Clean Hospitals Day 2021: Why environmental hygiene is more important than ever

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World Health Organization (WHO) Service Delivery & Safety

Chair, Clean Hospitals

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Webber Training 20 Anniversary

www.webbertraining.com

October 20, 2021

Outline

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- Review of the importance of environmental hygiene in patient safety
- Clean Hospitals: project activities
- Results of a systematic review of interventions in the healthcare environment including their effect on key pathogens
- Development of a new framework and scoring system, and results of a global sentinel survey
- The cost and value of investing in environmental hygiene
- Clean Hospitals: perspectives

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The burden of healthcare-associated infections

- A silent pandemic
- at least 500,000 patients infected each day
- 16 million deaths every year
- NO healthcare system in the world has solved this problem
- > 50% of these infections are caused by contaminated hands

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COVID-19 sensitized the whole world to contact transmission

Hands and environment

Hands are a hyper-mobile prolongation of the environment

The good news?

Environmental hygiene and IPC awareness: never "waste" a pandemic…

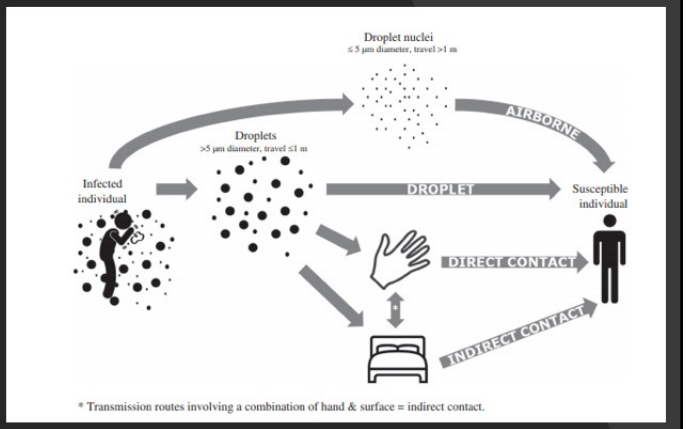

Figure from Otter et al. https://www.journalofhospitalinfection.com/article/S0195-6701(15)00367-9/fulltext

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Hand hygiene: alcohol-based handrub as standard of care has…

- Saved hundreds of millions of lives
- Saved billions of dollars
- Become a global movement and standard
- Been officially adopted in almost every country in the world (covering 98% of the world population)

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What is the WHO Multimodal Hand Hygiene Improvement Strategy?

Based on WHO Guidelines on Hand Hygiene in Health Care (2009)

Made up of **5 core elements,** to improve hand hygiene in health-care settings

System change
Alcohol-based handrubs at point of care and access to safe continuous water supply, soap and towels

Training and education
Providing regular training to all health-care workers

Evaluation and feedback
Monitoring hand hygiene practices, infrastructure, perceptions, & knowledge, while providing results feedback to health-care workers

Reminders in the workplace
Prompting and reminding health-care workers

Institutional safety climate
Individual active participation, institutional support, patient participation

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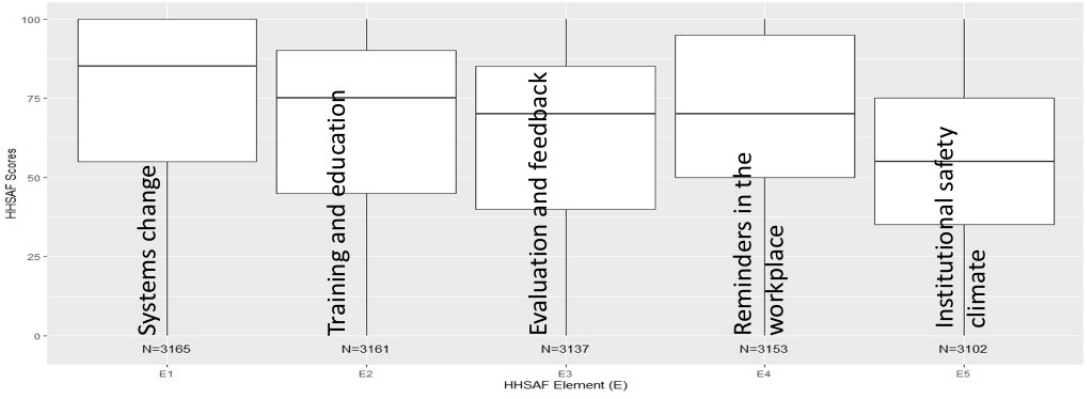
Worldwide hand hygiene implementation level monitored through the HHSAF*



Overall median score: 365, IQR 278 – 430 – Intermediate HH level

*Hand Hygiene Self-Assessment Framework, global WHO survey 2019

In press, *The Lancet Inf Dis*

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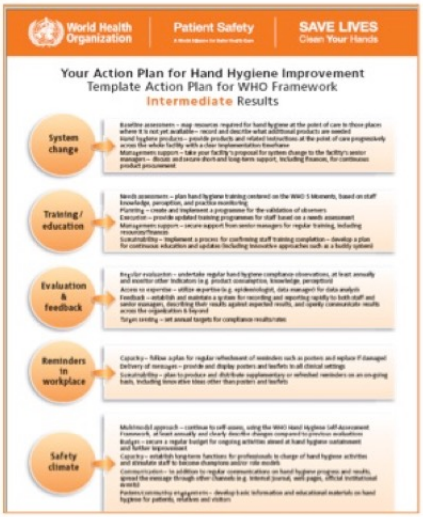
Continue to use the WHO Hand Hygiene Self-assessment Framework

Assessment → Action



www.who.int/gpsc/5may/hhsa_framework/ru/

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5 May

Annual WHO Hand Hygiene Day

For healthcare institutions
all over the world

Every year since 2009 …

5 May 2021

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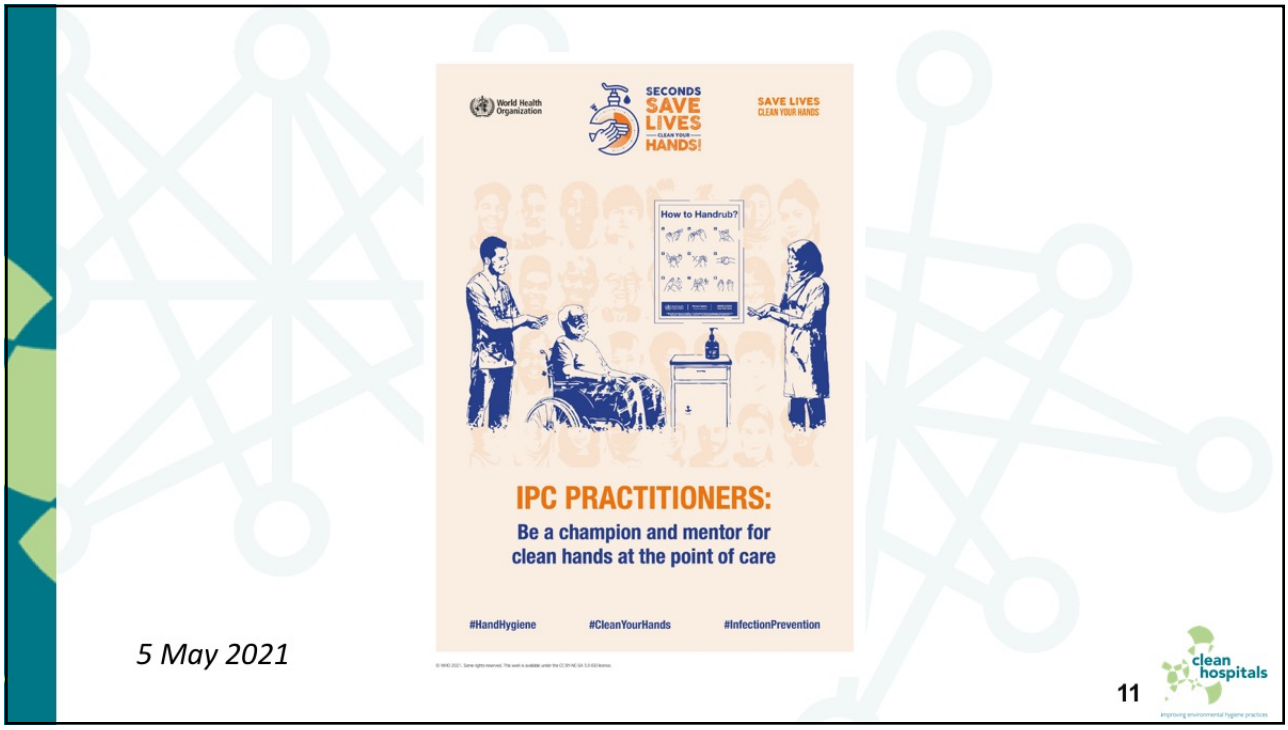

5 May 2021

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clean hospitals
improving environmental hygiene practices

5 May 2021

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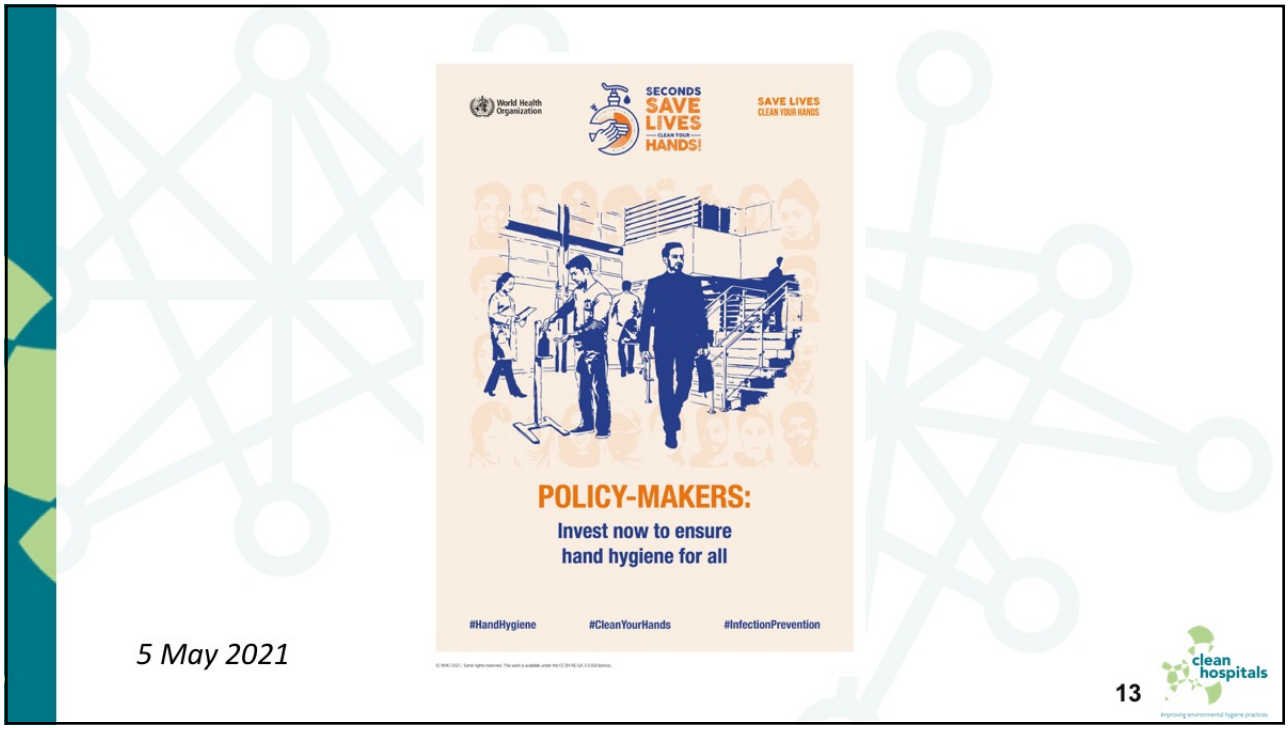
improving environmental hygiene practices


World Health Organization
SECONDS SAVE LIVES CLEAN YOUR HANDS!
SAVE LIVES CLEAN YOUR HANDS
POLICY-MAKERS:
Invest now to ensure hand hygiene for all
#HandHygiene
#CleanYourHands
#InfectionPrevention
5 May 2021
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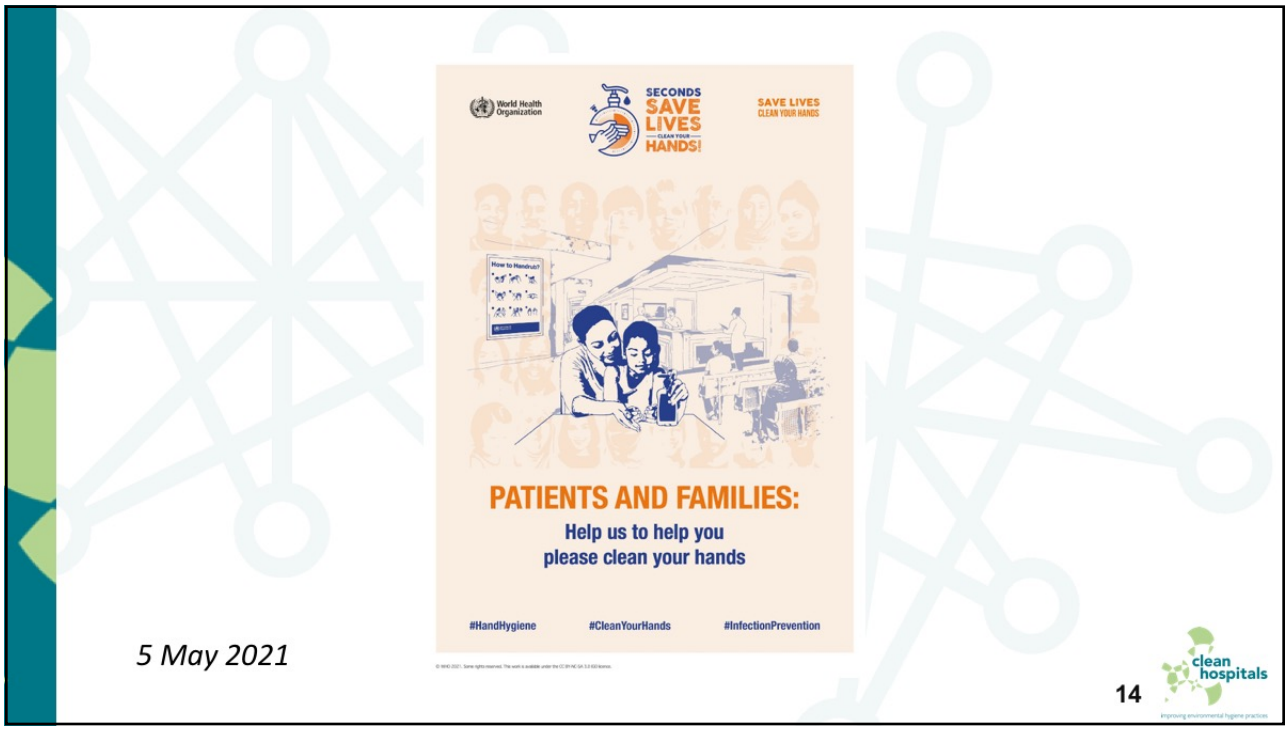
World Health Organization
SECONDS SAVE LIVES CLEAN YOUR HANDS!
SAVE LIVES CLEAN YOUR HANDS
How to Handrub?
PATIENTS AND FAMILIES:
Help us to help you please clean your hands
#HandHygiene
#CleanYourHands
#InfectionPrevention
5 May 2021
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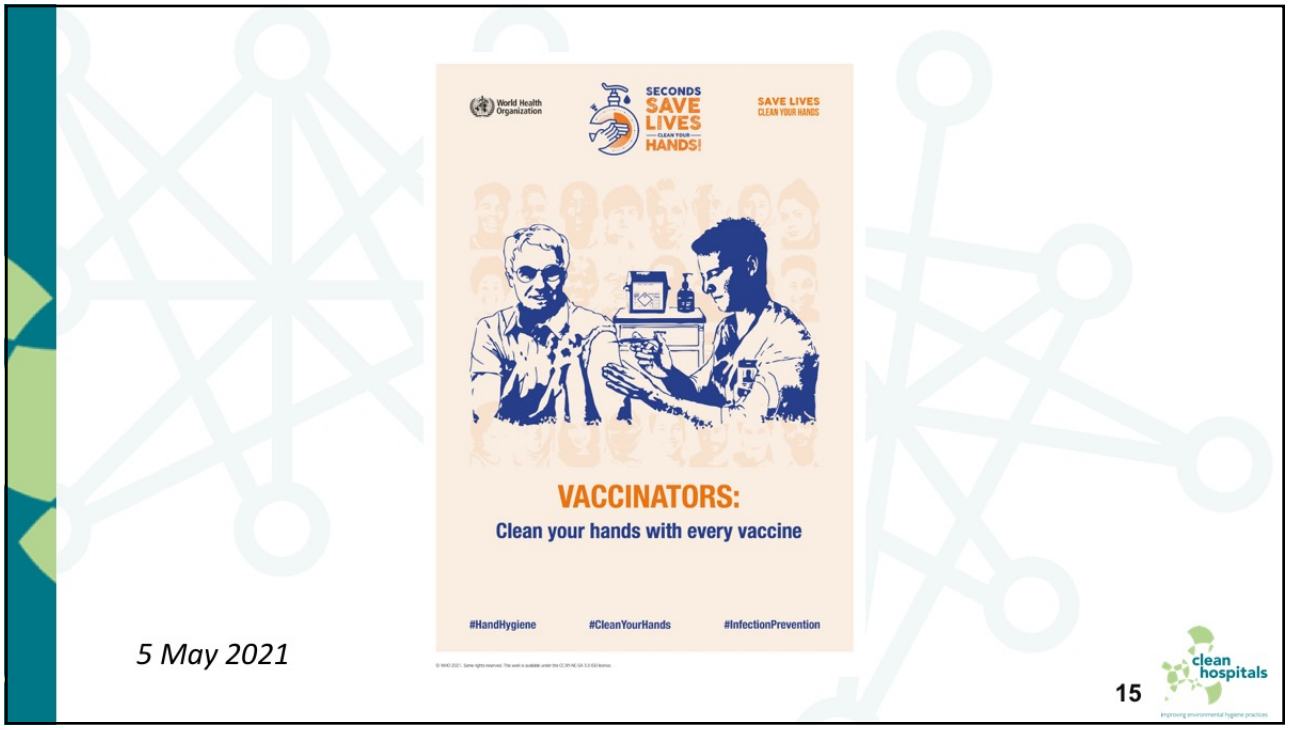

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improving environmental hygiene practices

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improving environmental hygiene practices

Poster version with masks (1)

5 May 2021

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Poster version with masks (2)

5 May 2021

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The last 25 years have …

- Shown that global change is possible for hand hygiene
- Given us a blueprint for how to replicate the model for environmental hygiene
  - Multimodal strategy
  - Adapt to Adopt
  - Self-assessment framework and associated tools

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Today's Challenge

Repeating this global movement for environmental hygiene

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Scope: Healthcare Environmental Hygiene (HEH) technical components

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Water management

Surface cleaning & disinfection

Laundry

Sterilization & device reprocessing

Air management

Waste management

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Scope: Healthcare Environmental Hygiene (HEH) human components

Workflow

Career development

Cost and value

Training

Monitoring

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The role of the environment in patient safety
A quick review of the evidence

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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]

HOW LONG DO NOSOCOMIAL PATHOGENS PERSIST ON INANIMATE SURFACES?

Kramer A, Schwebke I, Kampf G.
How long do nosocomial pathogens persist on inanimate surfaces?
A systematic review.
BMC Infect Dis. 2006;6:130. doi: 10.1186/1471-2334-6-130.

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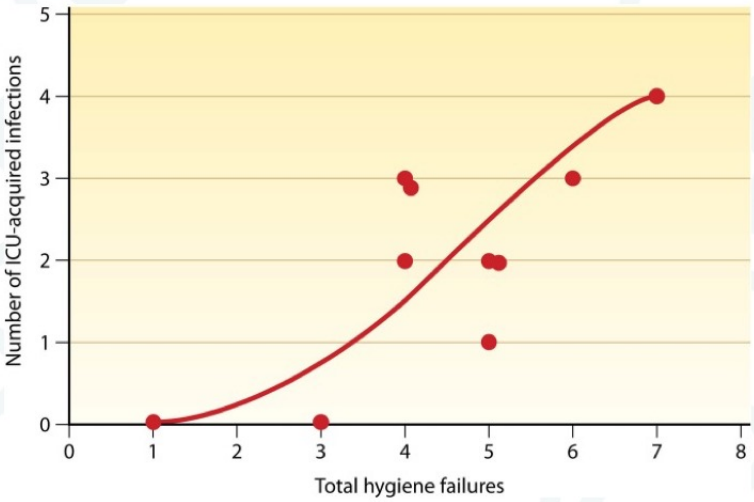
Relationship between environmental bioburden and hospital-acquired infections



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Dancer, S. J. Controlling Hospital-Acquired Infection: Focus on the Role of the Environment and New Technologies for Decontamination. Clin. Microbiol. Rev. 27, 665–690 (2014).

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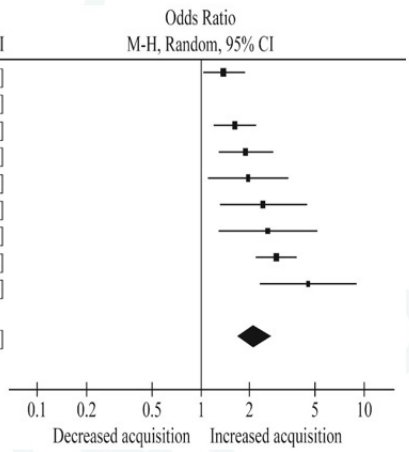
Risk of acquisition from prior room occupants by organism

Study or Subgroup	Decreased acquisition Events	Total	Control Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Huang (MRSA)	57	1454	248	8697	16.2%	1.39 [1.04, 1.86]
Nseir (ESBL producing Gram neg)	8	50	50	461	0.0%	1.57 [0.70, 3.52]
Huang (VRE)	58	1291	256	9058	16.2%	1.62 [1.21, 2.16]
Ajao (Klebsiella sp. or Escherichia coli)	32	648	235	8723	14.2%	1.88 [1.29, 2.74]
Nseir (Pseudomonas)	21	85	61	426	10.4%	1.96 [1.12, 3.45]
Drees (VRE)	19	138	31	500	9.7%	2.42 [1.32, 4.43]
Shaughnessy (Clostridium difficile)	10	91	77	1679	8.3%	2.57 [1.28, 5.15]
Mitchell (MRSA)	74	884	163	5344	16.4%	2.90 [2.18, 3.86]
Nseir (Acinetobacter)	16	52	41	459	8.6%	4.53 [2.32, 8.86]
Total (95% CI)		4643		34886	100.0%	2.14 [1.65, 2.77]
Total events	287		1112			

Heterogeneity: $Tau^2 = 0.09$; $Chi^2 = 21.32$, df = 7 (P = 0.003); $I^2 = 67\%$
Test for overall effect: Z = 5.74 (P < 0.00001)



Mitchell, B. G., Dancer, S. J., Anderson, M. & Dehn, E. Risk of organism acquisition from prior room occupants: a systematic review and meta-analysis. *J. Hosp. Infect.* 91, 211–217 (2015).

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Identifying the need

- The healthcare environment remains a major gap in IPC
- We need to address silos and fragmentation in the field
- Clean Hospitals' official launch was at "Interclean 2018"

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What is Clean Hospitals?

A coalition of international stakeholders who work explicitly to promote and support healthcare environmental hygiene

- research
- publications
- participation in conferences and events
- education and training
- specialized working groups

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improving environmental hygiene practices

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Clean Hospitals brought together academia and industry to:

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- Champion the science, the best practices and evidence- based solutions
- Create a network where project members can exchange and collaborate
- Create a platform from which to bring healthcare environmental hygiene into the spotlight

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Our mission

To reduce the burden of healthcare-associated infections all around the world by improving environmental hygiene practices

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2020 in Numbers

A very busy year despite COVID-19!

9 Peer reviewed publications

7 Other publications

3 Conferences in person

3 Conferences remotely

3 Teleclasses and Webinars

CH Day Teleclass: **21,000** live attendees and **77,109** on-demand attendees

Teleclass on COVID and Fake News: **38'000** attendees during live sessions

1 Global Clean Hospitals Day

1 Book chapter

+ **100s** of citations

+ **over 45** updates and short publications/ news items on the website

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Clean Hospitals publications in the last 2 years:

Peters A, Lotfinejad N, Palomo,R et al. **Decontaminating N95/FFP2 masks for reuse during the COVID-19 epidemic: a systematic review**. Antimicrob Resist Infect Control (In press)

Peters, A., Palomo, R., Ney, H. et al. "**The COVID-19 pandemic and N95 masks: reusability and decontamination methods"**. Antimicrob Resist Infect Control 10, 83 (2021).

Peters, A. Guitart C., Pittet D. "**Addressing the global challenge of access to supplies during COVID-19: Mask reuse and local production of alcohol-based handrub"** *Environmental and Health Management of Novel Coronavirus Disease (COVID-19).* Elsevier. Dehghani et al. Ed. 2021.

Peters A, Frat E, Iten A, Sauser J, Schibler M, Pittet D. **"Alcohol-based hand rub and influenza A: the danger of publishing a flawed study with no clinical relevance"**. *J Hosp Infect*. 104:1, p120-122, Jan 2020.

Peters A, Vetter P, Guitart C, Lotfinejad N, Pittet D. "**Understanding the emerging coronavirus: what it means for health security and infection prevention"**. *J Hosp Infect*. 104:4, p440-448, March 2020.

Peters A, Parneix P, Otter J, Pittet D. **Putting some context to the aerosolization debate around SARS-CoV-2**. *J Hosp Infect*. 2020;105(2):381-382.

33

Clean Hospitals publications in the last 2 years (2):

Peters A. Buetti, N. Harbarth S., Pittet D. **Der schadliche Effekt von Falschinformationen.** Swissnoso. Swiss Federal Office for Public Health (OFSP/ BAG). Nov. 2020.

Peters, A and Pittet, D. "**COVID-19 and health care environmental hygiene**". *MJA Insight*. 27 July 2020.https://webcache.googleusercontent.com/search?q=cache:YbdjlWUO3qQJ:https://insightplus.mja.com.au/2020/29/covid-19-and-health-care-environmental-hygiene/+&cd=2&hl=en&ct=clnk&gl=us

Otter, J. **Exploring SARS-CoV-2 hospital surface and air contamination in London**. *Reflections in IPC.* July 8, 2020. https://reflectionsipc.com/2020/07/08/exploring-sars-cov-2-hospital-surface-and-air-contamination-in-london/

Peters, A and Pittet, D. "**Clean Hospitals answers to a widely shared piece of fake news about alcohol-based handrub**". Press Release. *Clean Hospitals.* Sept 2020. https://cleanhospitals.com/2020/09/09/clean-hospitals-answers-as-a-network-to-a-misinformation-case/

Peters, A. "**The Impact of misinformation and fake news on public health during COVID-19**". Policy Brief. *Clean Hospitals.* Sept 2020. https://cleanhospitals.com/2020/09/30/policy-brief-the-impact-of-misinformation-and-fake-news-on-public-health-during-covid-19/

Hajjar, J., Parneix P. **Nonmedical fabric face masks: Why? When? And how?** Health& Co. Oct, 2020. https://www.hygienes.net/boutique/hygienes-2/nonmedical-fabric-face-masks-why-when-and-how/

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Clean Hospitals publications in the last 2 years (3):

Bervas, C., Parneix P. "**Dossier : Communication & formation – Infox : le défi des médias sociaux et du web.** Health& Co. Dec, 2020. https://www.hygienes.net/boutique/hygienes-2/nonmedical-fabric-face-masks-why-when-and-how/

Lepelletier D, Grandbastien B, Keita-Perse O, Parneix P, et al. "**Is unidirectional airflow in operating theater still recommended to reduce surgical site infections? The French point of view through the recent international literature"**. Infect Control Hosp Epidemiol. 2019 Mar;40(3):384-385.

Peters A, Pittet D. **Influenza and alcohol-based handrub: the danger of ignoring clinical relevance**. *mSphere*. 4:6, Nov/Dec 2019.

Pasquarella C, Agodi A., Auxilia F, Lytsy B, Mura I, Parneix P, et al. "**Air quality in the operating theatre: a perspective".** Aerobiologia 2019 36(Suppl. C) DOI: 10.1007/s10453-019-09584-0

Peters A, Otter J, Parneix P, Moldovan A, Tartari E, Kemmer M, Voss A, Pittet D. "**Clean Hospitals - transforming patient safety. A White Paper**." *European Cleaning Journal.* 17 Sept, 2019. http://www.europeancleaningjournal.com/magazine/articles/special-features/clean-hospitals-transforming-patient-safety-a-white-paper

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Clean Hospitals Day 2020

- 2020 was specifically focused on COVID-19
- Videos
- Webber teleclass
  (21,000 attendees live session and 77,109 on-demand)
- Webinars
- Industry involvement
- Social media

https://CleanHospitals.com/clean-hospitals-day/

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Clean Hospitals Day Programme – 20 October

10:00 – 12:30 CET	**INDEX™** *Keynote by Prof. Pittet*
13:30 – 18:00 CET	**1st Clean Hospitals Digital Day**
19:30 – 20:30 CET	**Webber Teleclass**

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INDEX™

- Largest global meeting place for the nonwovens market
  https://www.indexnonwovens.com/en/
- Infection Prevention Seminar
  - 10:00 – 10:45: keynote by Prof. Pittet
  - 10:45 – 12:10: Innovation consortium moderated by Prof. Pittet
  - https://www.indexnonwovens.com/en/pages/programme-1231#prevention-programme

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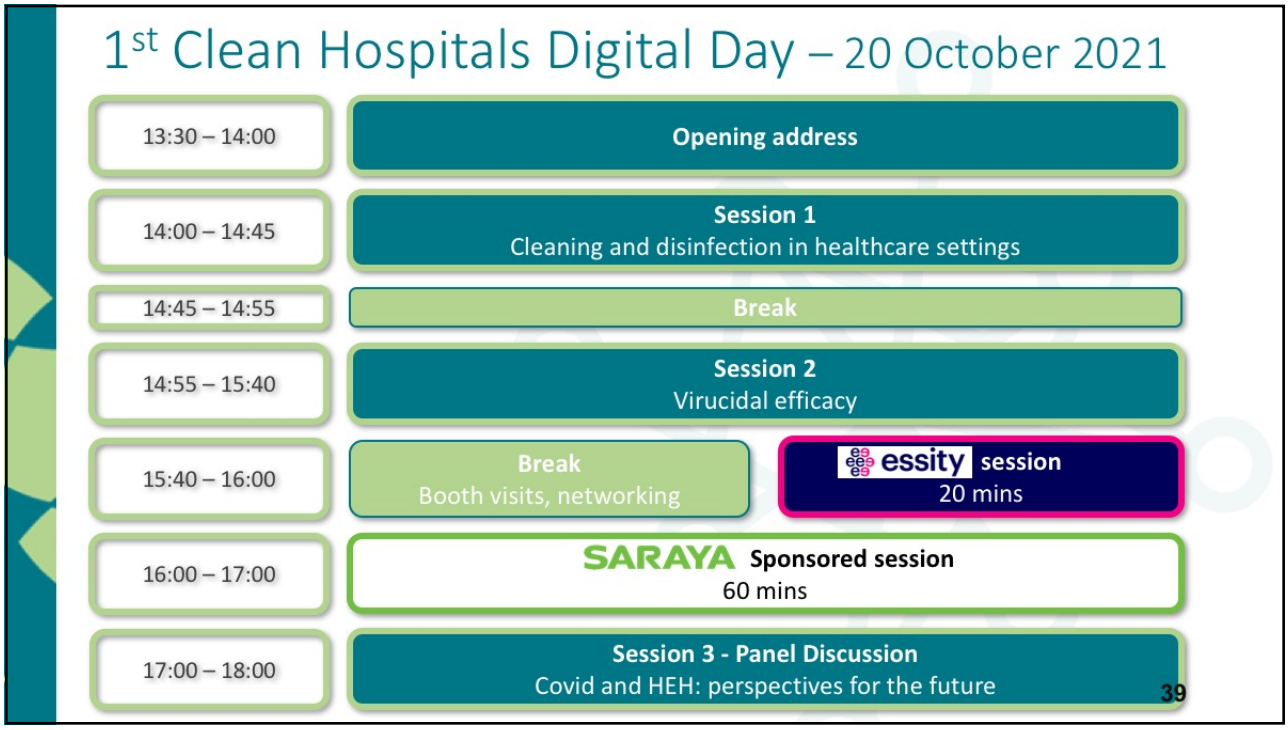
1st Clean Hospitals Digital Day – 20 October 2021
13:30 – 14:00
Opening address
14:00 – 14:45
Session 1
Cleaning and disinfection in healthcare settings
14:45 – 14:55
Break
14:55 – 15:40
Session 2
Virucidal efficacy
15:40 – 16:00
Break
Booth visits, networking
essity session
20 mins
16:00 – 17:00
SARAYA Sponsored session
60 mins
17:00 – 18:00
Session 3 - Panel Discussion
Covid and HEH: perspectives for the future
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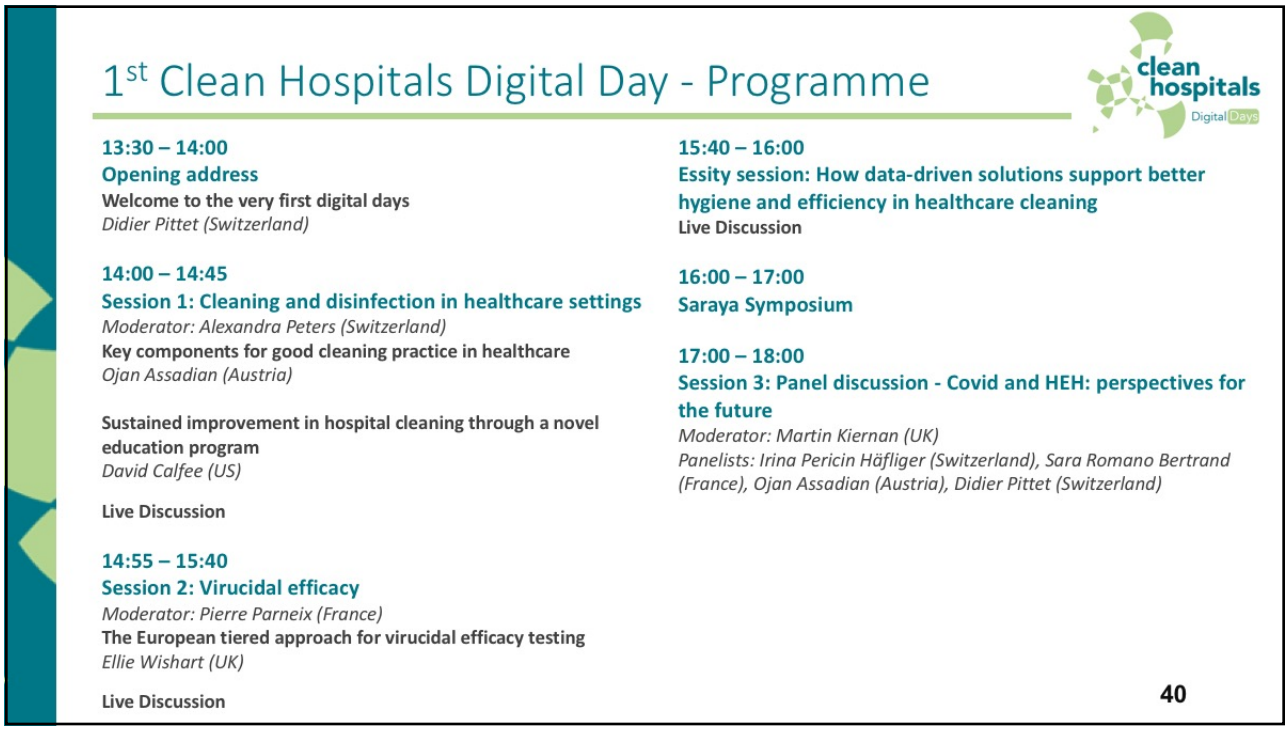
1st Clean Hospitals Digital Day - Programme
clean hospitals Digital Days
13:30 – 14:00
Opening address
Welcome to the very first digital days
Didier Pittet (Switzerland)
14:00 – 14:45
Session 1: Cleaning and disinfection in healthcare settings
Moderator: Alexandra Peters (Switzerland)
Key components for good cleaning practice in healthcare
Ojan Assadian (Austria)
Sustained improvement in hospital cleaning through a novel education program
David Calfee (US)
Live Discussion
14:55 – 15:40
Session 2: Virucidal efficacy
Moderator: Pierre Parneix (France)
The European tiered approach for virucidal efficacy testing
Ellie Wishart (UK)
Live Discussion
15:40 – 16:00
Essity session: How data-driven solutions support better hygiene and efficiency in healthcare cleaning
Live Discussion
16:00 – 17:00
Saraya Symposium
17:00 – 18:00
Session 3: Panel discussion - Covid and HEH: perspectives for the future
Moderator: Martin Kiernan (UK)
Panelists: Irina Pericin Häfliger (Switzerland), Sara Romano Bertrand (France), Ojan Assadian (Austria), Didier Pittet (Switzerland)
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1st Clean Hospitals Digital Day – Saraya Symposium

Hand hygiene challenges in the community and healthcare settings during Covid-19: alcohol-based handrub as a game changer

16:00 – 16:05
Introduction
Didier Pittet (Switzerland)

16:05 – 16:20
Use and perception of alcohol-based handrubs in the community and healthcare settings
Pierre Parneix (France)

16:20 – 16:35
Are alcohol-based handrubs efficacious against Covid-19 ? How about quality control and cost-effectiveness ?
Fernando Bellissimo-Rodriguez (Brazil)

16:35 – 16:50
Local production of alcohol-based handrub: a perfect exemple ready for prime time in Uganda, Africa
Hiroki Saito (Japan)

16:50 – 17:00
Q&A / Round table discussion
Moderator: Didier Pittet (Switzerland)

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2nd Clean Hospitals Digital Day – 7 Dec 2021

Preliminary Programme

Session 1:
Lessons learnt from the REACH study

The REACH cleaning bundle: method and results
Brett Mitchel (Australia)

Evaluating bio-burden of frequently-touched surfaces using ATP method
Greg Whiteley (Australia)

Live Discussion

Session 2: Air treatment and purification

A systematic review of the evidence on air filtration and recirculation
Ehsan Mousavi (US)

Effectiveness of air cleaners for removal of virus-containing respiratory droplets
TBC

Live Discussion

Session 3: Panel discussion

How to promote sustainable innovation in the field of healthcare environmental hygiene
Panelists to be determined

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Support for very low and low-income countries

- In partnership with the Webber Teleclass and Paul Webber
- To support professionals from very low and low-income countries (VL-LIC) to participate to the Clean Hospitals Digital Days
- Funding for the support for VL-LIC participants: 2,000€ per company
- Special conditions for middle-income countries
- Current database includes more than 100'000 healthcare providers and others from all countries around the world

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Clean Hospitals Digital Days Sponsors

Clean Hospitals is grateful for the contribution of the below sponsors:

B|BRAUN

essity Tork, an Essity brand

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Clean Hospitals Day : Posters

- Posters that can be used all year long
- You can adapt them to local languages and needs
- Encourage discussion and Environmental Services staff empowerment

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Clean Hospitals Day : Posters

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Clean Hospitals Day : Posters

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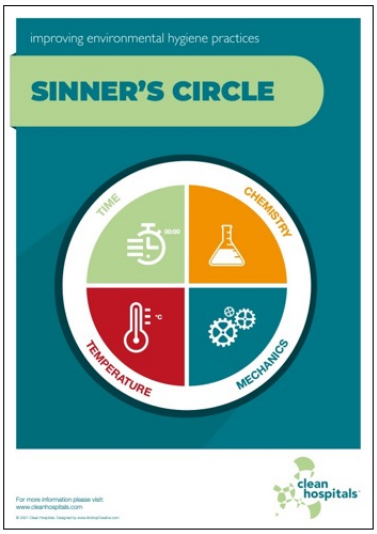
Clean Hospitals Day : Posters



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Are cleaner hospitals REALLY safer hospitals?
(and why perform a systematic review on this question?)

?

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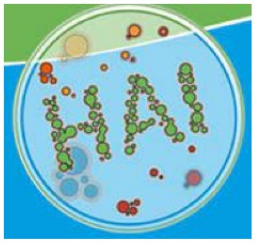
Contaminated hands cause at least 50% of HAI
Relatively little is known about the remaining %

There are few high-quality studies that link HEH interventions to a reduction in either patient colonization or healthcare-associated infections (HAI)

HEH is an often neglected field, and healthcare facilities tend not to invest sufficiently in environmental hygiene

Though there are many reasons for this, one is the lack of literature into the role that HEH plays in patient safety



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A systematic review of the effects of interventions in the healthcare environment

Design and methods:

Primary outcome: comparison of the measure of patient colonization or HAI compared to baseline

Secondary outcome: reduction in environmental bioburden

Databases: PubMed and Web of Science

Dates: papers until December 30, 2019 (COVID outbreak)

Exclusion criteria: in vitro studies, different outcome, hand hygiene intervention in parallel, outbreaks, complete structural rebuilds

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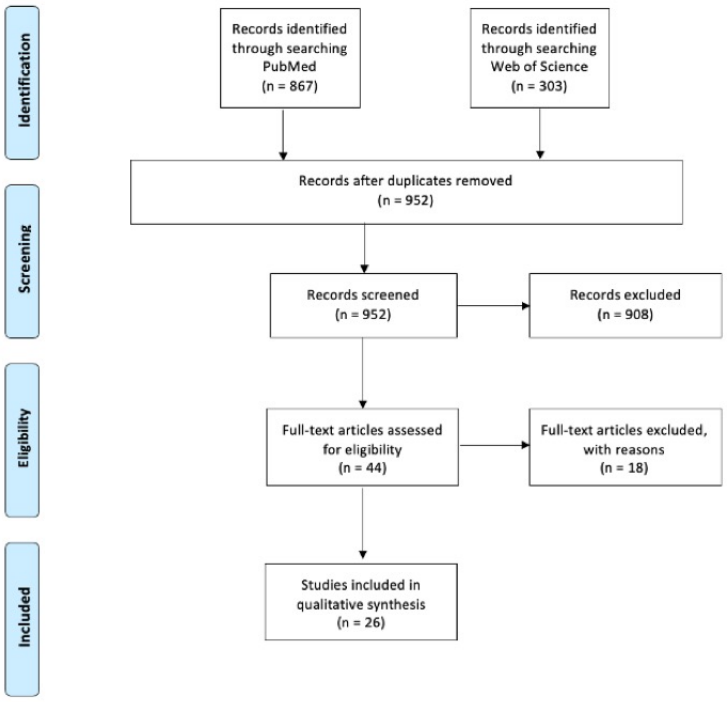
PRISMA flow chart



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A systematic review of the effects of interventions in the healthcare environment

Overall results

Primary outcome: Most interventions showed a reduction in colonization/HAI

- 88% (23/26) of studies showed a decrease in colonization or HAI for at least one of the organisms tested
- 58% of studies showed a significant decrease in colonization or HAI for all microorganisms tested

42% were of good quality according to scoring

81% of study interventions were recommended by the authors. Studies often were not powered adequately to measure significant reductions

Secondary outcome: all studies that analyzed bioburden showed a reduction in bioburden

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A systematic review of the effects of interventions in the healthcare environment

Information extracted from studies

- Study title
- Year
- Authors
- Study design
- Interventions
- Sample size (patients/proxy)
- Control
- Microorganisms studied
- Outcome
- Author recommendation
- Quality score
- Grade
- Reduction in bioburden
- Comments

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A systematic review of the effects of interventions in the healthcare environment

What about quality?

Overall: high-quality studies are rare

- 5/26 were RCTs
- 6/26 had a true control

Difficult to adapt the score for judging quality: frequent lack of controls/use of proxy controls, and studies that were often not designed to assess colonization/HAI as primary outcome(s)

Our score assessed 5 elements: study design, sample size, control, confounders, and conflicts of interest (COI) or reporting issues

- 0-4 points each, max 20 points, letter grades of A-D (each letter is 4 points)

This score is not intended for any purpose beyond its use in this review

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A systematic review of the effects of interventions in the healthcare environment

Microorganisms

The success of the interventions partly depended on the microbes studied and how successfully specific microorganisms are spread through the environment

Most commonly studied microorganisms:

Out of 26 studies:

- 13 observed the impact of an intervention on MRSA and/or *S. aureus*
- 17 observed the impact of an intervention on *C. difficile*
- 12 observed the impact of a HEH intervention on VRE

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A systematic review of the effects of interventions in the healthcare environment

A deeper dive into the interventions by microorganism

Results of:

- Studies with a grade A or B
- Which had a control
- Which looked at either *S. aureus, C. difficile,* or VRE
- Organized by individual experiments per microorganism

- N=5 studies total

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The 5 included studies:

Authors	Title	Design	Inervention	Study type
Ray et al., 2017	A Multicenter Randomized Trial to Determine the Effect of an Environmental Disinfection Intervention on the Incidence of Healthcare-Associated Clostridium difficile Infection	Multicenter randomized trial	Training and monitoring of EVS personnel with feedback	Human factors
Boyce et al., 2017	Prospective cluster controlled crossover trial to compare the impact of an improved hydrogen peroxide disinfectant and a quaternary ammonium-based disinfectant on surface contamination and health care outcomes	Prospective cluster crossover RCT	Daily cleaning with HP, feedback to staff	Chemical
Mitchell et al., 2019	An environmental cleaning bundle and health-care-associated infections in hospitals (REACH): a multicentre, randomised trial	Multicentre, stepped-wedge RCT	Training, auditing, feedback, implementation of enhanced cleaning practices, and the incorporation of disposeable wipes	Bundle: chemical (minor), human factors, mechanical (minor)
Anderson et al., 2017	Enhanced terminal room disinfection and acquisition and infection caused by multidrug-resistant organisms and Clostridium difficile (the Benefits of Enhanced Terminal Room Disinfection study): a cluster-randomised, multicentre, crossover study	Cluster-randomised , crossover trial (RCT)	UVC terminal room disinfection +/- Bleach	Bundle: mechanical, chemical
Wilcox et al., 2003	Comparison of the effect of detergent versus hypochlorite cleaning on environmental contamination and incidence of Clostridium difficile infection	Prospective quasiexperimental study	Hypochlorite with training	Bundle: chemical, human factors (minor)

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Interventions on *C. difficile*

Author	Micro-organism	Intervention	Total reduction	Significant reduction	Effect of the HEH intervention
Mitchell et al, 2019[44]	*C. difficile*	Bundle	No	No	rate of colonization: NA rate of HAI: 2.34 to 2.52 Unit of measure: 10,000 occupied bed-days RR: 1.07 CI: 95%CI 0·88–1.30 P value: 0.4655
Wilcox et al, 2003[41]	*C. difficile*	Hypochlorite	Yes	Yes	rate of colonization: NA rate of HAI for both wards combined: 12.4 - 10 Unit of measure: 100 admissions RR: NA CI: NA P value: < 0.05
Boyce et al, 2017[29]	*C. difficile*	Liquid hydrogen peroxide	Yes	No	rate of colonization and rate of HAI (combined): 1.0-0.56 Unit of measure: number of cases per 1,000 patient days RR: NA CI: NA P value: NA Composite outcome (colonization+ HAI rate of all microbes): 10.3-8.0 incidence rate ratio 0.77; P = 0.068; 95%CI 0.579-1.029.
Ray et al, 2017[36]	*C. difficile*	Training, monitoring and feedback	No	No	No data available for the intervention period. rate of colonization: NA rate of HAI for preintervention period only (intervention vs. control hospitals): 5.6- 5.8 Unit of measure: 10,000 patient days RR: NA CI: NA P value: 0.8
Anderson et al, 2017[45]	*C. difficile*	UV	Yes	No	rate of colonization and rate of HAI (combined): 31.6- 30.4 Unit of measure: 10,000 exposure days RR: 1.0 CI: 95%CI 0.57 to 1.75 P value: 0.997

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Interventions on *S. aureus*

Anderson et al, 2017[45]	*S. aureus*	UV	Yes	No	rate of colonization and rate of HAI (combined): 50.3- 36.5 Unit of measure: 10,000 exposure days RR: 0.78 CI: 95%CI 0.58 to 1.05 P value: 0.104
Anderson et al, 2017[45]	*S. aureus*	bleach	Yes	No	rate of colonization and rate of HAI (combined): 50.3- 48.2 Unit of measure: 10,000 exposure days RR: 1.00 CI: 95%CI 0.82 to 1.21 P value: 0.967
Anderson et al, 2017[45]	*S. aureus*	Bundle: UV+ bleach	Yes	No	rate of colonization and rate of HAI (combined): 50.3- 46.9 Unit of measure: 10,000 exposure days RR: 0.97 CI: 95%CI 0.78 to 1.22 P value: 0.819
Mitchell et al, 2019[44]	*S. aureus*	Bundle	Yes	No	rate of colonization: NA rate of HAI: 0.97 to 0.80 Unit of measure: 10,000 occupied bed-days RR: 0.82 CI: 95%CI 0.60–1.12 P value:0.2180
Boyce et al, 2017[29]	*S. aureus* (MRSA)	Liquid hydrogen peroxide	Yes	No	rate of colonization and rate of HAI (combined): 2.79- 1.96 Unit of measure: number of cases per 1,000 patient days RR: NA CI: NA P value: NA Composite outcome (colonization+ HAI rate of all microbes): 10.3-8.0 incidence rate ratio 0.77; P = 0.068; 95%CI 0.579-1.029.

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Interventions on VRE

Mitchell et al, 2019[44]	VRE	Bundle	Yes	Yes	rate of colonization: NA rate of HAI: 0.35 to 0.22 Unit of measure: 10,000 occupied bed-days RR: 0.63 CI: 95%CI 0.41–0.97 P value: 0.0340
Boyce et al, 2017[29]	VRE	Liquid hydrogen peroxide	Yes	No	rate of colonization and rate of HAI (combined): 6.6- 5.49 Unit of measure: number of cases per 1,000 patient days RR: NA CI: NA P value: NA Composite outcome (colonization+ HAI rate of all microbes): 10.3-8.0 incidence rate ratio 0.77; P = 0.068; 95%CI 0.579-1.029.
Anderson et al, 2017[45]	VRE	UV	Yes	No	rate of colonization and rate of HAI (combined): 63.4- 29.4 Unit of measure: 10,000 exposure days RR: 0.41 CI: 95%CI 015 to 1.13 P value: 0.084
Anderson et al, 2017[45]	VRE	Bleach	Yes	Yes	rate of colonization and rate of HAI (combined): 63.4- 31.9 Unit of measure: 10,000 exposure days RR: 0.43 CI: 95%CI 0.19 to 1.00 P value: 0.049
Anderson et al, 2017[45]	VRE	Bundle: UV+ bleach	Yes	Yes	rate of colonization and rate of HAI (combined): 63.4- 39.0 Unit of measure: 10,000 exposure days RR: 0.36 CI: 95%CI 0.18 to 0.70 P value: 0.003

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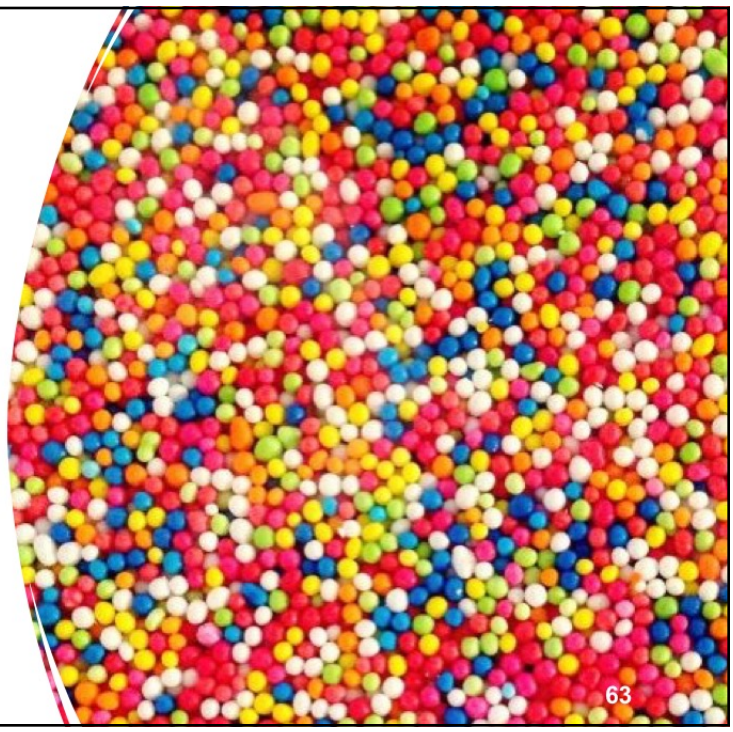
Overall results of high-quality studies on common microorganisms

- High heterogenicity
- Each intervention was only tested once per microorganism
- Cannot reform a metanalysis



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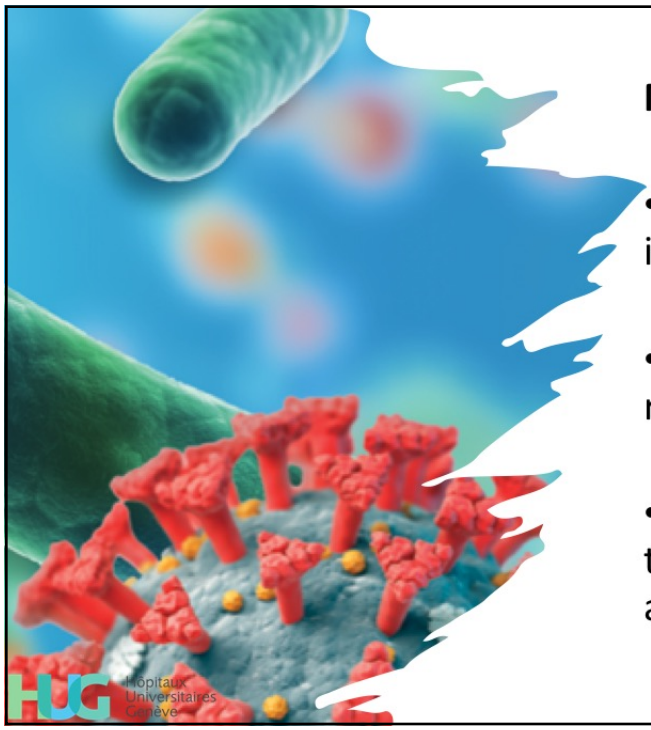

Main messages:

clean hospitals

- The healthcare environment is important for patient safety
- We need more and better research
- But we do NOT need to wait for those studies to start making HEH a priority NOW

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Outline

- Review of the importance of environmental hygiene in patient safety
- Clean Hospitals: project activities
- Results of a systematic review of interventions in the healthcare environment including their effect on key pathogens
- Development of a new framework and scoring system, and results of a global sentinel survey
- The cost and value of investing in environmental hygiene
- Clean Hospitals: perspectives

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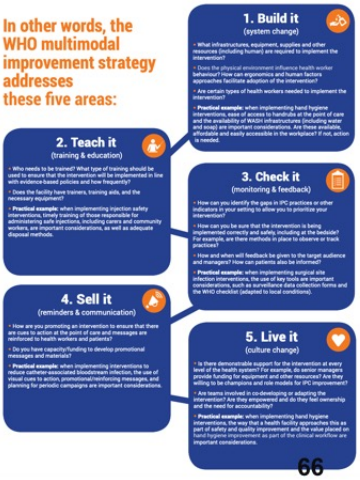
Where do we go? The Healthcare Environmental Hygiene Self-Assessment Framework (HEHSAF)

Theoretical Framework:
WHO Multimodal Improvement Strategy for Hand Hygiene promotion
(in use since 2009)

1. System change
2. Training & Education
3. Monitoring & Feedback
4. Workplace Reminders
5. Cultural Safety Climate



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The idea of HEHSAF is for institutions to improve, not meet a pre-defined level

World Health Organization | Patient Safety | SAVE LIVES Clean Your Hands

Hand Hygiene Self-Assessment Framework 2010

Introduction and user instructions

Total Score (range)	Hand Hygiene Level
0 - 125	Inadequate
126 - 250	Basic
251 - 375	Intermediate (or Consolidation)
376 - 500	Advanced (or Embedding)

Healthcare Environmental Hygiene Self-Assessment Framework

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To develop a Healthcare Environmental Hygiene Self-Assessment Framework (HEHSAF)

Methods

- Sent out the survey in 3 rounds starting on the April 16, 2020
- Initial round aimed for 2 hospitals per country and included 175 countries, from our database of over 18,000 hospitals around the world
- Additional rounds to target low/middle low- income countries:
- 746 hospitals were contacted in total
- Aimed for a minimum of 4 hospitals from each of the four income levels as defined by the World Bank*

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*World Bank Country and Lending Groups – World Bank Data Help Desk. https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups.

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HEH global sentinel survey

Healthcare environmental hygiene: results of an international sentinel survey of hospital practices in healthcare environmental hygiene

Alexandra Peters[1], Marie N. Schmid[2], Pierre Parneix[3], Marlieke DeKraker[1], Julien Sauser[1], Didier Pittet[1]

[1]Infection Control Programme & WHO collaborating Centre on Patient Safety, University of Geneva Hospitals and Faculty of Medicine, Geneva, Switzerland; [2]University of Geneva, Geneva, Switzerland; [3]Nouvelle Aquitaine Healthcare-Associated Infection Control Centre, Bordeaux University Hospital, Bordeaux, France

OBJECTIVES: Our survey aims to show how environmental hygiene programs work around the world and what specific challenges they face. The larger objective of this work is to use the data collected to develop a Healthcare Environmental Hygiene Self-Assessment Framework (HEHSAF), in order to help hospitals improve their healthcare environmental hygiene in line with the Clean Hospitals® project.

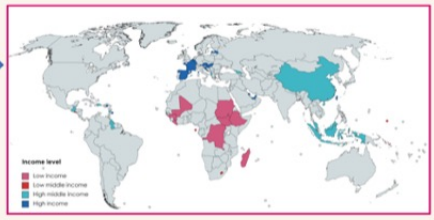
METHODS:

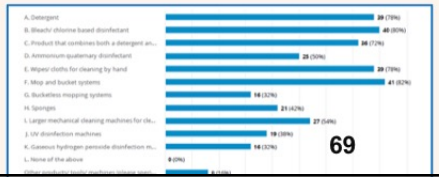
Survey based on the WHO multimodal improvement strategy

13 High income
9 Upper-middle income
5 Lower-middle income
8 Low income

Sent to 743 hospitals

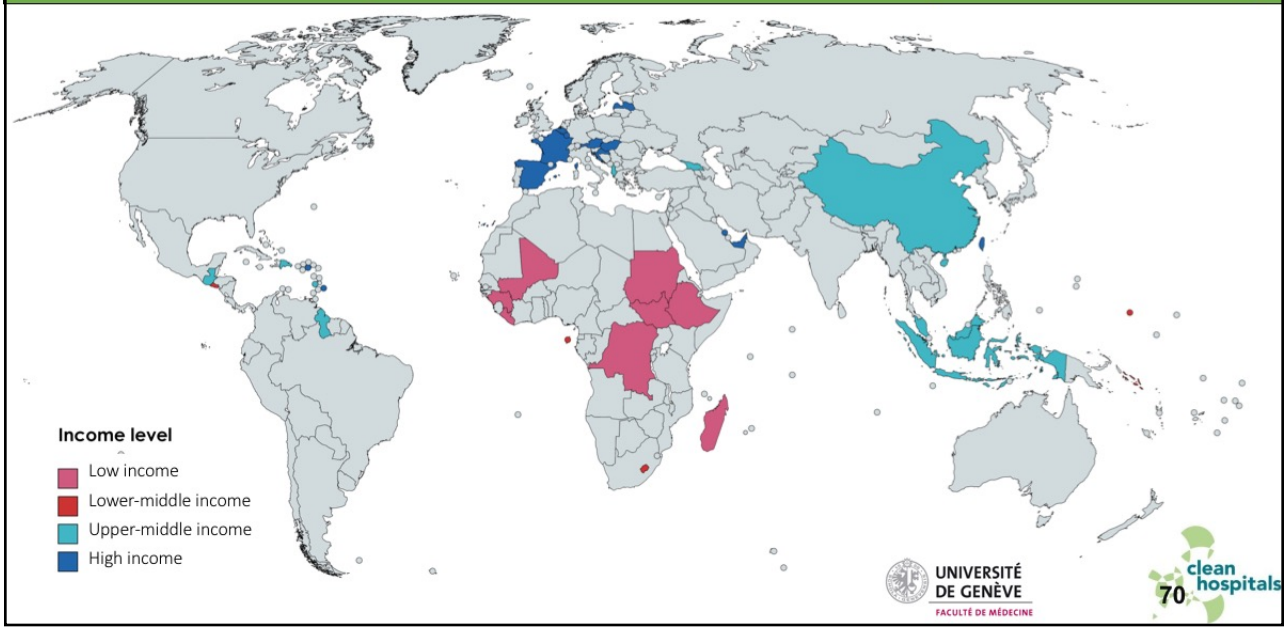
51 hospitals participated from 35 countries





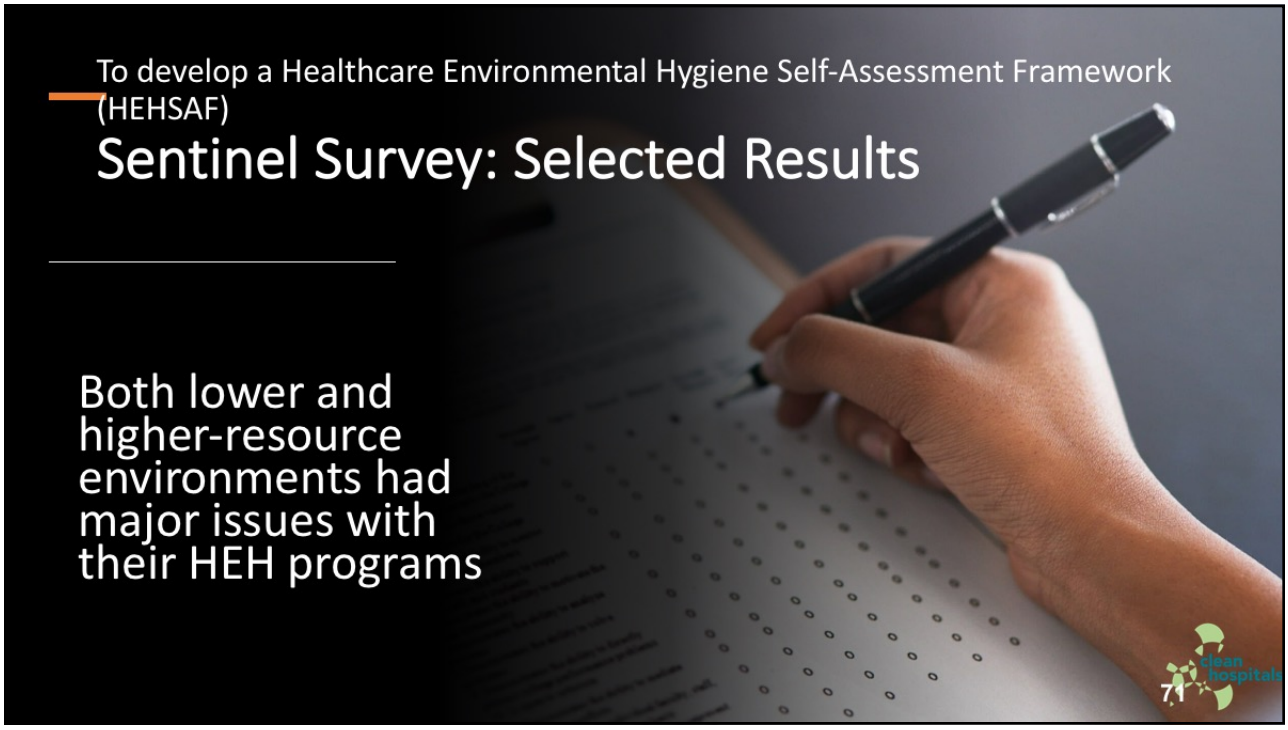
RESULTS: Survey respondents maintained that healthcare environmental hygiene is given sufficient consideration in 71% of hospitals, although some of their other responses may suggest otherwise. Although 63% of participants

Outcome: 51 hospitals from 35 Countries completed the survey



To develop a Healthcare Environmental Hygiene Self-Assessment Framework (HEHSAF)

Sentinel Survey: Selected Results



Both lower and higher-resource environments had major issues with their HEH programs

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Healthcare Environmental Hygiene Self-Assessment Framework (HEHSAF)

2. SYSTEM CHANGE	
2.1 Does your healthcare facility have sufficient cleaning and disinfection products and supplies available?	A. Cleaning/ disinfection products and supplies are not or only rarely available
	B. Products and supplies are sometimes available
	C. Products and supplies are always available
	D. Don't know
2.2 Are the available products and supplies appropriate for their intended task?	A. Cleaning/ disinfection products and supplies are not or only rarely appropriate
	B. Products and supplies are sometimes appropriate
	C. Products and supplies are always appropriate
	D. Don't know
2.3 Please rank the importance of the following factors when purchasing HEH products and supplies in terms of importance (1=most important, 5= least important)	A. Price
	B. Efficacy
	C. Surface compatibility
	D. Availability
	E. Relationship with current suppliers
	F. Other (please specify)
	G. Don't know
2.4 Does your hospital implement evidence-based protocols (either according to availab	A. No healthcare environmental hygiene protocols are available
	B. Healthcare environmental hygiene protocols are available but not based on current best practice
	C. Healthcare environmental hygiene protocols are available and based on current best practice for certain tasks/ en
	D. All healthcare environmental hygiene protocols are available and based on current best practice and updated reg
2.5 Does your healthcare facility have different protocols for different risk zones (i.e. officies vs. patient rooms vs. operating theaters, etc.)?	A. Healthcare environmental hygiene protocols do not vary from one zone to the next
	B. Some protocols are adapted to high-risk zones, such as operating theaters/ transplant wards
	C. All healthcare environmental hygiene protocols are adapted to each risk zone
	D. Don't know

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2.1. What cleaning products and supplies are available for SURFACES?

	Higher income	Lower income
Detergent	70%	86%
Bleach/ chlorine-based disinfectant	74%	93%
Product that combines both a detergent and a disinfectant	74%	57%
Quaternary ammonium disinfectant	61%	29%
Wipes/ cloths for cleaning by hand	78%	64%
Mop and bucket systems	87%	79%
Bucketless mopping systems	17%	29%
Sponges	39%	29%
Larger mechanical cleaning machines for cleaning floors/ large surfaces	61%	7%
UV disinfection machines	48%	0%
Gaseous hydrogen peroxide disinfection machines	30%	0%
None of the above	0%	0%
Other products/ tools/ machines	13%	7%

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2.2. What supplies are available for STERILIZATION?

	Higher income	Lower income
Equipment for the chemical sterilization of instruments	82.6%	28.6%
Products for the chemical sterilization of instruments	82.6%	36%
Equipment for the heat sterilization of instruments	82.6%	100%
Products for the heat sterilization of instruments	78%	43%
Although some supplies are available, our hospital cannot perform adequate sterilization (equipment is not in good working order, etc.)	9%	43%
Sterilization is outsourced	13%	0%
Adequate sterilization is not available	4%	21%
Don't know	4%	0%

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2.3. What supplies/evidence for WATER quality & control ?

	Higher income	Lower income
Clean water	91%	57%
Running water	78%	86%
Additional water filtration when needed	78%	21%
Don't know	0%	0%

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2.4. What supplies are available for AIR/AIR control?

	Higher income	Lower income
Windows than can be opened	65%	79%
Ventilation system	96%	50%
High Efficiency Particulate Air (HEPA) filtration where needed	87%	21%
Don't know	4%	0%
Other air filtration systems	13%	7%

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2.6. What supplies/ systems are available for WASTE MANAGEMENT?

	Higher income	Lower income
Containers for sharps	100%	93%
Separation of normal and medical/ hazardous waste	91%	71%
Machines to shred and sterilize	26%	0%
Waste collection services	96%	79%
Recycling	43%	7%
Open dump sites within 100 meters of hospital	9%	21%
Open dump sites more than 100 meters of hospital	9%	7%
Landfill sites for waste disposal	30%	29%
External treatment of medical waste only	43%	29%
External treatment of solid waste	30%	29%
Access to a sewage treatment system	22%	21%
Don't know	0%	77 0%

2.10. Does your hospital have different protocols for different risk zones (i.e. offices vs. patient rooms vs. operating theaters, etc.)?

	Higher income	Lower income
A. Healthcare environmental hygiene protocols do not vary from one zone to the next	4%	14%
B. Some protocols are adapted to high-risk zones, such as operating theaters/ transplant wards	13%	57%
C. All healthcare environmental hygiene protocols are adapted to each risk zone	83%	29%

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3.2. What type(s) of training does Environmental Services staff (EVS) receive?

	Higher income	Lower income
Classroom	57%	36%
On the job training	87%	86%
E-learning	26%	7%
Manuals	57%	36%
Don't know	9%	7%
Other (no training given)	4%	7%

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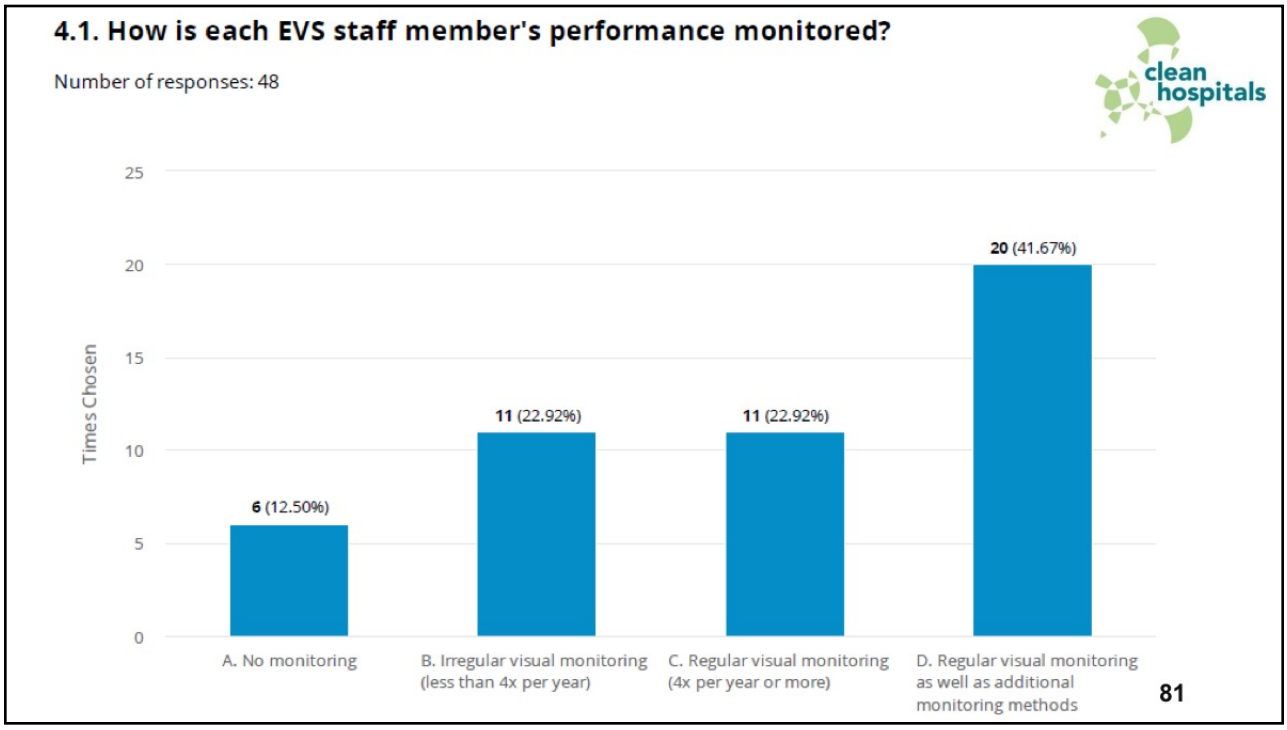
3.3. Does your hospital provide/require formal training for EVS staff upon hiring ?

	Higher income	Lower income
A. No formal training	22%	36%
B. Some formal training	48%	57%
C. Comprehensive formal training	30%	7%

80


4.1. How is each EVS staff member's performance monitored?
Number of responses: 48
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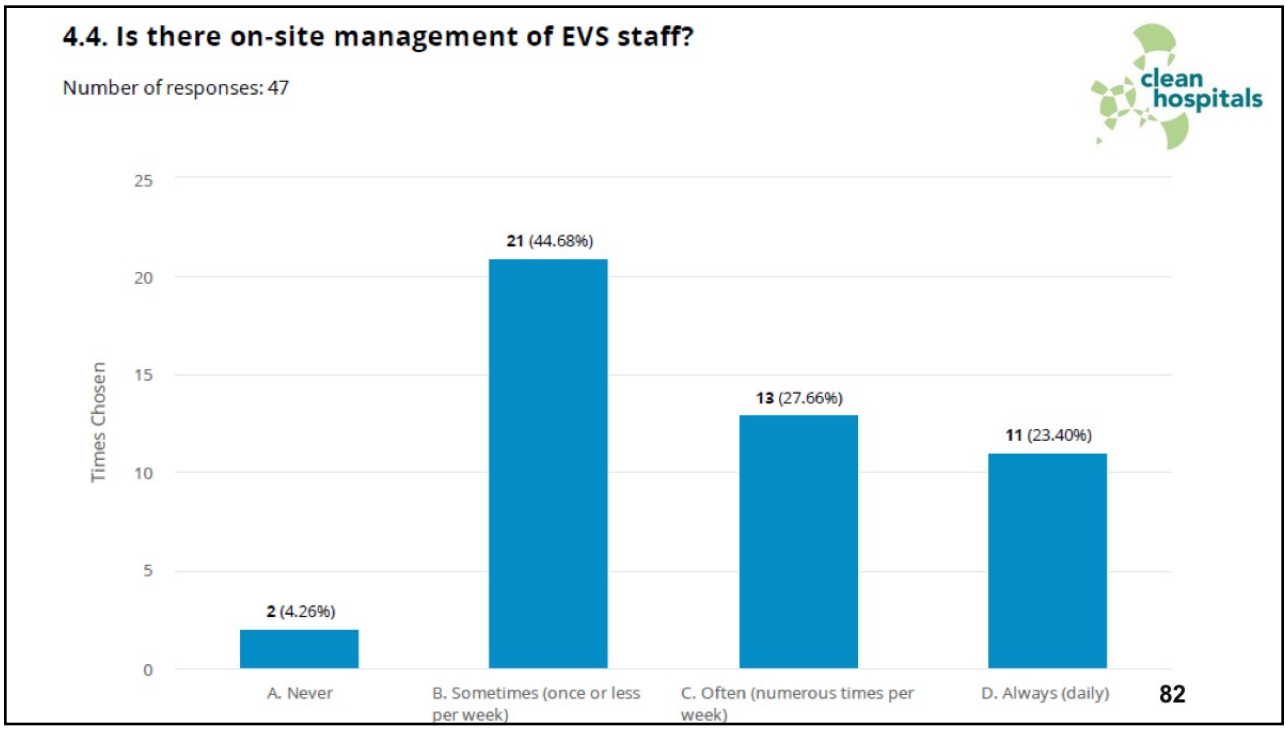
Times Chosen
25
20
15
10
5
0
6 (12.50%)
11 (22.92%)
11 (22.92%)
20 (41.67%)
A. No monitoring
B. Irregular visual monitoring (less than 4x per year)
C. Regular visual monitoring (4x per year or more)
D. Regular visual monitoring as well as additional monitoring methods
81


4.4. Is there on-site management of EVS staff?
Number of responses: 47
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Times Chosen
25
20
15
10
5
0
2 (4.26%)
21 (44.68%)
13 (27.66%)
11 (23.40%)
A. Never
B. Sometimes (once or less per week)
C. Often (numerous times per week)
D. Always (daily)
82

4.4. Is there on-site management of EVS staff?

	Higher income	Lower income
A. Never	0%	14%
B. Sometimes (once or less per week)	50%	43%
C. Often (numerous times per week)	27%	29%
D. Always (daily)	23%	14%

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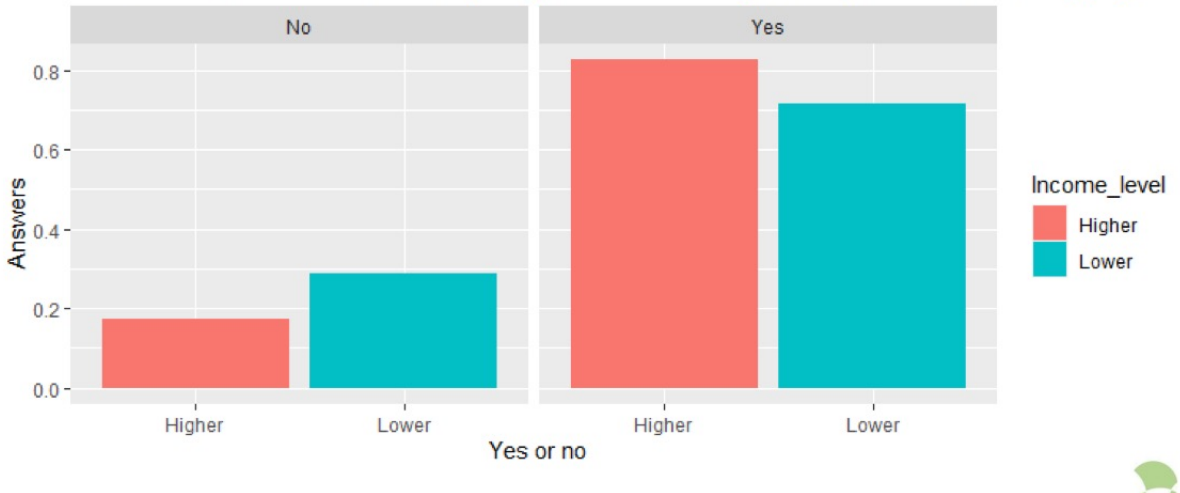
6.1. Do environmental services (EVS) staff and nursing staff speak the same language?



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6.3. How easily can EVS staff initiate communication with higher levels of the hospital hierarchy in general?

	Higher income	Lower income
A. No upward communication with superiors is possible	9%	21%
B. Upward communication with direct superiors is possible	41%	14%
C. Upward communication with direct superiors is frequent	23%	36%
D. Upward communication with superiors above direct management is possible	14%	21%
E. Upward communication with superiors above direct management is frequent	14%	7%

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HEHSAF Validation

Testing the tool in at least 5 hospitals in our network in different geographic and resource levels

- HUG, the Hospital Center University de Bordeaux, and Imperial College London Healthcare Trust, Baskent University Istanbul Hospital, and Hospital Kuala Lumpur and possibly others

Using in-depth feedback from colleagues in those hospitals and from stakeholders to further improve and validate the tool, to get it ready for large scale use

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- Clean Hospitals: perspectives

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Cost and Value

One small outbreak can cost over 1 million Euros!

Dik et al. Cost-Analysis of Seven Nosocomial Outbreaks in an Academic Hospital. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4749280/

Otter et al. Counting the cost of an outbreak of carbapenemase-producing *Enterobacteriaceae*: an economic evaluation from a hospital perspective. https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X(16)30464-9/fulltext

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How can hospitals save costs in environmental hygiene?

- Decide which elements need which level of cleaning
- Calculate the cost/benefit of HEH in their institution
- Keep staff longer, educate and motivate them
- Decide when fancy/high-tech machinery is necessary or not

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Cleans Hospitals: current research agenda

- Finalize the Healthcare Environment Hygiene Self-Assessment Framework (HEHSAF) in collaboration with stakeholders/partners
- Implementing the HEHSAF as a Global Survey (medium/long-term)
- Developing tools and making them available to institutions to address the elements of the HEHSAF that their institutions needed support in
- Developing and teaching modules for improving Healthcare Environment Hygiene programs for high and low resource settings
- Further develop the transposable model toward excellence in hospital environmental hygiene
- Promote large multi-site, intervention studies to assess efficacy and cost-effectiveness

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The "transposable model" aims:

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- To understand how the best HEH programs work around the world; in different resource and cultural contexts
- To identify and develop universal themes to support and improve
- Develop tools and resources for improving HEH in healthcare institutions based on "model hospitals" and developments by the Clean Hospitals stakeholders
- Test the "transposable" model and validate it in different healthcare settings
- Develop criteria for excellence in HEH
- Organize Train-The-Trainers programs at "HEH Excellence Centers"

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Conclusions

- Healthcare Environmental Hygiene (HEH) is a domain that reserves recognition considering its central role in patient safety
- HEH is a multidisciplinary discipline that contains several elements; its promotion should be based on evidence and should be multimodal
- Clean Hospitals has been developed on the model of the Clean Hands uinitiative, currently endorsed on more than 190 countries worlwide
- Based on the most recently conducted evidence-based systematic review on HEH interventions to reduce environmental bioburden, patient colonization and infection, successful interventions could be designed, but should be tested more appropriately
- The pilot-tested HEH self-evaluation framework is under further development engaging a large group of stakeholders and institutions worldwide
- A transposable model for HEH will allow in the future to engage all HCFs
- The cost-efficacy of HEH remains to be tested in a larger scale and should be part of appropriate research in the near future

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Clean Hospitals Partners

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improving environmental hygiene practices

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ECOLAB
BODE Chemie GmbH A company of the HARTMANN GROUP
HARTMANN
MetalSkin
SARAYA
SINECLOR HYGIÈNE S.A.

For more information about joining our project, initiatives, or Digital Days

Please visit the Clean Hospitals website:

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www.webbertraining.com/schedulep1.php	
October 28, 2021	*(FREE Teleclass)* **HAND HYGIENE RELOADED** Speaker: **Prof. Hugo Sax**, HumanLabZ, Zurich
November 4, 2021	**DISCOVERING AND TRANSFORMING THE INNER ICP EDUCATOR: EXPLORING CORE ELEMENTS OF AN INNOVATIVE PROFESSIONAL'S EXPERIENCE** Speaker: **Dr. Gwyneth Meyers**, Alberta Health Services
November 18, 2021	*(FREE Teleclass)* **THE SANITATION ECONOMY & PUBLIC HEALTH** Speaker: **Alexandra Knezovich**, Toilet Board Coalition, Switzerland
December 2, 2021	**EMERGING FUNGAL INFECTIONS AND INFECTION PREVENTION AND CONTROL** Speaker: **Prof. Andreas Voss**, Radboud University, The Netherlands
	(FREE Teleclass)


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