CHAIR
Coalition for Community & Healthcare Acquired Infection Reduction

Collaborate. Investigate. Innovate. Educate. Advocate.

CATC – Nov 2025 Update

Barry Hunt, BSc
Co-Founder
Executive Director

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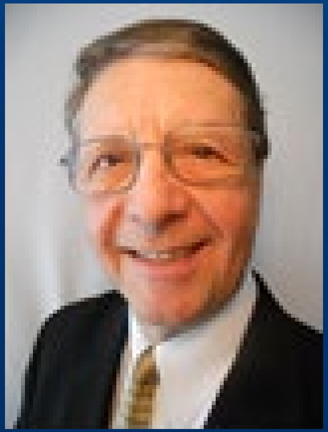
Community & Healthcare
Acquired Infection Reduction

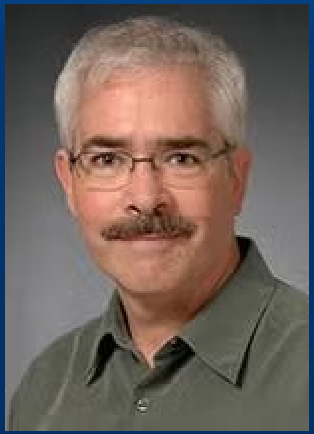
2014 Leadership Team



Richard Dixon, BSc, HSM

Barry Hunt, BSc

Dr. Elizabeth Bryce, MD, PhD



Prof Bill Anderson, PhD, P Eng

Roger Holliss, P Eng

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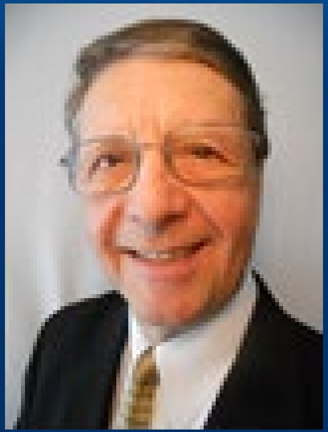
2025 Leadership Team



Richard Dixon, BSc, HSM

Healthcare admin
Planning
Design
Operations
Infection control
EIP studies

CSA Standards

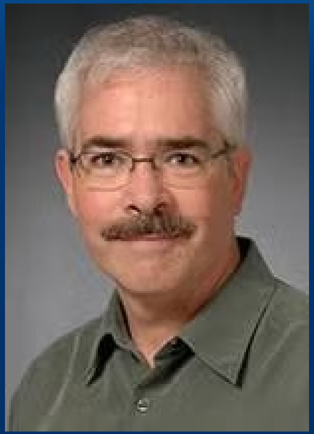
Barry Hunt, BSc
University of Guelph
University of Waterloo

Anesthesia, Respiratory
Medical Gas
Infection Control
Healthcare Infrastructure
Innovation, Research
Technology Development
Laboratory, EIP studies

CSA Standards

Dr. Dick Zoutman, MD
Professor Emeritus
Queen's University

Medical Microbiology
Internal medicine
Infectious Disease
Kingston Health Sciences Centre



Prof Bill Anderson, PhD, P Eng
Professor Emeritus
University of Waterloo

Chemical engineering
UV, Antimicrobial materials
Air & water decontamination
Research
Technology development
EIP studies

Roger Holliss, P Eng
University of Waterloo

Healthcare Engineering
Facility Management
EIP studies

CSA Standards

CHAIR Advisors

Dr. Elizabeth Bryce, MD, PhD, Regional Medical Director for Infection Control at Vancouver Coastal Health (retired), Professor Emeritus, University of British Columbia

Dr. Titus Wong, BSc, MD, MHSc, FRCPC, Infectious Disease & Medical Microbiology, Clinical Assistant Professor, Department of Pathology and Laboratory Medicine, UBC; Medical Lead for Infection Prevention and Control for Coastal, Vancouver Coastal Health (VCH); Executive Medical Director for IPAC & Medical Staff Wellness at Provincial Health Services Authority (PHSA); Medical Director for Infection Prevention & Community Health at BC Centre for Disease Control (BCCDC)

Dr. Victor Leung, MD, Medical Director of Infection Control, Providence Health Care, Clinical Professor, Pathology and Laboratory Medicine, UBC

Dr. Joe Vipond, MD, Emergency Physician, Co-Founder Canadian Covid Society, Past-Presideny Canadian Association of Physicians for the Environment

Craig Doerksen, P.Eng., MFM, P.Eng, CCHFM, CFM, CEM, Shared Health, Executive Director, Capital, Clinical Engineering & Facilities Management, Manitoba

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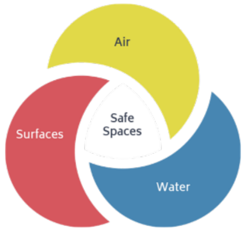
CHAIR Advisors



Dr. Myles Sergeant, MD, PEng., Executive Director, Canadian Coalition for Green Health Care

Cris Gresser, RN, Clinical Specialist, Health Capital Investment Branch, Hospitals and Capital Division, Ontario Ministry of Health (retired)

Dr. Rebecca Hancock-Howard, M.Sc., Ph.D., Institute of Health Policy, Management and Evaluation, Dalla Lana School of Public Health, University of Toronto

Dr. Diane de Camps Meschino, MD, Founder Reproductive Life Stages Programme, Women's College Hospital, Associate Professor, University of Toronto, affiliate of the World Health Leadership Network

Dr. Leslie Kasza, MD, Cardiologist, Edmonton

Dr. Gosia Gasperowicz, PhD, Developmental Biologist, University of Calgary

Dr. David Fisman, MD, PhD, Professor of Epidemiology, Dalla Lana School of Public Health, University of Toronto

International Advisors

Professor Kimberly A. Prather, PhD, co-Director, Meta-Institute for Airborne Disease in a Changing Climate, Distinguished Professor, Distinguished Chair in Atmospheric Chemistry, Scripps Institution of Oceanography, Airborne Institute (https://airborne.ucsd.edu), University of California, San Diego

Professor Yaneer Bar-Yam, PhD, Founding President New England Complex Systems Institute, Co-Founder The World Health Network

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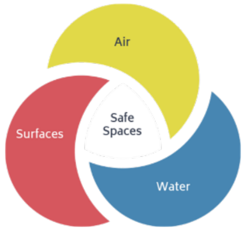
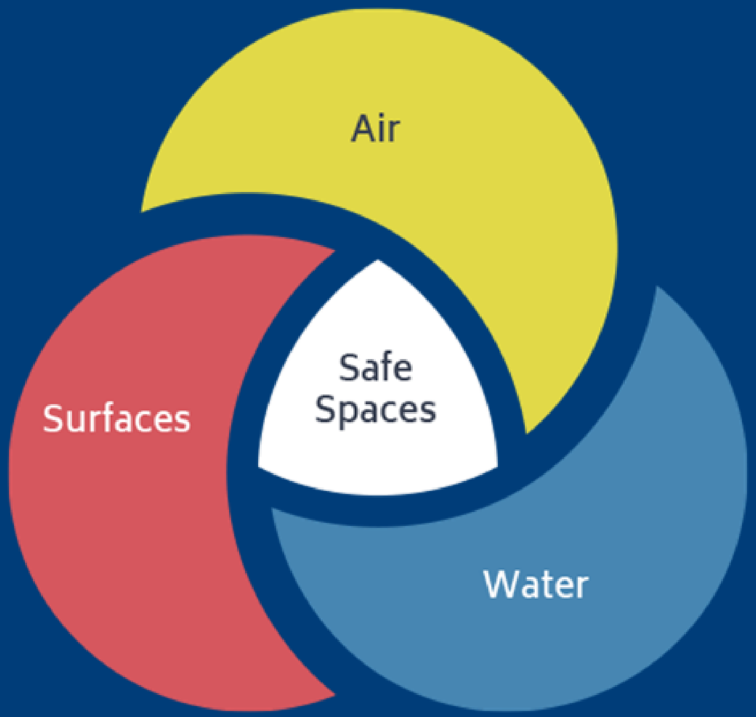


Our Mission and Vision



Our Mission

To inspire and guide Engineered Infection Prevention (EIP).

Our Vision

Safe spaces, free from pathogens.

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Engineered Infection Prevention (EIP)

Materials, technology & automation

designed to

reduce exposure to pathogens

Product of Canada

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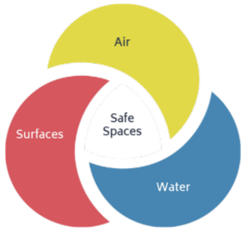
“Biologically Clean”



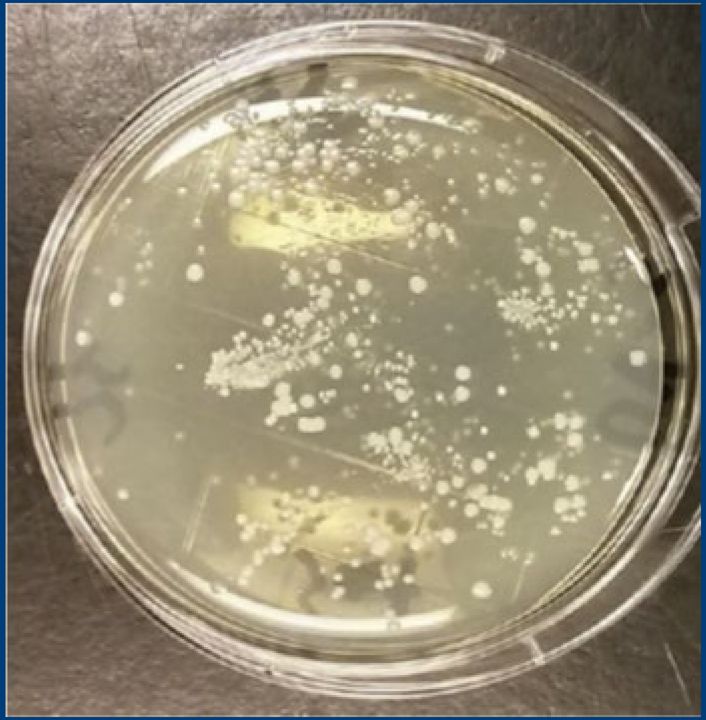
Up to **100X** cleaner than today

Biologically Clean Surfaces

(<0.5 CFU / cm²)

EIP

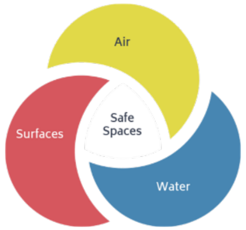
✓



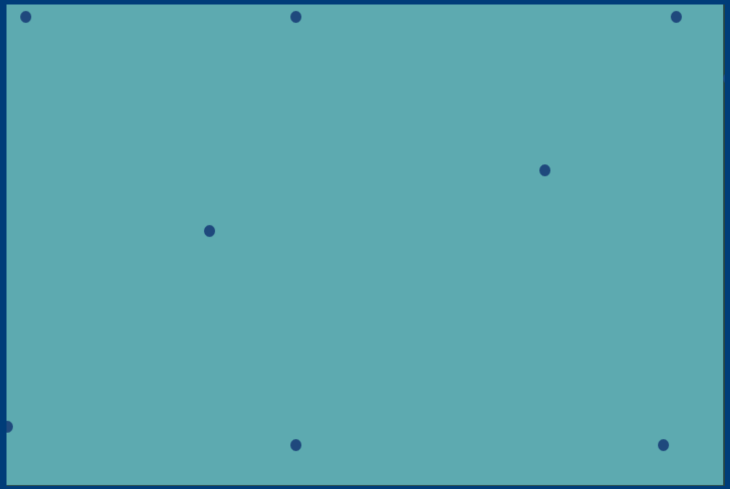
✗

Biologically Clean Air

(< 5 CFU / m^3)

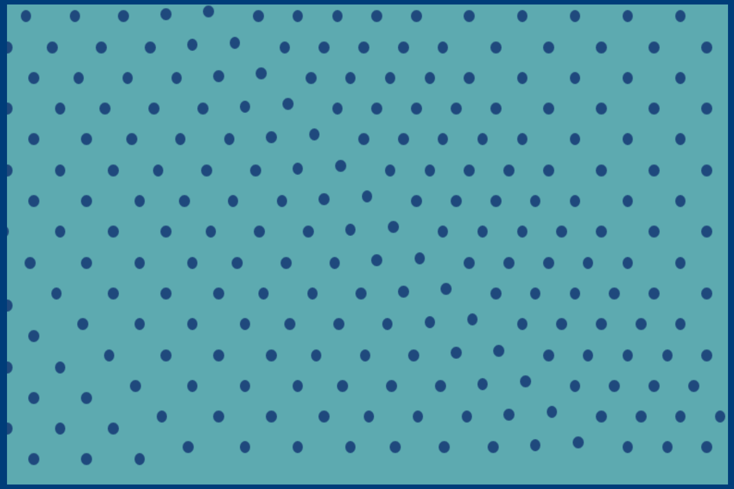


EIP



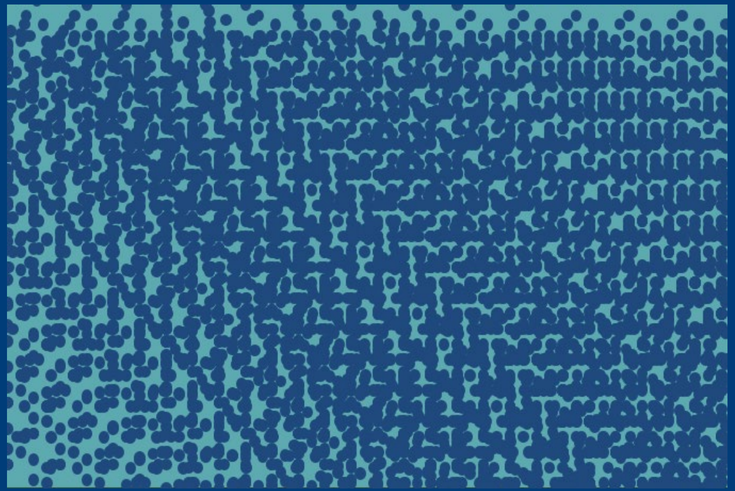
< 5 CFU/m3

✓



50 CFU/m3

X

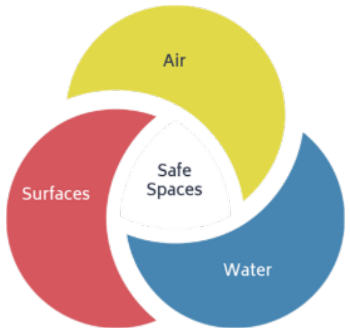


500 CFU/m3

X

New Hospital Builds

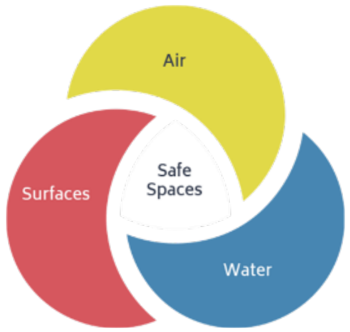
(CSA Z8000:24)



1. Engineered Infection Prevention (EIP) experts on the design team
2. Design hospital around infection control from the start
3. Follow Precautionary Principle
4. Use latest EIP technology
5. Informative UV Annex
6. Mandatory Cost – Benefit analysis of EIP

Existing Hospitals

(CSA Z317.12:25)



1. Engineered Infection Prevention (EIP) experts on the IPAC MDT
2. Compare EIP to traditional cleaning & disinfection
3. Follow Precautionary Principle
4. Use latest EIP technology
5. Informative UV Annex
6. Mandatory Cost – Benefit analysis of EIP

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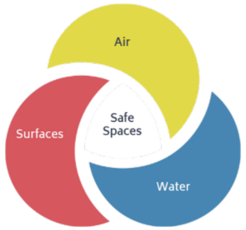
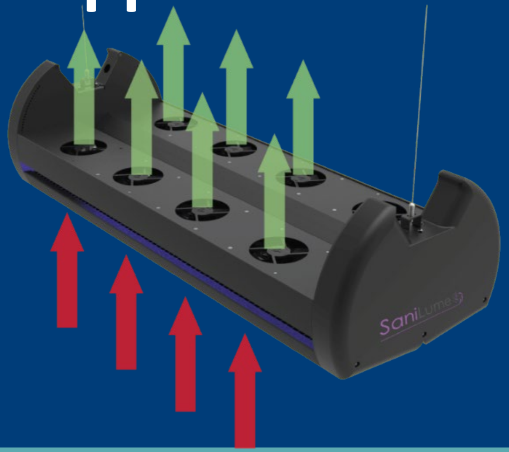
Engineered Infection Prevention (EIP)

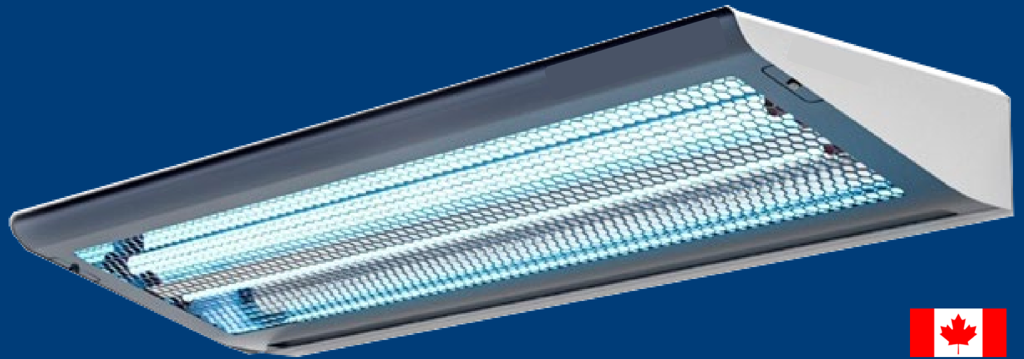


Upper Air GUV



Made in Canada

Self-disinfecting Rooms



Made in Canada

Self-disinfecting Surfaces

Made in Canada

Self-cleaning Sinks

Made in Canada

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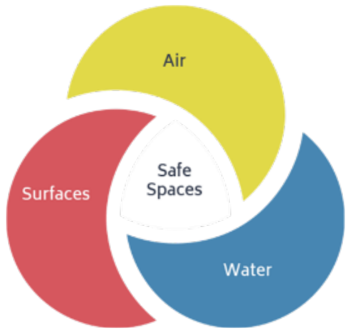
Daily Energy, GHG, Solid Waste, $



↑CFU = ↑ HAIs = ↑ ALOS

1. ALOS = 1 week
2. ALOS w HAI = 2 weeks
3. ALOS w MDRO HAI = 3 weeks

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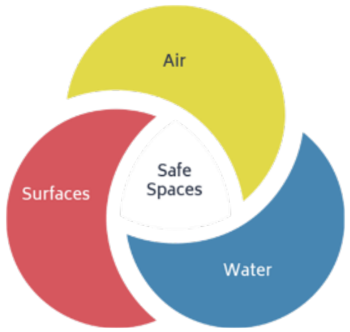
Universal Air Protection Rooms



1. 6^+ ACH

2. Choose at least one of:

Overhead extraction

Displacement ventilation

Upper Air UV

FarUV

23.2°C
583
aranet4
CO2 ppm
Rebreathed air %
3600
2800
2000
1200
800
600
420
8%
6%
4%
2%
1%
0.5%
0%
23.2°C 35
705
ppm CO2
aranet4

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Short Circuiting

1. Air Diffuser is only 24” from Exhaust Vent
2. Exhaust vent is on opposite side of room, away from patient
3. Particle / CO2 “Lock-up”

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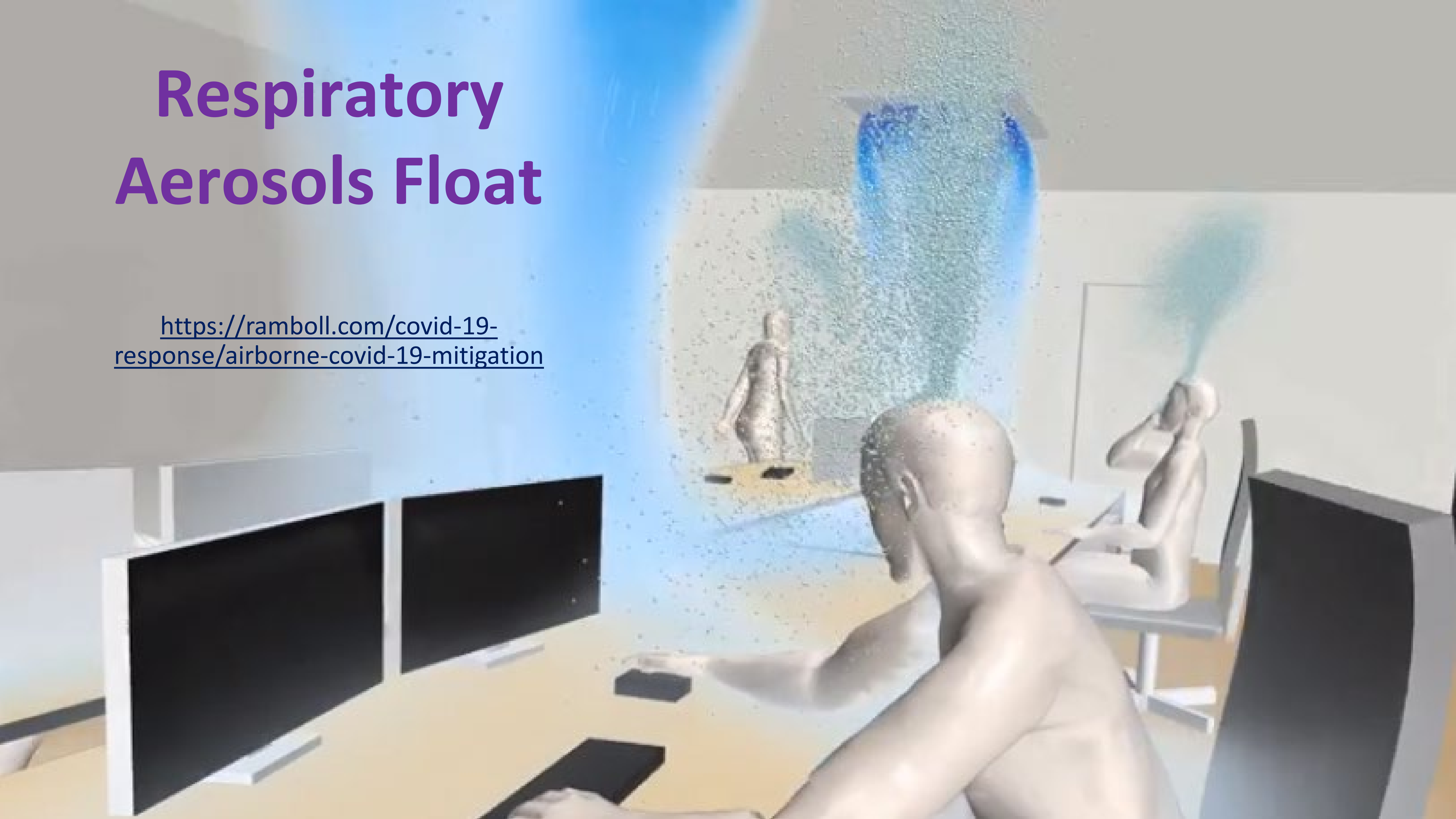
Universal Airborne Protection

(< 5 CFU / m^3)

CSA Z317.2	3 ACH	6 hours	Hallways, Common areas
	6 ACH	4 hours	Patient Room
	12 ACH	2 hours	AIIR
	20 ACH	1 hour	O.R.
EIP	Displacement	10 seconds	New Builds
	Extraction	10 seconds	New Builds
	Upper Air UV	10 seconds	Retrofits
	FarUV	10 seconds	Retrofits

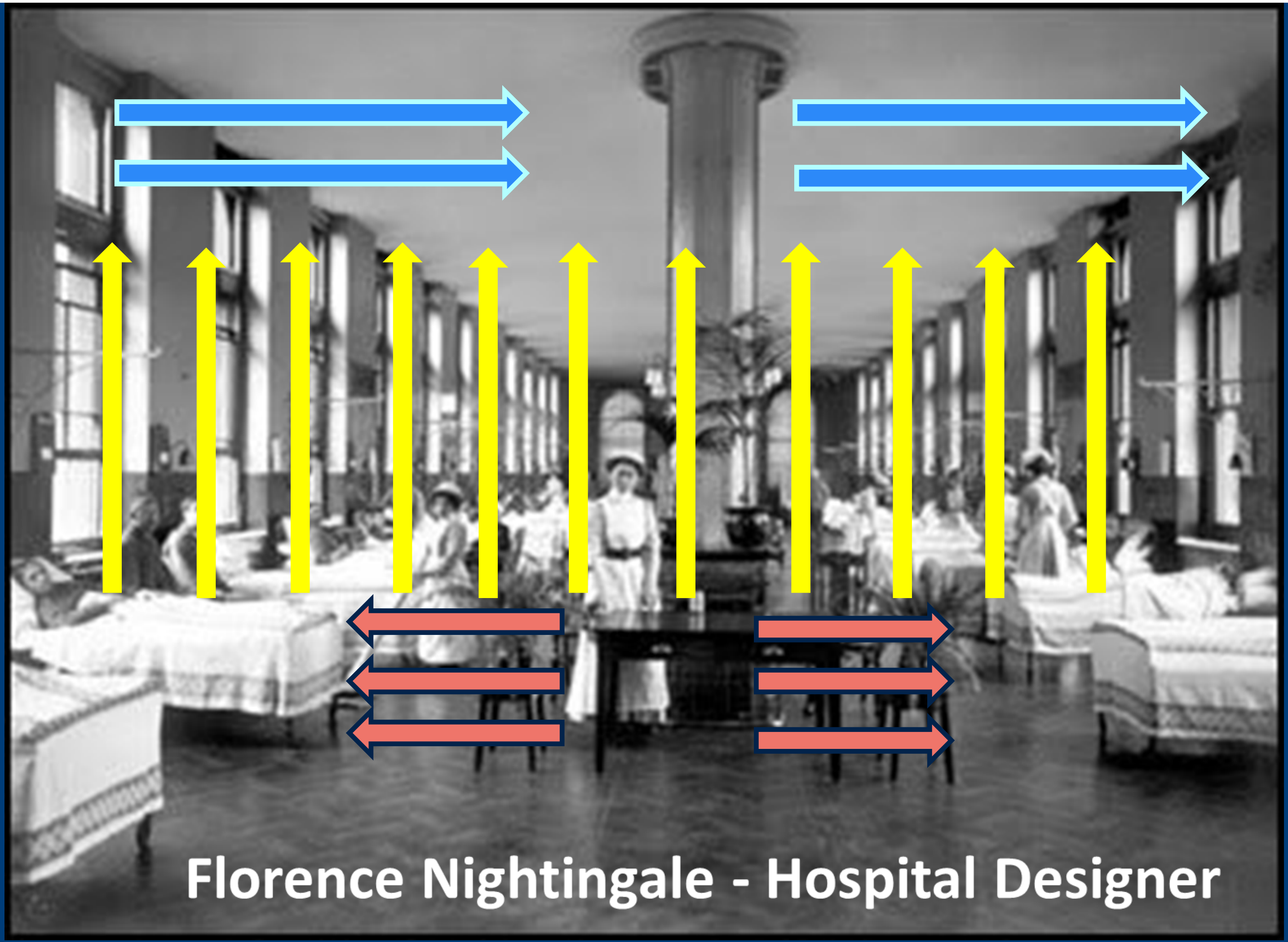
Respiratory Aerosols Float

https://ramboll.com/covid-19-response/airborne-covid-19-mitigation



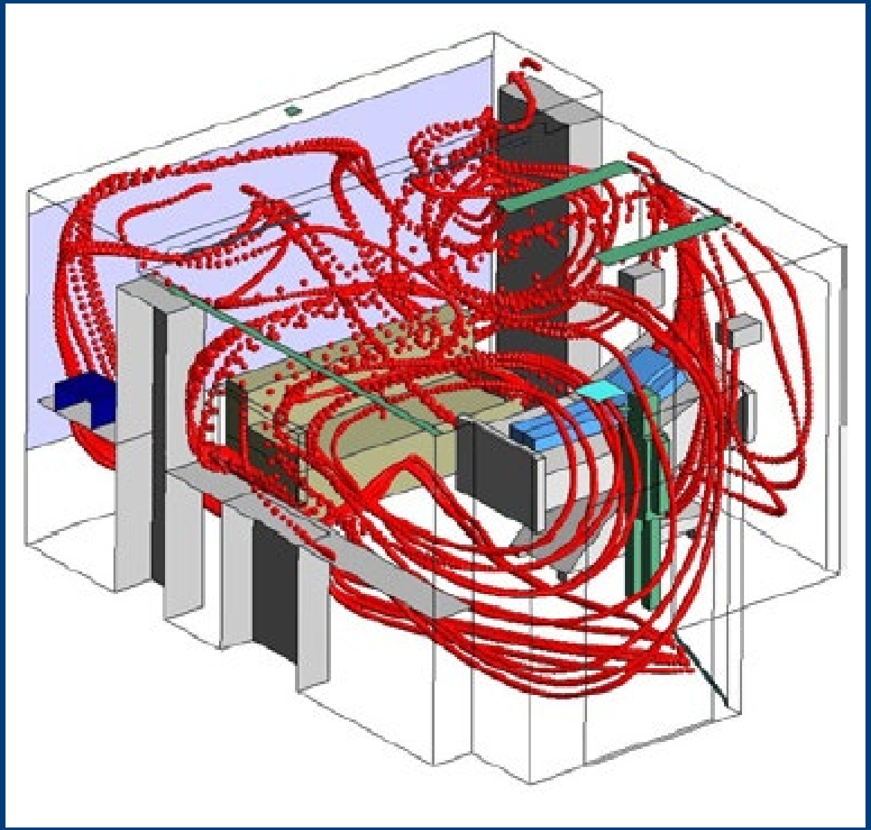
Displacement

1850s

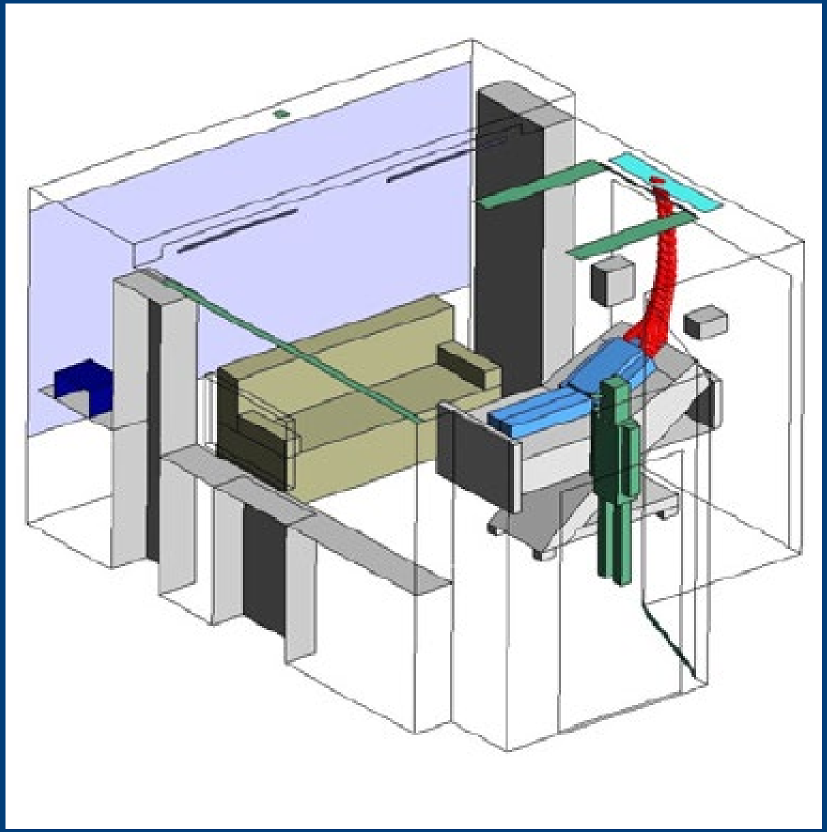



KISHOR KHANKARI
Ph.D., Fellow ASHRAE
President, AnSight LLC
Ann Arbor, MI
kishork@ansight.com

Extraction

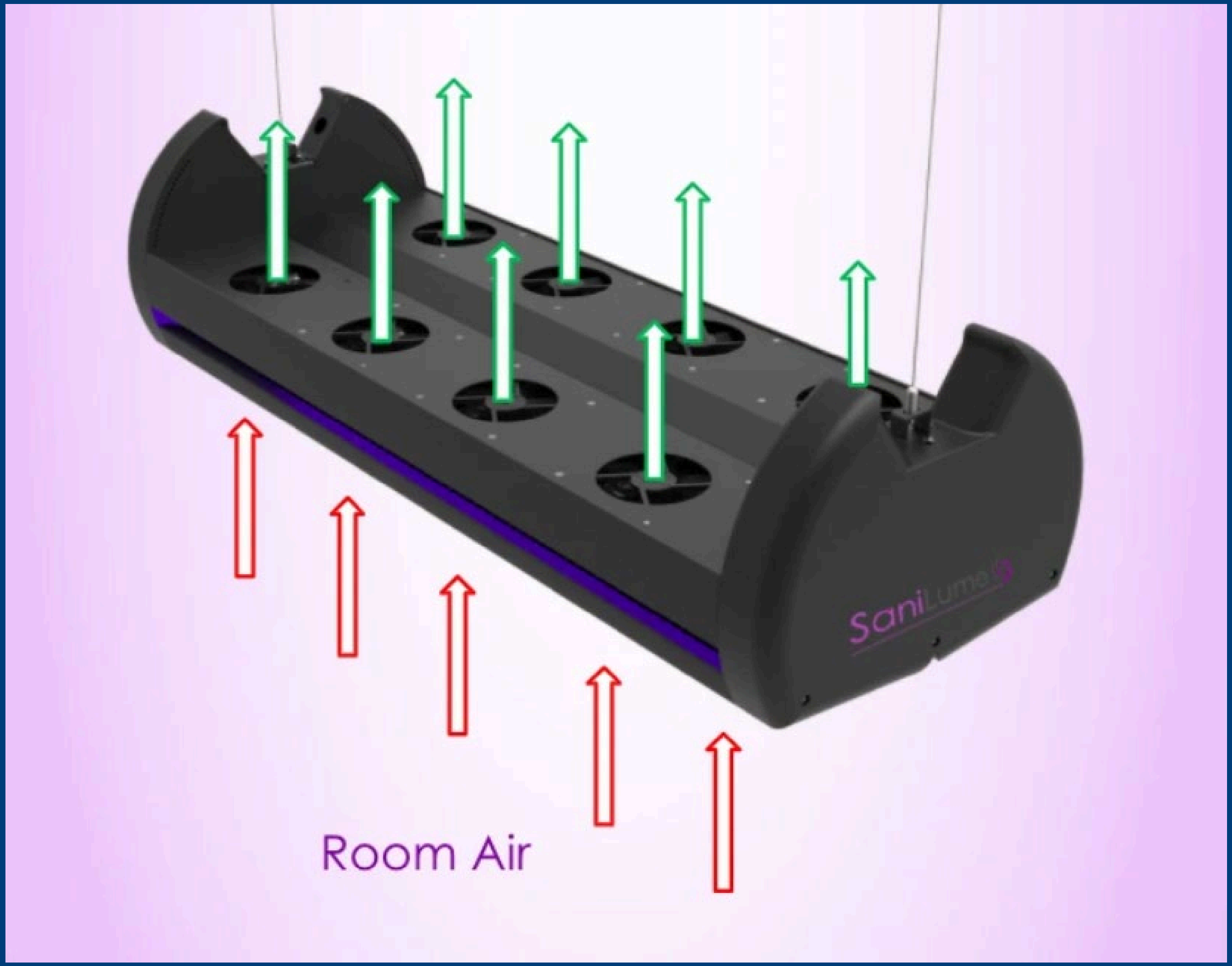


Typical



Extraction

Upper Air GUV



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Typical CFU/m^3

(50 to 500)

A typical patient room with 6 ACH in a modern hospital, bacterial concentrations generally range from 75-500 CFU/m^3. According to European Commission standards, levels below 50 CFU/m^3 are considered "very low," 50-100 CFU/m^3 is "low," 100-500 CFU/m^3 is "intermediate," and 500-2000 CFU/m^3 is considered "high"4. The WHO expert group considers bacterial loads less than 1000 CFU/m^3 as acceptable. CHAIR DOES NOT.

1. Che Noraini, M. J., Hafizah, J., Nurzafirah, M., & Siti Noor Syuhada, M. A. (2016). A study of microbe air levels in selected rooms of Hospital Sultanah Nur Zahirah, Kuala Terengganu. Malaysian Journal of Analytical Sciences, 20(5), 1072-1079. Found bacterial concentrations in patient rooms ranging from 75-278 CFU/m^3.

Abera, B., Adane, K., Mulu, W., Yizengaw, E., Tigabu, A., & Getaneh, A. (2024). Investigating Microbial Contamination of Indoor Air, Environmental Surfaces, and Medical Equipment in Jimma Medical Center, Southwest Ethiopia. Journal of Environmental and Public Health, 2024, 1266052 Reported mean bacterial counts in patient wards of 367 CFU/m^3

Różańska, A., Wójkowska-Mach, J., & Bulanda, M. (2021). Patient Safety Related to Microbiological Contamination of the Environment in Operating Theaters and Other Hospital Areas. International Journal of Environmental Research and Public Health, 18(7), 3781. Established that European Commission standards classify <50 CFU/m^3 as "very low" and 100-500 CFU/m^3 as "intermediate" contamination

Fekadu, S., & Getachewu, B. (2015). Microbiological Assessment of Indoor Air of Teaching Hospital Wards: A case of Jimma University Specialized Hospital. Ethiopian Journal of Health Sciences, 25(2), 117-122. Found mean bacterial counts in medical wards of 215 CFU/m^3 and noted WHO expert group considers <1000 CFU/m^3 as acceptable.

Cabo Verde, S., Almeida, S. M., Matos, J., Guerreiro, D., Meneses, M., Faria, T., Botelho, D., Santos, M., & Viegas, C. (2015). Microbiological assessment of indoor air quality at different hospital sites. Research in Microbiology, 166(7), 557-563. Reported bacterial concentrations in patient rooms between 101-500 CFU/m^3.

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*SARS-CoV-2

99% Inactivation

UV222: Approximately 1.2-1.7 mJ/cm^2

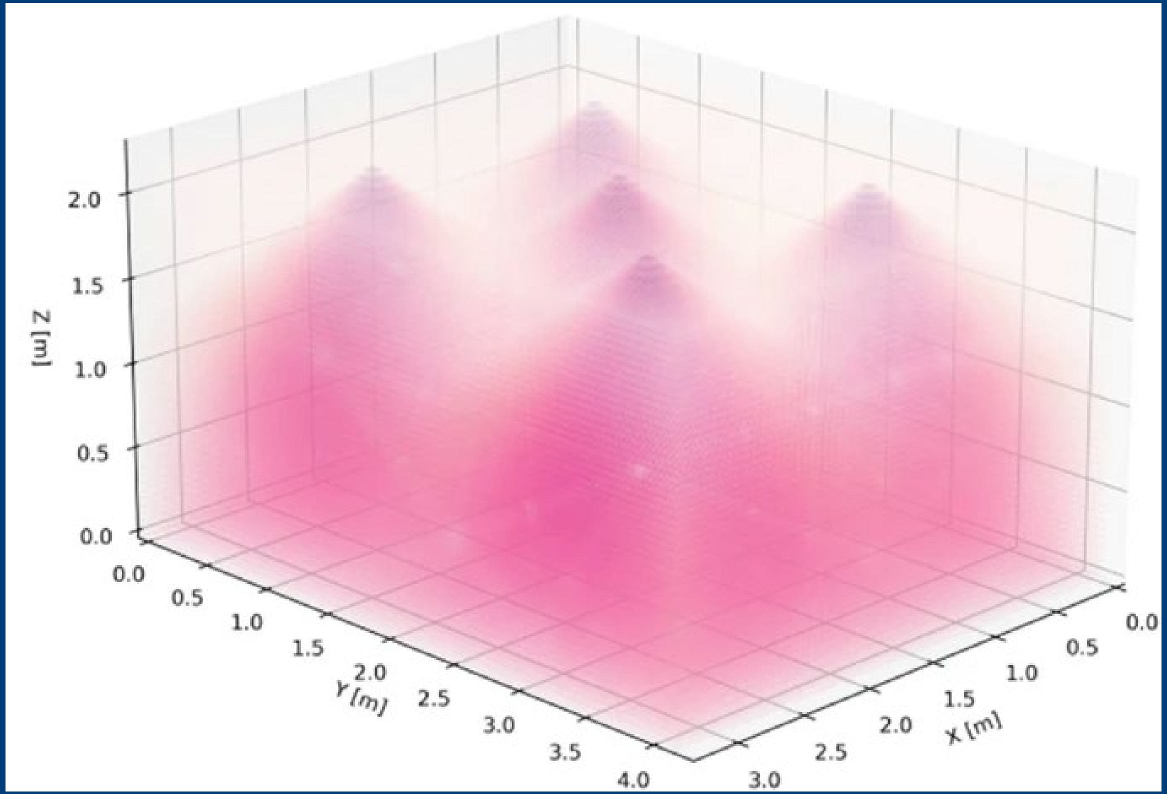
1. Buonanno M, Welch D, Shuryak I, Brenner DJ. Far-UVC light (222 nm) efficiently and safely inactivates airborne human coronaviruses. Sci Rep. 2020 Jun 24;10(1):10285. doi: 10.1038/s41598-020-67211-2. Erratum in: Sci Rep. 2021 Sep 27;11(1):19569. doi: 10.1038/s41598-021-97508-9. PMID: 32581288; PMCID: PMC7314750.

2. E. R. Blatchley III, B. Petri, and W. Sun, "SARS-CoV-2 UV Dose Response Behavior," Purdue University and Trojan Technologies, 2022. https://uvsolutionsmag.com/articles/2020/sars-cov-2-uv-dose-response-behavior/

UV254: Approximately 1.5 mJ/cm^2

1. Li, P., Koziel, J. A., Macedo, N., Zimmerman, J. J., Wrzesinski, D., Sobotka, E., Balderas, M., Walz, W. B., Paris, R. V., Lee, M., Liu, D., Yedilbayev, B., Ramirez, B. C., & Jenks, W. S. (2022). Evaluation of an Air Cleaning Device Equipped with Filtration and UV: Comparison of Removal Efficiency on Particulate Matter and Viable Airborne Bacteria in the Inlet and Treated Air. International Journal of Environmental Research and Public Health, 19(23), 16135. https://doi.org/10.3390/ijerph192316135

FarUV

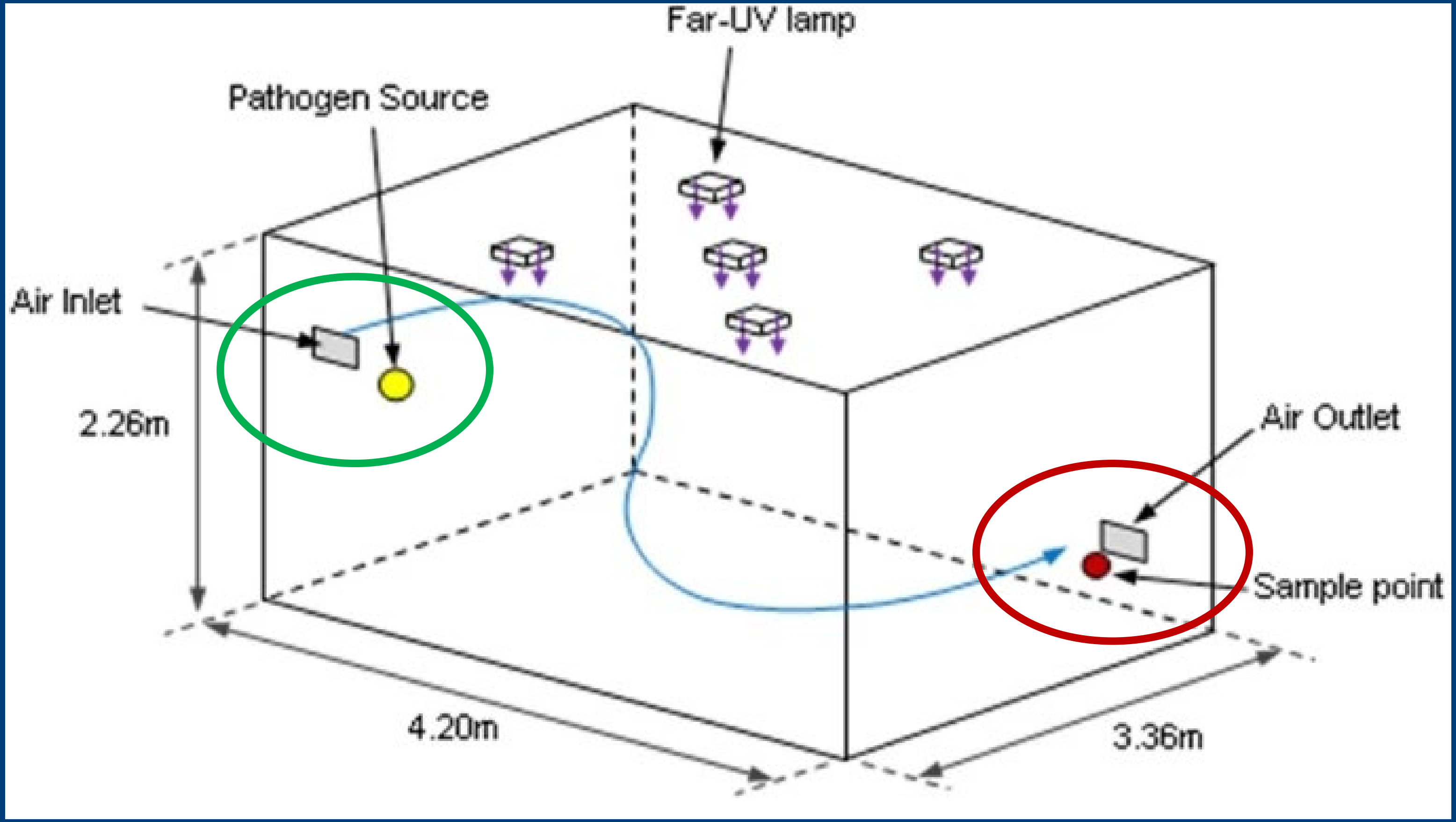


Eadie E, Hiwar W, Fletcher L, Tidswell E, O’Mahoney P, Buonanno M, et al. Far-UVC (222 nm) efficiently inactivates an airborne pathogen in a room-sized chamber. Scientific Reports. 2022;12(1):4373.

FarUV Exposure Reduction

(3 ACH, 5 x 11 W)

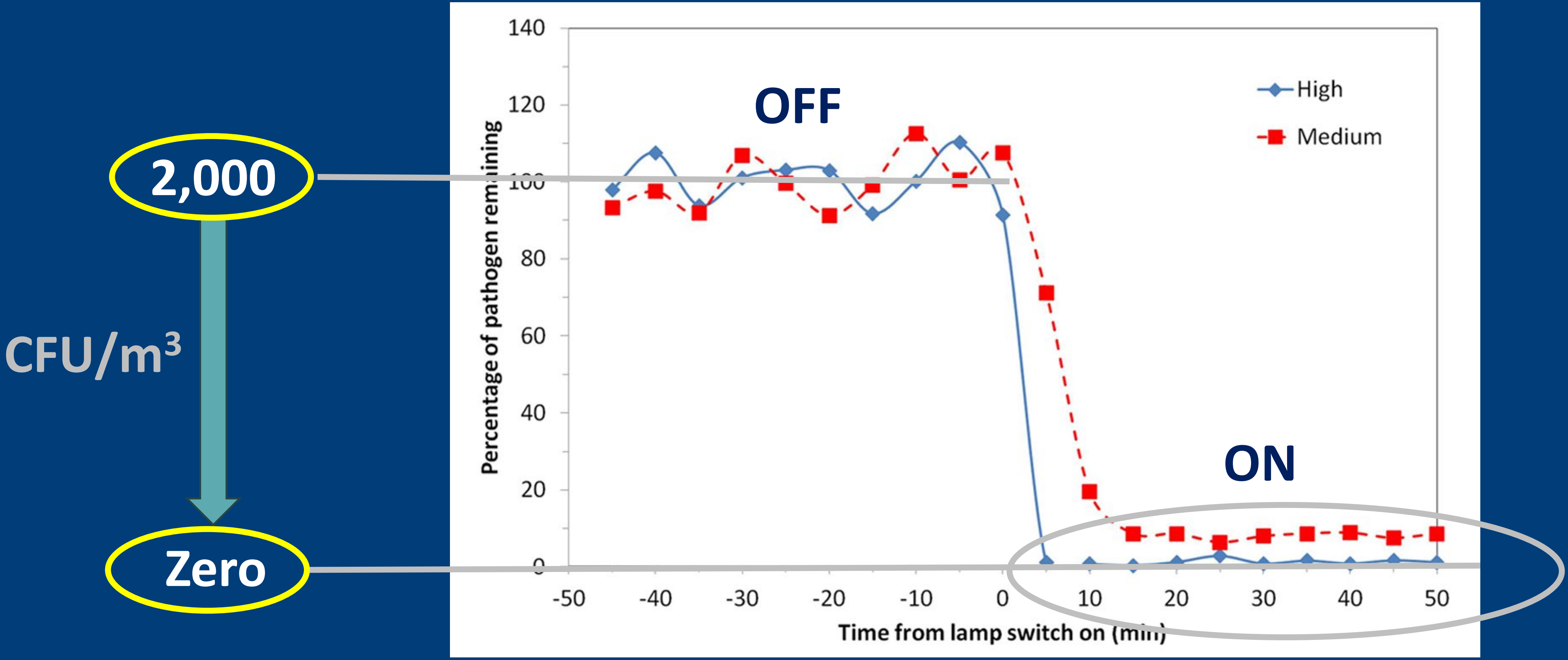
2,000 CFU/m³ in



X CFU/m³ out

Eadie E, Hiwar W, Fletcher L, Tidswell E, O'Mahoney P, Buonanno M, et al. Far-UVC (222 nm) efficiently inactivates an airborne pathogen in a room-sized chamber. Scientific Reports. 2022;12(1):4373.

FarUV Exposure Reduction



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Update

1. Cost-Benefit Analysis Standardization
2. National EIP Retrofit Proposal – Hospitals, Schools
3. Upper Air UV Studies - $10M, 2 Hospitals, 5 LTC
4. DiVE - Displacement Ventilation – CHES, CFD Studies, coalition of the willing
5. CSA Z317.2 – HVAC – DV, EV, Upper Air UV, FarUV; Cost-benefit Analysis
6. INHALE – new IAQ advocacy group

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1st Stage Cost Benefit - Upper Air

				%	COST
# of Hospital Beds	95,000	0	Bathroom AutoUV	50%	$0 million
Annual HAI %	10%	79,167	Upper Air UV	40%	$396 million
HAI Mortality Rate	5%	0	Self-Disinfecting Sinks	30%	$0 million
Avg Beds Per Room	1.2	0	Patient Room AutoUV	40%	$0 million
Est. # of Patient Rooms	79,167	0	Copper Overbed Tables & BedRails	40%	$0 million
ALOS - no HAI	7.0	0	Copper Toilet Seats	5%	$0 million
ALOS - with HAI	16	0	Copper Door Hardware	5%	$4 million
Avg Treatment Cost HAI	$20,000	$1.5 million	Annual Operating Cost per bed	40%	$0.4 billion
Reclaimed Beds	4,540		Environmental Contribution	80%	
			Patient Room Contribution	70%	

	Annually	30 Years
HAIs Prevented	103,563	3,106,898
Lives Saved	5,178	155,345
Additional In-Patients @ 90%	743,036	22,291,071
Savings - HAI Treatment	$2.1 billion	$62 billion
Value - Bed Availability	$6.8 billion	$204 billion
Total	$8.9 billion	$266 billion
Overall HAI Reduction	22%	

# In-Patients Before	4,953,571
# In-Patients After	5,696,607
Annual HAIs Before	577,920
Annual HAIs After	474,357

Payback
16
(Days)

ROI
666

5,779,167 Potential Annual Patient Stays

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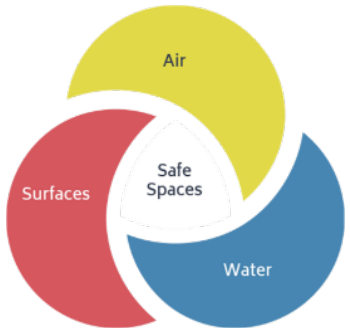
Cost Benefit Categories

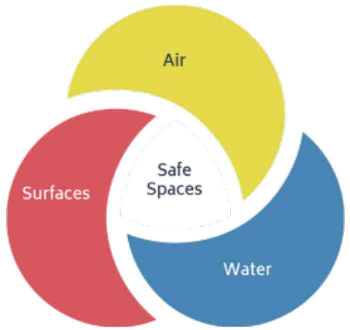


Healthcare Facility
Risk Reduction Estimate
ALOS
Treatment Cost
Bed Availability
Life Cycle Period

Process
Cost Savings of EIP Disinfection
Manual Disinfection Savings - Sinks
Manual Disinfection Savings - Overbed Tables
Manual Disinfection Savings - Bed Rails
Manual Disinfection Savings - Sinks
Manual Disinfection Savings - Bathrooms
Manual Disinfection Savings - Patient Rooms
Consumables Savings - Gowns
Consumables Savings - Gloves
Consumables Savings - ABHR
Consumables Savings - Chemicals
Time Savings - Contact Precautions
Time Savings - ABHR

Society
QALY / DALY
Cost of Social Services due to HAI
Cost of Healthcare due to HAI
Lost Family Income due to HAI
Additional Family Costs due to HAI
Lost Productivity to Business due to HAI
Lost tax revenue to country
Compounding Impact on Country P & L
Cost of Money over Life Cycle

Modelers, Economists Welcome!



Cost-Benefit Analysis Standardization