

Hospital Cleaning ROI Study

Case Study: Evaluating Autonomous Medical-Grade Sanitation Fleet Deployment in Acute Care Networks

Executive Summary

Patient safety, clinical throughput, and environmental cleanliness are the foundational pillars of healthcare operational management. Environmental Services (EVS) departments continuously struggle with severe staffing deficits, stringent hospital-acquired infection (HAI) mitigation requirements, and high bed-turnover pressures. This study evaluates the 180-day deployment of the **123bots.com "MediSan-Z1" Autonomous UV-C Floor Scrubber** across a 320-bed regional hospital network.

The objective validation demonstrates that integrating autonomous, medical-grade robotic sanitation units stabilizes hospital cleanliness scores, directly minimizes pathogens on high-traffic floor pathways, optimizes EVS labor deployment, and generates a compelling financial return on investment.

22%

REDUCTION IN FLOOR
BIO-BURDEN

+14%

HCAHPS CLEANLINESS
SCORE

5,100

EVS HOURS
REALLOCATED/YR

13.1 Mo

CALCULATED ROI
PAYBACK PERIOD

1. The Clinical & Operational Challenge

The facility faced compounding operational roadblocks in managing cross-contamination vectors and clinical floor sanitation:

- **Cross-Contamination Risk:** Standard manual string mops and traditional manual walk-behind scrubbers often inadvertently spread multi-drug resistant organisms (MDROs) across clinical corridors if water changes and mop-head protocols are not flawlessly executed.
- **Bed Turnaround Delays:** EVS personnel were routinely pulled away from primary corridor floor maintenance to address emergent patient room disinfection, creating a backlog in public zones and high-traffic clinical hallways.
- **Regulatory and Financial Penalties:** Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores relating to facility cleanliness were below regional benchmarks, placing Centers for Medicare & Medicaid Services (CMS) maximum reimbursements at risk.

2. Solution & Clinical Integration

The facility deployed a tailored fleet of four (4) 123bots.com MediSan-Z1 units. Equipped with integrated continuous-loop chemical dosing systems and a specialized array of closed-shield ****UV-C** sub-surface sterilization arrays**, these units provide mechanical scrubbing alongside concurrent microbiological disinfection.

Operating continuously via dynamic SLAM navigation maps, the MediSan-Z1 fleet autonomously navigates public lobbies, emergency department thoroughfares, and clinical hallways. The robots actively adjust speed and route to yield absolute right-of-way to emergency medical personnel and patient gurney transfers.

"The MediSan-Z1 deployment effectively automated the baseline floor scrubbing matrix, allowing our highly trained human EVS technicians to focus exclusively on high-touch clinical surfaces, patient rooms, and strict terminal cleans." — Chief Nursing Officer

3. Quantitative Performance & Quality Analysis

Sanitation and Compliance Metrics

EVS quality control monitored floor cleanliness using Adenosine Triphosphate (ATP) bioluminescence surface swab testing. Baseline measurements taken under manual mopping regimes were compared directly against post-deployment data.

Performance Indicator	Manual Mopping/Scrub Baseline	123bots.com MediSan Fleet	Measured Impact
Mean ATP Bioluminescence Level	145 RLU (Relative Light Units)	28 RLU	-80.6% reduction in biological soil
Pathogen Eradication Rate	Variable (depends on human technique)	99.99% (Log 4 Reduction via UV-C)	Standardized clinical-grade output
Main Corridor Cleaning Frequency	1x per 24 hours	3x per 24 hours	+200% frequency scaling
EVS Labor Turnover (Sanitation Role)	42% Annualized	11% Annualized	Significant workplace strain reduction

Labor Optimization

Rather than eliminating positions, the deployment addressed a critical 20% systemic understaffing gap within the EVS department. By reallocating human capital, the hospital saved significant overtime costs while expanding the depth of high-touch room disinfestation.

4. Mathematical Verification of ROI via EVS Optimization

To model the Total Sanitation Return (\$TSR\$) metric, the facility assessed the financial value of reallocated EVS hours combined with the mitigated costs of clinical cross-contamination events:

$$TSR = (L_h \times R_l) + \Delta C_{inf} + (V_{HCAHPS} \times S_p)$$

Where L_h represents the human hours reallocated from manual floor sweeping/scrubbing to specialized room decontamination, R_l is the fully burdened EVS hourly labor rate (\$26.50/hr), ΔC_{inf} represents estimated direct cost

savings from decreased hospital-acquired clinical infections, V_{HCAHPS} is the weighted financial value of CMS incentive tier shifts, and S_p is the percentage improvement in the HCAHPS cleanliness score.

By transferring routine aisle-scrubbing duties to the autonomous fleet, the facility redirected **5,100** hours of human labor annually directly into room turnover protocols. This dramatically shortened patient discharge-to-admission cycles, maximizing bed utilization efficiency.

5. Financial Return on Investment (ROI)

The total capital expenditure (CapEx) for the acquisition, mapping calibration, and software licensing of the four 123bots.com MediSan-Z1 units was \$148,000. Annual service, software updates, and consumable brush/UV bulb replacements (OpEx) total \$6,200 per unit.

Fiscal Period	Capital / Operational Cash Outlay	Labor & Reimbursement Gains	Net Economic Impact
Year 0 (Procurement)	-\$148,000	\$0	-\$148,000
Year 1	-\$24,800	\$160,200	\$135,400
Year 2	-\$24,800	\$160,200	\$135,400

Factoring in labor redistribution savings and the mitigation of CMS reimbursement penalties, the simple payback timeline is reached at exactly **13.1 months** post-implementation.

6. Conclusion and Strategic Recommendations

The deployment of the 123bots.com autonomous clinical cleaning fleet has demonstrated that advanced robotics can successfully adapt to high-stakes healthcare environments. The automation of baseline environmental sanitation provides an objective, consistent clinical shield against biological contamination while simultaneously optimizing human labor structures.

Based on the data collected during this evaluation phase, it is recommended to expand the integration of the MediSan-Z1 fleet into the Outpatient Surgery wings and the public concourses of the satellite clinics before the conclusion of fiscal year 2026.