CLINICAL EVIDENCE SUMMARY

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Flusher disinfectors and soiled utility room solutions

Reducing the risk of infection and cross-contamination

One of the most critical operations in a healthcare facility is the safe and efficient disposal of human waste and the disinfection of associated equipment. Bedpans and urine bottles are in use 24 hours per day, 7 days per week, a normal practice where the associated risk is not often recognized. Not only is there is a risk of infection to patients and residents from inadequate decontamination of reusable equipment,[1,2] there is also a risk to healthcare staff from handling and disposal of human waste.

At Arjo we leverage decades of global expertise to help healthcare facilities reduce the risk of cross-infection and protect staff, patients and residents from harm during this process.

Challenges

Healthcare-associated infections (HAI's): common, costly and often fatal

As one of the most common sources of preventable harm, healthcare-associated infections are among the leading threats to patient safety, affecting one out of every 31 hospital patients at any one time.[3]

Over a million HAI's occur across the U.S. healthcare system every year, leading to the loss of tens of thousands of lives and adding billions of dollars to healthcare costs[3], with the annual direct cost to hospitals ranging from 28 to 45 billion USD annually.[4] In the E.U., it is estimated that 6.5% of patients in acute care hospitals had at least one HAI.[5] In Australia, the burden of HAI's has been calculated to be approximately 165,000 cases per year, rendering them the most common complication for hospital patients.[6,7]

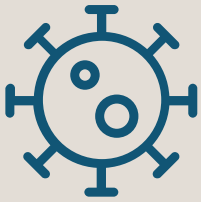
1 out of every 31 hospital patients

are affected by healthcare-associated infections[3]

Continually reviewing and improving strategies designed to protect patients and staff from the risk of HAI's has never been more important.

Increasing antibiotic resistance

As healthcare acquired infections have become a significant threat to patient safety, growing resistance to antibiotics will have a considerable impact on the ability to treat resulting infections. The cost of drug resistance to the economy is significant. In addition to death and disability, prolonged illness results in longer hospital stays, the need for more expensive medicines and financial challenges for those impacted.[8]



Emerging new strains

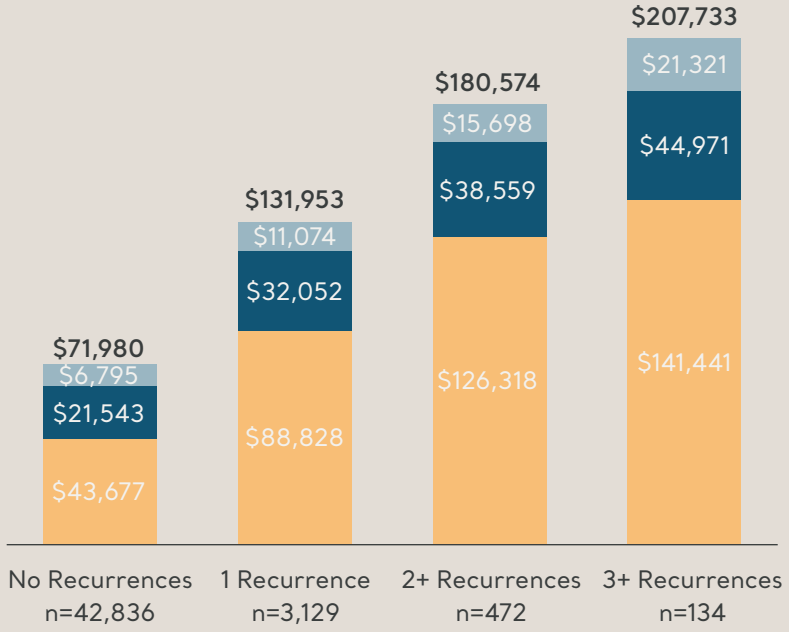
The emergence of a novel Coronavirus (SARS-CoV-2) and the resulting global pandemic has had a profound effect on healthcare systems worldwide with unprecedented clinical and operational challenges.

The impact of *Clostridioides difficile* infection

Human excreta is a source of many significant pathogens within healthcare facilities. One example is *Clostridioides difficile (C.difficile)*

- *Clostridioides difficile* infection (CDI) is a well-known cause of hospital-acquired infectious diarrhea with prolonged hospitalizations, increasing patient morbidity, mortality and healthcare costs[9]
- CDI is labelled as a "major health threat" because of the severity of symptoms, the all-cause mortality rate, the potential for antibiotic resistance, and the recurrence rate in patients who suffer from CDI[10]
- 25% of patients with an initial CDI episode experience recurrent CDI, and 40%–65% of patients with one recurrence will experience multiple episodes[11,12]
- Sepsis and the requirement for bowel surgery with high risk of mortality are known to be serious complications[9]
- CDI spores can remain on equipment such as reusable bedpans if not cleaned and disinfected properly. Thorough cleaning and disinfection processes to prevent transmission is important[13]

Total, all-cause, direct medical costs during the 12-month period after an index CDI episode were substantial for any patient with recurrent CDI, and highest for those with 3 or more recurrences. Inpatient costs made up the majority of the total costs[14]



Risks associated with manual cleaning of bedpans

Managing the disposal of human waste is an essential aspect of healthcare delivery. However, the topic has a low level of focus compared to other aspects of infection prevention strategies. Consequently, a lack of knowledge and understanding amongst healthcare staff[15] contributes to poor practice of excreta management in the clinical environment.

Despite manual emptying and cleaning of bedpans being recognized as a risky procedure to be avoided,[15] a global survey by the International Federation of Infection Control[16] discovered up to 50% of bedpans worldwide are emptied and cleaned manually by healthcare workers placing them at considerable risk.

Of the bedpans manually cleaned:

- 17% solely with water
- 39% with detergent
- 44% with a disinfectant

Not only is there is a risk of infection to patients from inadequate decontamination of reusable equipment, but there is also a considerable risk to healthcare staff from manual cleaning of bedpans.

50% of bedpans worldwide are emptied and cleaned manually by healthcare workers[16]

Evidence table

Ref	Authors	Study Name	Type	Aim	Results
15	M. Lepainteur, S. Nérome, G. Bendjelloul, C. Monteil, B. Cottard-Boulle, M. Nion-Huang, V. Jarlier, S. Fournier.	Evaluation of excreta management in a large French multi-hospital institution, Journal of Hospital Infection, Volume 91, Issue 4,2015, Pages 346-350.	Cross sectional survey	To evaluate the use of equipment for the management of excreta and to review practices of healthcare workers in their disposal.	Total of 28 AP-HP hospitals including 342 acute care units and 194 rehab and long-term care units were evaluated. 5697 (43%) wore diapers and 1767 (13%) used a bedpan. 43% of the toilets were equipped with hand sprayers, a device favoring the spread of fecal material in the environment. 68% of units equipped with bedpan washer-disinfectors. In 71% of the units the bedpan was rinsed before disinfection, mostly in the patient's bathroom (62%). Only 9% of healthcare workers said they followed an educational program about excreta disposal.
16	Popp W, Zorigt K, Borg M, Zerafa S, Khamis N, Damani N, et al.	Global practices related to handling of feces and urine in hospitals — results of an International Federation of Infection Control (IFIC) survey. International Journal of Infection Control 2014;11.	International Survey	To gain further insights into the handling of human waste, specifically feces & urine, in hospitals worldwide.	There were 1.440 responses from 93 countries: 76% bedpans were reusable: 49% plastic, 51% steel. Where reusable bedpans were used, washer disinfectors were available in 50% of instances. Manual bed pan cleaning: • With water only 17% • With detergent 39% • With disinfectant 44% Manual bedpan cleaning carried out in: • dirty utility/sluice room 61% • patient's bathroom 44% • other rooms 10% Influence of culture and religion is important.

Soiled utility room set up and risk of cross-contamination and transmission

Due to the high volume of contaminated items, there are more bacteria and viruses that pass through the soiled utility room than any other place in a healthcare facility. Without safe waste disposal, disinfection of associated items and provision for safe hand hygiene, the sluice room can become the focal point for cross-transmission, cross-infection and outbreaks in hospitals and care homes.

Minimizing caregiver exposure to human waste during its disposal in the soiled utility room is fundamental. Caregivers can be exposed to splashes and aerosols[17] during manual cleaning of bedpans and urine bottles or when emptying waste, which can lead to caregiver illness or cross-infection with patients. For this reason, manual cleaning of bedpans in either the soiled utility room or in a patient's room at the sink using a hand spray or wand is discouraged.[17]

The soiled utility room should be designed to avoid risk of cross-contamination between clean and dirty goods. The environment requires separate clean and dirty areas for associated activities. Consideration for workflow, storage, hand washing, easy cleaning and disinfection of all equipment and surfaces are important criteria to consider.

Weaknesses in any aspect of soiled utility room design increases the risk of this area becoming a source for cross-transmission and cross-infection and outbreaks in hospitals and care homes.

Approaches to human waste disposal

There are two key methods for the management and disposal of excreta in healthcare:

1

Reprocessable

Reusable bedpans and urinals which are either manually cleaned or reprocessed in a flusher disinfector.

2

Disposable

Disposable pulp or plastic liners (hygiene bags) which are either macerated and disposed of into the local waste water system or disposed of as waste.

1. Reprocessable

Flusher disinfectors

The use of flusher disinfectors to reprocess reusable bedpans and other items can reduce waste management, ongoing costs and logistics concerns for healthcare facilities compared to use of disposable single patient use alternatives.[17]

Arjo's flusher disinfectors (also known as washer disinfectors) such as the Ninjo™, Tornado™ and Typhoon™ are used to empty, flush, clean and disinfect reusable bedpans, urine bottles, commode buckets and other items.

The caregiver's process is simple. Caregivers approach the flusher disinfector with a soiled item, open the device manually or using touch-free operation to avoid contaminating the device exterior.

Hands-free activation and opening

Items ready for cleaning and disinfection process

The soiled bedpan is then placed in the flusher disinfector. The door is closed, and the item is emptied, flushed, cleaned and disinfected, without further caregiver intervention. Automated operation features are designed to help reduce the risk of cross-contamination while delivering highly effective cleaning and disinfection results. The disinfection phase can be controlled by time and temperature, or by the chosen A_o value.

Each time Arjo flusher disinfectors are used, they perform a validated self-cleaning and disinfection cycle, ensuring that the interior of the machine is disinfected. Items are placed in special racks inside the machine, depending on the different sizes of bedpans and other items, which facilitates a thorough cleaning by the fixed and rotating steam nozzles in the chamber. The Pipe System Disinfection (PSD) feature disinfects the entire pipe and nozzle system at the end of each cycle. Effective cleaning and disinfection is critical to limit pathogen exposure. An option is available to record or track disinfection records, offering traceability for a facility's disinfection operations.

Manual cleaning

Manual emptying of bedpans and urine bottles into a slop hopper sink or toilet is still carried out routinely. It is an underestimated, unpopular and labor-intensive task for caregivers[17]. This practice, with its risk of spreading microorganisms directly to the environment or indirectly via healthcare personnel, has been ignored for a long time[17].

Hand washing of reusable bedpans and urine bottles means waste is disposed of into a toilet or clinical sink, and the bedpans and urine bottles are washed by hand. This method is no longer recommended.[18] Staff risk exposure to infective material from aerosols and splashback, while cleaning cloths and wipes risk environmental cross-contamination[17].

Evidence related to manual cleaning of reusable bed pans and urinals mainly focuses on practices associated with the disposal of excreta during investigations into outbreaks or increased incidents of infection. These were often linked to poor practice and included the use of hand sprayers and wands to manually rinse and clean bedpans either in the patient's room or before using a washer disinfector. The manual cleaning process can create splashes and aerosols causing risk of contamination to both the environment and the healthcare worker and is unlikely to remove all organic material.[16]

2. Disposable

Macerators

Single-use bedpans and urinals made of biodegradable pulp are disposed of in a macerator. For centers using macerators and single-use bedpans and urinals, part of the attraction for staff lies in being able to dispose of the container along with the waste.

After use, the single use bedpan and waste contents are placed directly into the macerator. Once macerated, the pulverized waste flows into the regular sewage system. While considered convenient for caregivers, the large amount of waste produced by macerators can lead to blocked sewage disposal pipes and wastewater overflows.

In some jurisdictions, macerators may be banned due to effluent load into waste water treatment facilities or local water reservoirs.

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 during patient use
- Plastic holders that support the single use bedpan still require decontamination after each use often leading to facilities investing in both macerators for single use waste items and flusher disinfectors to disinfect reusable bedpan holders
- High recurring investment into disposable bed pans, urinals and emesis bowls
- Significant storage space required for large volume of boxes of disposable products
- Labor time and costs to frequently transport boxes of disposable products to each ward

Hygiene bags

Disposable hygiene bags are used inside a reusable holder that needs to be disinfected after each use. The disposable hygiene bag containing patient waste is typically disposed of in the patient's room. Odor can be a problem creating an unpleasant environment for patients and visitors. Measures to manage odor should be a consideration if hygiene bags are to be used. Operational budgets must be managed well in order to balance the increased costs associated with ongoing disposable use.

Regardless of which method is chosen, successful implementation is dependent on a well planned and consistent process, staff training, and effective maintenance of equipment.

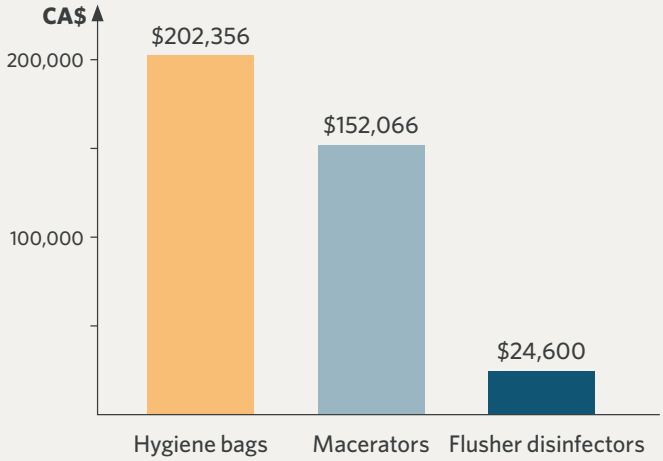
Evidence table

Ref	Authors	Study Name	Type	Aim	Results
19	Carole Hallam, Andrea Denton, Gary Thirkell.	COVID-19: considerations for the safe management and disposal of human excreta,Infection Prevention in Practice, Volume 2, Issue 4, 2020.	Literature Review	To examine different infection prevention and control practices with management and disposal of human excreta.	Limited evidence to explore difference between washer disinfectors and macerators. These different methods both have pros and cons with regards to the environmental aspects as well as the infection prevention and control implications. Manual cleaning can pose associated infection risks to both staff and patients. Adherence to infection prevention and control standards are paramount to the safe management and disposal of excreta.
2	Bryce E, Lamsdale A, Forrester L, Dempster L, et al.	Bedpan washer disinfectors: an in-use evaluation of cleaning and disinfection. Am J Infect Control. 2011 Sep;39(7):566-70.	Quality improvement approach	As part of a comprehensive approach to decreasing *Clostridium difficile* in a health authority, an evaluation of the in-use performance of 2 brands of bedpan decontaminators (BPDs) in 2 acute care facilities were performed.	A total of 1,982 observations were recorded. Percent failures rates ranged from 7.6% to 33% dependent on the intervention phase. Polypropylene materials had fewer failures compared with stainless steel. The addition of rinse agent significantly improved results particularly in polypropylene items (1% failure rate). A number of human factors issues and equipment design features compromised the BPD's ability to function adequately.

The hypothetical hospital

In a 400-bed hospital model, 33% of patients use a bedpan during an average stay of 4 days. Despite higher acquisition costs, annual operation costs for flusher disinfectors are between six to eight times less than macerators or hygiene bags respectively.[18]

Annual operation + acquisition cost:



8x more costly to use hygiene bags[18]

6x more costly to use macerators[18]

Economic issues

Acquisition costs are higher for washer disinfectors than for macerators, but the opposite is true in terms of their operating costs. While bedpan washers cost more in terms of energy consumption (electricity), macerators generate high expenditures for disposable supplies (bedpans), in addition to incurring extra costs for reprocessing bedpan supports.[18]

Environmental issues

Bedpan washers use more energy compared with macerators. However, macerators produce a large volume of waste even though it consists of biodegradable recycled pulp paper that is discharged into the municipal sewage system.[18]

Arjo safe soiled utility room system – keeping people safe

During care delivery, reusable items such as bedpans, urinals, emesis bowls and commode buckets become contaminated with bodily fluids and human waste. Soiled utility rooms should be used to ensure that this waste is properly disposed of, without risk of cross-contamination.

Safe human waste disposal requires an integrated approach incorporating:

- Equipment that effectively cleans and disinfects reusable bedpans and other receptacles while minimizing staff exposure to human waste
- Clear care processes and procedures based on effective infection prevention practices
- Staff training and education
- Safe soiled utility room layout and design to encourage good practice

The Arjo safe soiled utility room system is based on the following principles for keeping people safe:

Patients and Residents	Caregivers
1. Soiled utility environments present a risk of cross-transmission to patients and residents	**5.** Soiled utility environments are a challenge for caregivers to keep safe
2. Patients and residents are vulnerable to infection	**6.** Caregivers can also be vulnerable to organisms acquired in the soiled utility room – which may cause infection
3. Transmission can lead to infection and infection can lead to outbreaks	**7.** Our safe soil utility system is simple and easy to use increasing the time available to care for clients
4. Safe soiled utility systems minimizes the risk of cross-transmission, infection and outbreaks	**8.** Our safe soiled utility system makes it easy for carers to keep themselves and their patients and residents safe

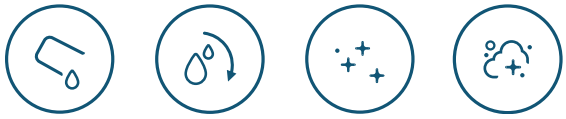
Planning a safe soiled utility room

Arjo has outlined four cornerstones of an efficient soiled utility room to keep people safe:

1. Soiled or dirty area
This is an area set aside for soiled goods, kept separate from the clean area. It usually consists of a bench or a stainless-steel discharge table. There should also be a lockable cupboard or cabinet for storing chemicals or disinfectants in the soiled area of the soiled utility room. When a caregiver enters a soiled utility room carrying an item contaminated with bodily fluids, this must be disposed of quickly, with minimal human contact.

2. Hand washing station
Most important in the soiled utility room is a well-organized hand wash station. This station should be easily accessible, equipped with a mixer tap, and include accessories like liquid soap dispensers, disposable paper towels, and a wastepaper bin. Taps are a source of potential contamination by hands and automatic taps or those with elbow levers are preferred.

3. Flusher disinfector



Empty Flush Clean Disinfect

Soiled goods, such as reusable bedpans, urine bottles, and commode buckets are placed into the flusher disinfector, emptying, flushing, cleaning, and disinfecting the receptacles without further work by caregivers. Reprocessed goods, both cleaned and disinfected, are transferred to the clean storage area ready for use.

Arjo Flusher disinfectors offer three models: freestanding to provide correct loading height, wall-mounted to enable underfloor cleaning and under-table model to free up workspace.

Arjo safe soiled utility system — making it easy for the caregiver to do the right thing: achieving disinfection and preventing cross-transmission.

4. Clean storage area
Once bedpans and other items are cleaned and disinfected, they will be stored in a clean storage area, to ensure they do not become contaminated before use. Cupboards or racks provide good storage facilities. Plus, if stainless steel bedpans are used, a heated storage cabinet can be a good option.

Ninjo

Tornado

Typhoon

Standards and testing

ISO 15883-3

Arjo flusher disinfector family, Ninjo, Tornado and Typhoon, comply with the requirements of EN ISO 15883-3 as thermal disinfectors for human waste containers.

Arjo flusher disinfectors will destroy non-heat resistant viruses including SARS-CoV-2 virus contamination that may be on bedpans and urine bottles. Arjo recommends running at least the "Normal + Detergent" program utilizing the Arjo branded detergent. The A_o value of the thermal disinfection process can be monitored on the display during and at the end of the program run.

C. difficile testing

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

To independently verify the ability of Arjo's flusher disinfectors (models FD1600/NINJO, FD1800/TORNADO and SP6000/TYPHOON)* to remove *C. difficile* spores, the Department of Medical Microbiology at Lund University in Sweden conducted extensive testing.[21]

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.

Case study

To learn how Arjo Flusher Disinfectors played a role in helping to reduce rates of *C. difficile* at one hospital group in Milan, Italy, please download a copy of the *Clostridium (Clostridioides) difficile* - White Paper, from Arjo.com

Summary

Despite compelling evidence highlighting good practice, and discouragement of manual cleaning techniques, common methods still used for the disposal of patient waste unnecessarily expose caregivers and those they are caring for to unnecessary harm. With decades of expertise in this area, Arjo can help healthcare facilities reduce the risk of cross-infection and protect staff, patients and residents from harm during this process.

For further information, please contact your local Arjo sales representative or visit Arjo.com

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At Arjo, we believe that empowering movement within healthcare environments is essential to quality care. Our products and solutions are designed to promote a safe and dignified experience through patient handling, medical beds, personal hygiene, disinfection, diagnostics, and the prevention of pressure injuries and venous thromboembolism. With over 6,000 people worldwide and 60 years caring for patients and healthcare professionals, we are committed to driving healthier outcomes for people facing mobility challenges.

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