Invisible Threats

Infection Prevention in Senior Living

Dr. Mark “Tuck” Stibich

Chief Epidemiologist, Managing Partner

Dr. Mark “Tuck” Stibich is an infectious diseases epidemiologist with a focus on preventing healthcare-associated infections. He is a partner at Forefront, the founder of Xenex, and is involved in a number of other projects. At Forefront, Dr. Stibich advises on the environment of care as well as project efficiency using his skills as a Lean Six Sigma Black Belt. He has over 120 granted patents relating to infection control and earned his PhD at the Johns Hopkins School of Public Health.

Gary Pollack

Managing Partner Engagement

With over 40 years of experience in healthcare support services, Gary Pollack brings a wealth of knowledge and expertise to Forefront. His extensive background spans Environmental Services, Laundry and Linen, and Food and Nutrition Services, ensuring comprehensive operational excellence.

Today’s Program

Objective: ***Learn about AMR and gain tools to use in your community.***

Approach:

1. Overview of AMR
2. Infection control assessment
3. Map key process flows.
4. Identify critical risk 'moments.'
5. Apply RCA tools (e.g., 5 Whys, Fishbone).
6. Propose targeted improvements and controls.

Who We Are

Forefront is a specialized culinary & support services company dedicated to serving the continuum of care.

Senior Living | Healthcare | Specialty Care

Our Mission
We deliver outstanding culinary and support services to enhance our partners success and advance their mission.

Our Vision
We create healthy foods and environments to promote care, healing and better living.

Our Core Values
Integrity. Tenacity. Service Excellence. Creativity. Safety. Caring.

Who We Serve

Healthcare
Health Systems, Community Hospitals, Critical Access Hospitals
Behavioral Health, Ambulatory Care

Senior Living
Life Care Communities, Assisted Living, Skilled Nursing, Rehabilitation, Memory Care, Hospice

What We Do

- Food Service
- Clinical Nutrition
- Environmental Services
- Infection Prevention
- Laundry & Linen
- Facilities Management
- Recruiting & Staffing

What is AMR?

Objective: ***Learn about AMR***

Approach:

1. Scale of the problem
2. Future projections
3. Environment as target area

Antimicrobial Resistance: The Future of AMR

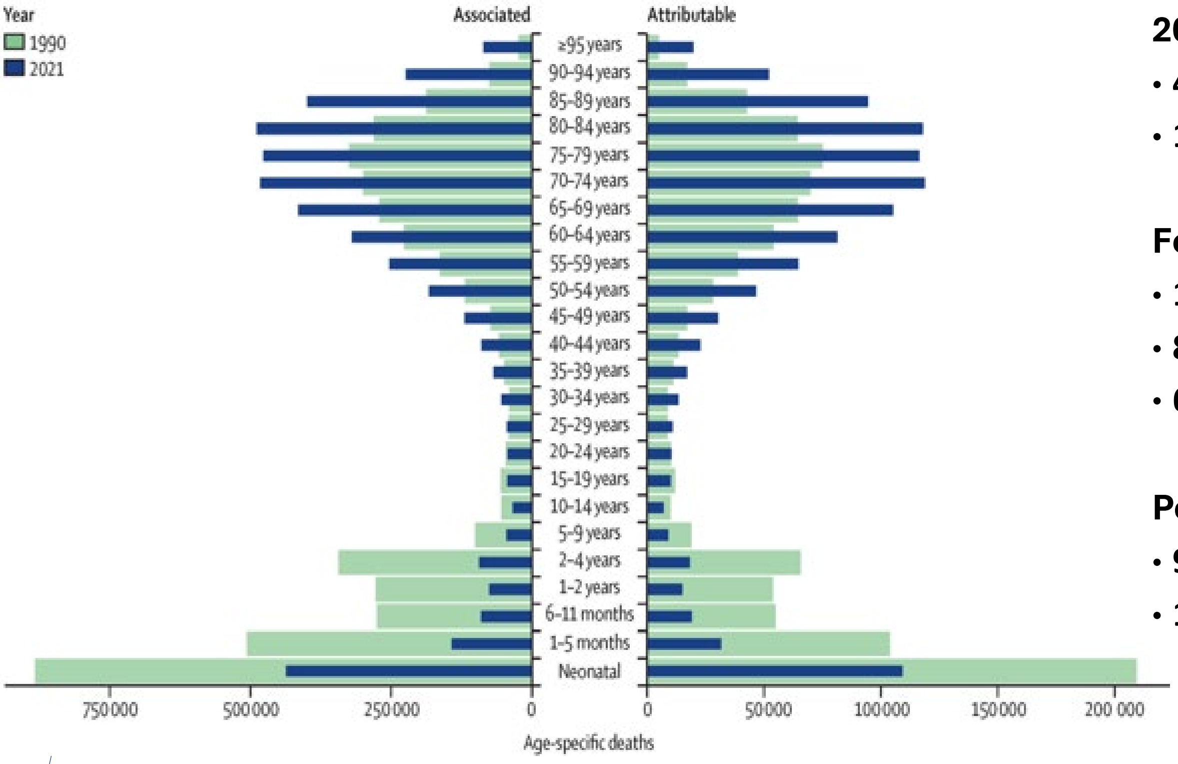
Drug-resistant 'superbugs' sicken ~3 million Americans annually, kill 35,000+.

Pipeline problem: last new antibiotic class for worst superbugs discovered in 1962.

Sponsors of 41% of newly FDA-approved antibiotics in last decade went bankrupt.

Future: routine medical procedures may become unsafe without aggressive prevention.

Global burden of bacterial antimicrobial resistance 1990-2021: A systematic analysis with forecasts to 2050



2021 Estimates:

- **4.71 million** deaths associated with bacterial AMR
- **1.14 million** deaths attributable to bacterial AMR

Forecast for 2050:

- **1.91 million** attributable AMR deaths
- **8.22 million** associated AMR deaths
- **65.9%** of attributable deaths expected in adults 70+

Potential Impact of Interventions (2025–2050):

- **92 million** deaths averted with better infection care and antibiotic access
- **11.1 million** AMR deaths prevented with new Gram-negative drug development

https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(24)01867-1/fulltext

AMR: Beyond Infections

Millions of people in the United States receive care that can be complicated by bacterial and fungal infections. Without antibiotics, we are not able to safely offer some life-saving medical advances.

Sepsis Treatment

Anyone can get an infection and almost any infection can lead to sepsis — the body's extreme response to an infection. Without timely treatment with antibiotics, sepsis can rapidly lead to tissue damage, organ failure, and death.

AT LEAST **1.7M** adults develop sepsis each year.

Surgery

Patients who have surgery are at risk for surgical site infections. Without effective antibiotics to prevent and treat surgical infections, many surgeries would not be possible today.

1.2M women had a cesarean section (C-section) in 2017. Antibiotics are recommended to help prevent infection.

Chronic Conditions

Chronic conditions (e.g., diabetes) put people at higher risk for infection. These conditions and some medicines used to treat them can weaken the immune system (how the body fights infection).

Organ Transplants

Organ transplant recipients are more vulnerable to infections because they undergo complex surgery. Recipients also receive medicine to suppress (weaken) the immune system, increasing risk of infection.

MORE THAN **33,000** organ transplants were performed in 2016. Antibiotics help organ transplants remain possible.

Dialysis for Advanced Kidney Disease

Patients who receive dialysis treatment have a higher risk of infection, the second leading cause of death in dialysis patients.

MORE THAN **500,000** patients received dialysis treatment in 2016. Antibiotics are critical to treat infections in patients receiving life-saving dialysis treatment.

Cancer Care

People receiving chemotherapy for cancer are often at risk for developing an infection during treatment. Infection can quickly become serious for these patients.

AROUND **650,000** people receive outpatient chemotherapy each year. Antibiotics are necessary to protect these patients.

2019 AR Threats Report, CDC

2026 Infection Threats in Senior Living

Norovirus: LTCFs most common US outbreak setting; 2,630 outbreaks 2024–25 season in U.S.

Candida auris: Ongoing emergence, requiring MDRO cleaning protocols.

Influenza, RSV, COVID-19: expect seasonal surges; vaccine + PPE essential.

Variant influenza strains.

Michigan's Aging Population

- Approximately **19–20% of Michigan's population is age 65+ (2024–2025 estimates)**, approaching **1 in 5 residents**.
- Michigan's **65+ population grew ~8–10% from 2020–2024**, driven by aging Baby Boomers and net outmigration of younger cohorts in some regions.
- The **85+ population is among the fastest-growing segments**, increasing demand for **high-acuity care (skilled nursing, memory care, complex assisted living)**.
- Michigan has approximately **430–450 licensed nursing homes** with **~48,000–52,000 beds**.
- This is supported by a large network of **assisted living and adult foster care homes**, which are more prominent in Michigan than in many states.

Infections in Michigan

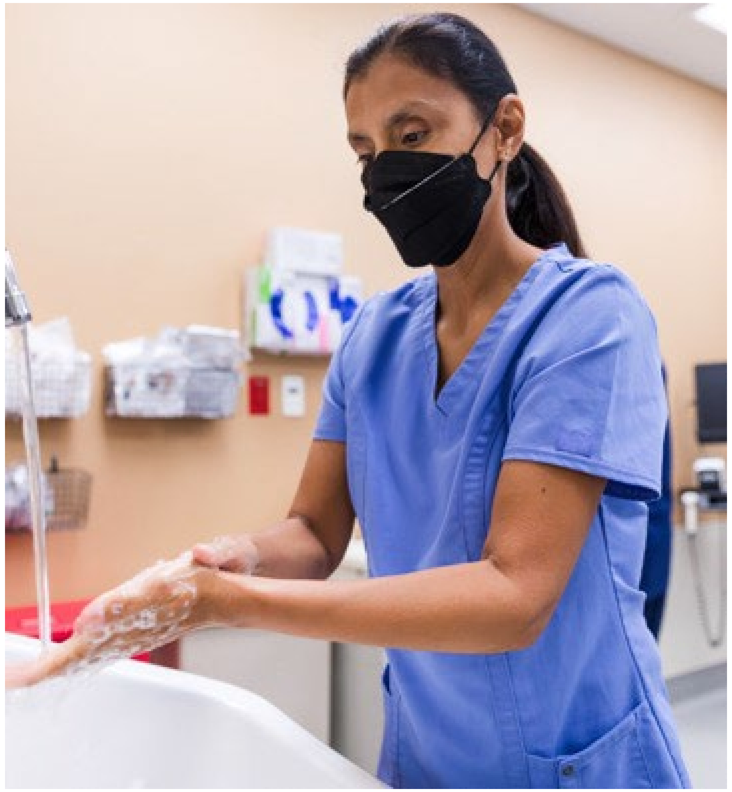
During peak respiratory season:

- **~10–13 infections per 1,000 residents weekly**

- **Up to 20–30% of facilities reporting cases in a given week**

- **Respiratory infections (COVID, influenza, RSV)** remain the dominant driver of infection burden, with **seasonal patterns extending beyond winter into spring**.

CMS & Michigan Regulatory Backbone



CMS requires at least part-time on-site Infection Preventionist with specialized training.

Facilities must align infection surveillance with NHSN LTCF modules.

The Michigan Department of Health and Human Services requires:

Reporting of **communicable diseases and outbreaks**

Coordination with local health departments
Michigan nursing homes are governed under:

Public Health Code (Act 368 of 1978)
Licensing rules for health facilities (including infection control requirements)

Cost of Infections

Objective: *Learn about AMR*

Approach:

1. How infections spread from surfaces
2. Opportunities for improvement
3. Role of employee engagement

The Cost of Infections

HAIs lengthen stay, increase readmissions, and impact financial margins.

Drug-resistant infections kill ~35,000 annually in US; some estimates 162,000 (*CDC AR Threat Report*).

Economic impact: outbreaks raise staffing costs, PPE, reputational harm.

Investing in prevention is cost-effective and strategic.

Resident Impact Stories

Case Example: 89-year-old resident admitted for rehab developed Candida auris infection.

Result: 30 additional hospital days, readmission, family dissatisfaction.

Cost impact: >$40,000 incremental cost, reputational harm, staff morale impact.

Human stories connect infection prevention directly to executive responsibility.

The Business Case for Prevention

Environmental cleaning bundles are cost-effective vs outbreak costs.

Leadership engagement reduces adverse events and drives ROI.

Checklist identifies high-ROI gaps (air, water, EVS validation, training).

Role of the Environment

Objective: ***Learn about AMR***

Approach:

1. How infections spread from surfaces
2. Opportunities for improvement
3. Role of employee engagement

Prior Room Occupancy Risk

ORIGINAL INVESTIGATION

Risk of Acquiring Antibiotic-Resistant Bacteria From Prior Room Occupants

Susan S. Huang, MD, MPH; Rupak Datta, BS; Richard Platt, MD, MS

Table 3. Predictors of Methicillin-Resistant *Staphylococcus aureus* (MRSA) and Vancomycin-Resistant Enterococci (VRE) Acquisition*

Model	Odds Ratio (95% Confidence Interval)	P Value
MRSA		
Prior occupant MRSA positive	1.4 (1.0-1.8)	.04
Age, in decades	1.1 (1.0-1.2)	.02
Pre-ICU LOS†	1.2 (1.1-1.4)	<.001
Leukemia	0.4 (0.2-0.9)	.02
VRE		
Prior occupant VRE positive	1.4 (1.0-1.9)	.02
Age, in decades	1.2 (1.1-1.3)	<.001
Pre-ICU LOS†	1.4 (1.3-1.6)	<.001
Diabetes mellitus	1.3 (1.0-1.7)	.03

Prior Environmental Contamination Increases the Risk of Acquisition of Vancomycin-Resistant Enterococci

Marci Drees,[1,2,3] David R. Snydman,[1,2,3] Christopher H. Schmid,[1,2] Laurie Barefoot,[1] Karen Hansjosten,[1] Padade M. Vue,[3] Michael Cronin,[4] Stanley A. Nasraway,[1,3] and Yoav Golan[1,3]

[1]Tufts–New England Medical Center and [2]Sackler School of Graduate Biomedical Sciences and [3]School of Medicine, Tufts University, Boston, and [4]Tufts University, Medford, Massachusetts

Table 3. Univariate predictors of acquisition of vancomycin-resistant enterococci (VRE) using Cox proportional hazards.

Environmental variables		
Prior room occupant colonized with VRE	3.07 (1.63–5.80)	<.001
Any room occupant in prior 2 weeks colonized with VRE	2.49 (1.30–4.80)	.006
Positive room culture result prior to admission or VRE acquisition	3.39 (1.20–9.58)	.02
Either positive room culture result or prior room occupant colonized with VRE	2.52 (1.43–4.45)	.001

Prior Occupancy Room Risk

ORIGINAL ARTICLE

Evaluation of Hospital Room Assignment and Acquisition of *Clostridium difficile* Infection

Megan K. Shaughnessy, MD;[1] Renee L. Micielli, MD;[1] Daryl D. DePestel, PharmD;[2] Jennifer Arndt, MS;[3] Cathy L. Strachan, MSRN;[4] Kathy B. Welch, MS;[5] Carol E. Chenoweth, MD[1,3]

TABLE 3. Multivariate Analysis of Risk Factors for Acquisition of *Clostridium difficile* Infection (CDI)

Risk factor	HR (95% CI)	*P*
Prior room occupant with CDI	2.35 (1.21–4.54)	.01
Greater age	1.00 (0.99–1.01)	.71
Higher APACHE III score	1.00 (1.00–1.01)	.06
Proton pump inhibitor use	1.11 (0.44–2.78)	.83

ORIGINAL ARTICLE EPIDEMIOLOGY

Risk of acquiring multidrug-resistant Gram-negative bacilli from prior room occupants in the intensive care unit

S. Nseir[1,2], C. Blazejewski[1], R. Lubret[1], F. Wallet[3], R. Courcol[3] and A. Durocher[1,2]

1) Intensive Care Unit, Calmette Hospital, University Hospital of Lille, Lille, 2) Medical Assessment Laboratory, Lille II University, Lille and 3) Microbiology Laboratory, Biology and Pathology Centre, University Hospital of Lille, Lille, France

TABLE 2. Characteristics of patients with or without multidrug-resistant (MDR) *Pseudomonas aeruginosa* or *Acinetobacter baumannii* during intensive-care unit (ICU) stay

	ICU-acquired MDRPA				ICU-acquired *A. baumannii*			
	Yes (*n* = 82)	No (*n* = 429)	p value	OR (95% CI)	Yes (*n* = 57)	No (*n* = 454)	p value	OR (95% CI)
Prior room occupants with the same MDR GNB	21 (25)	64 (14)	0.023	1.9 (1.1–3.5)	16 (28)	36 (7)	<0.001	4.5 (2.3–8.9)

Surface Survival Time

Table 1: Persistence of clinically relevant bacteria on dry inanimate surfaces.

Type of bacterium	Duration of persistence (range)	Reference(s)
Acinetobacter spp.	3 days to 5 months	[18, 25, 28, 29, 87, 88]
Bordetella pertussis	3 – 5 days	[89, 90]
Campylobacter jejuni	up to 6 days	[91]
Clostridium difficile (spores)	5 months	[92–94]
Chlamydia pneumoniae, C. trachomatis	≤ 30 hours	[14, 95]
Chlamydia psittaci	15 days	[90]
Corynebacterium diphtheriae	7 days – 6 months	[90, 96]
Corynebacterium pseudotuberculosis	1–8 days	[21]
Escherichia coli	1.5 hours – 16 months	[12, 16, 17, 22, 28, 52, 90, 97–99]
Enterococcus spp. including VRE and VSE	5 days – 4 months	[9, 26, 28, 100, 101]
Haemophilus influenzae	12 days	[90]
Helicobacter pylori	≤ 90 minutes	[23]
Klebsiella spp.	2 hours to > 30 months	[12, 16, 28, 52, 90]
Listeria spp.	1 day – months	[15, 90, 102]
Mycobacterium bovis	> 2 months	[13, 90]
Mycobacterium tuberculosis	1 day – 4 months	[30, 90]
Neisseria gonorrhoeae	1 – 3 days	[24, 27, 90]
Proteus vulgaris	1 – 2 days	[90]
Pseudomonas aeruginosa	6 hours – 16 months; on dry floor: 5 weeks	[12, 16, 28, 52, 99, 103, 104]
Salmonella typhi	6 hours – 4 weeks	[90]
Salmonella typhimurium	10 days – 4.2 years	[15, 90, 105]
Salmonella spp.	1 day	[52]
Serratia marcescens	3 days – 2 months; on dry floor: 5 weeks	[12, 90]
Shigella spp.	2 days – 5 months	[90, 106, 107]
Staphylococcus aureus, including MRSA	7 days – 7 months	[9, 10, 16, 52, 99, 108]
Streptococcus pneumoniae	1 – 20 days	[90]
Streptococcus pyogenes	3 days – 6.5 months	[90]
Vibrio cholerae	1 – 7 days	[90, 109]

BMC Infectious Diseases BioMed Central

Research article **Open Access**

How long do nosocomial pathogens persist on inanimate surfaces? A systematic review

Axel Kramer*[1], Ingeborg Schwebke[2] and Günter Kampf[1,3]

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* Corresponding author

How do these pathogens move?

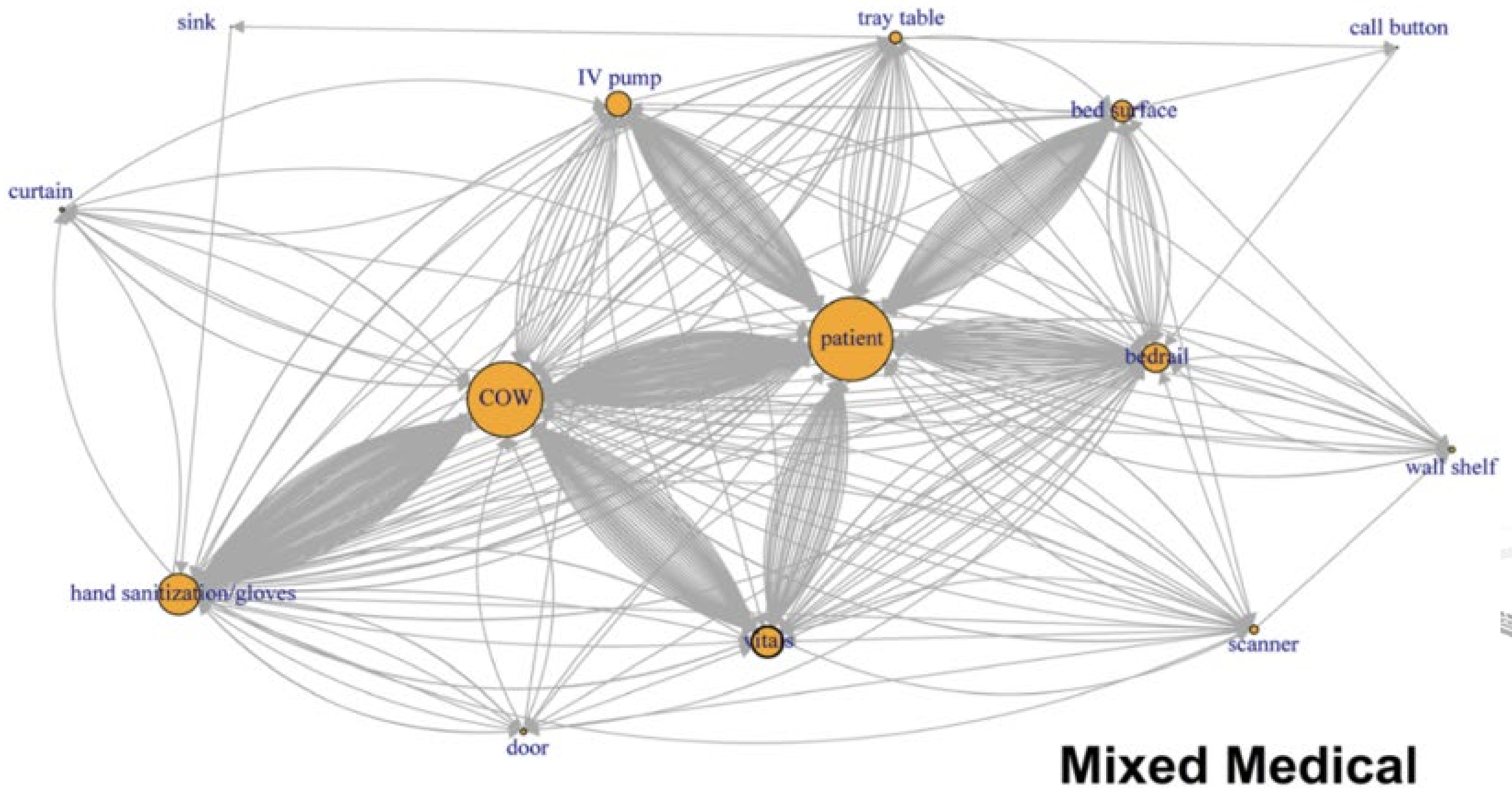


Fig. 1 Directed network plots for each inpatient unit aggregating all sequences across all encounters for 24 h of observation

Invisible Pathways of Transmission

Airborne spread: under-ventilated rooms raise risk; dining halls and therapy areas high risk.

Environmental surfaces: prior occupant increases risk; high-touch surfaces often missed in routine cleaning.

Staff workflow: compliance, engagement, and training directly influence infection rates.

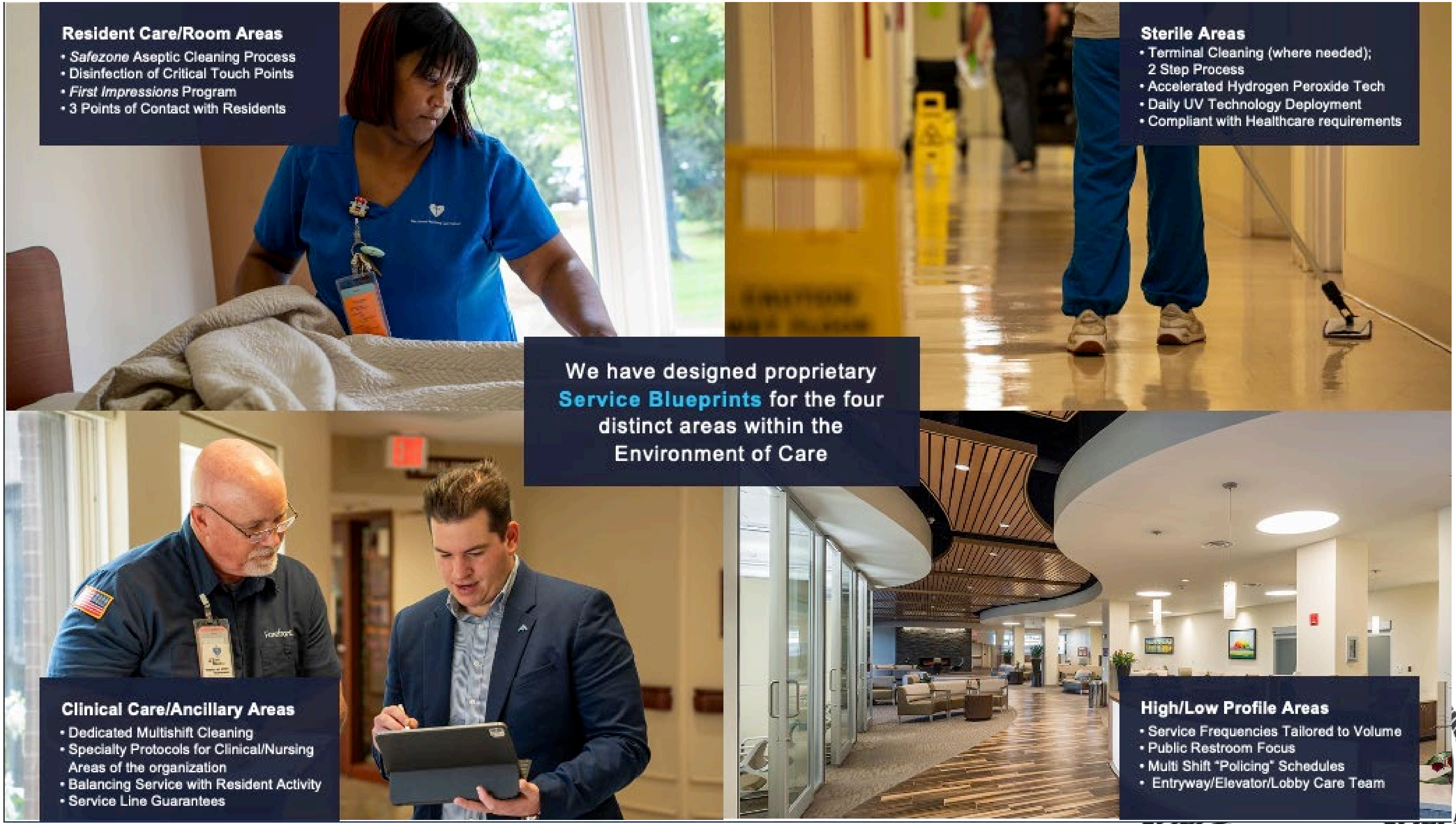
Environmental Services & Employee Engagement

EVS staff are frontline infection preventionists.

Standardized cleaning workflows by zone reduce variation.

Employee engagement drives adherence and satisfaction.

Visual dashboards link compliance to outcomes (UTI, RTI, MDRO).


Resident Care/Room Areas
• Safezone Aseptic Cleaning Process
• Disinfection of Critical Touch Points
• First Impressions Program
• 3 Points of Contact with Residents
Sterile Areas
• Terminal Cleaning (where needed); 2 Step Process
• Accelerated Hydrogen Peroxide Tech
• Daily UV Technology Deployment
• Compliant with Healthcare requirements
We have designed proprietary Service Blueprints for the four distinct areas within the Environment of Care
Clinical Care/Ancillary Areas
• Dedicated Multishift Cleaning
• Specialty Protocols for Clinical/Nursing Areas of the organization
• Balancing Service with Resident Activity
• Service Line Guarantees
High/Low Profile Areas
• Service Frequencies Tailored to Volume
• Public Restroom Focus
• Multi Shift "Policing" Schedules
• Entryway/Elevator/Lobby Care Team

SAFEZONE™
Aseptic Cleaning Process

Aseptic Cleaning Process

This process ensures we clean every room in a strategic order to reduce any risk of cross-contamination.

We divide each room into five zones and we divide each floor into two zones using a different microfiber cloth for each:

1	2	3	4	5
Resident Care Area	High Touch Areas	Ledges, Edges, Trash Cans, & Furniture	Sink & Shower	Toilet

We divide the floors into **two zones** using a different mop head for each

1	2
Resident Care Area	Bathroom

Proprietary Floor Care Programs

Forefront has innovative programs available to achieve greater efficiency with cutting-edge technology.

Validating & Monitoring
Forefront will implement three methods of infection prevention evaluation which are approved by the CDC.

1 Direct Patient Observation

2 Fluorescent Gel Marking

3 ATP Testing

CENTERS FOR DISEASE CONTROL AND PREVENTION

CDC approved evaluation methods

A daily visual inspection provided by the management team utilizing our proprietary Forefront Round Factory handheld tool. A quantitative rollup inspection is conducted 2x per week for each EVS schedule.

Daily inspections using fluorescent-marking tools and black lights. Directors use a marking tool prior to cleaning then use a black light afterward to inspect the marked areas.

ATP testing uses bioluminescence technology to measure the presence of ATP (Adenosine Triphosphate), an organic compound. A high level indicates the potential presence of harmful bacteria, viruses, or pathogens.

Fluorescent Marker Program “Touch Points”

- Resident/Patient Rooms will be “randomly” selected by Housekeeping/EVS Management
- A minimum of 25% of the licensed beds will be tested quarterly (per CDC recommendations)
- Noted deficiencies will be shared with associate for training and immediate correction
- Results shared monthly with Forefront Healthcare's Regional Director and Epidemiologist

PreventD℠

Infection Prevention and Defense

Our **Infection Prevention Program** is called PreventD. It was designed around the most up to date, evidence-based academic research which we have applied to our cleaning protocols and training.

Program Highlights

IP Support Team & Corporate Epidemiologist

IP Support Visits & Consultation

Comprehensive IP Training Program

Infection Prevention Audits

Executing daily cleans where it matters

Innovation Spotlight

Electronic hand hygiene monitoring with dashboards for compliance.
UV disinfection systems for rooms and shared spaces.
Dashboard analytics integrating infection rates, staff training, and EVS audits.
Future-proofing: link investment to both clinical safety and ROI.

Gallup Q12 Survey for Employee Engagement

Gallup Q12 is a validated tool linking engagement to performance.

Engaged EVS staff are more consistent and reliable in infection prevention tasks.

Facilities with higher engagement scores report fewer HAIs and higher resident satisfaction.

Use survey results to guide recognition, training, and workflow design.

Interactive Self-Assessment Checklist

Score yourself 1–5: 1 = ad hoc, 3 = basic, 5 = high reliability.

Domains: Hand Hygiene, HAI Surveillance, Environmental Hygiene, Staff Training, IP Tools, Risk Assessment, Air/Water, PPE, Vaccination, Outbreak Response, Communication.

Use results to target gaps, assign owners, and track improvements.

Checklist Domains (1-5 maturity)

1. Hand Hygiene (monitoring & feedback).
2. Surveillance (UTI, respiratory outbreaks, NHSN adoption).
3. Environmental Hygiene (standard workflows, validation with fluorescent markers, ATP).
4. Staff Training & Competency (Project Firstline, observed drills).
5. IP Tools (disinfectant list, SOPs, compliance aids).
6. Risk Assessment (ICRA, construction/renovation risks).
7. Indoor Air Quality (ventilation, CO_2, HEPA, UVGI).
8. Water Management (Legionella WMP).
9. PPE & Source Control (fit testing, supply monitoring).
10. Vaccination & Sick Leave programs.
11. Outbreak Response Playbook (roles, triggers, drills).
12. Communication & Data (executive dashboard, huddles).

Scorecard: Key Metrics to Trend

UTI rate per 1,000 resident days (catheter vs non-catheter).

Respiratory infections & outbreaks by unit/season.

Hand hygiene adherence, cleaning validation pass rate.

Vaccination coverage (staff & residents), sick leave use.

Air quality spot checks (CO_2), water management logs.

Scenario: Winter Respiratory Surge in Memory Care

Trigger: 3 resident cases in 72h + staff illness.

Actions: PPE escalation, adjusted dining, enhanced cleaning, HEPA deployment.

Data: line list, attack rate, absenteeism, cleaning validation.

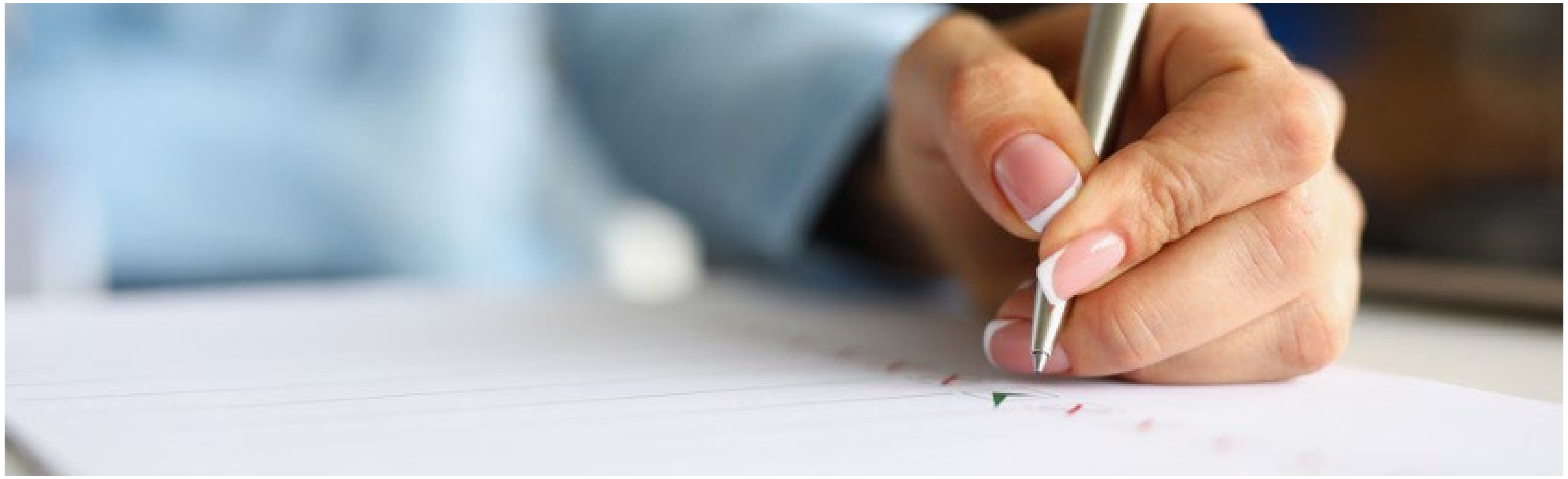
Debrief: after-action review updates playbook & training.

Call to Action

Complete the self-assessment within 30 days; pick 3 priority gaps.

Refresh staff training with CDC modules and Project Firstline.

Start monthly Infection Prevention huddle with EVS, Nursing, Facilities, Admin.



Leadership Lens: Infection = Strategy

Infections are not only clinical events—they are financial and reputational risks.

Outbreaks drive occupancy losses, penalties, and staff burnout.

Strategic leadership frames infection control as core to mission and sustainability.

Key executive question: What would a major outbreak cost your facility tomorrow?

Comparison Benchmarks

PA LTCFs: 1.08 infections per 1,000 resident days in 2024.

National LTCF rates vary between 0.7–1.2 per 1,000 resident days (CDC NHSN).

PA respiratory infection surge (+38%) exceeded national average (+25%).

Benchmarking highlights urgency for local facilities to invest in prevention.

Key References

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Root Cause Analysis Using Lean Six Sigma – C. diff Infection Control

Identifying High-Risk Moments through Process Mapping

Introduction & Objectives

Objective: *Use Lean Six Sigma RCA to pinpoint and mitigate infection control risks in a C. diff scenario.*

Approach:

1. Map key process flows.
2. Identify critical risk 'moments.'
3. Apply RCA tools (e.g., 5 Whys, Fishbone).
4. Propose targeted improvements and controls.

Case Study Snapshot

Context: MedStar Health's Lean Six Sigma team reduced C. diff infections.

Key Root Causes Identified:

- Supplies scattered → inconsistent use
- Overuse of broad-spectrum antibiotics
- Cleaning protocol gaps and human error

Outcomes: Faster supply access, improved cleaning, reduced antibiotic misuse.

Improvement Strategies

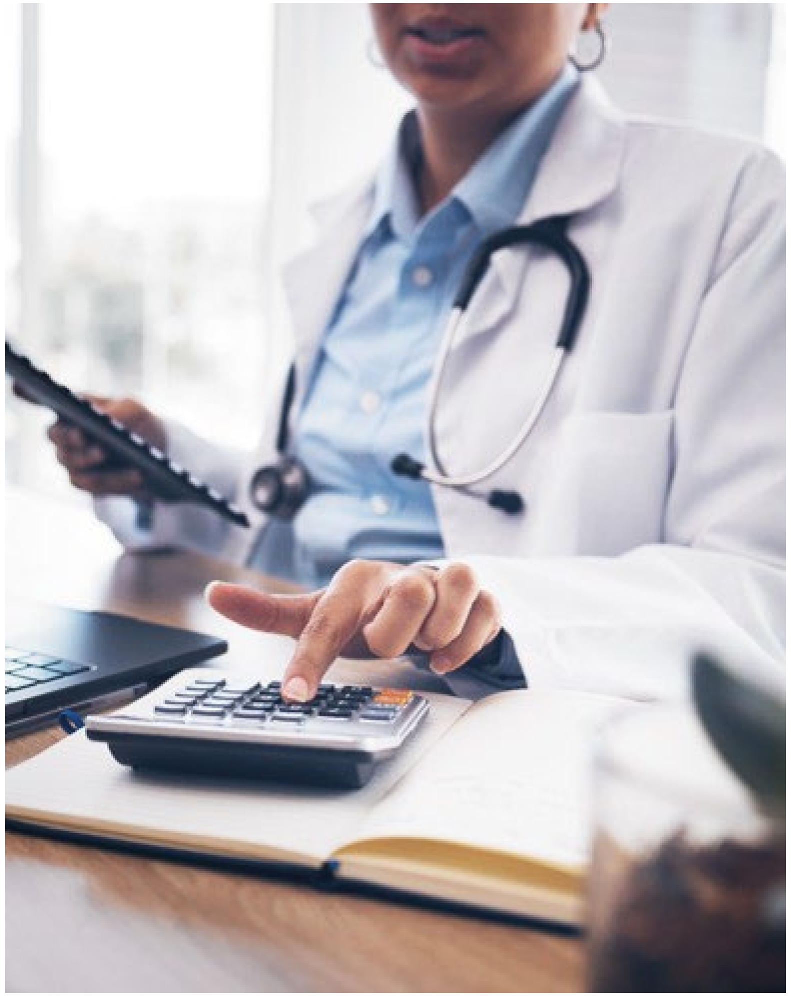
Supply Simplification: Create grab-and-go C. diff kits.

Antibiotic Stewardship: Implement protocol reviews and audit feedback.

Enhanced Cleaning: Deploy UV terminal cleaning.

Staff Training & Monitoring: Reinforce hand hygiene, cohorting, isolation.

Monitoring & Control



Establish Control Charts to track:

- C. diff infection rates
- Cleaning compliance rates
- Antibiotic usage metrics

Regular audit cycles and feedback mechanisms to sustain improvements.

Lessons Learned & Next Steps

RCA must dig deeper than surface issues to avoid missing multiple failure points.

Lean Six Sigma tools like process mapping and RCA are effective for infection control.

Next Steps:

- Pilot the new interventions.
- Measure impact.
- Scale successful tactics hospital-wide.

Case Study: MedStar Health Program

Lean Six Sigma project implemented to address high C. diff infection rates.

Root causes: supply delays, antibiotic overuse, inconsistent cleaning.

Improvements observed:

- 29% reduction in C. diff infections hospital-wide.
- Faster access to bundled precaution supplies.
- Reduced inappropriate antibiotic use via stewardship programs.
- Enhanced terminal cleaning with pulsed xenon UV technology.
- Demonstrates measurable patient safety and cost-saving impact.

Lean Six Sigma Tool: 5 Whys

A simple yet powerful tool to drill down into the root cause.

Ask 'Why?' five times (or as many as needed) to move past symptoms.

Encourages teams to identify systemic issues, not just surface-level failures.

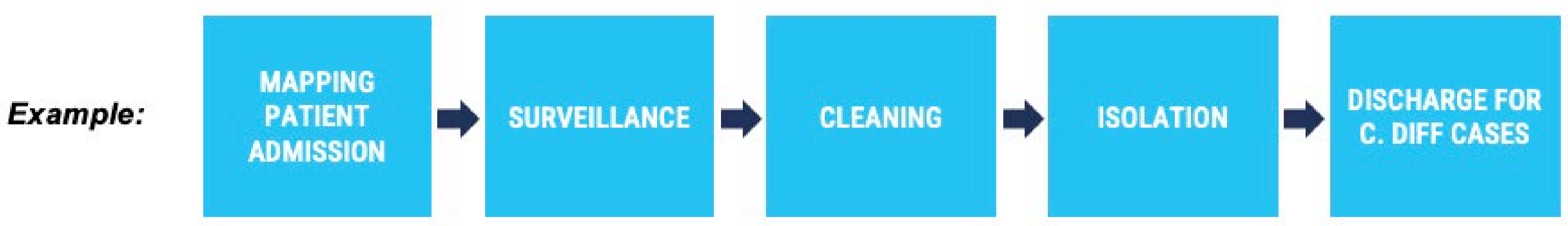
Example: 'WHY WAS CLEANING DELAYED?' → 'SUPPLY NOT AVAILABLE' → 'SUPPLIES STORED IN MULTIPLE LOCATIONS.'

Lean Six Sigma Tool: Process Mapping

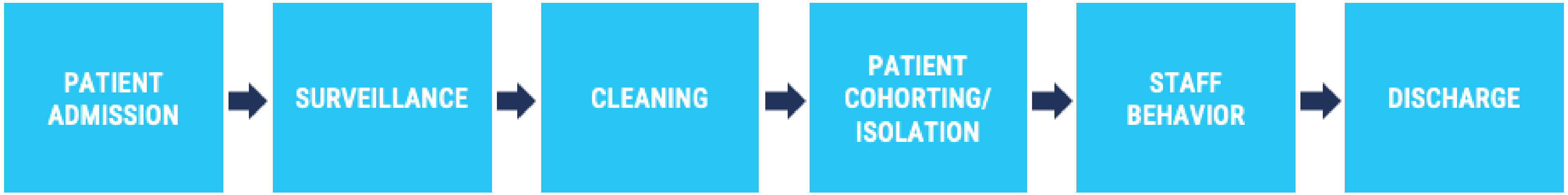
Visual representation of the steps in a workflow.

Identifies waste, variation, and high-risk 'moments' in infection control processes.

Supports cross-disciplinary understanding of where failures can occur.



Process Map – Infection Control Workflow



High-risk touchpoints:

- Surveillance delays
- Isolation lapses
- Environmental cleaning gaps
- Supply retrieval delays
- Inappropriate antibiotic prescribing

Lean Six Sigma Tool: Fishbone Diagram

Also known as Ishikawa or Cause-and-Effect Diagram.

Helps identify potential root causes under categories: People, Process, Equipment, Environment, Materials.

Visual structure promotes brainstorming and thorough analysis of infection control failures.

Example: Causes of gaps in cleaning high-touch surfaces during a C. diff outbreak.

RCA in Action – Fishbone Diagram