator equipment	Daily and after use	Detergent
Scanners	Daily and after use	Detergent
Gas cylinder holders	After use	Detergent
Thomas splints	After use	Detergent
Monkey poles	After use	Detergent
Weights	After use	Detergent
Braun frames	After use	Detergent
Radios	Weekly	Detergent
Telephones	Daily	Detergent
Computers/keyboards	Weekly	Detergent
Printers	Weekly	Detergent
Fax	Weekly	Detergent
CCTV equipment	Monthly	Detergent
Flip charts	Monthly	Detergent
Accessories, i.e. staplers, in-trays, hole punchers	Monthly	Detergent

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