AN INTEGRATED APPROACH TO HOSPITAL

CLEANING: MICROFIBRE CLOTH AND STEAM

CLEANING TECHNOLOGY

Executive summary

This report explains the implications and benefits of an integrated approach to hospital cleaning which utilises a combination of microfibre cleaning materials and periodic steam cleaning.

The cleanliness of hospitals is an issue that is frequently raised at national level, and the NHS is actively seeking ways to improve the cleanliness of healthcare premises. This topic is of particular concern because cleanliness standards have been linked with the reduction of healthcare-associated infections (HCAIs), particularly MRSA and *Clostridium difficile*.

Current practice is to remove contaminants physically by cleaning, and – in patient-sensitive areas such as intensive care units (ICUs) – with the addition of biocides (disinfectants).

Recent research concluded that both microfibre materials and steam cleaning have a proven ability to raise levels of both aesthetic and microbiological cleanliness, particularly when employed together as an integrated cleaning programme.

However, this research also revealed that introducing these technologies may have far-reaching – and potentially beneficial – implications for ward management. In particular, the study highlighted the important role that domestic staff play in maintaining cleanliness, and illustrated how – if introduced correctly – these new techniques will have a positive impact on the relationships between domestic and medical staff.

In order to fully understand the advantages and implications of introducing these new techniques, Section 1 of this report summarises the efficacy of: existing cleaning material; microfibre materials; and steam cleaning. Each removes contaminants under laboratory conditions to a variable degree. On wards, however, it is clear that the new techniques – which depend upon a rigorous one-cloth-per-patient-area cleaning regime – can deliver heightened levels of cleanliness, and reduce the likelihood of cross-contamination.

There are, of course, financial implications when introducing new cleaning techniques. The recent study did not review these. However, the authors of this report have reviewed cost implications from several UK-based, industry-sponsored studies (and one from Sweden); and likely costs are explained and estimated in Section 2.

The benefits of these new techniques can only be achieved through a carefully implemented and frequently reinforced training programme (for both domestic and nursing staff). This report presents guidelines for the introduction of an integrated cleaning system, based on the experiences gained during the on-ward study (Section 3).

Finally, this report acknowledges that the widespread adoption of these techniques will result in a radical re-think of the cleaning process, and the development of a new cleaning culture because of the special requirements of these techniques – particular the need for a dedicated laundry facility. Further studies are required to: evaluate the wider cost implications; investigate the use of these techniques in highly sensitive areas; and to validate the efficacy of hand-held cleanliness-monitoring equipment.

Contents

Introduction

1. The cleanliness of hospitals is an issue that is frequently raised at national level – by MPs and the media, and by hospital staff, patients and visitors.

2. The microorganisms that are responsible for healthcare-associated infections (HCAIs) are often part of the patient's own flora, or may be acquired either from healthcare staff, or from the environment (e.g. from contaminated surfaces).

3. Although there is limited scientific evidence that the cleanliness of healthcare premises is linked to infection, cleanliness has been linked with the reduction of HCAIs, particularly MRSA[1].

4. What is clear, however, is that some microorganisms can persist in a viable state in the hospital environment for weeks, if not months. Minimising this contamination is a fundamental aspect of cleaning[2, 3].

5. Current practice is to remove the contaminants physically by cleaning, and – in patient-sensitive areas such as intensive care units (ICUs) – with the addition of biocides (disinfectants).

6. It is important for the NHS to find ways to improve cleanliness, not just to allay patients'/staff concerns over infection, but because doing so also has positive implications for staff morale, patient recovery times, and overall improvements in delivery of healthcare.

7. Therefore the Chief Nursing Officer (CNO) sponsored a study of microfibre and steam cleaning technologies[4] as possible alternatives to the prevailing cleaning techniques (conventional cloths, mops and biocides).

8. The study concluded that both of these techniques have a proven ability to raise levels of both aesthetic and microbiological cleanliness, particularly when employed together as an integrated cleaning programme. However, the study also revealed that introducing these technologies is not a simple matter of swapping one technique for another; there are far-reaching – and potentially beneficial – implications for ward management.

9. This document describes the key considerations for hospitals that are reviewing their cleaning regimes, and it forms the basis of best practice guidance for the implementation of an integrated programme of microfibre and steam cleaning technologies.

Section 1 – Cleaning techniques and technologies

10. The main objectives of cleaning are:

    - to remove surface soil to achieve an aesthetically pleasing environment, contributing to patient safety and confidence
    - to remove the microorganisms that spread disease
    - to remove harmful chemical residues, and the dust, dirt and grime upon which microorganisms may feed and grow.

11. The NHS Estates National Specifications for Cleanliness (2004)[5] covers issues such as frequency of cleaning, monitoring, and health and safety, but the Standard does not cover efficacy of cleaning (i.e. the degree to which the cleaning process removes dirt, bacteria and viruses). The NHS Healthcare Cleaning Manual (2004)[6] provides advice and guidance on cleaning methods and equipment.

1.1 Cloths, mops and detergents

12. The removal of dirt and microorganisms from healthcare premises typically involves the passage of cloths and wet-loop mops across surfaces.

13. Simply wiping surfaces is not always sufficient to completely eliminate microorganisms, so in patient-sensitive areas (such as ICUs) traditional cloth-based cleaning is augmented by biocides (disinfectants), as well as detergents, to neutralise contaminants.

Figures 1–3: Typical mop bucket, wet loop mop head and janitorial hand cloths.

14. Used cloths and mop heads will be dirty, but biocides, where used, will usually render any microorganisms inactive. The cloths and mop heads can be laundered and re-used, and most have a life expectancy of 75–100 washes.

1.1.1 Are they effective?

15. Cleaning with mops and cloths is not a scientific process. The efficiency with which these tools remove dust, dirt and microorganisms inevitably depends on the actions of the staff using the tools (factors include frequency of rinsing cloths/mops and of changing the cleaning fluid; reaching into corners and crevices).

16. There is little scientific data concerning the efficacy of wet loop mopping, or wiping.

17. Typically, cleaned areas are subject to a visual check for signs of dust and grime ('cosmetic cleanliness'). Such checks may not be sufficiently sensitive or discriminatory and may overestimate microbiological cleanliness. However, this does not necessarily mean that a simple visual check of cleaned areas is ineffective. Cosmetic cleanliness precedes, and contributes to, microbiological cleanliness. This is because actively metabolising organisms that are starved of nutrients or rendered incapable of spore formation by biocides (or both) invariably die on clean, dry surfaces eventually.

18. Evidence from the laboratory and ward-based experiments during the current study suggests that traditional cloths do reduce the bio-burden (the biologically active contaminants that cause disease).

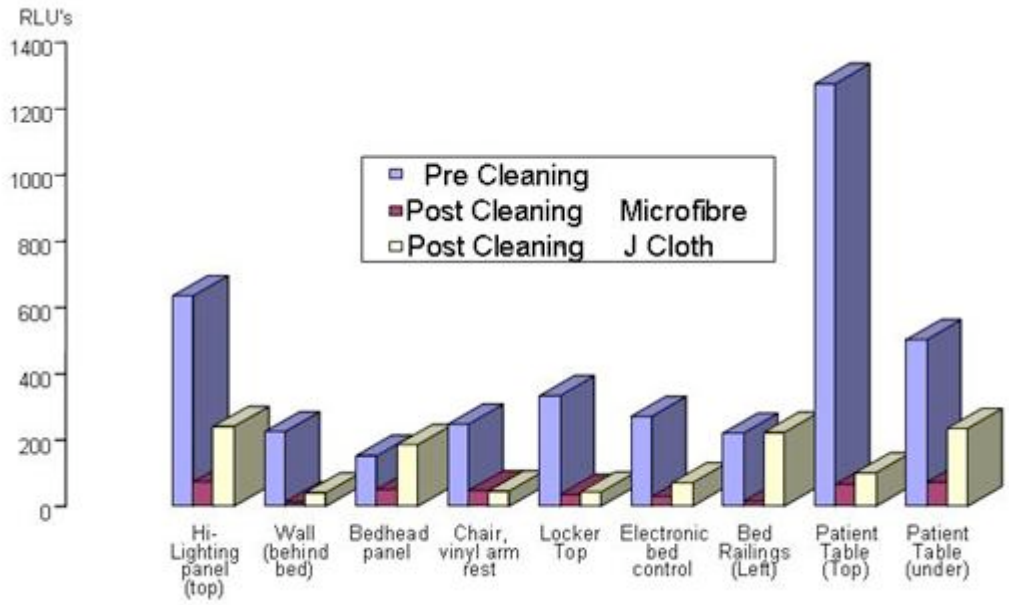

Figure 4: Results from the recent study show that both traditional cloths and microfibre materials effectively clean a range of typical surfaces in a healthcare environment. (Cleaning is measured using the ATP test; the experimental method is described in the accompanying Laboratory Report.)

19. However, it should be noted that the biocides that may be used in conjunction with cloths and mops contain compounds such as halides, reactive oxygen molecules such as peroxides, and quaternary ammonium compounds that can be harmful to health and degrade the built environment. Moreover, the continued (and sometimes excessive) use of

biocides is increasingly implicated in microorganisms' increasing ability to resist such treatments.

1.2 Microfibre cleaning materials

20. Microfibre mops and cloths have a different structure to classical woven cloths. They are made of composite synthetic fibres. These are much finer than other textiles, so there are more fibres per cloth; but in addition, the individual microfibres are engineered to create a very large surface area per fibre for collecting microscopic biological debris.

21. The microfibres are naturally statically charged and, because they are so small, they can reach into invisible crevices in surfaces that are inaccessible to conventional cleaning materials. Dirt clings to the fibres because of electrostatic attraction, capillary action, or a combination of the two. This results in the materials having a strong 'suction effect', i.e. they collect as much dirt as possible in just one wipe.

22. The microfibre cloths and mops are designed to be used dry or dampened with water only (and therefore are not recommended for use in situations where biocides would normally be considered essential).

23. Used cloths contain potentially harmful contaminants. Therefore, used microfibre cloths must be safely packaged and transported for thermal recycling in purpose-designed and validated washing machines. (The materials are cleaned by heat and water only; detergents should not be used because some detergents will degrade the microfibres.)

Figure 5: A typical two-person microfibre cleaning workstation – with the required number of dry and damp cloths and mop heads, plus a laundry management system comprising detachable bags to segregate cloths and mops.

24. The method relies on individual patient zone cleaning, to eliminate cross-contamination. Cloths are not used for more than one patient zone or common patient area such as bathroom or toilet. After use, cloths and mops are placed in the dedicated laundry containers.

1.2.1 Are they effective?

25. Laboratory and ward tests conducted as part of the current study[4] indicate that cloths woven from microfibres consistently outperform traditional cloths, in terms of their ability to remove bacteria from a variety of hospital surfaces. (The methodology is described in full in V Gant et al[4].)

26. Microfibre cloths and mops are strong and highly resistant to tearing and snagging, and have extremely low levels of linting (i.e. they do not deposit 'fluff', unlike conventional cloths).

27. However, it is important to note the following:

- Microfibre cloths are for general purpose/daily cleaning, i.e. maintaining surfaces. They do not perform so well on old and damaged surfaces, because the fibres can be repeatedly snagged in the surface defects, making it more difficult to wipe without using excessive force.

- Microfibre materials are not suitable for cleaning up body fluids (which must be removed in line with existing national guidelines; i.e. using hypochlorite solution and a disposable cloth), or for highly sensitive areas where biocides are usually essential.

- Not all microfibre materials are of the highest quality; lower-grade materials will not deliver the required level of cleanliness.

- These materials are designed to be used as part of a well coordinated and tightly implemented cleaning system; using one cloth in isolation will not produce the desired effect.

- Used cloths contain microorganisms and other contaminants; they also have a finite 'carrying capacity'. In practice this means that separate cloths must be used for each patient area.

1.2.2 Re-thinking daily cleaning

28. The current study demonstrates that cleaning using microfibre technology is effective, providing the correct cleaning regime is followed.

29. Cleaning needs to be planned carefully, and an appropriate number of cloths and mop-heads should be provided at the start of a shift; with used materials handled correctly and decontaminated according to manufacturers' instructions. Typically, domestic staff work

with cleaning trolleys that are stocked with the correct materials for their shift. Staff training is crucial to the success of the technique.

30. There is a significant capital expenditure in equipment and training for the rollout of a new cleaning regime (see Section 2).

1.3 Steam cleaning

31. Steam cleaning uses superheated dry steam delivered, under pressure, at greater than 140˚C, to loosen dirt, grease and sticky oils from surfaces. The high temperature of the steam kills microorganisms (thermal disinfection) and, because the steam cleaning machines incorporate vacuum extraction (and some have integrated microfibre tools), all dirt, water and contaminants are removed from the area being cleaned.

32. The technology can be used for cleaning both hard surfaces and most textiles.

33. Steam cleaning units are available from a range of manufacturers, and typically a selection of cleaning tools/attachments is available.

Figures 6 and 7: The steam and vacuum cleaning tools in use in University College London Hospital during the current study.

1.3.1 Is it effective?

34. Prior to the current study, there have been no objective studies of this technology's performance and ease of implementation in the healthcare environment.

35. Laboratory tests performed for the current study confirmed that steam cleaning on each of the test surfaces – laminate work surface, stainless steel, floor tiles (smooth vinyl and textured proprietary linoleum), vinyl coverings and curtain textiles – completely removes the selected test microorganisms (*MRSA*, *Acinetobacter*, *Klebsiella* and *Clostridium difficile* spores) and completely disinfects the cleaned surface.

36. The tests also confirmed that, with the correct tool selected and an appropriate cleaning technique employed, the steam and vacuum effectively removed soil from each of the common hospital surfaces tested.

37. Steam cleaning is also well suited to deep restorative cleaning of heavily contaminated surfaces, particularly in awkward crevices, corners and equipment components such as wheels and between bed rails.

38. Prior to the current study, there were concerns over aerosolisation of contaminants (i.e. live microorganisms being spread around the cleaning area, instead of removed by the vacuum). However, the tests showed no evidence of dispersion of viable organisms. (*Bacillus stearothermophilus* was used as the marker, because it is notable for its resistance to heat.)

1.3.2 Periodic intensive cleaning

39. Steam cleaning is a totally different way of cleaning. Training is essential, as is close supervision and monitoring of cleaning work. (An advantage is that equipment manufacturers provide standard operating procedures than can be adapted into training materials.)

40. The current study demonstrates that, although this technique is very efficient at removing dirt and contaminants, it is an intensive, time-consuming activity; and the equipment size and presence of electric cables and steam hoses present a health and safety issue. (For example, during the trial, steam accidentally triggered a fire alarm; so smoke alarms should be isolated close to steam-cleaning activities.) In addition, the process generates a degree of noise, which makes it unsuitable for use close to patients.

41. It is therefore ideally suited to periodic deep-cleansing treatments rather than daily use.

42. Indeed, because it results in the thorough restoration of surfaces, it works well in conjunction with microfibre cleaning technology as part of an integrated hygiene ‘system’.

Section 2 – The costs and benefits of new cleaning technologies

2.1 Costs

43. The current study did not analyse the cost of either steam cleaning or microfibre technologies. However, the authors of this report have reviewed several industry-sponsored hospital-based trials of microfibre cleaning regimes in the UK and one in Sweden, and their results have informed this section of the report.

44. The Swedish study (at University Hospital Lund)[7] analysed the cost breakdown of conventional cleaning, and found that it is typically:

    - 7% equipment, cleaning materials and cleaning liquids
    - 70–85% labour.

45. Other costs identified by the study are for administration, transportation of materials and wastage.

2.1.1 Microfibres

46. The introduction of the microfibre cleaning technique requires a capital investment to purchase and stock cleaners' trolleys. There may also be costs to make any modifications to storage facilities and laundry equipment (see Section 3). We estimate this capital cost to be in the order of £1,500 per 20 beds.

47. There is also the ongoing cost of laundry (which includes energy and water consumption, and handling costs) and the cost of replacing spent cloths/mops. (Note that detergents should not be used to clean microfibre cloths; a small saving in traditional laundry costs.) It is also worth noting that, although more individual items are needed under the microfibre system, microfibre materials weigh less than conventional cloths and mops, which means that more items can be accommodated in a wash load, resulting in a small cost saving.

48. It is not easy to give direct cost comparisons between conventional and microfibre materials because there are lots of factors involved (many sorts of mops/cloths, all needing different laundry requirements and with different expected service life).

49. The Swedish study did evaluate costs for conventional and microfibre cloths/mops, and concluded that it is the laundry costs which are most significant:

    - Over the product's lifetime, the conventional mops typically cost 2–3 times as much as the microfibre mops; for cloths, the opposite is true, with microfibre cloths being approximately 40% more expensive than conventional cloths.

- Water consumption is the largest cost element in laundering; but energy is the largest cost if cloths have to be tumble dried.

- It is more expensive to launder items on the wards than in a central laundry; but on-ward washing is beneficial because it reduces the potential for spreading pathogens.

50. The team concluded that, because the microfibre cloths/mops have a longer service life, they are about half the overall cost of conventional cloths/mops (1998 prices).

2.1.2 Steam cleaning

51. Steam cleaning involves a capital investment to purchase the equipment. The system used during the current study, for example, cost approximately £750. New models, with specialist application tools for healthcare environment cleaning, would range in cost up to approximately £2,200. However, depending on circumstances, hospitals might choose to lease equipment, or to negotiate a specialist contractor to provide the equipment and personnel to carry out periodic deep cleaning.

52. The steam cleaning units do require consumables such as brushes and squeegees, which need to be replaced periodically.

2.2 Potential savings

53. Given the approximate 10:1 ratio of labour to materials costs, it is significant that both the Swedish study, and a trial at St Richard's Hospital, Chichester[8, 9] found that cleaning is quicker using microfibre materials.

54. At St Richard's, the research team found that cleaning took 26% less time using microfibre cloths and mops, when compared with the conventional cleaning materials. They commented that 'there are clearly significant time benefits in removing water from the overall cleaning process'.

55. As a stand-alone process, periodic steam cleaning does not bring any cost savings. However, it does help to maintain the integrity of surfaces, and ensures that the microfibre process remains quick and effective.

2.3 Non-cost issues

56. The experience of the current study is that the non-cost issues associated with these cleaning techniques are equally as important as financial considerations, if not more so.

- Clinically, there are proven benefits in terms of quantifiable reductions in pathogens.

- The one-cloth-per-patient-area regime of the microfibre cleaning process reduces cross-contamination.

- Eliminating the need for staff to carry heavy buckets of water, and the risk of water spillage, has positive health and safety benefits, as does a reduction in the use of biocides (which may cause staff to suffer allergies and skin complaints).

57. Adopting a 'scientific' approach to cleaning can also make it easier to gather monitoring data and therefore to publicise improvements.

58. In addition, introducing this new way of working requires a total re-think of the cleaning function, which can have a number of intangible benefits too.

59. Ideally, it will result in:

- greater cooperation between nursing and cleaning staff
- better morale among cleaning staff (who will be properly trained and given well defined responsibilities)
- improved staff morale overall
- greater patient and public confidence in the cleanliness of healthcare premises.

60. The current study confirmed that 'ownership' is the primary driving value to achieving high standards of hygiene. Education and appropriate recognition can enhance team relationships based on shared responsibility; this contributes to the desired change in cleaning culture.

61. No matter what cleaning system is adopted, it is now clear that cleaning is a science, with complex skills and knowledge; and staff need to know about risk, and transmission of microorganisms. The implication is that 'domestics' should be regarded with greater respect by the rest of the healthcare team, because they play a very valuable part in infection control.

62. Cleaning staff who have been taught how to monitor their own standards and how to audit, and who have been taught skills of leadership and team working, assertiveness and change management will feel part of the overall healthcare team. In this way, they will respond positively to standards because they are not simply imposed on them, but owned by them.

63. Equally, supervisors and facilities management staff should also receive training about the new techniques, so that they can achieve minimum competency standards. Having used the equipment themselves, managers and team leaders will appreciate the benefits and can pass on their positive experiences to staff. Early training will also give managers the confidence they need to ensure that the system is correctly implemented.

64. However, it is very important to stress that, if the system is not introduced sensitively, there could be management/public relations problems – for example, patients' concerns over lack of disinfectant smells; or cleaners not willing to change working practices. Crucially, the laundry system must be managed carefully – without it, the system will fail.

65. These issues are discussed in Section 3.

Summary of technologies

Cloths/mops	Microfibres	Steam cleaning
suitable for a daily cleaning regime	suitable for a daily cleaning regime	suitable for periodic deep cleaning
suitable for cleaning hard surfaces; not suitable for cleaning absorbent textiles	cleans hard surfaces and some textiles – cloths are used damp	cleans hard surfaces and most natural and synthetic textiles and flexible materials
familiar technology	adaptation of familiar technology	unfamiliar technology
minimal training required	training essential	training essential
where biocides are used, these leave residues that can be harmful to health, degrade the build environment and are implicated in driving anti-microbial resistance	biocides must not be used because they degrade the quality of the materials	biocides are not needed because biological contaminants are neutralised and removed by the process
laundry of used materials required	laundry regime must be strictly adhered to because materials contain pathogens	–
colour-coding of materials required to minimise cross-contamination	one-cloth-per-patient-area regime minimises cross-contamination; colour coding not essential, but recommended for visual audit of compliance	dirt and contaminants are extracted to a sealed container (water filter), greatly reducing the likelihood of cross-contamination
consumables need to be regularly replaced	consumables have extended life expectancy	periodic replacement of consumables required (brushes, squeegee blades etc)
		machines are robust; periodic descaling of the boiler unit is required

Section 3 – Guidance on implementing new cleaning techniques

3.1 Options appraisal

66. Laboratory and ward tests provide scientific evidence of the efficacy of microfibre and steam cleaning technologies, but any cleaning regime will only be as good as the people who are implementing it. Therefore, when conducting an options appraisal exercise for cleaning strategies, assessing staff availability, experience and willingness to try something new is as important as weighing up the relative costs of the systems.

67. The current study also highlighted the importance of reviewing:

    - laundry facilities
    - storage facilities (including space for the temporary storage of used cloths if there are laundry problems).

68. This is because the entire system will break down if there are delays or errors in the decontamination process.

    - For example, during the study over 2,500 items of contaminated microfibre had to be returned to a central laundry, processed and returned to ward ready for the next cleaning shift. A laundry failure occurred, resulting in bags of hazardous material being left in temporary holding areas.

3.2 Managing change

69. Buy-in from all staff is crucial, but particularly the cleaning staff who will bear the brunt of the changes – physically as well as mentally. They will learn new cleaning techniques and a new management system, and may even have to re-organise their cleaners' room to accommodate the larger workstations.

    - For example, at both trial sites used in the current study, the initial workstation design had to be modified so the trolley could fit inside the cleaners' room. Cleaning staff were accustomed to using the cupboard as a rest room (although this is not officially endorsed), often because they were reluctant to use the general staff rooms because they felt excluded from the ward team. This meant that many of the cleaning staff resented the fact that the new technology had 'occupied' their space.

70. Training is an essential part of managing change. Training in the new systems is, clearly, an integral part of implementation, but it is also an opportunity to engage staff in the overall objectives of the changes.

71. Changing the cleaning philosophy can have positive outcomes:

    - Recognition for training (e.g. certificates of competency) can be a boost to staff who are not often recognised as an important part of the healthcare team.
    - Introducing a new management system is, if handled sensitively, an opportunity to reinvigorate the workforce, whose work will be assessed against the new regime, and improvements can be praised and rewarded.
    - Changes of this scale will impact on all other staff, and patients and visitors, and present a good opportunity to emphasise the team approach to healthcare.

72. The introduction of a planned programme of deep cleaning (using steam) and daily microfibre cleaning will impact on the routines and plans of other staff (including modern matrons and ward managers) and other departments (such as facilities). It is important for the cleaning team to understand how their work affects the routine of others; and that cooperation and rescheduling might be necessary. Equally, steps should be taken to secure the cooperation and assistance of non-domestic staff.

73. The time required to fully address all these issues will depend on local circumstances; but experience of the current study and anecdotal evidence from other UK-based trials suggest that rushing through a change programme results in essential factors being overlooked – to the detriment of the whole project.

3.3 Preparing for implementation

74. A comprehensive audit is essential before implementation.

3.3.1 Audit of cleanability

75. The cleanability of the building fabric and conditions of all surfaces to be cleaned must be checked prior to implementation. This is necessary because microfibres are an aggressive contact cleaning method; the microscopic fibres grab at dirt and will strip away any material on the surface, such as fresh soil and layers of detergent residue, and can further damage flaking polished finishes.

76. A thorough, deep clean of areas using steam cleaning technology may be needed to remove residual soiling prior to commencement of the microfibre programme. The microfibre materials than act to maintain the cleanliness of the hospital environment.

3.3.2 Audit of essential support facilities

77. Ideally, soiled mops and cloths should be cleaned close to the place where they are used. This creates a closed-loop system, where materials are decontaminated and prepared for re-use without the need to move them around the building or site; thus minimising the potential to spread contamination. Some countries have implemented on-ward microfibre cleaning with appropriately calibrated washing machines. However, it is unlikely that this

would be practical in the UK for reasons of quality control. (Large numbers of washing machines present large numbers of opportunities for decontamination failure.) A central decontamination facility, perhaps placed in or alongside the central sterile services department (CSSD), would provide more effectively controlled decontamination.

78. It is essential to note that:

- microfibre hand cloths are very effective, resulting in visible felting of dust and waste, and should be placed in designated laundry bags to avoid losing deposits, and minimise patients' exposure to unsightly cloths
- excess dry matter should be removed from dry mops before they are placed into laundry machines, to avoid felting of mops
- microfibre mops and hand cloths must be washed separately to avoid transfer of dry felted matter from mops to cloths
- microfibre materials ***cannot*** be washed together with conventional materials (to avoid cross-contamination)
- the laundry process must match (and preferably exceed) the planned demand, with full consideration given to contingency plans in case of machine breakdown
- machines should be loaded appropriately; overloading reduces the mechanical cleaning action.

3.3.3 Development of schedules and audit tools

79. Cleaning schedules should be reviewed because staff will be required to work in a different way. This typically involves prioritising activities, and reviewing the frequency/timing of cleaning – particularly where the steam cleaning/microfibres techniques are adopted in partnership.

80. This could be introduced in the form of an HACCP system. HACCP stands for Hazard Analysis Critical Control Points (a health and safety system developed by NASA to ensure that food sent on space missions was safe to eat). The method seeks to plan out unsafe practices, by identifying Critical Control Points (CCPs) in processes, and then closely monitoring these processes, with full documentation and back-up. HACCP is widespread in the food industry, but is also used in other sectors, such as cosmetics and pharmaceuticals.

81. In particular, it will be important to introduce methods and/or equipment for testing the efficacy of cleaning; and for collating data to prove value/benefit of change.

82. The current study used a hand-held device to detect metabolising bacteria (indicated by their production of adenosine triphosphate – ATP). The study concluded that ATP detection and similar rapid testing technology do have a place in the modern managed hospital as a training and quality monitoring tool.

83. New detection technology, which may include Bluetooth-aware sensors, could also be useful, particularly during training (to validate competency); or as a final check in the ward to confirm compliance with agreed standards.

3.3.4 Training

84. It is essential that the Trust makes a strong commitment to a robust competency-based framework for training and change management. Training should be carefully planned and implemented ahead of the launch of the new cleaning regime.

85. Although the manufacturers of microfibre cleaning materials and steam cleaning equipment provide training programmes, these tend not to take full account of the specific needs of the healthcare environment. Therefore, tailored training programmes should be developed, based on manufacturers' information, but adapted to take account of the particular circumstances of the hospital.

86. Initial training will need to be rolled out ahead of implementation; but ongoing training will be crucial to the success of the system, particularly in large metropolitan centres where staff churn is high.

87. Periodic refresher training is also advisable – to minimise the risk of staff gradually returning to previous practices (e.g. using cream cleaners or chlorine-based products).

88. The Association of Domestic Management (ADM) and the British Institute of Cleaning Science (BICS) are reviewing microfibre cleaning, and developing competencies around cleaning and hygiene. Their work may provide an opportunity for developing national standards in microfibre systems specifications and in training of cleaning technicians within the healthcare environment.

3.4 Launch of new cleaning regime

89. All wards are different, both physically and in their manner of healthcare delivery.

90. The following issues were identified during the current study and should be particularly helpful during the planning and early stages of introducing a combined steam cleaning/microfibre programme:

3.4.1 Microfibres:

- It is advisable to begin the programme with a thorough steam clean, because moving straight to microfibre cleaning of heavily soiled environments, combined with lack of chemicals, can be very hard work, as well as creating a negative impression of the system among cleaners (because it is very strenuous, and results might not meet expectations).

- To ensure the new system is not subverted, it is advisable to remove the traditional cleaning equipment from cleaners' rooms.

- The biohazard created by contaminated microfibre is significant. Be vigilant for examples of poor practice, such as dragging used microfibre bags on the floor through the corridors and into the service and public lifts; leaving used microfibres in cleaning cupboards overnight; and storing unused damp microfibre overnight for next day use.

- Cloths that are prepared for use, but are **not** then used, still only have a 12-hour safety period. Unused cloths must be returned for laundry decontamination at the end of each shift.

3.4.2 Laundry

- It is recommended that a 'laundry captain' be appointed, who is thoroughly trained in the equipment, its programmes and laundry detergents. This person should take ownership of this critical facility. Incorrect use of equipment can cause a range of problems that result in a laundry backlog and consequent shortfall in supplies to the ward.

- The method of washing within open weave bags has merit, but given the high content of soil particularly in dry mops, these should be first removed from the bags and excess loose soil removed prior to proceeding with the laundry process.

3.4.3 Steam cleaning

- The training manual supplied by the manufacturer for the current study was comprehensive, and the manufacturer's training demonstrated the recommended 'standard operating procedure' for each environmental surface and piece of equipment studied. This training package could be easily adapted to a certifiable training module.

3.4.4 Staffing issues

- Staff may express concern about the impact of using microfibre materials for this first time. The microfibres grab at accumulated soil, so the first time the system is used the cleaners will need to employ additional force when wiping with cloths and mops, possibly resulting in muscular pain to the lower back and arms. Staff concerns can be allayed by ensuring that these effects are clearly explained during initial training.

- Similarly, cleaners and their supervisors may feel uncomfortable with the concept of cleaning without large quantities of cleaning fluids. Their concerns might also include: how to clean off limescale; how to tackle body fluid spills; and how to make sinks shine and toilets smell nice. A thorough understanding of the way the technology works combined with ongoing training should alleviate these concerns.

- It is advisable to prepare for attempts to work around any system. For example, during the current study if the correct materials were unavailable because of a laundry supply chain breakdown, or late delivery to the ward, staff implemented their own reserve process, whereby they washed out cloths and mops by hand and left them overnight to dry within the cleaners' cupboard – a totally unacceptable practice.

- Cleaning supervisors may feel challenged by change to routine; again, training will help to ease them through the change management process and provide them with the skills they need to act as 'team coach'.

3.4.5 Management

- The housekeeper can play an essential role in 'bonding' the relationship between domestic and clinical staff.

- Patients and visitors may also raise concerns about the new technologies. For example, they might wonder why cleaning staff are not using the 'traditional' mop-and-bucket method, with its inherent 'hospital smell'.

- Plan ahead for ways to publicise implementation – for staff, patients and visitors. Publicity messages should be repeated periodically after the system is launched; consider the use of posters and fact sheets to inform people about the system in use (for example, place information stickers over sinks/toilets in bathrooms).

Section 4 – Conclusion and recommendations

91. Both steam cleaning and microfibre materials have proved to be very effective at removing microorganisms and general dirt and grime. Moreover, the two technologies work well together.

92. These technologies reduce the reliance on biocides in all but the most infection-critical areas, which is an environmental advantage. This is also beneficial because the use of biocides has been linked to increasing tolerance of pathogens to a wide range of antibiotics.

93. However, the success of these technologies depends on their correct implementation. Used microfibre materials contain pathogens, and must be recycled through a closed-loop laundry system.

94. The special requirements for the use of these technologies require a radical re-think of the cleaning process, and the development of a new cleaning culture. Training is essential; and will need to be ongoing.

95. This current study did not specifically investigate the costs of implementing these new techniques. However, evidence from other studies suggests that the technologies are likely to offer good value for money, mainly because cleaning times may be reduced. Other cost savings may be achieved because of improvements to staff health (such as a reduction in allergic reactions to cleaning fluids and less heavy lifting of buckets of water), and reductions in cross-contamination between patients (and staff).

96. There is a growing demand for microfibre cloths and mops, so manufacturers are offering a wider range of products, at various prices. It is likely that market forces will drive prices down further. Therefore technical and performance standards should be established for microfibre tools, so that their true value – in terms of life-cycle and cost-per-use – can be calculated.

97. It is likely that there will be additional non-cost benefits to introducing these technologies; in particular, this is an opportunity to enhance the status of cleaning staff and engender a positive feeling of teamwork on the ward.

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