

Real-world application of an integrated MCDA–economic framework in continence care technology: a hospital-based case study

Gianpaolo Franzoso¹, Novella Piazzetta¹, Giorgia Zorzetto¹, Mirsad Pasalic², Valentina Ceron², Flavia Damiano³, Cristina Tridello³, Marina Coppola¹

¹Pharmacy unit, Veneto Institute of Oncology IOV-IRCCS, Padua - Italy

²Medical Oncology inpatient unit, Veneto Institute of Oncology IOV-IRCCS, Padua - Italy

³Surgical Inpatient Unit Nurse Manager, Veneto Institute of Oncology IOV-IRCCS, Padua - Italy

ABSTRACT

Introduction: Hospital-based Health Technology Assessment (HTA) supports transparent decisions about adopting medical technologies by balancing practical benefits against clinical, organizational, and economic consequences. This study evaluated a single-use continence care system using an integrated decision-support framework.

Methods: The single-use system, based on disposable absorbent components, was compared with the standard reusable bedpan/urinal pathway, including washing and reprocessing. The assessment combined Multi-Criteria Decision Analysis (MCDA), Budget Impact Analysis (BIA), Cost-Consequence Analysis (CCA), a 30-day field test across inpatient units at two hospital sites, and an implementation-specific questionnaire. During the field test, 168 admissions were recorded. MCDA used a weighted aggregate score, while the economic analysis adopted the hospital perspective over three years. Deterministic sensitivity analyses examined economic inputs and MCDA domain weights.

Results: The single-use system offered perceived advantages in ease of use, hygiene, and odor reduction. However, these did not offset limited supporting evidence, lower patient-comfort ratings, operational issues, and higher costs. The MCDA score decreased from 4.80 for standard care to 2.60 for the single-use system (difference: –2.20). Cost per patient increased from €0.65 to €1.00, an incremental cost of €0.35. The three-year budget impact was €2,634 and remained within the local affordability threshold. As the technology was more costly and produced lower overall MCDA value, it was classified as dominated. Sensitivity analyses did not alter the recommendation.

Conclusion: The integrated MCDA-economic framework supported transparent hospital-level decision-making. Affordability and perceived practical advantages were insufficient to justify routine adoption of the single-use continence care system.

Keywords: Budget impact analysis, Cost-consequence analysis, Continence care, Hospital-based HTA, Multi-criteria decision analysis, Medical devices, Real-world evidence

Introduction

Hospital-based Health technology assessment (HTA) plays a key role in supporting decisions on the adoption, replacement or disinvestment of medical technologies. Unlike national or regional HTA processes, hospital-based HTA is closely linked to local workflows, available resources, procurement constraints and organizational priorities. For this reason, it requires methods that are sufficiently

structured to ensure transparency, while remaining adaptable to the operational context in which the technology will be used (1-4).

The implementation of Regulation (EU) 2021/2282 has strengthened the role of HTA within European health technology governance, particularly by promoting common clinical assessment and methodological convergence across Member States (2,3). At the same time, hospital-level decisions continue to require local information on workflow, resource use, implementation feasibility and budget impact that may not be fully captured by supra-national or national assessments (4-6).

In this context, decision-making may be particularly challenging when a technology offers intuitive or perceived advantages, such as greater ease of use, improved hygiene or reduced handling burden, while robust comparative clinical evidence is limited. If such technologies are evaluated only through a narrow economic lens, relevant organizational or

Received: May 20, 2026

Accepted: September 7, 2026

Published online: October 6, 2026

Corresponding author:

Giorgia Zorzetto

email: giorgia.zorzetto@iov.veneto.it



experiential consequences may be missed. Conversely, if they are evaluated only through user perception or qualitative preference, their real cost and operational impact may be underestimated.

Multi-Criteria Decision Analysis (MCDA) has been increasingly used in healthcare to structure complex decisions involving multiple dimensions of value. MCDA allows decision-makers to combine heterogeneous criteria, such as clinical benefit, safety, organizational consequences, patient-related outcomes, and technical relevance, through an explicit scoring and weighting process (7,8).

To address this need, an institutional decision-support framework was developed to integrate MCDA with structured economic evaluation. The framework combines a value-risk appraisal with Budget Impact Analysis (BIA), Cost-Consequence Analysis (CCA), and a rule-based recommendation matrix, allowing decision-makers to assess both multidimensional value and economic sustainability within a single process (7-10).

Previously published hospital-based HTA decision-support tools and prioritization frameworks have emphasized the need for multidimensional criteria, stakeholder-informed scoring, and explicit consideration of local implementation conditions (6,11). However, economic assessment is often reported as a parallel component or summarized as a cost criterion within MCDA, rather than being operationally connected to field-testing evidence, BIA, CCA, and a final recommendation rule. The contribution of this case study is therefore not the proposal of a new generic MCDA theory, but the transparent application of an integrated local workflow that links real-world ward feedback, weighted MCDA, budget impact, cost-consequence interpretation, and dominance-based decision rules within a single hospital adoption decision.

This study presents a real-world application of the framework to the evaluation of a continence care technology in a hospital inpatient setting. The assessed technology was a single-use system intended to replace, at least partially, standard reusable bedpans and urinals. The case was selected because it illustrates a frequent hospital decision problem: a technology with plausible practical benefits and positive user perception, but uncertain incremental value when clinical, economic, and organizational dimensions are assessed together.

Methods

Study design and setting

A hospital-based HTA case study was conducted using an integrated MCDA-economic framework. The evaluation was performed in an oncological hospital with two sites, but the decision problem was not specific to oncology: the target population was represented by inpatients with reduced mobility requiring assisted toileting or excreta management. The assessment was designed to support an institutional decision regarding the potential adoption of the technology in routine care.

The structure of the assessment was consistent with the multidimensional perspective recommended in HTA models and with good-practice guidance for healthcare MCDA and BIA (4,7-10). The framework combined quantitative scoring,

local economic estimates, field testing and qualitative observations in order to capture both measurable outcomes and implementation-related consequences.

Intervention, comparator and PICO

The intervention assessed was a single-use continence care system based on disposable absorbent components for excreta collection. The technology is intended to simplify the management of patient elimination needs by avoiding part of the handling, washing, and reprocessing activities associated with reusable devices.

The comparator was the standard reusable bedpan/urinal pathway currently used in routine care. This pathway includes the use of reusable devices and the related activities required for collection, transport, washing, sanitization, and reprocessing. The comparison therefore considered not only acquisition costs, but also the broader care pathway and the organizational consequences of each option.

The PICO was defined as follows: Population, patients with reduced mobility requiring assisted toileting; Intervention, disposable excreta collection kit; Comparator, reusable bedpan/urinal pathway; Outcome, reduction in potential cross-contamination risk, assessed through documented reprocessing requirements, staff-reported operational issues, and availability of evidence supporting infection-control benefit.

Field testing and questionnaire-based data collection

Field testing was conducted for 30 consecutive days in inpatient areas across the two hospital sites. The technology was used in routine care for non-self-sufficient inpatients requiring assisted toileting or excreta management. During the 30-day observation period, 168 admissions were recorded in the involved inpatient areas. This figure was used as the pragmatic field-test denominator for the clinical context; no formal sample-size calculation was performed because the study was designed as a hospital-based implementation assessment rather than as an effectiveness trial.

Structured questionnaires were administered to healthcare professionals involved in the use of the technology, including nursing staff, nursing coordinators and healthcare assistants. The questionnaire was developed specifically for this implementation assessment by the institutional HTA team and was not adapted from a previously validated instrument. It used a 1-5 increasing positivity scale and covered current practice, perceived safety, practical benefits, operator workload, patient-care experience, and perceived quality of care. The items were designed to mirror the organizational, technical, patient-related, and safety dimensions used in the MCDA and CCA. No formal psychometric validation or inferential survey analysis was performed; the questionnaire was used as a pragmatic tool to support real-world implementation appraisal. Free-text and informal comments collected during ward visits were used to contextualize the structured responses.

The pharmacist responsible for the assessment regularly visited the participating wards to collect completed questionnaires, verify practical issues with operators, and discuss implementation problems directly with the staff. Questionnaire responses and qualitative observations were

not used as stand-alone evidence of clinical effectiveness; they supported the scoring of organizational, technical, and patient-related criteria and informed the CCA interpretation.

MCDA methodology

The MCDA component assessed the value-risk profile of the technology across domains relevant to hospital-based HTA. The criteria reflected the institutional framework aligned with the regional MCDA logic and included clinical effectiveness, safety, organizational impact, patient experience, and economic impact. Criteria and weights were not elicited ad hoc for this single case study. They were derived from a pre-defined institutional framework aligned with the regional RATEC approach, in which criteria and relative weights had been defined through a structured expert-consensus process involving members of Medical Device Assessment Units and multidisciplinary hospital stakeholders, including clinical, pharmaceutical, nursing, technical, and managerial/procurement perspectives. The weighting process was consensus-based rather than a formal AHP or Delphi exercise, and the resulting weights were adopted as fixed inputs for this case-study application. For transparency and reproducibility, all aggregate weights used in the present assessment are reported in Table 1, while the subcriterion structure used for the value-risk dashboard is reported in Table 2.

For each criterion, the new technology was compared with the current standard and assigned a score on a 0-1-3-5-7-9 ordinal scale, where higher values indicate a more favorable performance. Evidence certainty and contextual validity influenced scoring through structured critical appraisal. When evidence was indirect or limited, scores were downgraded even when a plausible benefit was identified. Field-testing results were used only for criteria in which real-world implementation experience

was directly relevant, such as workflow, usability, training needs, and patient-care experience (Tables 1 and 2).

The weighted aggregate MCDA score was calculated as $MCDA = \sum(w_j \times S_j)$, where w_j is the predefined weight of criterion j , and S_j is the score assigned to the technology for that criterion. The incremental MCDA value was calculated as $\Delta MCDA = MCDA_{new} - MCDA_{standard}$. Positive $\Delta MCDA$ values indicate a higher value of the new technology compared with the comparator, whereas negative values indicate a lower value.

The value-risk plot was used as a complementary graphical output. It summarizes the position of the new technology in a matrix based on value and risk coordinates. These coordinates are related to, but not numerically identical to, the weighted aggregate MCDA score because they are generated from the value-risk decomposition used by the institutional dashboard. Final interpretation was therefore based on the integrated rule-based decision matrix rather than on the graph alone.

Economic evaluation

The economic evaluation was conducted from the hospital provider perspective. The time horizon for the BIA was 3 years, consistent with the institutional decision process. Costs were expressed in euros and were based on internal acquisition prices, local consumption estimates, and assumptions on resource use for the reusable pathway and the single-use system. No discounting was applied because the analysis was a short-term budget impact assessment rather than a long-term cost-effectiveness model.

The costing approach distinguished common pathway components from incremental decision-relevant costs. Some resources, such as staff handling time or basic protective materials, were present in both pathways and therefore had limited impact on the incremental comparison. The economic

TABLE 1 - Complete aggregate MCDA scoring matrix used in the case study

Criterion	Weight	Standard score	New score	Standard weighted score	New weighted score	Δ	Main rationale
Clinical effectiveness	0.10	3	5	0.30	0.50	+0.20	Marginal potential benefit; no robust comparative clinical evidence
Safety	0.15	3	5	0.45	0.75	+0.30	Theoretical reduction in cross-contamination risk; evidence indirect
Organizational impact	0.30	5	3	1.50	0.90	-0.60	Workflow issues, training needs, and bag-management problems observed in field testing
Patient experience	0.25	3	1	0.75	0.25	-0.50	Reduced comfort and bedside management concerns reported by operators
Economic impact	0.20	9	1	1.80	0.20	-1.60	Higher cost per patient for the single-use system
Total weighted aggregate score	1.00			4.80	2.60	-2.20	Overall lower value of the new technology

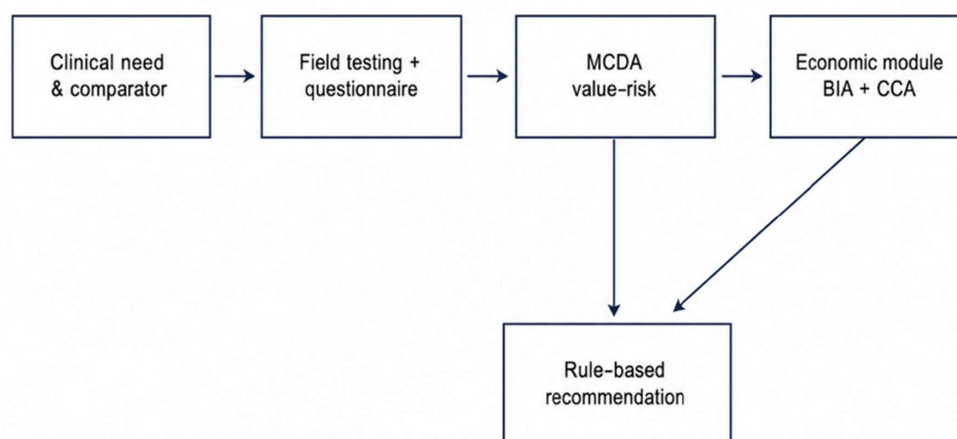
model used the relevant incremental cost per patient for the BIA: €0.65 for the reusable standard pathway and €1.00 for the single-use system, corresponding to $\Delta\text{Cost} = €0.35$ per patient. The model also included a one-off implementation/acquisition cost of €1,500 in the first year.

Budget impact was calculated by comparing a baseline scenario in which all eligible patients remained on the standard pathway with a mixed scenario in which the single-use system was introduced according to predefined adoption rates. CCA was used to present costs and consequences

TABLE 2 - Value-risk subcriterion matrix used to position the technology in the MCDA dashboard. Positive and negative signs reflect the value-risk scoring logic of the dashboard and should be interpreted together with the final recommendation

Domain	Domain weight	Subcriterion	Impact	Evidence score	Subweight	Index	Rationale
Technical relevance	0.20	Operator skills/ professional expertise	-1	7	0.24	-0.0806	Additional operator requirements
Technical relevance	0.20	Ease/comfort of use	-1	5	0.18	-0.0324	Practical issues despite perceived ease in selected steps
Patient benefit	0.50	Quality of life	-1	3	0.26	-0.1014	Reduced patient comfort/ bedside management concerns
Patient benefit	0.50	Specific clinical outcomes	+1	3	0.15	+0.0338	Potential but limited outcome relevance
Patient benefit	0.50	Risk of complications	+1	3	0.22	+0.0726	Theoretical reduction in cross-contamination risk
Economic impact	0.42	Economic impact domain	+1 risk contribution	9	1.00	+3.7800	Higher cost increases the risk component
Organizational impact	0.58	Medical team working time	+1 risk contribution	5	0.19	-0.1047	Expected time savings not fully realized
Organizational impact	0.58	Healthcare performance	+1 risk contribution	5	0.38	-0.4188	Workflow and implementation concerns

Integrated decision framework



Final decision integrates weighted value, affordability, consequences and contextual feasibility

FIGURE 1 - Overall decision framework showing the interaction between field testing, MCDA, BIA, CCA and the rule-based recommendation.

separately across clinical, organizational, patient-related, and economic dimensions. The simplified cost-value indicator previously labeled as “soft ICER” was retained only as a supportive internal cost-per-MCDA-unit indicator. It is not comparable with conventional ICERs based on QALYs and is not interpreted when a technology is dominated (Table 3).

Uncertainty analysis

To assess uncertainty, deterministic one-way sensitivity analyses were performed on the main parameters most likely to influence the recommendation: the cost of the new technology, the cost of the standard pathway, adoption volumes, and the MCDA score of the new technology. In addition, a simple MCDA structural sensitivity analysis was added to explore uncertainty in domain weights. The tested scenarios increased the weight of the potentially favorable domains (clinical effectiveness and safety) by 20%, decreased the economic-impact weight by 20%, and decreased the organizational and patient-experience weights by 20%, with proportional rescaling of the remaining domains to keep the total weight equal to 1.00. These scenarios were selected to test whether plausible changes in the most influential domains could reverse the dominance interpretation. A probabilistic sensitivity analysis was not performed because the assessment relied on a single-center implementation dataset and local estimates rather than on parameter distributions derived from comparative trials. The sensitivity analyses were interpreted according to whether they changed the dominance status or the final rule-based recommendation (Table 4).

Decision rule

The final recommendation was generated through a rule-based integration of the MCDA output and economic results.

First, the MCDA value-risk profile identified whether the new technology provided additional value and whether relevant risks were present. Second, the BIA assessed affordability within local budget thresholds. Third, the CCA described the direction of consequences across clinical, organizational, patient-related, and economic dimensions. Finally, the supportive cost-per-MCDA-unit indicator was considered only when a meaningful trade-off existed.

When the new technology generated a lower MCDA value and a higher cost than the comparator, it was classified as dominated. In this situation, the cost-per-MCDA-unit indicator was considered not applicable, because calculating a ratio would not add meaningful information to the decision.

Results

Field testing and questionnaire findings

During the 30-day observation period, 168 admissions were recorded in the involved inpatient areas. Healthcare professionals reported perceived advantages related to ease of use in selected steps, perceived hygiene, and odor reduction. These findings suggested that the technology addressed practical needs that can be meaningful in routine inpatient care.

At the same time, several critical issues emerged during field testing. The single-use system did not produce a consistent reduction in procedure time, required specific training, and introduced practical complexity in bag management, including closure, emptying, and disposal. In some settings, keeping the device at the bedside generated concerns about space management, perceived hygiene, and patient comfort. These observations were central to the final appraisal because they showed that the theoretical simplification of the care pathway did not fully materialize in real-world use (Table 5).

TABLE 3 - Economic evaluation assumptions and input parameters

Parameter	Value/assumption
Analytical perspective	Hospital provider perspective
Currency	Euro (€)
Time horizon	3 years
Data sources	Internal acquisition prices, local consumption estimates, field-test observations, ward feedback and decision-support application outputs
Cost per patient - reusable standard pathway	€0.65
Cost per patient - single-use system	€1.00
Incremental cost per patient	€0.35
One-off implementation/acquisition cost	€1,500 in year 1
Adoption scenario	50% in year 1, 60% in year 2, 90% in year 3
Target population volumes	1,500 patients in year 1; 1,600 in year 2; 1,700 in year 3
Discounting	Not applied, because the analysis was a short-term BIA
Cost-value indicator	Supportive cost-per-MCDA-unit indicator; not applicable when the new technology is dominated

TABLE 4 - Deterministic sensitivity analysis, including economic and MCDA domain-weight scenarios

Scenario	Parameter value	Economic result	Δ MCDA	Interpretation
New technology cost per patient -10%	€0.90	+€0.25	-2.20	Dominated; not favorable
New technology cost per patient +10%	€1.10	+€0.45	-2.20	Dominated; not favorable
Standard pathway cost per patient -10%	€0.585	+€0.415	-2.20	Dominated; not favorable
Standard pathway cost per patient +10%	€0.715	+€0.285	-2.20	Dominated; not favorable
Patients treated with new technology -10%	2,916 over 3 years	3-year BIA €2,520.60	-2.20	Within threshold; not favorable
Patients treated with new technology +10%	3,564 over 3 years	3-year BIA €2,747.40	-2.20	Within threshold; not favorable
New technology MCDA score +10%	2.86	+€0.35	-1.94	Dominated; not favorable
Clinical effectiveness and safety weights +20%; other domains proportionally rescaled	Clinical effectiveness 0.12; safety 0.18	+€0.35	-1.92	Dominated; not favorable
Economic-impact weight -20%; other domains proportionally rescaled	Economic impact 0.16	+€0.35	-1.91	Dominated; not favorable
Organizational and patient-experience weights -20%; other domains proportionally rescaled	Organizational 0.24; patient experience 0.20	+€0.35	-2.25	Dominated; not favorable

TABLE 5 - Summary of field-testing findings

Positive findings	Critical findings
Ease of use in selected steps	No consistent reduction in overall procedure time
Improved perceived hygiene	Complexity in bag closure, emptying, and disposal
Reduction of odors	Need for specific training and initial learning phase
Positive staff perception in selected situations	Concerns about bedside device management and patient comfort
Potential use in specific high-infectious-risk contexts	Routine adoption not supported without procedure revision and further evidence

MCDA results

The MCDA assessment showed a lower overall value-risk score for the single-use system compared with standard care. The current reusable pathway obtained a weighted aggregate MCDA score of 4.80, whereas the single-use system obtained a score of 2.60, corresponding to Δ MCDA = -2.20.

The negative result was mainly driven by the economic impact of the single-use system, patient-comfort concerns, and organizational issues observed during field testing. Potential advantages were identified in safety, mainly related to theoretical reduction of cross-contamination risk, but the supporting evidence was indirect and did not compensate for the negative findings in other domains. The value-risk plot positioned the technology in the unfavorable area, with a risk score of 5.43 and value score of 0.08 (Fig. 2).

Economic and budget impact results

The single-use system was associated with a higher cost per patient than the standard reusable pathway. The cost per patient was €1.00 for the single-use system and €0.65 for the reusable standard, resulting in an incremental cost of €0.35 per patient (Table 6).

The BIA estimated a year-1 budget impact of €1,762.50 and a 3-year cumulative budget impact of €2,634. Although this amount remained within the institutional affordability threshold, the incremental expenditure was not justified by a corresponding increase in multidimensional value. The BIA therefore did not reverse the unfavorable interpretation generated by the MCDA and CCA components.

CCA and final integrated decision

The CCA showed a mixed profile. The single-use system improved perceived safety in relation to a theoretical reduction of cross-contamination risk. However, it worsened patient comfort, operator time, training requirements, organizational impact, and direct costs. Several dimensions were neutral, including clinical effectiveness, procedure time, space or instrumentation, indirect costs, and recommended use.

Because the technology was associated with higher incremental cost and lower incremental MCDA value, it was classified as dominated. In this situation, the supportive cost-per-MCDA-unit indicator was not informative and was considered not applicable. The final rule-based recommendation

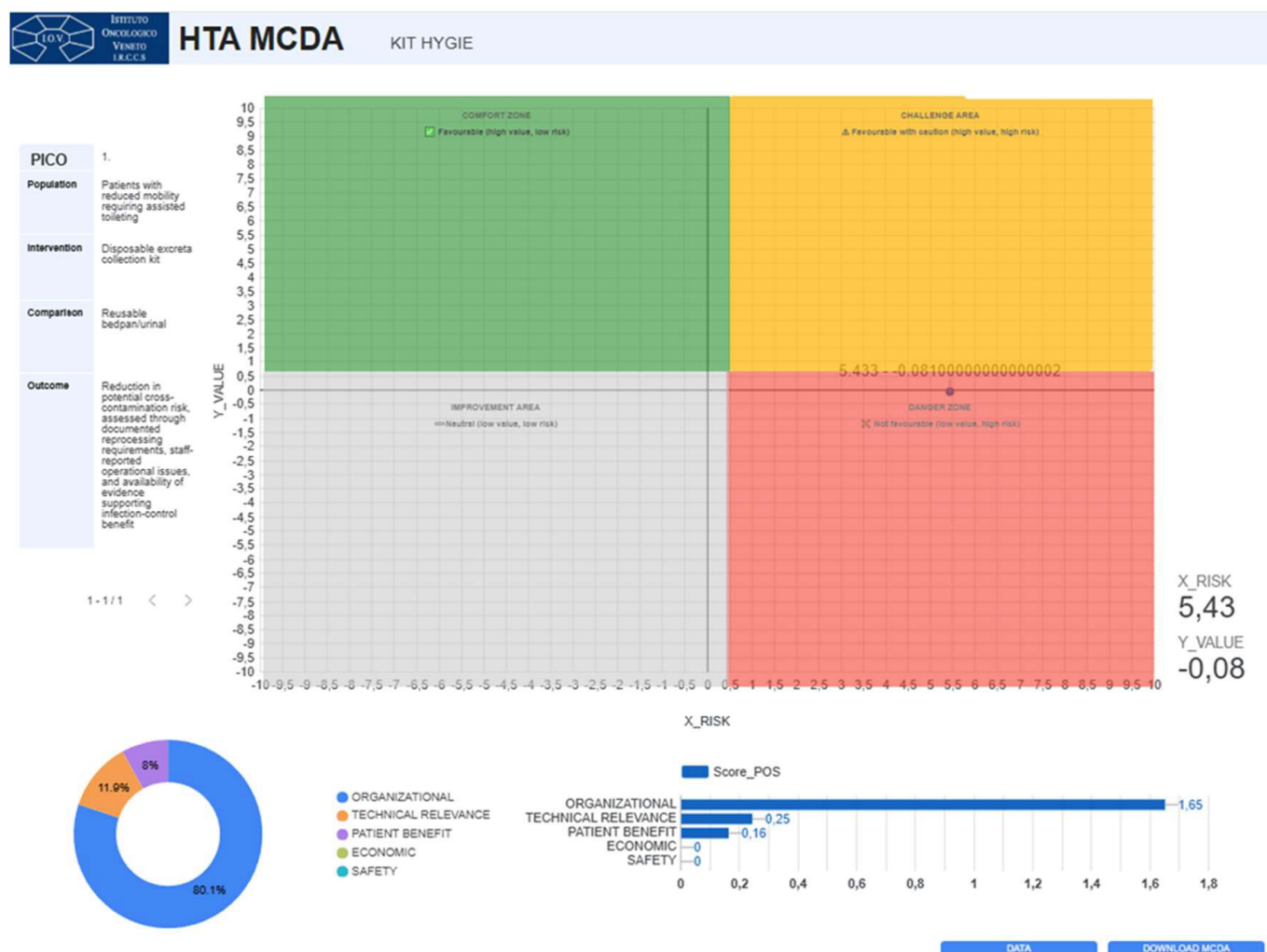


FIGURE 2 - Value-risk MCDA results for the Kit Hygie case study. The new technology is located in the unfavorable zone, characterized by a high risk (5.43) paired with a low value (-0.08).

TABLE 6 - Cost comparison per procedure between the disposable system and the traditional bedpan pathway

Description	Unit Cost (€)	Total cost new technology (€)	Total cost comparator (€)
Gloves	0.03	0.03	0.03
Underpad 40 × 60 cm	0.15	-	0.15
Bedpan	4.67	-	0.05
Washing cycle	-	-	0.45
Healthcare Assistant (HCA) hourly rate	0.42	1.26	1.26
Hygie Kit	1.00	1.00	-
TOTAL	-	2.29	1.94

HTA BIA MCDA KIT HYGIE			
TYPE	Decision KPIs	Economic KPIs	COMMENT
1. New technology	kit hygie		
2. Comparator	Reusable bedpan/urinal		
3. Start year		2026	
4. Budget impact year 1 €		€ 1762.50	
5. 3-year budget impact €	WITHIN THRESHOLD	€ 2.634	
6. Delta cost / patient €		€ 0,35	
7. Current MCDA score		4,80	
8. New MCDA score		2,60	
9. Delta MCDA		-2,20	
10. Cost per patient - standard €		€ 0,65	
11. Cost per patient - new €		€ 1	
12. Numerical soft ICER (€/MCDA)	Dominated. Higher cost and lower value		DOMINATED: The new technology costs more and has a lower MCDA value. Soft ICER not applicable.
13. Recommendation	Not favourable		The technology has an unfavourable value/risk profile. Economic considerations do not change this orientation.

TYPE	year1	year2	year3
1. year	2026	2027	2028
2. Budget impact €	1762.5	336	535.5
3. Baseline expenditure €	975	1040	1105
4. Mixed scenario expenditure €	2737.5	1376	1640.5
5. Patients treated with new technology	750	960	1530

TYPE	RESULT
1. MCDA (VALUE/RISK)	Not favourable
2. BIA THRESHOLD	WITHIN THRESHOLD
3. BIA - ECO_CLASS - sustainability	Sustainable
4. BIA - MCDA_ECO - assessment	Not favourable
5. Recommendation	Not favourable
6. Comment	The technology has an unfavourable value/risk...

FIGURE 3 - Although the three-year BIA shows sustainability, the introduction of the new technology is unfavorable as it is associated with higher costs and lower value.

was therefore not favorable for routine adoption. Selective use could be considered only in clearly defined subgroups or settings, such as patients at particularly high infectious risk, and should be accompanied by additional evidence collection, staff training, and reassessment of operational procedures.

Sensitivity analysis results

The deterministic sensitivity analyses did not change the final recommendation. Across all tested economic scenarios, the single-use system remained more costly than the comparator or retained a lower MCDA value. Even when the new technology score was increased by 10%, Δ MCDA remained negative (-1.94). The MCDA domain-weight scenario analysis also did not reverse the conclusion: increasing the weights of clinical effectiveness and safety by 20% resulted in Δ MCDA = -1.92, and reducing the economic-impact weight by 20% resulted in Δ MCDA = -1.91. The conclusion was therefore robust to plausible one-way variations in both economic inputs and principal MCDA domain weights.

Discussion

This case study illustrates the practical value of an integrated MCDA-economic framework for hospital-based HTA. The evaluated technology had intuitive advantages and generated some positive perceptions among healthcare professionals. However, the structured assessment showed that these perceived benefits were not sufficient to produce a favorable overall value-risk profile when evidence, organizational impact, and economic consequences were considered together (7-10).

The most relevant finding is the discrepancy between perceived usefulness and overall measurable value. In many hospital decisions, technologies may appear attractive because they simplify a visible part of the care process or address an operational discomfort. Nevertheless, the overall value of a technology depends on the balance between benefits, evidence, costs, workflow impact, and feasibility. In the present case, the single-use system increased cost per patient and did not improve the overall MCDA value-risk

 HTA CCA KIT HYGIE			
Dimension	Current comparator	New technology	Impact direction
1. Clinical effectiveness	The reusable system represents the established standard of clinical practice and shows no critical issues in terms of clinical outcomes. No evidence is available demonstrating an effectiveness advantage of the new technology.	The proposed technology does not show clinically relevant differences versus the current comparator in terms of primary outcomes. Available evidence shows equivalence or marginal, non-statistically significant improvements.	Neutral
2. Safety	The reusable system involves structured washing and sanitization processes. However, a theoretical risk of cross-contamination related to reuse remains, mitigated by adherence to reprocessing procedures.	The single-use system presents a potential theoretical advantage in reducing the risk of cross-contamination. However, reported operational difficulties (particularly bag management) could introduce critical issues if not adequately managed and standardized. The theoretical improvement is not supported by robust evidence.	Improves
3. Quality of life / PROMs	The traditional system is generally well tolerated and familiar to patients and operators. Its use does not involve reported comfort issues compared with established practice.	Operator observations indicate reduced patient comfort compared with the traditional system. In particular, device management and keeping the bedpan at the bedside may negatively affect the patient experience.	Worsens
4. Procedure time	The system does not involve significant changes in procedural time compared with standard practice, as it is already integrated into care workflows.	The introduction of the new technology may reduce procedural times. In some contexts, it may cause a slight increase related to the initial learning phase.	Neutral
5. Operator time	The system requires additional activities related to device washing and sanitization. However, these activities are standardized and consolidated in routine practice.	Although the system eliminates washing and sanitization activities, operators report practical issues in bag management (closure, emptying and disposal), which may make the process less smooth than expected. The time benefit is therefore not fully consolidated.	Worsens
6. Training required	No significant additional training is required, as the device is already known and routinely used by staff.	Specific training is required to use the new technology, with an initial organizational impact on implementation time.	Worsens
7. Organizational impact	The system is fully integrated into existing organizational processes. However, it requires management of reprocessing phases and dedicated equipment.	The introduction of the system modifies the operational workflow. However, critical issues emerged in daily device management, particularly regarding: difficulty emptying bags; device management at the bedside; limited possibility of dedicating the bedpan to a single patient. These aspects reduce the expected organizational benefit.	Worsens
8. Space / equipment use	Requires availability of equipment for washing and sanitization (e.g. washer-disinfectors), with related impact on space and technological resources.	The system reduces the need for washing equipment; however, it requires continuous presence of the device at the patient bedside, with possible issues in space management and perceived hygiene.	Neutral
9. Direct costs	The unit cost of the device is limited and amortized over multiple uses. However, costs associated with the reprocessing process should be considered.	Higher unit cost, while the economic evaluation should also consider avoided washing and sanitization costs; however, economic benefits are uncertain in light of the operational issues identified and uncertainty about overall benefit.	Worsens
10. Indirect costs	The system entails indirect costs related to staff time, water, energy and detergent consumption, as well as management of washing equipment.	The system could reduce indirect costs related to reprocessing; however, operational difficulties and possible lower acceptability by operators may limit the actual overall economic advantage.	Neutral
11. Recommended use	The system represents the current standard of clinical practice and is indicated for routine use in care settings, as it is established, known to operators and integrated into organizational processes.	In light of the issues reported by operators, routine adoption of the system is not currently supported. Selective use in specific contexts (e.g. patients at high infectious risk) is suggested, accompanied by a review of operating procedures and further staff training.	Neutral
12. SECTION NOTES	null	null	null

[DATA](#)
[DOWNLOAD MCDA](#)

FIGURE 4 - Results of the CCA for the Kit Hygiene. The dashboard highlights a predominantly negative (worsens) or neutral (neutral) impact across key organizational, direct cost, and perceived quality dimensions, contrasted with a single theoretical improvement (improves) in safety.

profile. The integrated framework therefore prevented a decision based solely on subjective perception or isolated operational advantages.

The classification of the technology as dominated is particularly informative. A purely economic evaluation would have shown that the single-use system was more costly than the reusable pathway, but it would not have explained whether the additional cost could be justified by broader dimensions of value. Conversely, a purely qualitative assessment might have emphasized perceived hygiene and usability without adequately accounting for cost and organizational burden. The integrated framework made these trade-offs explicit.

Another important aspect is the role of field testing. Product characteristics and theoretical pathway advantages are often insufficient to predict real-world performance. In this case, field observations showed that the expected simplification of the process was limited by bag management issues, training needs, and workflow adaptation. These findings support the inclusion of implementation data in hospital-based HTA, especially for technologies whose value depends on routine use by healthcare professionals.

The supportive cost-per-MCDA-unit indicator should be interpreted with caution. The term ‘soft ICER’ was used internally to describe a pragmatic ratio between incremental cost and incremental MCDA value, but it should not be confused with conventional ICERs based on QALYs or other health outcomes. Because MCDA scores are dimensionless and institution-specific, this indicator cannot be compared across technologies or settings without recalibration. Moreover, when a technology is dominated, as in this case, calculating a ratio is unnecessary and potentially misleading.

The study also shows the usefulness of CCA and BIA in combination with MCDA. CCA allowed costs and consequences to remain visible as distinct components rather than being compressed into a single economic endpoint. BIA supported the interpretation of affordability and local expenditure consequences, which are essential for hospital-level decisions where budget constraints and implementation feasibility strongly influence adoption (9,10).

This case has practical implications for hospital decision-makers. First, technologies with weak evidence and mainly perceived benefits should be assessed with particular attention to organizational consequences. Second, small differences in

unit cost may become relevant when the incremental value is limited or negative. Third, structured frameworks can improve accountability by making explicit why a technology is adopted, rejected, or reserved for selected contexts.

Generalizability and transferability

Although the assessment was conducted in a single institution, the clinical use case is not specific to oncology. Assisted toileting and excreta management for non-self-sufficient inpatients occur across many hospital settings, including medical, surgical, rehabilitation, and long-term care wards. Therefore, the decision problem is potentially transferable beyond the oncological setting.

The most transferable components of the framework are the decision structure, the explicit MCDA scoring logic, the BIA/CCA integration, the dominance interpretation, and the rule-based recommendation hierarchy. Conversely, several inputs are context-specific and should be recalibrated before application elsewhere: local reprocessing costs, staff time, washer-disinfector availability, procurement prices, adoption volumes, waste-management procedures, infection-control protocols, and institutional affordability thresholds.

In hospitals where reprocessing is outsourced or associated with higher operational costs, the economic profile of single-use solutions may become more favorable. Conversely, in hospitals with efficient in-house reprocessing and established workflows, the incremental value of single-use systems may be lower. The framework is therefore generalizable as a method, whereas the case-study result should be interpreted as context-specific.

Limitations

The assessment has limitations. First, it was conducted in a single hospital and was based on local costs, workflows, and professional feedback. Second, field testing lasted 30 days and may not fully reflect longer-term adaptation by staff. Third, the questionnaire was developed specifically for this implementation assessment and was not formally validated or pilot-tested as a psychometric instrument; it should therefore be interpreted as a pragmatic data-collection tool rather than as a validated measurement scale. Fourth, the number of questionnaire responses was not used to estimate a formal response rate, because the assessment was designed as a pragmatic implementation study rather than as a survey with inferential objectives. Fifth, the weighting system was derived from a predefined consensus-based institutional/regional framework and was not re-elicited for this individual case. Although domain-weight sensitivity analysis did not change the recommendation, future applications should further evaluate weight stability across stakeholders and settings. Finally, evidence supporting infection-control benefit was indirect and did not demonstrate a robust clinical advantage, and probabilistic sensitivity analysis was not feasible because parameter distributions were not available.

Despite these limitations, the case study provides a useful example of how hospital-based HTA can integrate multidimensional value and economic sustainability in a reproducible

decision process. The findings are consistent with the broader methodological direction of HTA and MCDA guidance, which emphasizes transparent criteria, explicit trade-offs, and the integration of contextual factors into decision-making (1,4,7,8).

Conclusions

The integrated MCDA-economic framework provided a transparent and structured approach to the hospital-level evaluation of a single-use continence care technology. In the present case, the technology showed perceived advantages in hygiene, odor reduction and ease of use, but these benefits were not supported by sufficient evidence or accompanied by improved overall value.

Compared with the reusable pathway, the single-use system was associated with higher cost per patient and a lower MCDA score. The technology was therefore classified as dominated within the integrated appraisal and did not demonstrate sufficient incremental value to justify routine adoption.

This case supports the use of integrated hospital-based HTA frameworks to guide decisions on medical technologies, especially when perceived practical benefits must be balanced against evidence uncertainty, organizational consequences and economic sustainability.

Disclosures

Conflict of interest: The authors declare no conflict of interest.

Financial support: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability statement: The data used for the assessment were derived from local institutional sources and the decision-support application. Aggregated data relevant to the interpretation of the case study are reported in the manuscript.

References

1. Ferrante di Ruffano L, Harris IM, Zhelev Z, et al. Health technology assessment of diagnostic tests: a state of the art review of methods guidance from international organizations. *Int J Technol Assess Health Care*. 2023;39(1):e14. [CrossRef PubMed](#)
2. European Parliament and Council of the European Union. Regulation (EU) 2021/2282 of December 15, 2021 on health technology assessment and amending Directive 2011/24/EU. *Official Journal of the European Union*. 2021;L458:1-32. Available from: [Online](#) (Accessed May 2026)
3. European Commission. Implementation of the Regulation on health technology assessment. Brussels: European Commission; Available from: [Online](#) (Accessed May 2026).
4. EUnetHTA Joint Action 2. HTA Core Model® version 3.0. 2016. Available from: [Online](#) (Accessed May 2026)
5. Agenzia Nazionale per i Servizi Sanitari Regionali (AGENAS). Programma Nazionale HTA Dispositivi Medici 2023-2025. AGENAS; 2024.
6. Sampietro-Colom L, Morilla-Bachs I, Gutierrez-Moreno S, et al. Development and test of a decision support tool for hospital health technology assessment. *Int J Technol Assess Health Care*. 2012;28(4):460-465. [CrossRef PubMed](#)
7. Thokala P, Devlin N, Marsh K, et al. Multiple criteria decision analysis for health care decision making—an introduction:

- report 1 of the ISPOR MCDA emerging good practices task force. *Value Health*. 2016;19(1):1-13. [CrossRef PubMed](#)
8. Marsh K, IJzerman M, Thokala P, et al.; ISPOR Task Force. Multiple criteria decision analysis for health care decision making—emerging good practices: report 2 of the ISPOR MCDA emerging good practices task force. *Value Health*. 2016;19(2):125-137. [CrossRef PubMed](#)
 9. Sullivan SD, Mauskopf JA, Augustovski F, et al. Budget impact analysis—principles of good practice: report of the ISPOR 2012 Budget Impact Analysis Good Practice II Task Force. *Value Health*. 2014;17(1):5-14. [CrossRef PubMed](#)
 10. Drummond MF, Sculpher MJ, Claxton K, et al. *Methods for the Economic Evaluation of Health Care Programmes*. 4th ed. Oxford University Press; 2015.
 11. Martin J, Lal A, Moodie J, et al. Hospital-Based HTA and Know-4Go at MEDICI in London, Ontario, Canada. In: Sampietro-Colom L, Martin J, eds. *Hospital-Based Health Technology Assessment: The Next Frontier for Health Technology Assessment*. Springer; 2016:127-152. [CrossRef](#)
 12. Ruggeri M, Cadeddu C, Roazzi P, et al. Multi-Criteria-Decision-Analysis (MCDA) for the horizon scanning of health innovations an application to COVID 19 emergency. *Int J Environ Res Public Health*. 2020;17(21):7823. [CrossRef PubMed](#)