



*Direction de l'évaluation des technologies et des
modes d'intervention en santé (DETMIS)*

Cost-efficiency analysis of bedpan washers and hygienic covers

**Document prepared by: Alain Lapointe
Luigi Lepanto**

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hygienic covers

Evaluation report prepared for the DETMIS by:

Alain Lapointe
Luigi Lepanto

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Management

Dr. Luigi Lepanto, Director

Researchers

Mouhcine Nassef, Research Assistant

Alain Lapointe, Executive Advisor

For more information on this publication or about any other of the DETMIS's activities, please contact:

Direction de l'évaluation des technologies et des modes d'intervention en santé

Centre hospitalier de l'Université de Montréal

Hôpital St-Luc

1058 rue St-Denis

Montréal, Québec H2X 3J4

Telephone: 514.890.8000 extension 36400

Email: luigi.lepanto.chum@ssss.gouv.qc.ca

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¹ Translator's note: Office of Health Services and Technology Assessment

Mission

The mission of the CHUM's *Direction de l'évaluation des technologies et des modes d'intervention en santé* is to guide decision-makers in choosing technologies on the basis of thorough evaluations founded on probing data and state of the art methodologies.

The DETMIS' primary mandate is to produce data on the effectiveness, safety and costs of technology under consideration for adoption or use by the CHUM. Its secondary mandate is to draft technology adoption policies that reflect the institution's values as well as the importance it places on the results of evaluations conducted. As such, when an adoption policy limits access to a new technology, it is imperative that the health care professionals affected are involved in accepting the policy.

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Executive Summary

The recovery of faeces and urine from hospitalized patients is an important issue for CHUM Centre-ville in attempting to better control the sources of contamination in a hospital.

The recent report from AETMIS entitled “Analyse comparative des équipements de traitement des bassines de lit » analyses bedpans from an organisational, economic and environmental perspective. The objective of this report is to guide CHUM Centre-ville in comparing bedpan washer machines with care bag hygienic covers to manage human disposable wastes.

Organisational issues

The following organisational issues were deemed important:

- To reduce the risk of contamination, the manual cleaning of bedpans and the use of pressure water pistols must not be allowed in the patient toilet.
- Bedpan washers should be located in a special room on each care unit.
- In these special rooms, sufficient space should be allowed for bedpans to be washed.
- Two (2) bedpan washers should be installed on each care unit to reduce the congestion of bedpans to be disinfected.
- It is well documented in the literature that carrying bedpans from the patient room to the bedpan washer room is a source of contamination.
- • Studies have demonstrated that bedpan washer machines cannot eradicate
- *C. difficile* bacteria on bedpans and so they must then be sterilized.
- Exclusive use of care bag hygienic covers imposes a few weeks inventory of these hygienic covers; moreover, a contingency plan should be prepared to meet any supply problems.

Economic issues

To compare the economic impact of bedpan washer machines and care bag hygienic covers, we adapted the comparative scenario described in the AETMIS report to a 770 bed hospital where 2 bedpan washers are used on each care unit and where patient attendants carry bedpans to the washers' rooms.

Taking into account the cost of manpower to carry the bedpans to the bedpan washers' rooms, the total cost for the treatment of bedpans with the washer machines is **\$413,136** for a travel time of 2 minutes from the patient rooms to the washers' rooms. By comparison, the cost of using care bag hygienic covers in the same scenario would be **\$319,481**.

It should be noted that in this scenario, we assume that the patient attendants will travel only once between the patient room and the washer's room. That may not always be the case.

Some may argue that the above mentioned cost for the bedpan washer machines represents the “process cost” to disinfect those bedpans and not the real cost because the attendants are already paid to do that among other things. To obtain a more representative cost assessment, the various departments of the CHUM could identify the additional costs generated by episodes of *C. difficile*. During the budgetary period of 2008-2009, there have been more than 220 clinical cases of *C. difficile*. Bedpan washers may not diminish this incidence to the same degree as hygienic covers.

Environmental issues

It is difficult to assess the environmental impact of using bedpan washer machines or care bag hygienic covers. The literature review revealed that the bedpan washer machines consume more electricity due to the disinfection cycle and also increase hot water requirement. Moreover, the use of detergents and limescale removers could affect the environment.

The disposal of care bag hygienic covers could also affect the environment due to the volume of waste carried to the landfill sites. It should be noted that an ecological version (oxobiodegradable) of these hygienic covers is now available in Canada and represents an interesting development in this regard.

Conclusion

The choice of the type of management of human disposable wastes should be guided by two main issues: 1) the reduction of the risk of contamination and 2) an efficient work organization. The use of care bag hygienic covers for the management of hospitalized patients’ faeces and urine is an interesting approach for a hospital due to its safety, a lower risk of contamination, a simplified treatment process and more time for the personal to attend to patients. Despite the fact that the *process cost* favours the use of care bag hygienic covers, a field study must be performed to better identify the real cost of using bedpan washer machines. This report could then be updated on the basis of the collected data and be used as a model for future studies.

Eventually, the final choice rests on the recognition of all costs pertaining to the transport of the bedpans whose handling implies without any doubt, important contamination risks.

Cost-efficiency analysis of bedpan washers and hygienic covers

Preface

This evaluation was requested by the CHUM Centre-ville to help in the choice of strategies for disposing of faeces and urine from hospitalized patients.

This report is based largely on a Technical Note recently published by the *Agence d'évaluation des technologies et des modes d'intervention en santé* (AETMIS)(2)² that synthesized information from various scientific articles. The aim of the current report is to consider the information from the AETMIS report, adapting it to the functional and technical plan for the future CHUM.

The current document includes a brief introduction, a comparative analysis between bedpan washers and hygienic covers, from an organisational, economic and environmental perspective, a discussion of the information presented and a brief conclusion.

Introduction

As part of the Functional and Technical Plan of the *CHUM Centre-ville*, disposal of faeces and urine from hospitalized patients is an important component in the implementation of hygiene measures aimed at controlling potential sources of contamination in a hospital center.

As a result, the recent AETMIS report, entitled “*Comparative Analysis of bedpan processing Equipment*” (2) looks at bedpan management from an organisational, economic and environmental perspective. It compares the following technologies: bedpan washers, macerators and hygienic covers.

Though it does not specify the best choice for a hospital, this report does state that: “...beyond the economic and environmental aspects, the main issues

² Translator's Note : Health Services and Technology Assessment Agency

consistently raised by practitioners were the effectiveness of the equipment or procedures to reduce the risk of infection and optimize work planning.”

In order to help CHUM Centre-ville’s decision-makers to make an informed choice, this report compares two of those technologies from an organisational, economic and environmental perspective while taking into account the human resources required for optimal functioning.

Comparative Analysis

For technical and environmental reasons, macerators have not been retained as an option for the future CHUM. This comparative analysis therefore only considers bedpan washers and hygienic covers.

A) Organisational perspective

The technical note published by AETMIS provides excellent coverage of the organisational aspect of the use of bedpan washers and hygienic bags. Briefly, when it comes to the CHUM, the relevant issues are:

- To reduce the risk of contamination, the manual cleaning of bedpans and the use of pressure water pistols in the patient bathroom should not be common practice.
- Bedpan washers should be located in a special room in each care unit, reserved specifically for this purpose.
- In each special room, adequate space must be planned for bedpans that need disinfecting and those that have been disinfected.
- On each unit, at least two (2) bedpan washers should be installed in each bedpan washer room, in order to reduce the congestion of bedpans to be disinfected.
- It is well documented in the literature that carrying bedpans from the patient room to the bedpan washer room is a sure source of contamination (2).
- During peak periods, staff often has to return to the bedpan washer room to recover disinfected bedpans, resulting in loss of time.
- Studies have demonstrated that bedpan washers cannot eradicate *C. difficile* spores on reusable bedpans and that they must be sent to the central sterilization service to eliminate these spores.
- For optimal performance (i.e. to minimize the risk of contamination), frequent preventive maintenance must be conducted on all bedpan washers in the care unit.
- Exclusive use of hygienic covers requires that the CHUM keep in inventory enough hygienic covers to last a few weeks. In addition, a back-up plan should be established to confront an insufficient supply of hygienic covers.

The AETMIS' technical note (2) also underscores that “the use of bedpan washers and macerators as bedpan management methods do not fully prevent the risk of workplace contamination. The main reasons are bedpan transport outside the rooms and in the corridors; accumulation of soiled bedpans on counters until a machine is available; non-compliance with hygiene practices ...and the likelihood of errors resulting from long and complex procedures.” The report also mentions that “...hygienic bags would be a safer procedure because the supplies do not leave the isolation area.” “...although hygienic covers incur higher operating costs, they save many nursingcare hours due to the speed of the process (using hygienic covers).”

B) Economic perspective

To compare the economic issues surrounding the use of bedpan washers versus hygienic covers, we have used the base data from the scenario presented in the AETMIS report, adapting it to a hospital centre with 770 beds. The economic comparison rests on the following parameters:

- A hospital with 770 beds and 29 care units;
- 33% of bedridden patients require the use of a bedpan;
- 4 bedpans/bed or 4 hygienic covers/bed are soiled each day;
- the average patient stay lasts 4 days;
- the cost of preventive maintenance is 5% of the purchase cost of the bedpan washers;
- the lifespan of bedpan washers and bedpans is estimated at 15 years;
- the electricity consumption of bedpan washers, the cost per kWh of electricity, the quantities of detergent and rinsing agent and their respective purchase costs are the same as those used by the AETMIS.

In addition, in order to better ascertain the total costs to the CHUM of each technology, we also took into account the following:

- 2 bedpan washers were planned for each unit, instead of just one;
- The transportation of bedpans was assumed to be done by patient attendants;
- The hourly rate for a patient attendant was estimated to be \$24.06/hour (including 18.07% in benefits and a 12% employer share) (information provided by Mr. Pierre Clermont, payroll services, DRFPE, CHUM);
- We did not take into account administration fees for ordering hygienic covers or for infrastructure adjustments for facilities to accommodate bedpan washers (storage space, plumbing work, electricians, etc.);
- We did not take into account the time taken to install bedpans (or hygienic covers), under patients, or the time to remove them as the time required in both scenarios is identical;
- The average weight of a soiled hygienic cover is estimated to be 500 gr.;

- The recovery costs for non contagious waste is \$73.13/metric ton (including government dues and the cost of lifting a container) (information from Mrs. Sylvie Boudreault, Manager, Hospital Housekeeping Services, CHUM);
- The cost of sterilizing a bedpan is estimated at \$0.50;
- The costs of a hygienic cover and a disposable support are, respectively, \$0.74 and \$1.94 (following a long-term agreement with Hygie Canada; information from Mr. Eric Tanguay, CEO of Hygie Canada); an option including “recycling of disposable supports” could be established with this company.

Table 1 presents the results of these costs assuming a total transportation time of 2 minutes between the patient room and the disinfecting room.

Taking into account the cost of human resources involved in transporting bedpans to the disinfecting room, the total costs of handling bedpans using bedpans washers is \$413,136 assuming a transportation time of 2 minutes. In comparison, the cost of using hygienic covers under this scenario is \$319,481.

It should be noted that under the previous scenario, we assume that the attendant will only make one trip to the disinfecting room where there will be space available to place the bedpan in one of the two bedpan washers, which may not always be the case.

Some would argue that the costs mentioned under the column “bedpan washers” represent the costs of the handling process and not the real costs of processing them because the staff is already paid to do this work, among other things. In order to obtain an operations cost that fits as close as possible to the real conditions, the various departments in the CHUM could identify the additional operational costs they would face during episodes of contamination such as episodes of *C. difficile*. During the fiscal year 2008-2009, the CHUM registered a little more than 220 such episodes, which probably represents a significant impact on the operational budgets of these departments.

TABLE 1

EQUIPMENT AND ACCESSORIES	PURCHASE COSTS DISTRIBUTED ANNUALLY (CAN\$)					
	BEDPAN WASHERS (Amortisation over 15 years)			HYGIENIC COVERS		
	Qty	Unit Cost	Annual cost	Qty	Unit Cost	Annual cost
No. of care units	29					
No. of bedpan washers / unit	2					
No. of bedpan washers	58	\$10,000	\$38,667			
Reusable bedpans	770*0.33*2	\$90	\$3,049			
Total			\$41,716			

	Annual costs of operations (CAN\$)					
	BEDPAN WASHERS			HYGIENIC COVERS		
		Unit value	Annual cost		Unit value	Annual cost
Hygienic covers						
No. of covers/day				4*770*0.33	1,016	
Unit cost					\$0.74	
Cost/day				1,016*0.74	\$752	
Cost/year				\$752*365		\$274,480
Disposable supports for covers						
No. of supports/stay				770*0.33	254	
Avg. length of stay					4 days	
Unit cost					\$1.94	
Cost/year				254*1.94*365/4		\$44,964
Waste recovery						
Weight of soiled cover					500 g	
Weight of waste/day				4*770*0.33*500	508,200 g	
Transportation cost/metric ton					\$73.13	
Total cost of transportation				508.2/1000*\$73.13		\$37
Maintenance	58	\$10,000*5%	\$29,000			
Electricity						
No. of cycles/day	4*770*0.33/2	508				
Elect. consumption/cycle		0.16kWh/cycle				
Cost per kWh		\$0.058				
Elect. cost/day	508*0.16*0.058	\$4.72				
Elect. cost/year	\$4.72*365		\$1,721			
Detergent						
No. of cycles/day	4*770*0.33/2	508				
Detergent consumption/cycle		\$0.015 L/cycle				
Detergent consumption/day	508*0.015	7.62 L				
Cost of detergent		\$5.36/L				
Detergent cost/day	7.62L*\$5.36/L	\$40.84				
Detergent cost/year	\$40.84*365		\$14,907			
Rinsing agent and descaler						
No. of cycles/day	4*770*0.33/2	508				
Consumption/cycle		0.003L/cycle				
Consumption /day	508*0.003	1.52L				
Cost of rinsing agent		\$9.39/L				
Cost/day	1.52L*\$9.39/L	\$14.27				
Cost/year	\$14.27*365		\$5,209			
Bedpan sterilisation						
No. of bedpans/stay	770*0.33*2	508				
Avg. duration of stay		4 days				
No. of bedpans to sterilise/year	508*365/4	46,355				
Cost of sterilising 1 bedpan	\$0.50					
Total cost of sterilisation	46,365*\$0.50		\$23,178			
Attendant						
No. of bedpan transports/day	4*770*0.33	1,016				
Avg. duration of transport		2 min				
Time required/day	1,016*2	2,032				
Time required/year	2,032/60*365	12,361 hrs				
Attendant hourly rate		\$24.06				
Cost of transportation/year	12,361*24.06		\$297,406			
Total			\$413,136			\$319,481.00

C) Environmental perspective

It is difficult to evaluate the relative impact of using bedpans washers or hygienic covers on the environment. According to Johnson (1), as reported in the AETMIS technical note, “bedpan washers used much more electricity owing to the length of the disinfection cycle and the use of hot water”. In addition, the use of detergents and limescale removers could have an effect on the environment.

The same could be said for the disposal of hygienic covers which, given the non-negligible volume involved, could also have a sanitary and environmental impact through their handling in a hospital centre and their transportation to landfill waste sites. It should be noted that an environmentally-friendly version (oxo biodegradable) (2) of these covers is now available in Canada — an interesting parameter from an environmental perspective.

Discussion

The choice of bedpan management options must be made on the basis of two issues: 1) reducing risks of contamination and 2) the efficient work organisation. As mentioned in the AETMIS report, “eliminating the source of risks of contamination starts with reducing the handling, transport and processing delays related to soiled supplies.”

On the basis of the description of the bedpan use context provided in the AETMIS report, it is undeniable that this approach involves manipulation, transport and possible delays in the processing of soiled materials. Furthermore, it has been demonstrated that bedpan washers do not destroy *C. difficile* spores (3). In fact, specifically when *C. difficile* bacteria are present, it is recommended to use single use technologies such as hygienic covers (2).

The AETMIS report builds a scenario for acquiring certain technologies for handling bedpans without taking into account labour costs. Under these scenarios, bedpan washers appear to be an interesting solution given its low operations costs.

However, if we take into account the transportation time and financial costs this represents, the handling costs of bedpans is higher than that of purchasing hygienic covers. As illustrated in Table 1, the cost of transportation for barely 2 minute trips from the patient room to the disinfecting room represents higher costs, on an annual basis, than what it would cost to acquire hygienic covers. It should be noted that the costs of using bedpans do not take into account the costs related to potential episodes of *C. difficile* infections (the average cost of which is estimated to be \$16,717 per stay) (2).

On the other hand, choosing hygienic covers involves a certain degree of vulnerability when it comes to supply of this material. It is therefore important for a hospital center to have a stock of covers on-site. And, if, despite these measures, it becomes necessary to turn to a Plan B in the case of a complete run on stocks of hygienic covers, the pressure pistols available in patient rooms (dedicated to rinsing urinals) could be used temporarily to rinse reusable bedpans which would then be sent to the central sterilisation service for complete disinfection after patients leave.

Conclusions

In conclusion, the use of hygienic covers to dispose of fecal and urinary waste from bedridden patients is a highly interesting option for a hospital centre because it combines a number of advantages: safety during usage, a reduction in contamination risks, a simplified handling process and freeing staff to spend more time with patients. However, although the bedpan *handling* costs point to an advantage in using *hygienic covers*, a field study should be conducted to get a better estimate of the real costs involved in using bedpan washers. This comparative analysis could be revised and improved based on the new data and could serve as a model for future analyses.

The final choice of technology should take into account the costs involved in transporting bedpans, which inevitably involves contamination risks.

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