Healthcare-associated infections can cause severe illness. A trust switched from using chlorine-based products to sporicidal wipes to cut rates of C difficile

Tackling C difficile with environmental cleaning

In this article...

- Why the trust changed from chlorine-based products to sporicidal wipes for environmental cleaning
- How a project to test the effectiveness of sporicidal wipes was designed and implemented
- The reduction in C difficile infection rates during and after the study period

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How a project to test the effectiveness of sporicidal wipes was designed and implemented

The reduction in C difficile infection rates during and after the study period

5 key points

1. The most effective ways to prevent C difficile infection are: focused antibiotic management, handwashing, patient isolation, and effective environmental cleaning

2. Chlorine-based cleaning products are widely used to reduce rates of C difficile at acute trusts

3. Chlorine-based products must be used at high concentrations to be effective, making them irritant, toxic and corrosive

4. Sporicidal wipes contain peracetic acid, which breaks down into vinegar, carbon dioxide and water when the wipes are wet. They are environmentally friendly, safe for use close to patients, and can be used on all fabrics

5. Using sporicidal wipes for environmental cleaning can help significantly reduce rates of C difficile infection

Introduction

C difficile infection (CDI) can cause severe illness and suffering, particularly for older people, those on antibiotics, and people with debilitating illnesses. Antibiotics can disturb normal gut

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Abstract


Background

Chlorine-based cleaning products are often used in acute settings for high-level disinfection of the environment to help control C difficile. However, these products must be used at high concentrations, making them irritant, toxic and corrosive. This means they are inappropriate for the near-patient environment, and can lead to user resistance and non-compliance. More recently, products using peracetic acid and hydrogen peroxide have become available, which are highly effective even under conditions of heavy soiling.

Aim

To determine whether peracetic acid sporicidal wipes could help reduce rates of C difficile at an acute London trust.

Method

An observational study of C difficile rates was carried out at an acute London trust between 2006 and 2010. All inpatients aged two years and over were monitored. Chlorine-based cleaning regimens and products were changed to peracetic acid sporicidal wipes in April 2008 and monitored for 18 months. Inpatient bed days were also monitored to ensure findings were not affected by changing patient numbers.

Results

The mean C difficile rate per 1,000 patients fell from six to two following the 2008 introduction of the sporicidal wipes. In the first half of 2009, this rate dropped to below two. The overall rate of C difficile infection was reduced by 72% following the introduction of the wipes.

Conclusion

The introduction of sporicidal wipes resulted in a significant reduction in C difficile rates. This supports the need to review and enhance traditional environmental cleaning regimens for preventing and controlling C difficile in acute settings.

Scanning electron micrograph of C difficile
flora, allowing *C. difficile* to produce toxins that cause diarrhoea and colitis. CDI is also transmitted by spores, which contaminate the environment and can be resistant to cleaning. The most effective tools to prevent and tackle CDI are:

» Focused antibiotic management to reduce gut disturbance;
» Handwashing, rather than alcohol gel or rub, when caring for patients with diarrhoea;
» Isolation of patients with diarrhoea to contain the source of CDI;
» Effective environmental cleaning to reduce transmission from contaminated surfaces (Dancer, 2009; Department of Health, 2008a; 2007).

Chlorine-based products are part of a standard range of measures used for environmental cleaning to reduce rates of *C. difficile* in acute trusts (DH and Health Protection Agency, 2008). However, to really drive down rates of infection, rather than just maintain control of *C. difficile*, cleaning products must be reviewed and improved where appropriate.

This article describes the introduction of peracetic acid-releasing sporicidal wipes into the environmental cleaning regimen of an acute London trust, and the subsequent observed reduction in CDI rates.

**Background**

*C. difficile* spores can survive in the environment for months or even years, across a range of surfaces and equipment used in patient care. The contaminated environment is a major source for CDI acquisition (DH, 2008a; Pratt et al, 2007).

Chlorine-based products have traditionally been used for high-level disinfection, largely because of a lack of practical alternatives able to kill bacterial spores and other resistant organisms. To be effective, chlorine-based products must be used at concentrations high enough to deliver reliable sporicidal activity. However, at these concentrations they are irritant, toxic and corrosive, making them inappropriate for the near-patient environment. This can also lead to user resistance and non-compliance. More recently, products using peracetic acid and hydrogen peroxide have become available. Peracetic acid is highly effective against vegetative bacteria and viruses, and shows rapid sporicidal activity even under conditions of heavy soiling (Center for Disease Control, 2008; Wilcox et al, 2003).

Following screening trials, the trust decided to replace existing chlorine-based protocols with wipes which, when wet, release peracetic acid and hydrogen peroxide. The reaction takes place on the wipes so they are safe to use in the near patient environment, and have minimal adverse impact on the user.

**Method**

The study started in April 2006, with the sporicidal wipes introduced in April 2008. All patients aged two years and over admitted to the Royal Free Hampstead Trust were included in the study.

CDI cases were identified using DH and Health Protection Agency definitions (DH, 2008b), and only cases occurring 48 hours after admission were included in the study. More than one case for the same patient was counted if there was a 28-day period between samples, and symptoms had resolved during this time. Diarrhoea was defined as:

» Stool loose enough to take on the shape of its container (Bristol Stool Chart 5–7; tinyurl.com/stoolchart);
» Not attributable to any other causes;
» Occurring at the same time as a positive toxin assay (Lewis and Heaton, 1997).

Occupied bed-day data was collected weekly so that any fall or rise of CDI rates could not be attributed to changes in patient numbers.

**Sporicidal wipes**

Before the sporicidal wipes were introduced, the trust used chlorine-releasing agents for cleaning in cases of suspected or actual infectious diarrhoea as recommended by the DH (2007).

However, these agents can be unpopular with users because of irritating fumes, and dilution and preparation issues. They can also damage furnishings and equipment (CDC, 2008). An effective sporicidal alternative was therefore sought, based on the following criteria:

» Specific proven sporicidal activity;
» User-friendly format;
» Environmentally friendly with non-toxic fumes;
» Would not damage furnishings and equipment;
» Had non-selective action so would not promote microbial resistance.

The Clinell Sporicidal wipe manufactured by Gama Healthcare Ltd UK (www.gamahealthcare.com) was chosen. The wipe contains peracetic acid, one of the safest, most effective bactericidal, sporicidal and viricidal agents (CDC, 2008; Medical Devices Agency, 2002).

After the wipes were introduced, users said they were preferable to chlorine as they were easier to handle, and easy to activate and use in practice. The peracetic acid breaks down into vinegar, carbon dioxide and water, making them environmentally friendly, and since they do not produce toxic fumes they are safe to be used in close proximity to patients. The wipes contain no alcohol or organic solvents, so they can be used on all fabrics.

The sporicidal wipe also works in highly soiled conditions. Unlike chlorine, there is no need to pre-clean areas, saving valuable time. Unlike many chlorine-based products that need carefully measured dilution or are complex to make up before use, the wipes are ready immediately on contact with water.

Peracetic acid is delivered on demand at the site, and as the wipes provide a non-selective action there is no risk of microbial resistance. The wipes can also be easily stored within the ward environment.

**Project implementation**

The sporicidal wipes were ordered and delivered every month to the infection prevention and control (IPC) nurses. To ensure efficient and effective use, the nurses then distributed them on a case-by-case basis. A member of the IPC team also visited every patient identified as CDI-positive to discuss their care face to face. A pack was taken directly to the bedside which included:

» Two packets of 25 sporicidal wipes;
» The sporicidal wipe information sheet;
» Patient information sheet on CDI;
» Individualised patient care plan;
» CDI care pathway with a wall-mounted poster for staff information.

**Training**

Ward staff were taught how to activate the dry sporicidal wipes with water, and how to clean the patient environment with the wipes. Ward-based cleaners and domestics, housekeepers, and other health professionals involved in direct patient care were also trained how to use the wipes, as they are equally important in maintaining a clean environment (Eckstein et al, 2007).

Training included daily environmental cleaning of horizontal surfaces, patient furniture, toilet facilities, bed frames, commodes, and medical equipment, such as infusion pumps. Frequent touch points, such as door handles, taps and light switches were also cleaned.

The wipes were also used for terminal cleaning, following the discharge or transfer of patients with CDI, and for cleaning equipment after use throughout the day. Teaching was reinforced on
annual, mandatory IPC updates for all clinical staff and allied health professionals, and was included on IPC awareness days for all trust staff. Individual ward visits by the IPC nurses included discussions with staff, and matrons were sent flyers and newsletters to further disseminate information on the wipes to other clinical staff.

Ward rounds
All patients identified with CDI were visited on weekly ward rounds by an IPC team, including IPC nurses, a microbiologist, and an antimicrobial pharmacist. This was to ensure good practice and to deliver fresh supplies of sporicidal wipes.

Ward staff were reminded that the wipes are for single-patient use only, and that if a patient’s symptoms resolve and they are discharged, unused wipes should be discarded and not used in any other area or with any other patient.

Three months after the sporicidal wipes were introduced, weekly multidisciplinary ward rounds were introduced to monitor infection prevention and control measures and patient care. Sporicidal wipe availability, use and environmental cleaning was also audited. When the ward rounds were introduced, awareness of the specific environmental cleaning required for patients who are isolated with known CDI, and use of the sporicidal wipes, was 70% among clinical and cleaning staff. This is now 100%.

Increased awareness has been achieved by incorporating information about isolation room cleaning, specifically relating to CDI patients, into teaching sessions and mandatory IPC annual updates for nursing staff. Domestic staff have also received targeted teaching.

As CDI rates markedly improved at the trust, ward staff recognised the benefit of the wipes and started to contact the IPC nurses to request them. Additionally, clinical units such as endoscopy, X-ray and theatres requested wipes for cleaning areas following investigations and procedures on patients with CDI, or possible infectious diarrhoea.

Results
Data was collected on the number of cases of CDI and the number of occupied beds in the hospital. It was necessary to know how many patients were in hospital at any given time so that any fall or rise in CDI would not be attributed to changes in patient numbers.

CDI case numbers and bed occupancy were provided from April 2006 to September 2009. To create a rate, the number of cases was divided by the number of patients occupying beds. This was then multiplied by 1,000 to get a rate per thousand patients a week (Table 1).

The distribution of CDI rates by year was also investigated (Fig 1). The study results show the spread of CDI rates was much higher in the two years before 2008-09, with a particularly wide range of infection rates in 2007-08 (Fig 2). The results also show the mean and median infection rates are much lower in 2008-09 and 2009-10 than in the preceding two years, with a significant drop in infection rates from 2008-09 onwards (Table 2).

Before the sporicidal wipes were introduced in April 2008, a chlorine-based cleaning product was used. The study results show that CDI rates were significantly lower after the introduction of the wipes.

The annual supply of peracetic acid wipes cost £6,566. The cost per patient for CDI is around £4,000 (Song et al, 2008; Wilcox et al, 1996). When the cost per patient is multiplied by the reduction in cases in 2008-09, compared with 2007-08, the cost saving is £660,000. We acknowledge that other variables that were not part of the study may have contributed to this saving.

Discussion
Reports of investigations into outbreaks of C difficile at Stoke Mandeville Hospital and Maidstone and Tunbridge Wells Trust said environmental cleaning was a major area where improvements could have been made (Healthcare Commission, 2007; Health and Safety Executive, 2006). This provided a focus for the trust to improve its CDI rates.

The study was limited to observing a reduction in CDI rates following introduction of the sporicidal wipes, and some variables were not measured. These include the introduction of the IPC ward rounds and the influence of focused training for using the sporicidal wipes (previous training for use of chlorine products was limited to general induction). Isolation practices, patient care and antibiotic regimens related to CDI management did not change during the study period, nor did the method for collecting stool samples and laboratory testing for C difficile.

IPC meetings
Before the sporicidal wipes were introduced, rates of CDI were reported at fortnightly IPC meetings to clinical, divisional, nursing, operational and medical leads.
This practice has continued and has been an essential forum for key trust staff. It is chaired by the director of IPC who leads the trust’s IPC programme.

Costs
It is difficult to compare the costs of the wipes and the original chlorine-based product because of the frequent, ineffective use of the chlorine.

This was through dilution, wastage, or staff non-compliance because the product was not user-friendly. The annual cost of the chlorine-based product was less than the cost of the wipes, but the savings from the reduction in CDI rates was vastly greater. This has been sustained. Where changing from chlorine products to sporicidal wipes incurs a cost increase, sustained reductions in CDI rates must be measured alongside expenditure to demonstrate financial savings, and improvements in patient care.

Support
The root cause of CDI must be analysed to ensure clinical care aspects, as well as environmental cleanliness issues, are addressed. This article describes observed reductions in CDI rates following introduction of peracetic acid sporicidal wipes, and also describes the support required to implement the initiative which can be applied to any healthcare setting.

Manufacturer of the wipes provided support at IPC awareness days, and gave information to IPC nurses. This included advice on packaging, printed documents, and product acceptability information. Dispensers for the wipes are provided and fitted to trust specifications.

Conclusion
Strategies to prevent and control CDI must include a range of IPC measures. This study has demonstrated how one intervention can have a positive impact on CDI rates.

Continual monitoring to maintain the momentum of the intervention proved important in fostering staff ownership, and ensuring sustained use of the sporicidal wipes. CDI rates for the trust have fallen by more than 70%, and the improvement has been sustained. The cost savings demonstrated during the study have underlined the benefits of investigating and implementing improvement processes, such as the change to sporicidal wipes for environmental cleaning. These wipes are an invaluable investment in reducing CDI rates, and improving patient safety and quality of care. NT

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