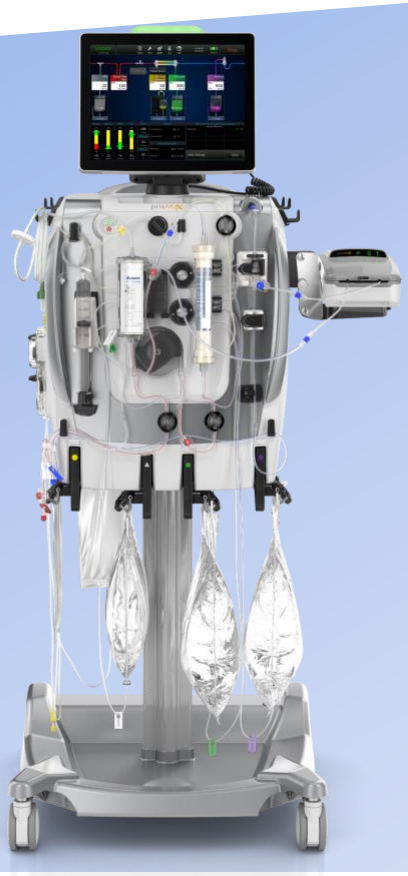
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L'Unité d'évaluation des technologies et des modes d'intervention en santé (UETMIS) du Centre Universitaire de Santé McGill (CUSM)

Health Technology Assessment Unit (TAU) of the MUHC



October 16, 2026

Auto-Effluent Drainage for Continuous Renal Replacement Therapy at the MUHC

Economic Analysis of Adoption Strategies

Brief report
Report no. 111

Report prepared for the Technology Assessment Unit (TAU) of the McGill University Health Centre (MUHC)

by

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Mission Statement

The MUHC Health Technology Assessment Unit (TAU) advises hospital administrators and clinical teams in difficult resource allocation decisions. Using an approach based on independent, critical evaluations of the available scientific evidence and a transparent, fair decision-making process, novel and existing medical equipment, drugs and procedures used by healthcare professionals are prioritized on a continuous basis ensuring the best care for life with the best use of resources.

Declaration of Conflicts of Interest

Members of TAU's research staff and policy committee declare no conflicts of interest.

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KEY FINDINGS AT A GLANCE

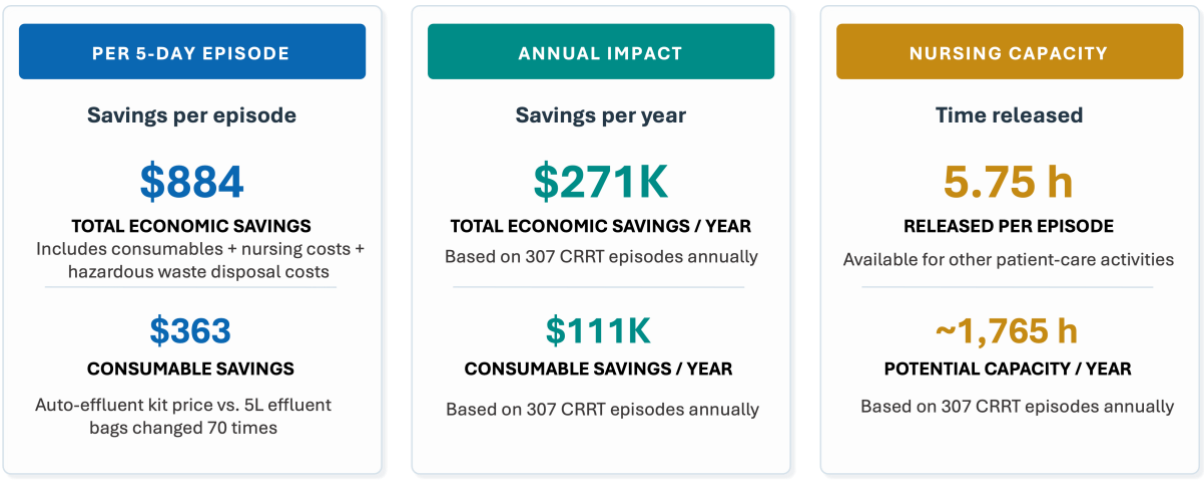
WHAT DID WE DO?

Compared the budget impact of 3 strategies for effluent management in continuous renal replacement therapy (CRRT) at the adult intensive care units of the Royal Victoria Hospital and Montreal General Hospital:

1. Current practice, requiring approximately 14 manual 5-L effluent bag changes per patient-day
2. Universal adoption of auto-effluent drain accessory
3. Hybrid strategy in which auto-effluent is used for a selected proportion of CRRT episodes

Key findings

Savings with auto-effluent versus current manual effluent management per 5-day episode



Total economic savings include the modeled value of nursing time. Nursing time represents increased clinical capacity, not necessarily cash-releasing savings.

Overall interpretation

FINDINGS	INTERPRETATION
• The financial advantage derives from lower consumable use and, more substantially, from reducing nursing time spent changing effluent bags. • The direct budget saving for consumables is approximately $363 per five-day episode, or $111,441 per year, assuming 307 CRRT episodes annually at the 2 MUHC sites. • Auto-effluent also releases approximately 6 hours of nursing time per episode for other patient-care activities.	**Universal auto-effluent is less costly than current practice and the illustrative hybrid strategy**

TAU RECOMMENDATIOM

CONSIDER IMPLEMENTATION

Routine adoption of auto-effluent appears economically favourable if MUHC CRRT treatment durations are broadly consistent with the five-day base case. Actual CRRT volume, treatment duration and kit utilization should be monitored following implementation to confirm the projected budget impact.

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EXECUTIVE SUMMARY

BACKGROUND

Continuous renal replacement therapy (CRRT) is used in critically ill patients who require continuous renal support. At the MUHC, CRRT is provided in the adult ICUs at the Royal Victoria Hospital and Montreal General Hospital using PrisMax systems.

Under current practice, effluent is collected in disposable 5-L bags. Nursing staff may change these bags approximately 12–14 times per patient-day, requiring repeated handling of effluent that may contain hazardous medication, interrupting other nursing activities, and contributing to CRRT workflow burden.

The PrisMax Auto-Effluent Drain Accessory automatically manages effluent drainage and substantially eliminates manual effluent bag changes. The accessory can remain in place for up to six days. Given the limited direct comparative clinical evidence for the accessory, this assessment focused on the question most relevant to the MUHC adoption decision: **the economic and resource implications of alternative adoption strategies**.

ORGANIZATIONAL POLICY QUESTION

Should the MUHC ICUs adopt auto-effluent for the management of CRRT effluent, either routinely or for selected patients, in place of current manual effluent bag changes?

EVALUATION QUESTIONS (Objectives of this report)

1. What are the costs and resource implications of current practice compared with universal and targeted adoption of auto-effluent?
2. What are the implications of each strategy for nursing workload, occupational exposure to potentially hazardous effluent, ergonomics, workflow and waste management?

METHODS

- A hospital-based cost model was developed using MUHC purchasing and nursing cost information and locally informed resource-use assumptions.
- Costs were examined from two perspectives. Direct consumable costs represent expenditures that could affect the hospital budget. A broader economic/resource analysis additionally assigned a value to nursing time required for effluent management. Released nursing time should be interpreted as increased nursing capacity rather than necessarily as cash-releasing savings.

Base case model inputs

- The base case assumed a five-day CRRT episode, 14 manual effluent bags per day, five minutes of nursing time per bag change, and a conservative filter life of 60 hours. A 5L effluent bag costs $12.91, while an auto-effluent kit costs $540.75 and can be used for up to six days. Nursing time was valued at $88.05/hour.

- The hybrid strategy was modeled as 25% of CRRT episodes receiving auto-effluent and 75% remaining under current practice. This proportion is illustrative and based on the assumption that approximately 25% of CRRT episodes at the MUHC involve hazardous medication. It should not be interpreted as an observed MUHC utilization rate.

Sensitivity analysis

- Sensitivity analyses examined the effect of varying CRRT treatment duration (1 to 12 days) and the number of effluent bags used per day (10 to 18 bags).

KEY FINDINGS

- For a five-day CRRT episode, direct consumable costs were estimated at $903.70 under current practice, $540.75 with universal auto-effluent, and $812.96 under the illustrative hybrid strategy. **Universal adoption therefore generated a direct consumable saving of $362.95 per 5-day CRRT episode**.
- Current practice requires approximately 5.83 hours of nursing time for 70 effluent bag changes during a five-day episode. In comparison, the incremental auto-effluent setup time was estimated at approximately 0.08 hours. Valued at $88.05/hour, nursing resource costs were approximately $513.63 under current practice and $7.34 with universal auto-effluent.
- Combining consumables, hazardous-waste disposal costs, and nursing resource use resulted in estimated total economic costs of $1,432.20 for current practice, $548.09 for universal auto-effluent, and $1200.02 for the hybrid strategy. **Universal adoption therefore generated an estimated economic/resource saving of $884.11 per five-day episode.**
- Assuming an annual volume of 307 5-day CRRT episodes at both MUHC ICUs**, universal adoption would generate approximately $111,425 in direct consumable savings per year compared to current practice.** When the value of released nursing time is included, the estimated annual economic/resource benefit increases to approximately $271,422.
- The economic advantage depends on CRRT duration. At 14 manual bags per day, the consumable cost of one auto-effluent kit is recovered after approximately **3 treatment-days**. Because a second kit is required beyond six days, consumable costs increase discontinuously at day seven.

CONCLUSIONS

- Under the five-day base-case assumptions, universal auto-effluent is the lowest-cost strategy. It provides a relatively modest direct consumable saving but a more substantial workflow benefit by reducing nursing time devoted to repetitive effluent bag changes.

- Reducing manual bag handling may also reduce opportunities for occupational exposure to potentially hazardous medications in CRRT effluent through spills, splashes, leaks and surface contamination. Automated drainage may further reduce the ergonomic burden associated with repeatedly lifting and emptying heavy effluent bags, although the magnitude of these benefits has not been quantified.
- Fewer bag-change interruptions may improve CRRT treatment delivery by reducing avoidable downtime and under-delivery of prescribed therapy. However, direct comparative evidence for auto-effluent is lacking, and whether reducing these interruptions improves downstream clinical outcomes remains uncertain (and was not the objective of this report).

RECOMMENDATION

- TAU recommends routine adoption of auto-effluent for continuous renal replacement therapy (CRRT) at the MUHC, provided that local CRRT treatment patterns are reasonably consistent with the assumptions used in this analysis.
- Following implementation, actual CRRT episode volume, treatment duration, auto-effluent kit use and consumable expenditure should be reviewed to confirm the projected budget impact.

SOMMAIRE

Drainage autologue des effluents pour la thérapie de remplacement rénal continu au CUSM : analyse économique des stratégies d'adoption

CONTEXTE

L'épuration extrarénale continue (EERC) est utilisée chez les patients en soins intensifs nécessitant une assistance rénale continue. Au CUSM, l'EERC est offerte dans les unités de soins intensifs pour adultes de l'Hôpital Royal Victoria et de l'Hôpital général de Montréal à l'aide des systèmes PrisMax.

Selon la pratique actuelle, l'effluent est recueilli dans des poches jetables de 5 L. Le personnel infirmier peut changer ces poches environ 12 à 14 fois par jour-patient, ce qui entraîne une manipulation répétée d'effluent pouvant contenir des médicaments dangereux, interrompt d'autres activités de soins infirmiers et alourdit la charge de travail liée à l'EERC.

L'accessoire de drainage automatique des effluents PrisMax gère automatiquement le drainage de l'effluent et élimine en grande partie les changements manuels de poches. Cet accessoire peut rester en place jusqu'à six jours. Compte tenu du peu de données cliniques comparatives directes concernant cet accessoire, cette évaluation s'est concentrée sur la question la plus pertinente pour la décision d'adoption du CUSM : **les incidences économiques et en termes de ressources des stratégies d'adoption alternatives**.

QUESTION DE POLITIQUE ORGANISATIONNELLE

Les unités de soins intensifs du CUSM devraient-elles adopter l'auto-évacuation des effluents pour la gestion des effluents de EERC, de façon systématique ou pour certains patients, en remplacement des changements manuels actuels des poches d'effluents ?

OBJECTIF

1. Quels sont les coûts et les implications en termes de ressources des pratiques actuelles comparativement à l'adoption universelle et ciblée de l'auto-évacuation des effluents ?
2. Quelles sont les implications de chaque stratégie sur la charge de travail du personnel infirmier, l'exposition professionnelle aux effluents potentiellement dangereux, l'ergonomie, l'organisation du travail et la gestion des déchets ?

MÉTHODES

- Un modèle de coûts hospitaliers a été élaboré à partir des données sur les coûts d'achat et de soins infirmiers du CUSM et d'hypothèses d'utilisation des ressources adaptées au contexte local.

- Les coûts ont été analysés selon deux perspectives. Les coûts directs des consommables représentent les dépenses susceptibles d'affecter le budget de l'hôpital. Une analyse économique et des ressources plus large a également attribué une valeur au temps infirmier requis pour la gestion des effluents. Le temps infirmier libéré doit être interprété comme une augmentation de la capacité de soins infirmiers plutôt que comme une simple réduction des dépenses.

Données d'entrée du modèle de base

- Le modèle de base suppose un épisode d'EERC de cinq jours, 14 poches d'effluent manuelles par jour, cinq minutes de temps infirmier par changement de poche et une durée de vie des filtres estimée à 60 heures. Une poche d'effluent de 5 L coûte 12,91 $, tandis qu'une trousse d'effluent automatique coûte 540,75 $ et peut être utilisée jusqu'à six jours. Le temps infirmier a été évalué à 88,05 $/heure.
- La stratégie hybride a été modélisée avec 25 % des épisodes d'EERC recevant une trousse d'effluent automatique et 75 % restant selon la pratique actuelle. Cette proportion est illustrative et repose sur l'hypothèse qu'environ 25 % des épisodes d'EERC au CUSM impliquent des médicaments dangereux. Elle ne doit pas être interprétée comme un taux d'utilisation observé au CUSM.

Analyse de sensibilité

- Les analyses de sensibilité ont examiné l'effet de la variation de la durée du traitement d'EERC (1 à 12 jours) et du nombre de sacs d'effluents utilisés par jour (10 à 18 sacs).

PRINCIPAUX RÉSULTATS

- Pour un épisode d'EERC de cinq jours, les coûts directs des consommables ont été estimés à 903,70 $ selon la pratique actuelle, à 540,75 $ avec l'auto-évacuation universelle et à 812,96 $ selon la stratégie hybride présentée à titre d'exemple. **L'adoption universelle a donc permis une économie directe de 362,95 $ sur les consommables par épisode d'EERC de cinq jours**.
- La pratique actuelle exige environ 5,83 heures de soins infirmiers pour 70 changements de poches d'effluent au cours d'un épisode de cinq jours. En comparaison, le temps supplémentaire d'installation de l'auto-évacuation a été estimé à environ 0,08 heure. Évalués à 88,05 $/heure, les coûts des ressources infirmières étaient d'environ 513,63 $ selon la pratique actuelle et de 7,34 $ avec l'auto-évacuation universelle.
- La combinaison des coûts liés aux consommables, à l'élimination des déchets dangereux et à l'utilisation des ressources infirmières a permis d'estimer les coûts économiques totaux à 1 432,20 $ pour la pratique actuelle, à 548,09 $ pour l'auto-évacuation universelle et à 1 200,02 $ pour la stratégie hybride. **L'adoption**

universelle générerait donc des économies estimées à 884,11 $ par épisode de cinq jours.

- En supposant un volume annuel de 307 épisodes d'EERC de cinq jours dans les deux unités de soins intensifs du CUSM, **l'adoption universelle générerait des économies directes sur les consommables d'environ 111 425 $ par année par rapport à la pratique actuelle.** Si l'on tient compte de la valeur du temps infirmier libéré, l'avantage économique et de ressources annuel estimé passe à environ 271 422 $.
- L'avantage économique dépend de la durée de l'EERC. À raison de 14 poches manuelles par jour, le coût d'une trousse d'auto-évacuation est amorti après environ trois jours de traitement. Comme une deuxième trousse est nécessaire au-delà de six jours, les coûts des consommables augmentent de façon discontinue à partir du septième jour.

CONCLUSIONS

- Selon les hypothèses de base d'une durée de cinq jours, l'évacuation automatique universelle des effluents est la stratégie la plus économique. Elle permet des économies directes relativement modestes sur les consommables, mais surtout une amélioration substantielle du flux de travail grâce à la réduction du temps infirmier consacré aux changements répétitifs des poches d'effluents.
- La réduction de la manipulation manuelle des poches peut également diminuer les risques d'exposition professionnelle aux médicaments potentiellement dangereux contenus dans les effluents de l'EERC, par déversements, éclaboussures, fuites et contamination des surfaces. Le drainage automatisé peut réduire davantage la charge ergonomique associée au levage et à la vidange répétés des lourdes poches d'effluents, bien que l'ampleur de ces avantages n'ait pas été quantifiée.
- La réduction des interruptions liées aux changements de poches peut améliorer l'administration du traitement par EERC en diminuant les temps d'arrêt évitables et les sous-doses de traitement prescrit. Cependant, les preuves comparatives directes concernant l'auto-effluent font défaut, et il reste incertain si la réduction de ces interruptions améliore les résultats cliniques ultérieurs (et ce n'était pas l'objectif de ce rapport).

RECOMMANDATIONS

- TAU recommande l'adoption systématique de l'auto-effluent pour l'épuration extrarénale continue (EERC) au CUSM, à condition que les pratiques locales en matière d'hémodialyse continue soient raisonnablement compatibles avec les hypothèses utilisées dans cette analyse.
- Après la mise en œuvre, le volume réel d'épisodes d'EERC, la durée du traitement, l'utilisation des trousses d'auto-effluent et les dépenses en consommables devraient être examinés afin de confirmer l'incidence budgétaire prévue.

Auto-Effluent Drainage for Continuous Renal Replacement Therapy at the MUHC: Economic Analysis of Adoption Strategies

1. BACKGROUND

Continuous renal replacement therapy (CRRT) provides continuous extracorporeal renal support for critically ill patients who may not tolerate intermittent hemodialysis. At the MUHC, CRRT using PrisMax systems is provided in the adult ICUs at the Royal Victoria Hospital (RVH) and Montreal General Hospital (MGH).

Effluent generated during treatment is currently collected in disposable 5-L bags. Based on local practice using an effluent flow of 3000mL/h (calculated using a prescribed effluent dose of 37.50 mL/kg/h for an 80kg patient), approximately 14 bags may require changing during each 24-hour period. In addition to the cost of the bags themselves, repeated changes require nursing time and involve leaving other clinical activities to attend to the CRRT device. In patients receiving hazardous medications, manual handling of effluent also creates potential occupational exposure through leaks, spills and splashes of contaminated fluid.

The PrisMax Auto-Effluent Drain Accessory provides an alternative method of managing effluent. The system alternates between two effluent bags, allowing one to fill while the other drains and thereby substantially reducing the need for repeated manual bag changes.

1.1 Reason for the evaluation

The decision facing the MUHC is whether to adopt the PrisMax Auto-Effluent Drain Accessory for CRRT in the adult intensive care units instead of current manual effluent management. The decision is not limited to whether the accessory should be acquired, but also how broadly it should be used. The present analysis therefore compared three strategies: **current manual effluent management**, **universal adoption of auto-effluent**, and a **hybrid strategy** in which auto-effluent is used for a selected proportion of CRRT episodes.

2. POLICY QUESTION

Should the MUHC ICUs adopt auto-effluent for the management of CRRT effluent, either routinely or for selected patients, in place of current manual effluent bag changes?

3. EVALUATION QUESTIONS (OBJECTIVES OF THIS REPORT)

This brief report addresses the following questions:

1. What are the costs and resource implications of three approaches to CRRT effluent management at the MUHC:
    - current practice using manual 5-L effluent bags for all CRRT episodes;
    - universal use of auto-effluent; and
    - a hybrid strategy in which auto-effluent is used for selected CRRT episodes.
2. What are the implications of each strategy for nursing workload, occupational exposure to potentially hazardous effluent, ergonomics, workflow and waste management?

4. METHODS

4.1 Economic model

- A cost model was developed from the MUHC hospital perspective. Costs were calculated per CRRT episode and per year.
- The base-case episode duration was five days. The principal model inputs are shown in Table 1.

Table 1. Model inputs for base case scenario

Model input	Base-case value
5-L effluent bag	$12.91/bag
Manual bag use	14 bags/patient-day
Auto-effluent kit	$540.75
Maximum kit duration	6 days
Nursing time per manual bag change	5 minutes
Additional auto-effluent setup	2.5 minutes/filter
Conservative filter life	60 hours/filter
ICU nursing cost	$88.05/hour
Hazardous waste disposal cost	$0.85/kg
CRRT episode duration	5 days
Hybrid auto-effluent proportion	25% of CRRT episodes (illustrative)
Annual CRRT episodes	307 (RVH: 1170 patient-days + MGH: 365 patient-days)/5

- The model separately estimated direct consumable costs and the economic value of nursing time.

4.2 Strategies compared

1. Under **current practice**, all CRRT effluent is managed using disposable 5-L bags.
2. Under **universal adoption**, all CRRT episodes use the auto-effluent accessory.
3. Under **hybrid adoption**, auto-effluent is used in a selected proportion of episodes. Because an actual eligible proportion has not yet been established, 25% was used for the base-case illustration.

4.3 Sensitivity analysis

Because treatment duration is an important determinant of consumable cost, costs were examined for CRRT episodes lasting from one to 12 days.

The consumable break-even duration was also calculated at different rates of manual bag utilization. These included 9.6 bags/day (assuming a prescribed effluent dose of 25 mL/kg/h), the 14 bags/day MUHC base case, and 18 bags/day as an external high-use comparator.

5. RESULTS

5.1 Base-case cost per CRRT episode

1. **Current practice**: For a five-day CRRT episode, current practice requires approximately 70 disposable effluent bags, costing $903.70, plus $14.88 in modeled hazardous-waste disposal and 5.83 nursing hours valued at $513.63, for a total modeled cost of $1,432.20 (Table 2).
2. **Universal auto-effluent adoption**: This scenario requires one kit costing $540.75 and additional setup labour is $7.34, for a total modeled cost of $548.09. This generates a total saving of $884.11 per episode vs. current practice and a direct consumable saving of **$362.95 per episode** (Table 2).
3. **Hybrid strategy** with 25% auto-effluent utilization: The weighted consumable cost under the hybrid strategy is $812.96, representing a total saving of $232.18 per episode vs. current practice and a direct consumable saving of **$90.74 per episode**.

Table 2. Base-case cost per five-day CRRT episode

	Current practice	Universal auto-effluent	Hybrid: 25% auto-effluent
Consumables	$903.70	$540.75	$812.96
Nursing resource cost	$513.63	$7.34	$385.22
Hazardous waste disposal	$14.88	-	-
Total resource cost	**$1,432.20**	**$548.09**	**$1,200.02**
Saving vs current			
Total	—	**$884.11**	**$232.18**
Direct consumables only	—	**$362.95**	**$90.74**

5.2 Nursing resource implications

1. **Current practice**: At five minutes per bag change, 70 manual bag changes require approximately 5.83 nursing hours during a five-day CRRT episode.
2. **Universal adoption**: Auto-effluent is estimated to require approximately five minutes of incremental setup time across the filters used during the same treatment period, equivalent to 0.08 nursing hours.

Universal adoption therefore releases approximately 5.75 nursing hours per five-day CRRT episode compared with current practice. At $88.05 per nursing hour, this represents approximately $506 of nursing resource value per episode beyond the direct consumable saving. This value should not be interpreted as an equivalent reduction in the nursing budget. Rather, it represents nursing capacity made available for other patient-care activities.

5.3 Annual impact

Assuming 307 5-day CRRT episodes annually [RVH: 1170 patient-days; MGH: 365 patient-days; (1170+365)/5], the annual impact is shown in Table 3.

Table 3. Annual impact of three comparative scenarios

	Current practice	Universal	Hybrid: 25% auto-effluent
Annual direct consumable cost	$277,436	$166,010	$249,580
Direct consumable saving	—	**$111,426**	**$27,856**
Annual total resource cost including nursing + hazardous waste disposal	$439,685	$168,263	$368,405
Annual total resource savings	—	**$272,422**	**$71,280**

5.4 Sensitivity to treatment duration

The economic comparison is sensitive to treatment duration because manual bag costs accumulate daily whereas each auto-effluent kit has a fixed cost and can remain in use for up to six days.

- At the base-case rate of 14 bags/day (assuming a prescribed effluent dose of 37.5 mL/kg/h for an 80kg patient, thus resulting in a 3000mL/h effluent flow rate), one auto-effluent kit becomes less expensive than manual bags after approximately **3 days** based on consumable costs alone (Appendix Table A-1).
- At a lower prescribed effluent dose of 25.0 mL/kg/h resulting in a calculated effluent flow of 2000 mL/h, the calculated rate of 9.6 bags/day would result in a break-even point at approximately **4.4 days** (Appendix Table A-2).

Consequently, auto-effluent is more expensive on consumables alone for very short treatment episodes, becomes cost-saving during approximately days three and four, and experiences another increase in cost when a second kit is required after day six (Figure 1). With continued CRRT, accumulated manual bag costs subsequently again exceed auto-effluent costs.

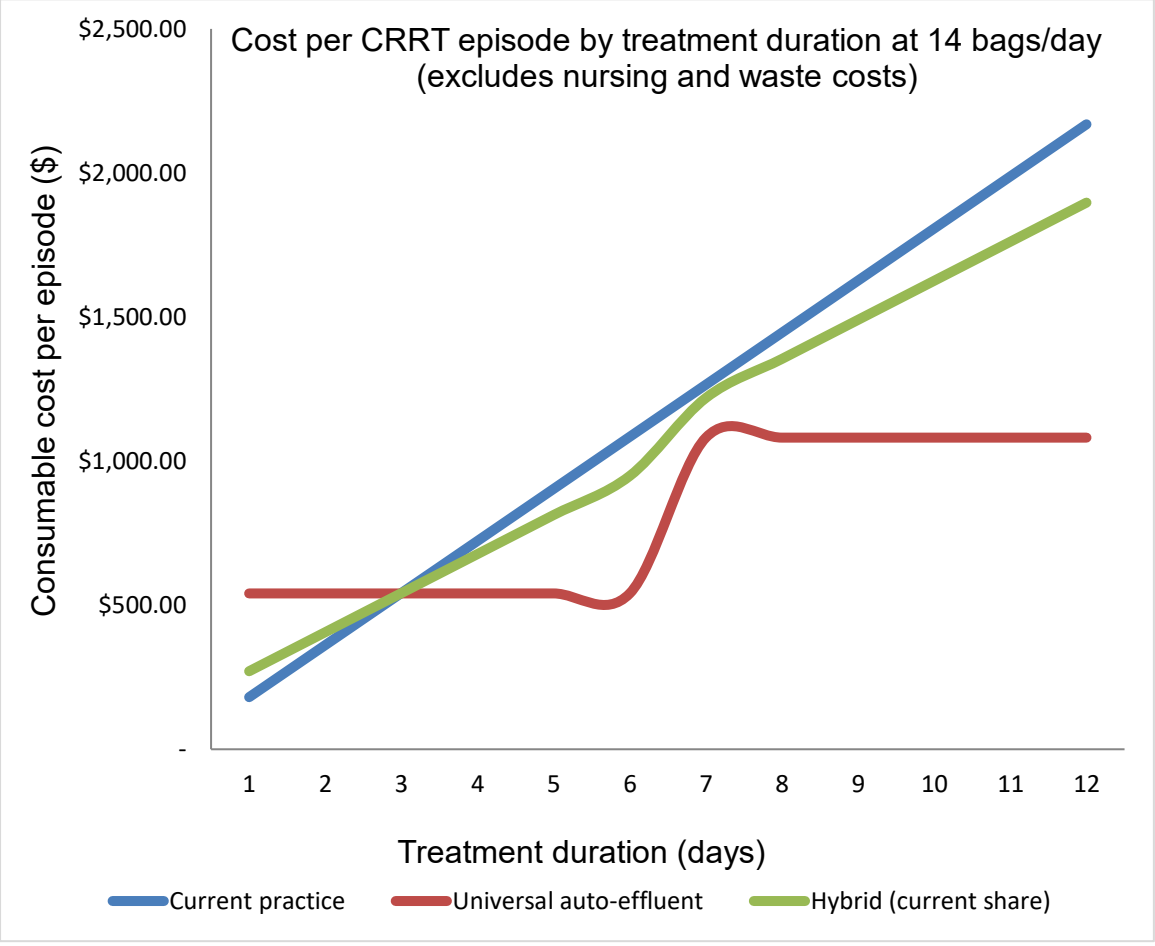


Figure 1. Cost per CRRT episode by treatment duration at 14 bags/day

This stepwise pattern means that the distribution of actual CRRT treatment durations at the MUHC will be more informative than a single average duration when estimating the final annual budget impact.

6. DISCUSSION

6.1 Occupational exposure to potentially hazardous medications

CRRT effluent may contain medications and active metabolites removed from the patient. When patients receive antineoplastic or other hazardous drugs, repeated disconnection, lifting, transport, and emptying of effluent bags can create opportunities for splashes, leaks, skin or eye contact, and surface contamination. NIOSH identifies disposal and waste handling as potential points of occupational exposure and notes that hazardous-drug exposure can be associated with acute and chronic health effects, including adverse reproductive outcomes.[1] The magnitude of risk from CRRT effluent at the MUHC cannot be quantified with available data because it depends on the drug, dose, timing, extracorporeal clearance, effluent concentration, and controls used. Reducing open manual handling is nevertheless consistent with minimizing worker contact with potentially contaminated waste.

6.2 Ergonomic burden of manual bag handling

A full 5-L effluent bag contains approximately 5 kg of liquid, excluding the bag and fittings. At 12-14 changes per day, staff may handle roughly 60-70 kg of liquid per patient-day across repeated lifts. The task can also involve reaching around equipment, constrained bedside space, awkward wrist or trunk postures, and controlling a flexible load while avoiding spills. Repetition, force, awkward posture, and time pressure are recognized contributors to work-related musculoskeletal strain. Although this report does not estimate injury rates, the cumulative ergonomic exposure is operationally relevant.

Automated drainage replaces these repeated lifts with setup and monitoring, and may therefore have a significant impact on ergonomic burden.

6.3 Potential effect of interruptions on delivered CRRT dose

CRRT dose received depends on treatment actually delivered, not only the prescribed effluent rate. Bag changes can pause therapy or trigger alarms and workflow delays, and these interruptions can reduce delivered treatment dose because less effluent is processed over the prescribed treatment period

Observational studies have found that interruptions accumulated into substantial downtime that may interfere with prescribed fluid-removal targets,[2-4] with one study reporting that bag

changes were the main contributor to non-negligible downtime (~1.17h per circuit).[5] However, these studies did not evaluate whether auto-effluent reduces downtime compared with manual bag management.

While these studies support the rationale of reducing manual bag changes, it is important to note that no comparative studies of auto-effluent vs. manual bag changes were identified, and furthermore, it remains to be established whether reducing downtime from bag-change interruptions improves downstream patient outcomes like mortality and renal recovery.

Reduced interruptions should therefore be treated as a plausible clinical and operational benefit, without claiming improved outcomes in the absence of evidence.

6.4 Limitations

- The analysis is based on several assumptions that should be considered when interpreting the results. The five-day episode duration is a modeling assumption rather than an observed distribution of MUHC CRRT treatment duration. Similarly, the 25% hybrid utilization rate is illustrative and requires confirmation.
- Nursing time was assigned an economic value of $88.05/hour. Because adoption of auto-effluent would not necessarily reduce ICU staffing expenditures, the value of nursing time released should be interpreted as **opportunity cost or increased clinical capacity**, rather than as cash-releasing savings.

7. CONCLUSION

- Under the five-day base-case assumptions, universal auto-effluent is the lowest-cost strategy. It provides a relatively modest direct consumable saving but a more substantial workflow benefit by reducing nursing time devoted to repetitive effluent bag changes.
- Reducing manual bag handling may also reduce opportunities for occupational exposure to potentially hazardous medications in CRRT effluent through spills, splashes, leaks and surface contamination. Automated drainage may further reduce the ergonomic burden associated with repeatedly lifting and emptying heavy effluent bags, although the magnitude of these benefits has not been quantified.
- Fewer bag-change interruptions may improve CRRT treatment delivery by reducing avoidable downtime and under-delivery of prescribed therapy. However, direct comparative evidence for auto-effluent is lacking, and whether reducing these interruptions improves downstream clinical outcomes remains uncertain (and was not the objective of this report).

8. RECOMMENDATION

Routine adoption of auto-effluent is recommended for CRRT at the MUHC.

- Under the base-case assumptions, universal adoption is economically preferable to both current manual effluent management and an illustrative hybrid strategy. It reduces direct consumable costs while substantially decreasing nursing time devoted to effluent management.
- Given uncertainty regarding actual CRRT treatment duration and annual volume, TAU recommends that **implementation be accompanied by a simple utilization review after approximately 6–12 months**, documenting the number and duration of CRRT episodes, number of auto-effluent kits used, and actual consumable expenditures. These data would allow the projected savings to be confirmed and the adoption strategy adjusted if necessary.

APPENDIX

APPENDIX A SENSITIVITY TABLES

Table A-1. Cost per CRRT episode by treatment duration

Duration (days)	Current practice	Universal auto-effluent	Hybrid (current share)	Universal savings vs current	Hybrid savings vs current
1	$180.74	$540.75	$270.74	($360.01)	($90.00)
2	$361.48	$540.75	$406.30	($179.27)	($44.82)
3	$542.22	$540.75	$541.85	$1.47	$0.37
4	$722.96	$540.75	$677.41	$182.21	$45.55
5	$903.70	$540.75	$812.96	$362.95	$90.74
6	$1,084.44	$540.75	$948.52	$543.69	$135.92
7	$1,265.18	$1,081.50	$1,219.26	$183.68	$45.92
8	$1,445.92	$1,081.50	$1,354.82	$364.42	$91.11
9	$1,626.66	$1,081.50	$1,490.37	$545.16	$136.29
10	$1,807.40	$1,081.50	$1,625.93	$725.90	$181.48
11	$1,988.14	$1,081.50	$1,761.48	$906.64	$226.66
12	$2,168.88	$1,081.50	$1,897.04	$1,087.38	$271.85

Base case: 14 bags/day; excludes nursing and waste costs; Auto-effluent kits can be used for up to 6 days

Table A-2. Break-even treatment duration for one auto-effluent kit

Manual bags/day	Manual consumable cost/day	Break-even days
9.6	$123.94	4.36
10	$129.10	4.19
14	$180.74	2.99
18	$232.38	2.33

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