

Flusher Disinfectors

Reducing the risk of cross-contamination

For hospitals and healthcare centres, managing and preventing the spread of *Clostridium difficile* can be a challenge.

C. difficile spores can live outside the body for months, and are easily spread by contact. Managing human waste safely, in line with infection prevention protocols, is crucial. Using flusher disinfectors to empty, flush, clean and disinfect bedpans and urinals, can significantly reduce the risk of cross-contamination and support efforts to contain and prevent nosocomial infections such as *C. difficile*.

Clostridium difficile:

Clostridium difficile (reclassified as *Clostridioides difficile* in 2016) is an opportunistic, nosocomial, spore-forming bacterium that affects some of the most vulnerable individuals. *C. difficile* infection (CDI) occurs when the natural balance of commensal bacteria in the colon is disrupted, for example, when taking antibiotics, advanced age or when the immune system is compromised. Under favourable conditions, *C. difficile* may become established in the small intestine, proliferate and produce the toxins that cause inflammation and gastrointestinal mucosal damage. Symptoms vary from mild, self-limiting, diarrhoea to pseudomembranous colitis, toxic megacolon, perforation, sepsis and death.¹ Epidemiological studies predict that 5% of inpatients may be at elevated risk while up to two thirds^{2,3} of all CDI cases arise from community exposure.

The prevalence and economic burden of CDI

During the last decade, the number and severity of CDI rose rapidly, exacerbated by the emergence of particularly toxic strains of *C. difficile*. Economic modelling estimated more than 606,000 episodes of CDI would occur across the USA in 2014, with infection contributing to more than 44,500 deaths. Fortunately, recent trends, suggest that CDI rates have slowed or reversed, in part, due to interventions such as active surveillance and reporting, antimicrobial control, improved hygiene and the decline of more aggressive ribotypes.⁴ However, complacency is not an option and CDI still represents a significant clinical challenge. Even when clearly defined prevention strategies are in place, containment can be challenging. In the United Kingdom, the incidence rate has stagnated over the past five years and had begun to rise again by 2018³ with more than 13,000 CDIs reported, 64% of which originated in the community.³

Besides having a considerable impact on the individual and their families, facility outbreaks of CDI are associated with a significant increase in healthcare cost and, in particular, direct and indirect costs associated with increased morbidity and length of stay.⁵ In 2014, the estimated inpatient cost of treating primary and recurrent infection was US\$ 4.7 billion,² with individual costs increasing significantly for recurrent episodes^{6,7} that occur days or weeks after initial treatment in up to 25% of cases.²

The risk of cross-contamination

Pathogens present in the bowel of infected individuals can be transferred to environmental surfaces through contact with faecal contamination. When outside of the body, *C. difficile* forms spores that can survive for several months on frequently touched surfaces like bed rails, toilets, grab bars, light switches and taps, with up to 40% of CDI attributed to environmental exposure.⁸ If hand-to-mouth transfer occurs, the spores, which are able to resist the acidity of the stomach, multiply in the bowel and put the individual at high risk of infection. Vigilance and hygiene are cornerstones of prevention but, unfortunately, bacterial spores are enduring and invisible and so the risk of

contamination may be underestimated given that 20% of cases may result from contact with an asymptomatic carrier.⁸

As *C. difficile* is transmitted via a faecal-oral route, safe disposal and effective decontamination of human waste is a pivotal component of any infection prevention strategy but can be challenging. As *C. difficile* spores are resistant to commonly used disinfectants and heat^{9,10} they need to be physically removed.

Facts

4.1%

Increase in hospital mortality
(approximately \$11,938)
for each CDI patient⁵

7,711

CDI cases in Europe in 2016¹¹

20.7%

European of CDI patients died¹¹

>600,000

CDI cases in the US in 2014²

44,500

US deaths due to CDI in 2014²

Controlling and preventing C. difficile infections

Hospitals and healthcare centres use a variety of measures to control and prevent CDI. Environmental disinfection and hand hygiene are the keys to reducing cross-contamination and new infections. For the care providers who handle human waste, in bedpans, urinal bottles and commode buckets, these cleaning and disinfection protocols are critical.

For the hospital administrators who manage infection prevention and control programs and processes, the first step is to determine an effective and safe strategy to manage human waste. Different options include (1) hand washing bedpans and urinals, (2) shredding disposable bedpans and urinals in shredders or macerators, and (3) the use of flusher disinfectant machines to clean and disinfect bedpans and urinals.

1. Hand washing

For some small healthcare centers, hand washing of re-usable bedpans and urinals is the selected approach. Waste is disposed of into a toilet or sluice, and the bedpans and urinals are washed by hand. This method is no longer recommended.¹² Staff risk exposure to infective material from aerosols and splashback, while cleaning cloths and wipes risk environmental cross-contamination. In addition, hand washing of the items takes time away from patient care.

2. Shredders and single-use bedpans and urinals

For centers using shredders (also referred to as macerators) and single-use bedpans and urinals, part of the attraction for staff lies in being able to get rid of the container along with the waste. The single use containers are most often made of biodegradable pulp. After use, the receptacle and waste contents are placed directly into the shredder. Once macerated, waste water flows into the regular sewerage system.

While single patient use equipment reduces the risk of cross-contamination, and is quick and easy to use, there are some disadvantages: the pulp containers can break in use, bedpan holders require an additional decontamination process and there is a risk of aerosol release when the macerator lid is opened.¹²

Compared to most other methods of disposal, macerators use high water volume, are prone to blockage and have recurring

acquisition costs for single use supplies.¹² There is also a need to manage the cross-contamination risk associated with reusable bedpan holders by having a secondary cleaning and disinfection for these close-patient contact items.

3. Flusher disinfectors

Flusher disinfectors (also known as washer disinfectors), such as the Ninjo™, Tornado™ and Typhoon™ (Arjo Ltd), are used to empty and clean re-usable bedpans, urine bottles and commode buckets, as well as other items. Care providers place the used items (containing patient waste) in the flusher disinfectant, close the door, and the items are emptied, flushed, disinfected and dried. As there is no exposure during the process, the risk of environmental and personal contamination is minimised.¹²

Each time they are used, flusher disinfectors perform a validated self-cleaning and disinfection cycle, ensuring that the interior of the machine remains disinfected. Items are placed in special racks inside the machine, depending on the type (different rack for different sizes of bedpans and bottles), which facilitates a thorough cleaning by the fixed and rotating steam nozzles in the chamber.

Both flusher disinfectors and macerators use energy and water in varying amounts and, while the former typically has a marginally higher acquisition cost, and requires routine chemical refills and performance validation, flusher disinfectors have been estimated to be six times more cost efficient over the product lifetime compared to macerators.¹²

High heat will not kill C. difficile spores. However, flusher disinfectors are also designed to physically remove and flush contaminated material. Using selected programs these devices remove 99.99% of C. Diff.¹³

“Flusher disinfectors may be up to six times less costly to operate than macerators”¹²

"Lund University investigation verifies ability of Arjo flusher disinfectors to remove 99.99% of *C. difficile* spores"¹³

To independently verify the ability of Ajro's flusher disinfectors (models FD1600/NINJO, FD1800/TORNADO and SP6000/TYPHOON)* to remove *C. difficile* spores, the Department of Medical Microbiology at the Lund University in Sweden conducted an in-depth investigation, headed by Mats Walder, Associate Professor and Chief Physician, and Björn Nilsson, Hospital Infection Control Technician.

The researchers conducted exhaustive tests, using different detergents with an intensive wash cycle. They tested a range of goods, notably bedpans of multiple types and designs, and also included best- and worst-case scenarios to ensure that the findings were consistent.

Soil solution

The solution used for the tests was a soil suspension containing protein solution that was mixed with *C. difficile* spores and cattle blood. The soil was placed on the surface, with no edges or areas of uneven thickness and left to dry.

Test results: Arjo flusher disinfectors removed more than 99.99% of *C. difficile* spores

Visual inspection of the bedpans and urinals after the process showed that no remaining soil could be seen.

The disinfection cycle resulted in a median log reduction factor of ≥ 5.6 , which equates to the removal of more than 99.99% *C. difficile* spores from the surfaces tested. In all cases, less than 1 cfu remained. These results exceed the minimum standard of a log 4 reduction as defined for surface decontamination.¹³



Advantages for hospitals and healthcare centres.

Implementing flusher disinfectors as part of a facility-wide infection prevention strategy, has a number of advantages:

- Eliminates recurrent purchase cost and storage of single-use goods
- No-touch disposal and disinfection
- Validated decontamination to exceptionally high standards
- Lifetime running costs that may be 6x lower than for macerators¹²

For healthcare providers, faced with the ongoing challenge to combat CDI and other hospital acquired infections, access to information on new approaches and equipment is key. The following case study demonstrates how one facility reduced the incidence of CDI from 4.1% to 0.61% and saved €800,000 in treatment costs over one year: Arjo flusher disinfectors played a central role.

*Selected programs

Lund University, Sweden – Medical Microbiology

Medical Microbiology is part of the Department of Laboratory Medicine in the Faculty of Medicine at Lund University, and consists of Bacteriology and Virology sections. Research at the Section of Bacteriology includes bacteriology, mycology and parasitology. The Department studies the pathogenesis in experimental and natural infections, characterization of microorganisms and virulence factors, development of experimental vaccines and immuno- and DNA-based diagnostics, microbial metabolites and public health microbiology.

Reducing *C. difficile* infections

at AO LODI in Italy

At the AO Lodi hospital group, a four-hospital network with a combined total of 975 beds, south of Milan, Italy, reducing the incidence of CDI became a priority in 2008. At that time, the incidence was 4.1%.

Dr. Marco Ferrari, Director of Hygiene Services for the hospital network, led the effort to reduce CDI as far as possible.

To start, Dr. Ferrari and his team conducted an in-depth analysis across the four hospitals - Lodi Hospital, Codogno Hospital, Casalpusterlengo Hospital, and the Hospital of Sant'angelo Lodigiano - to review the existing disinfection protocols, procedures and equipment. "First, we wanted to find out exactly where the problems were," said Dr. Ferrari. In addition to uncovering gaps in the hygiene processes, they found that the flusher equipment in place was not able to remove *C. difficile* spores from bedpans and urinals adequately.

Armed with this research, Dr. Ferrari prepared a comprehensive plan to address the problems and reduce CDI infections.

The plan featured three main pillars:

- Staff awareness and education
- Dedicated bedpans
- New flushers and fully updated disinfection rooms

Staff awareness and education:

AO Lodi launched an education campaign, to ensure that all staff were aware of the correct infection/disinfection procedures. They started with 30 nurses and doctors, ensuring that this core team was fully up-to-date on the new infection protocols, and cascaded information down to all employees. To increase awareness and engagement, they offered prizes and encouraged staff to work together.

Dedicated bedpans:

The new strategy mandated that patients at any of the four hospitals use a dedicated bedpan, for their exclusive use during their hospital stay. This significantly reduced the chance of cross-infections, and also helped staff to know the precise source and progress of any infections, very quickly.

“We made sure that each step, and procedure, worked exactly as we planned before proceeding to the next one.”

DR. MARCO FERRARI, DIRECTOR OF HYGIENE SERVICES,
AO LODI HOSPITAL GROUP

New flushers and fully updated disinfection rooms:

Since the old flusher equipment could not sufficiently remove *C. difficile* spores from bedpans and urinals, AO Lodi opted to replace all flusher equipment. After reviewing the options, a total of 40 Arjo flusher disinfectors were installed and disinfection rooms were updated with new surfaces.

Results

A step-by-step approach was key to the success of the plan. “The complete disinfection procedure includes multiple steps. We made sure that each step, and procedure, worked exactly as we planned before proceeding to the next one,” said Dr. Ferrari. “That way, we could ensure that the overall strategy was perfectly adapted to all of the people involved in disinfection processes.”

The new approach also introduced a task force that springs into action whenever a new infection is detected, to identify the source and take remedial action as quickly as possible.

Today, the incidence of CDI at AO Lodi has been reduced to 0.61%. The costs of managing CDI has also been significantly reduced; in the first year of the plan the hospital network saved €800,000. Community confidence is also greatly improved, as now local residents know that hospital acquired infections are very well managed at AO Lodi.



The first year
of the plan the
hospital network
saved €800,000

For more information please go to arjo.com

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Clostridium (Clostridioides) *difficile* - White Paper. March 2019. Only Arjo designed parts, which are designed specifically for the purpose, should be used on the equipment and products supplied by Arjo. As our policy is one of continuous development we reserve the right to modify designs and specifications without prior notice.

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