



MedPro Defense Waste Management System

THE PROBLEM

Traditional hospital transportation of waste has many failure points beyond the initial area of contamination. These failure points expose patients, personnel, and community environments to cross-contamination and higher infection risks. The chain of disposal is continuously engaging with a potential infection source. A transformational approach requires a sustainable end-to-end solution, which protects people and surfaces from physical and aerosolized pathogens at every stage, regardless of access to a macerator, and factors in operational constraints, such as costs, infrastructure, and the time to implement. Any new system should not place increased burden on frontline staff, neither contravene health guidelines. It should also conform to the Pollution Prevention Plan (PPP) as set out by cities, including Vancouver, Canada.¹

ABSTRACT

A new comprehensive human waste disposal concept, the MedPro Defense Waste Management System, reengineers the current prevalent systems and introduces an integrated and coordinated process, which results in a positive impact on infection control rates, and conforms to the particle size waste limits set out by the Vancouver PPP.¹

The MedPro Defense Waste Management System is defined by three pillars: flexibility, containment, and sustainability:

1. Flexibility: An easy-to-use mobile disposable waste containment system that can be implemented quickly in any location without access to a macerator, and can follow the patient throughout the hospital. Human waste is completely enclosed, and this

effectively eliminates exposure during transport and disposal.² Fundamental component: hygienic bag;

2. Containment: A choice of mobile and fixed equipment for patient rooms that ensures human waste never leaves the individual patient's zone; Fundamental components: macerator and absorbent materials.

3. Sustainability: Support products that are slurry-pipe-compatible and work with both the flexibility and containment options:

- Moist and dry maceratable wipes
- Universal pulp vessels that integrate with commode styles from different manufacturers
- Container supports
- Commode styles that seamlessly integrate with support products, including hygienic bags.

FLEXIBILITY VIA MOBILE CONTAINMENT SYSTEM

When a macerator is not immediately available, e.g., due to infrastructure or budget limitations, the Zorbi hygienic bags can fit any manufacturer's commode and follow the patient throughout the hospital journey to maintain the security and control of the human waste disposal chain. By securely enveloping the supports, pails, and commode seats, Zorbi bags quickly and efficiently contain patient excretions, including faeces, urine and emesis. The bag design reduces the chance of cross-contamination and exposure to human waste pathogens; minimizes the time, expense, and energy resources associated with cleaning and disinfecting reusable vessels. The Zorbi bags have been successfully implemented throughout Canada.



CONTAINMENT WITH PERMANENT EQUIPMENT

Medpro Defense and Haigh Healthcare offer Canada intuitive macerators, which are easy to maintain, and have features designed to maximize up time. In addition to hands-free operation and full system access for easy maintenance, the *Premium Flow* patented draining system ensures that no object greater than 5mm will leave the machine and enter the slurry pipe, conforming to vigilant PPPs set out by cities.

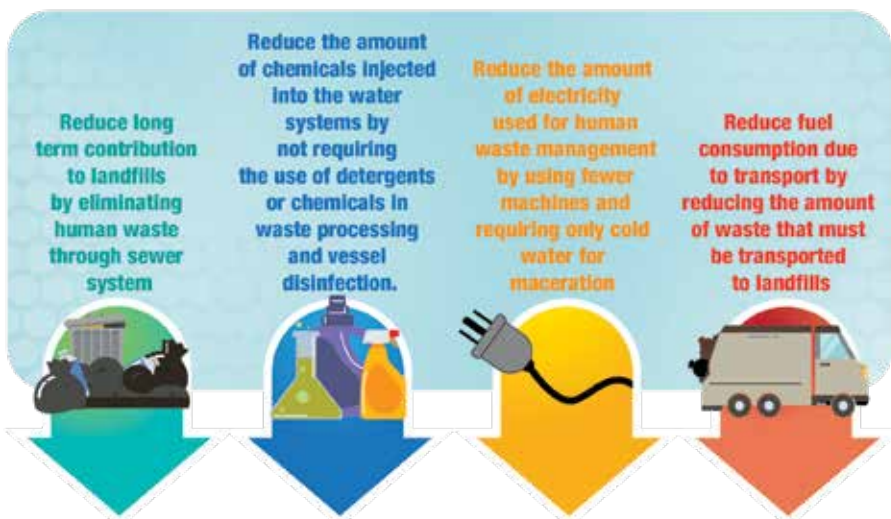


SUSTAINABILITY WITH SYSTEM SUPPORT TOOLS

The MedPro Defense System products service both the fixed and the bag options in the Human Waste Management line. This one-entry-point program simplifies procurement, reduces costs and inventory concerns, and promotes compliance from hospital staff.

- Commodes designed to promote advanced infection control and which are designed to work with hygienic bags and pulp vessels efficiently.
- Supports that can be used with any of our products, further simplifying the Human Waste Management function.

The macerator is the accepted conduit from the hospital to the municipal water waste grid. All MedPro Defense System products are engineered for the safety and sustainability of the municipal system. A complete range of biodegradable pulp vessels and moist and dry wipes are compatible with any macerator brand on the market. This allows for the continued use of existing macerators.



METRICS

Human waste, including faeces, urine, and vomit have been well documented as a source of cross-contamination for several diseases associated with nosocomial infection, including *Clostridioides difficile* (*C. difficile*) and norovirus.

The presence of pathogens in human waste and their ability to spread is well documented:

- Vomit and faeces are expected to carry high concentrations of pathogenic cells. For example, up to 10^9 of norovirus, 10^8 of salmonella, $10^{6,7}$ *C. difficile*.^{3,4}
- Outbreaks of Hepatitis A have been traced back to exposure to human fecal matter in Philadelphia.⁵
- There is also evidence of high concentrations of the virus that causes COVID-19 in faecal matter.⁶ It is possible for a plume to form and contaminate surfaces, or infect other patients as was the case with SARS in 2003.⁷

In addition to direct contact with waste, bio-aerosolization of waste expands the possibilities of exposure of people and surfaces to contamination. The aerosolization of waste due to air currents, breathing, coughing, and flushing of toilets demonstrates a need to limit the movement of human waste beyond what was originally thought.

- Vomiting leads to the aerosolization of particles and has been proposed to be an additional mechanism of transmission.⁸
- Flushing a toilet has been shown to produce an increase in concentration of particles in hospital rooms; the largest increase being produced when fecal waste is present. In addition, the concentration of particles was also increased after flushing when fecal waste was not present, suggesting that particles remaining from previous flushes could be aerosolized repeatedly over time.⁹

- Contamination due to the aerosolized waste has been shown to continue to be deposited on surfaces at a distance from the initial flushing source for up to 6 hours.³

Once aerosolized and transported by air currents, the pathogenic cells can be inhaled by other individuals or be deposited onto surfaces and then transmitted to a host through contact. These airborne and easily transmitted pathogens circumvent direct cleaning protocols, and have a significant impact on all facets of the healthcare system, including infection rates and cost.

- It takes fewer than 10 to 100 virions to cause norovirus infection, and these cells can persist for weeks on environmental surfaces. *Norovirus* displaced 57,800 patients annually in England and cost the NHS £107.6 million in direct costs. In addition, the illness incurs a loss of 6,300 quality-adjusted life-years annually.¹⁰
- Vancomycin-resistant enterococci (VRE) increases the relative cost of hospitalization by 61.9% and the average length of stay (LOS) by 68%.¹¹
- The cost associated with a nosocomial case of *C. difficile* is \$10,861 to \$36,960.¹²
- 23.5% of nosocomial infections can be traced to shared equipment and the environment.¹³
- 3-21 % reported HAI related to unclean bedpans and urinals¹⁴

By containing the waste at its source, the risk of contamination due to movement either by aerosolization or other means is reduced.¹⁵

PRACTICE CHANGES

Medpro Defense's waste management system can provide a cohesive program that can help simplify waste management across multiple departments within a given health centre. When a facility partners with MedPro Defense to implement a waste management solution plan, the key variables, aside from absolute cost, include:

- The concentration of patients in need of waste management support;
- The duration of the expected need of patients;
- The current roles, responsibilities, practices and protocols for handling human waste management and related activities;
- The current equipment in place and its expected remaining usable life;
- Any infrastructure opportunities and limitations in the institution and related to the institution (ex. municipal by-laws);
- All specific quantifiable outcomes and milestones;
- The frontline staff needs and perceptions.

Working with the various stakeholders, MedPro Defense team members can advise, plan, and implement solutions tailored to the client's specific situation. Whether a completely new construction or an existing site, the plan will respect location-specific measures and any constraints.

NARRATIVE

A patient with an acute respiratory infection presents at the emergency

department of a major metropolitan teaching hospital. In triage and awaiting care, the patient has their own MedPro Defense infection-control-friendly commode, with a Zorbi bag, a seat insert, and maceratable wipes. The patient does not travel from the emergency department to the common bathroom, mitigating the possibility of transmitting infectious droplets through touch, laboured breathing, or coughing.

Based on clinical needs, the patient is transferred to different areas for targeted care while still being part of the overall emergency department. The patient moves with the same commode, Zorbi seat insert, and maceratable wipes as they move through the department, providing a sense of comfort and dignity in this unsettling situation.

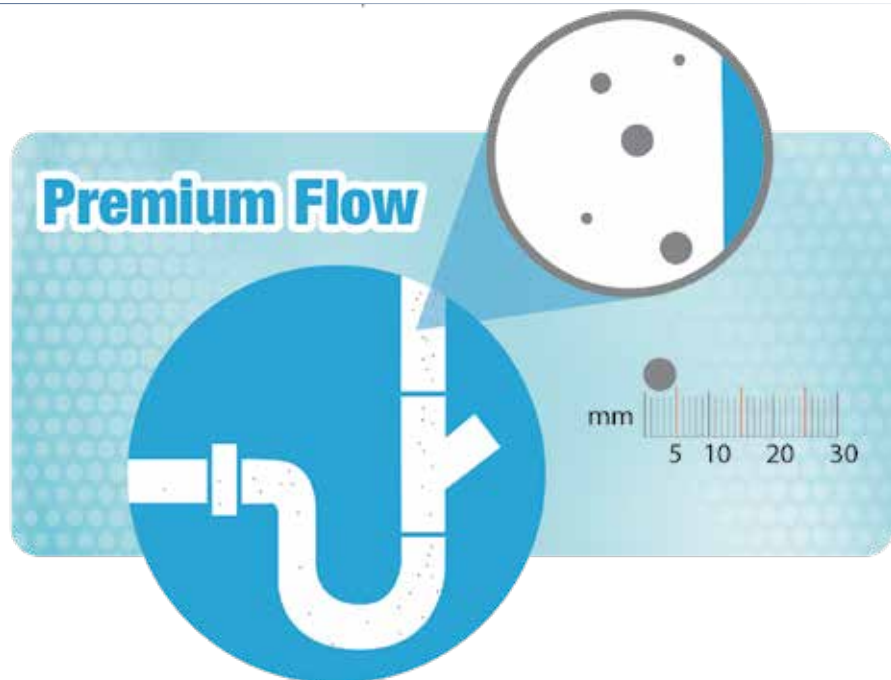
Once the patient is admitted to a unit, the staff can dispose of any human waste in a hands-free macerator located either in the patient's room, or at a central location in the ward. The patient will still have access to their familiar infection-control-friendly MedPro Defense commode, maceratable wipes, and Zorbi-compatible seat insert, which can now be used with any biodegradable maceratable pulp bedpan. This mobile system remains a source of consistency, comfort, and independence for the patient.

In the ward, the staff now has access to MedPro Defense macerator technology. They can package the maceratable wipes, pulp vessel, pulp vessel cover, and human waste and transport it efficiently and securely to

The MedPro Defense Waste Management System can help:

- Optimize waste containment and elimination strategies for each specific location within the hospital;
- Reduce staff confusion and errors, as well as macerator downtime and repair costs, by ensuring all products across the hospital work together;
- Improve patient satisfaction by allowing them to become familiar and comfortable with one model of commode and wipes, no matter where their hospital journey takes them.

the macerator. Because the macerator operates hands-free, the staff can package the human waste with minimal risk of cross-contamination due to air currents, spills, or inadvertent hand contact (e.g., while balancing full containers). Once the maceration cycle is initiated, and without having to touch any surface, they can remove their gloves in the garbage and proceed with hand hygiene. However, if by mistake something unacceptable enters the macerator; there will be no risk to the hard-to-reach drains and pipes in the wall because the patented *Premium Flow* technology ensures that nothing larger than 5mm in diameter can ever leave the macerator and enter into the pipes.



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