

# Changing hand hygiene behavior: Nudging concepts

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Supporting zero-harm for patients and staff.



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# Background

- Medical doctor and Ph.D. from Copenhagen University
- Chief Medical Officer in Sani Nudge
- Chair of the Danish Council for Better Hygiene
- Worked with hand hygiene compliance for the last seven years
- Podcast: [The Hygiene & Infection Prevention Network](#)



# The importance of hand hygiene

Infections and antimicrobial resistance present a **major threat** comparable in scale to climate change.

**CDC:** Practicing HH is a simple yet effective way to prevent HAIs.

**WHO:** Performing HH at the right moments is the most effective way to prevent HAI.





# The effects of hand hygiene

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## **Patient safety:** Fewer infections

- Length-of-stay (5-10 days per infection)
- Medication
- Re-operation
- Isolation regimen
- Readmission (30%)

## **Staff safety:** Fewer infections

- Safer working environment
- Decreased absenteeism
- Less family members infected (influenza, norovirus, etc.)

## **Costs:** x3 for patients with HAI

Knudsen AR, et al. Effectiveness of an electronic hand hygiene monitoring system in increasing compliance and reducing healthcare-associated infections. *J Hosp Infect.* 2021 Sep;115:71-74.

Guest JF, et al. Modelling the annual NHS costs and outcomes attributable to healthcare-associated infections in England. *BMJ Open.* 2020 Jan 22;10(1):e033367.

Rahmqvist M et al. Direct health care costs and length of hospital stay related to health care-acquired infections in adult patients based on point prevalence measurements. *Am J Infect Control.* 2016 May 1;44(5):500-6.

# The science of compliance

Tremendous opportunity to elevate patient care through improved HHC:

- The average HHC of HCWs is 30-40%
  - Before patient contact: 21%
  - After patient contact: 47%
- Improvements is difficult to sustain.

Centers for Disease Prevention and Control. Hand Hygiene in Healthcare Settings. <https://www.cdc.gov/handhygiene/>  
Erasmus V, et al. Systematic review of studies on compliance with hand hygiene guidelines in hospital care. *Infect Control Hosp Epidemiol* 2010;31:283-94.  
Gould D, et al. Measuring handwashing performance in health service audits and research studies. *Journal of Hospital Infection* 2007;66(2): 109-115.  
Gould D, et al. Interventions to improve hand hygiene compliance in patient care. *Cochrane Database Syst Rev*. 2017 Sep 1;9(9):CD005186.

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# Influential factors associated with HHC



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1. Time constraints and busyness (stress factor, cognitive load)
2. HH as self-protection (gloves and perception)
3. Awareness of being watched (Hawthorne effect)
4. Converting knowledge into action, and changing intention into behavior (system 1 and 2)
5. Availability and placement
6. Social pressure and role modelling (culture, management support)
7. Skin irritation
8. Knowledge

Sands M, et al. Determinants of hand hygiene compliance among nurses in US hospitals: A formative research study. *PLoS One*. 2020; 15(4): e0230573.  
Squires JE, et al. Understanding Practice: Factors That Influence Physician Hand Hygiene Compliance. *Infect Control Hosp Epidemiol*. 2014 Dec;35(12):1511-20.

# HHC in healthcare during the pandemic

## What have we learned?

- Many organizations reported a decrease in HHC.
- Time constraints, business, self-protection, leadership played a role.
- HHC is not given! Behavior and culture are dynamic variables and differs from organization, ward, person.

Huang F, et al. Covid-19 outbreak and health care worker behavioral change toward hand hygiene practices. *J Hosp Infect.* 2021:27–34.

Stangerup M, et al. Hand hygiene compliance of healthcare workers before and during the COVID-19 pandemic: A long-term follow-up study. *Am J Infect Control.* 2021 Sep;49(9):1118-1122.

Williams V, et al. Impact of COVID-19 on hospital hand hygiene performance: a multicentre observational study using group electronic monitoring. *CMAJ Open.* 2021 Dec 14;9(4):E1175-E1180.

Wang Y, et al. Compared hand hygiene compliance among healthcare providers before and after the COVID-19 pandemic: A rapid review and meta-analysis. *Am J Infect Control.* 2021 Dec 7;S0196-6553(21)00792-6.

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# Hand hygiene compliance of healthcare workers before and during the COVID-19 pandemic: A long-term follow-up study

Publication: American Journal of Infection Control. 2021;S0196-6553(21)00430-2.

## Results

HHC was significantly lower in the pre-pandemic follow-up period (46% vs 58%,  $P < .0001$ ) and in the follow-up period during COVID-19 (34% vs 58%,  $P < .0001$ ) compared with the intervention period with feedback (phase 1).

## Conclusion

Despite the COVID-19 pandemic, the HHC of the healthcare workers significantly decreased over time once the data presentation meetings from management stopped. The Sani Nudge solution helps staff to focus on hand hygiene.

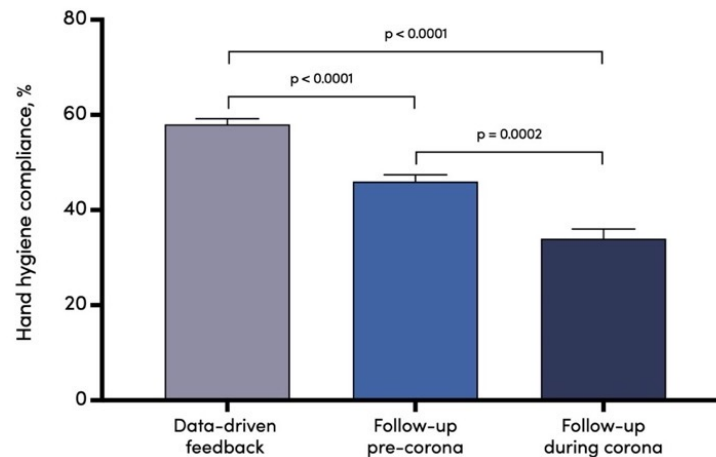


Fig. Hand hygiene compliance of the healthcare workers by periods (phases 1, 2, and 3)

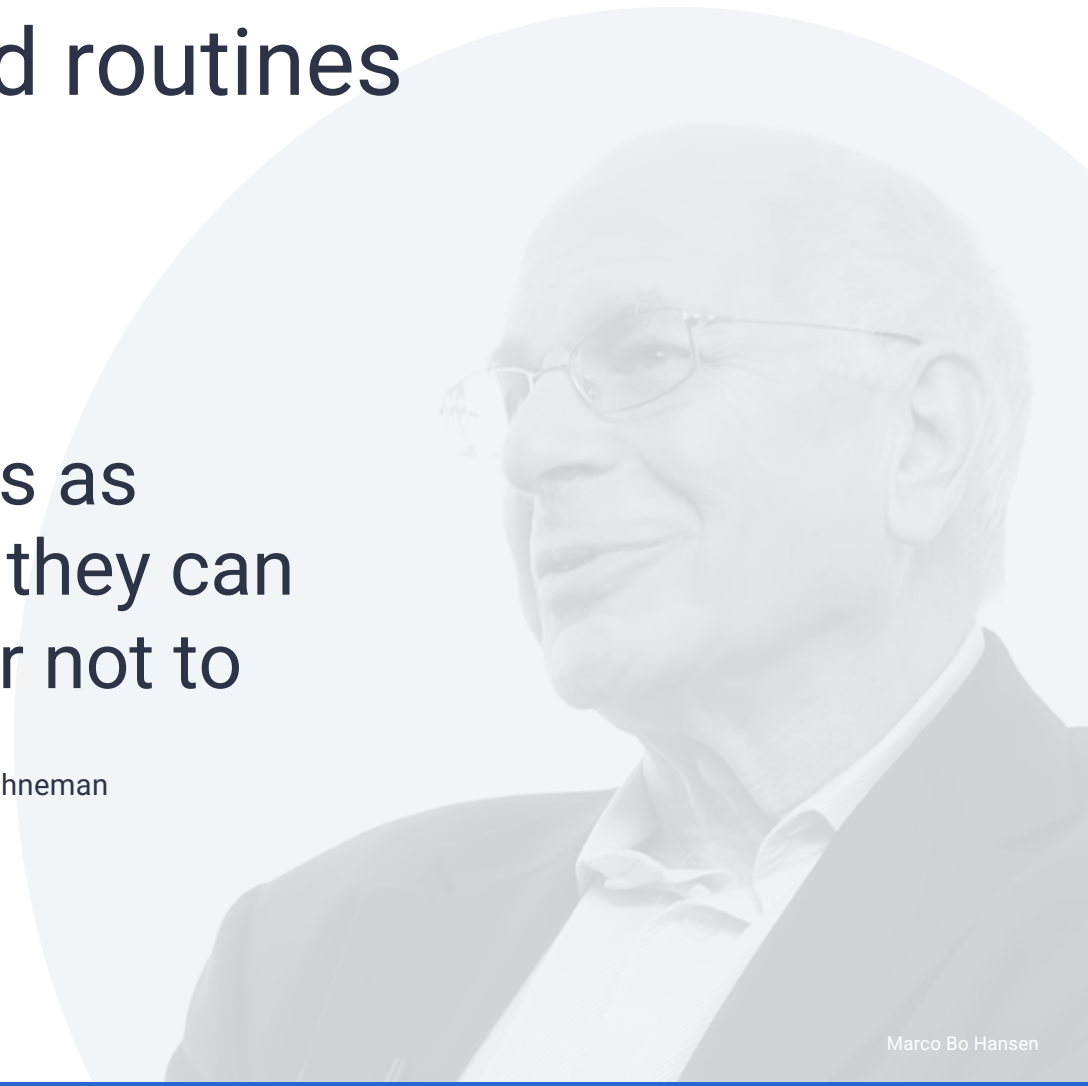


# We fall back into old routines and habits

“

Thinking is to humans as swimming is to cats; they can do it, but they'd prefer not to

Nobel prize winner – Daniel Kahneman



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## More of the same?

We invest too many resources in explaining and teaching our colleagues and patients because...

...we believe that behaviour change is primarily about changing people's attitudes.

But knowledge and will are not enough.

**Actions** must be prioritized over attitudes.

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HEALTHCARE PROVIDERS

# CLEAN HANDS COUNT FOR SAFE HEALTHCARE

On average, healthcare providers clean their hands **less than half** of the times they should. That means you might be leaving yourself and your patients at risk for potentially deadly infections.

**FACT:** Healthcare providers might need to clean their hands as many as **100 times per 12-hour shift**, depending on the number of patients and intensity of care. Know what it could take to keep your patients safe.



**Protect Yourself.  
Protect Your Patients.**

Who do your **#CLEANHANDSCOUNT** for?



**www.cdc.gov/HandHygiene**

This material was developed by CDC. The Clean Hands Count Campaign is made possible by a partnership between the CDC Foundation and GOJO.

We need to be better at documenting what works – and what we should do less of



# Make hand hygiene fun, again.

In an ideal world, HCWs base their decisions on scientific evidence and best practice. However, in clinical practice, human behavior is not that simple, and decisions are often affected by cognitive and emotional biases, especially when decisions are made under stress.

One way to address biases is to use nudging to modify a person's behavior toward the desired endpoint.



# Increasing interest for electronic hand hygiene monitoring systems (EMS)

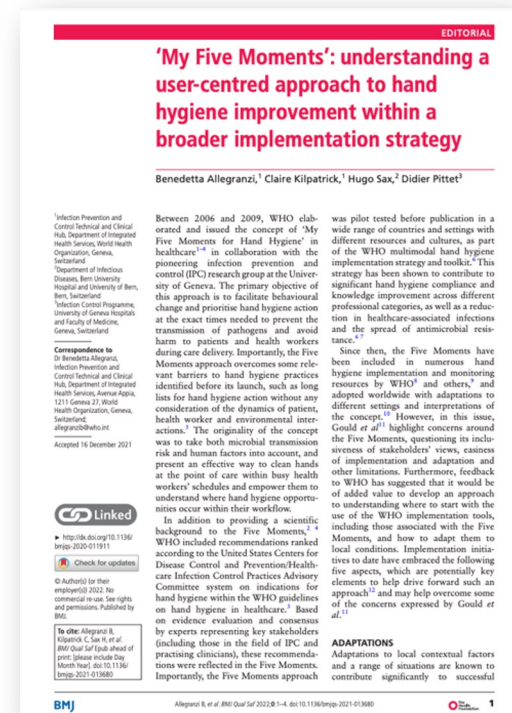
- Healthcare systems acknowledge the value of EMS
- COVID-19 has emphasized the need and showed the way
- Part of the automation and digitalization agenda
- Hospitals need tools that automate the data collection for them and provide easy-to-read and actionable compliance information
- Healthcare systems are facing an increasing pressure from accreditation bodies to measure and document hand hygiene compliance as part of quality assurance
- Healthcare organizations are starting to use EMS as part of the WHO's multimodal strategy for HH improvement



# Increased focus on EMS by WHO

"WHO is particularly attentive to encourage innovations, such as non-touch dispensers, **automatic monitoring systems...**"

"WHO strongly recommends hand hygiene as a key performance indicator and a minimum requirement for IPC programs in all countries."



Nudges: We all need some help occasionally



# Nudging

Subtle changes to the design of the environment without restrictions



Any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives"



Thaler and Sunstein





# Nudging in public

## Systematic review

**Conclusion:** Nudging interventions in proper hygiene and prevention practices, such as hand hygiene, have shown promising results and can be a crucial practice against the spread of COVID-19.

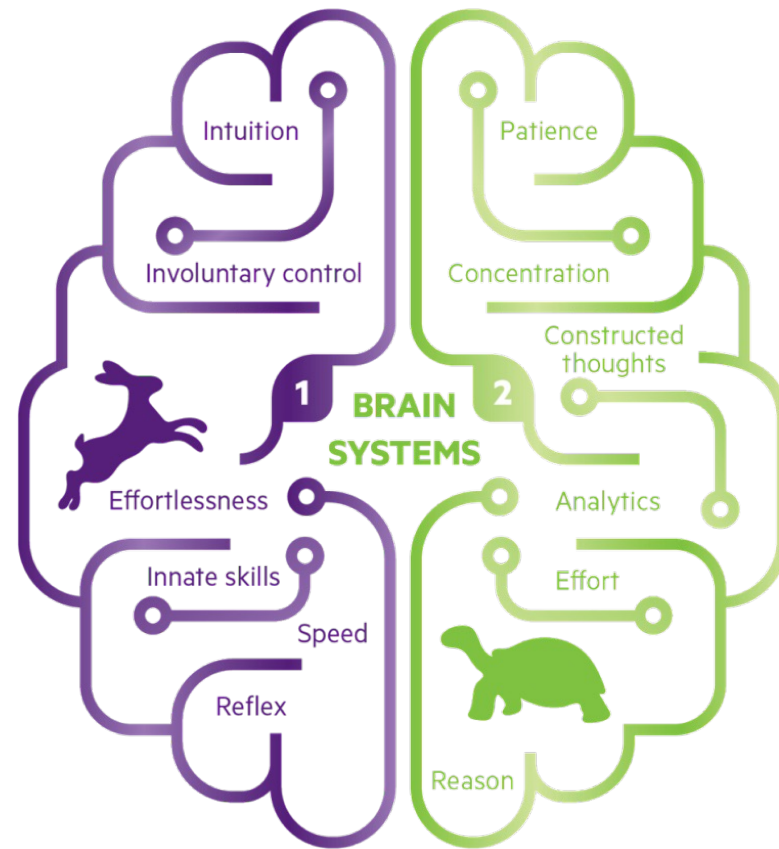
Nudging interventions that were effective:

- Used messages to communicate the risk of a possible infection
- Contained threatening messages
- Conveyed feelings of disgust
- Stressed social norms, positive behaviors, or feelings of comfort and well-being.

Core findings: Nudging interventions such as messages, images, posters, visual cues, olfactory cues, directional arrows, footprints, handprints and accessibility have been effective in several settings.

Mixed results were presented, especially regarding the gender-related content of the material, while the emotion-based content (i.e. a smiling emoticon) had a partial positive effect.





# Biases in hand hygiene behaviour 🧠

14 biases identified as contributors to non-compliance.

**'Present bias'** is a particularly important: Overweight immediate costs relative to future benefits.

HH is the immediate costs (time consumption, dry and scratching skin, smell of hand sanitizer), but the benefits are delayed (avoiding HAIs).

**Nudging** is one way to address biases by modifying a person's behaviour towards the desired endpoint.





# Behavioral Design in healthcare



Nudging



Feedback

# Light-guided nudging and data-driven performance feedback improve hand hygiene compliance among nurses and doctors

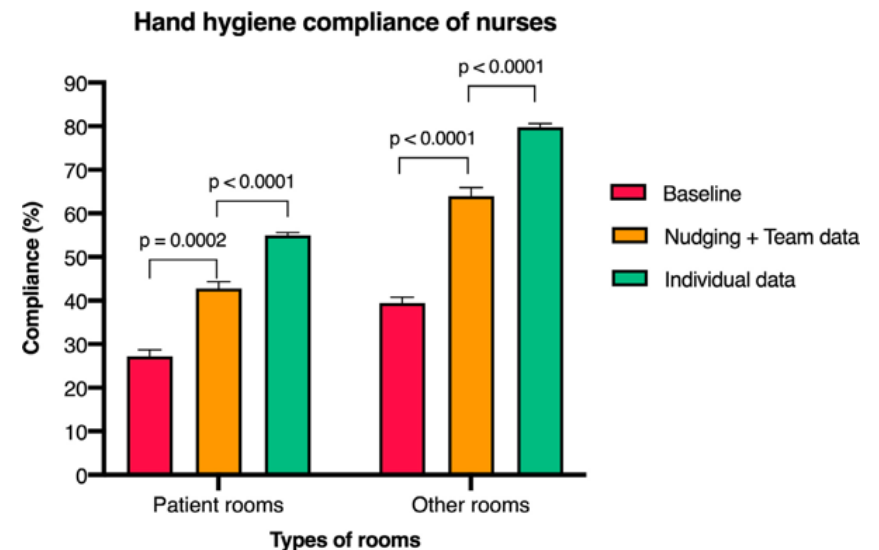
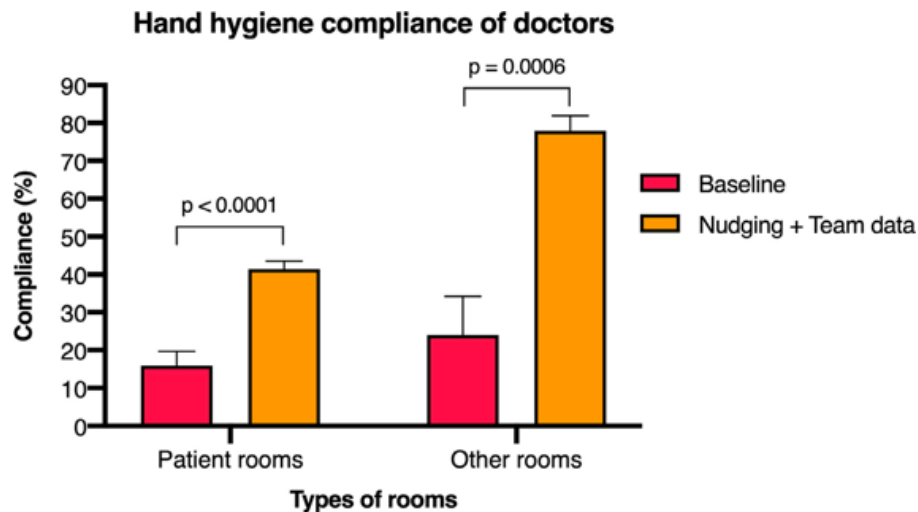
Publication: American Journal of Infection Control. 2021 Jun;49(6):733-739.

## Results

Both the doctors and nurses improved the hand hygiene compliance significantly with light-guided nudging and data-driven performance feedback in combination.

## Conclusion

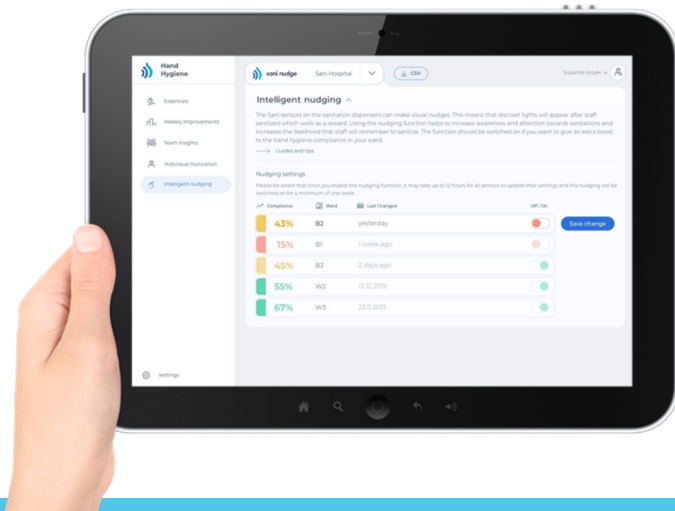
- Hand hygiene compliance of doctors and nurses significantly improved with EMS solutions.
- EMS provides hospitals with an effective tool to improve hand hygiene compliance with only limited efforts.





# Intelligent Nudging

Ability to react to low compliance scores in your facility at your fingertips. Activate visual nudging in wards that struggles and track how it impacts the compliance score. Save time and respond fast to outbreaks.



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# A digital team empowerment platform

I work with interfaces leveraging nudging theory to make data interesting, and reliable and that surface actionable insights so teams can make informed decisions to improve compliance.

- Non-disruptive to workflow
- Trustworthy data
- Easy to understand and use



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# Data insights

## Essentials <sup>^</sup>

Use Essentials to get an overview of your hospital's hand hygiene performance. Quickly see the past 24 hours compliance in the pie chart below and follow the performance level in the hospital in an intuitive line chart. Use the table to see a breakdown of compliance at each ward to help you focus your hand hygiene training.

→ Guide and tips

### Overall compliance

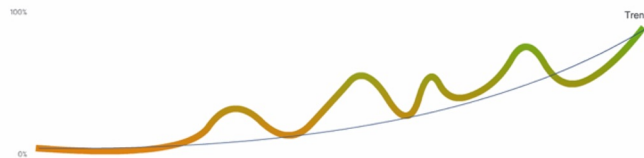
Past 24 hours



▲ 74% better than the same day last week!

### Compliance trend

Past 30 days



## Different levels

100-75% Top performer

75-50% Needs encouragement

50-25% Needs training

<25% Needs a conversation

Compliance	Ward	Active IDs	Sanitations
96%	N1 - Neurology	12	1200
78%	C1 - Cardiology	11	1240
72%	Oncology gastroenterology (O1)	75	1933
67%	General Surgery (G2)	50	1197
62%	Lymphoma and Leukemia (H4)	43	1557
59%	Kidney transplantation (R3)	53	1657
55%	Maternity and Obstetrics	42	1698
35%	Neurosurgery	49	1261
33%	Interstitial lung diseases (P1)	46	943
30%	Febril Neutropenia (H5)	50	869
22%	COPD (P3)	50	723
21%	Cardiovascular surgery (CR)	41	896

# A digital team empowerment platform

EMS interfaces leverage nudging theory to make data interesting, reliable and surface actionable insights so teams can make informed decisions to improve compliance.

- Non-disruptive to workflow
- Trustworthy data
- Easy to understand and use

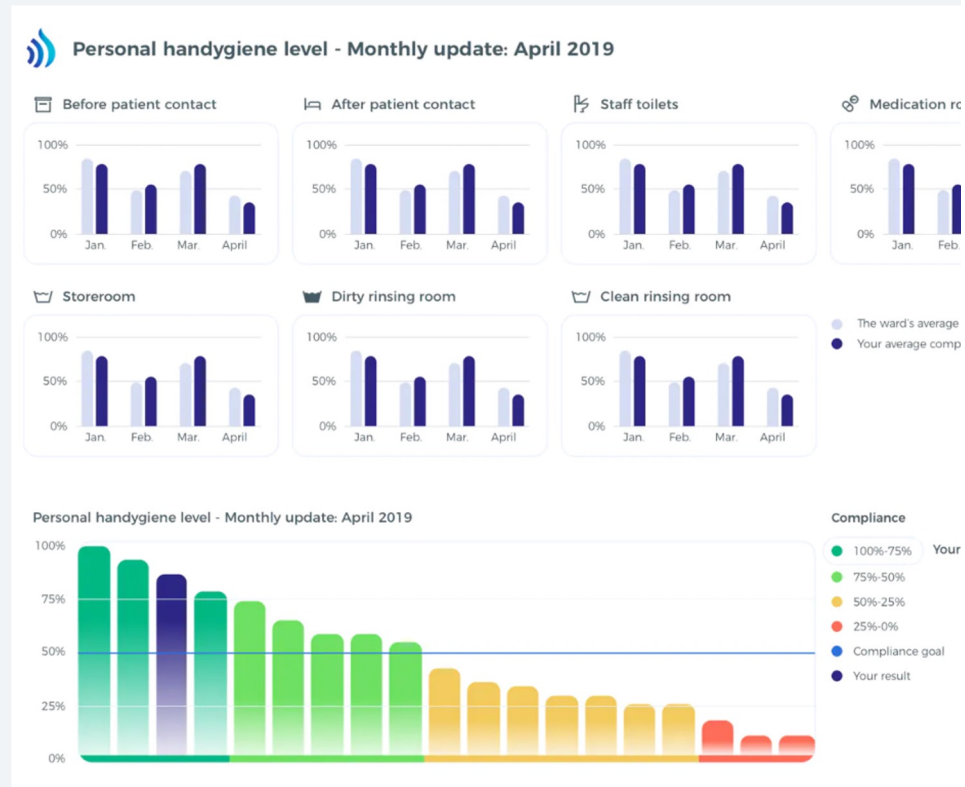
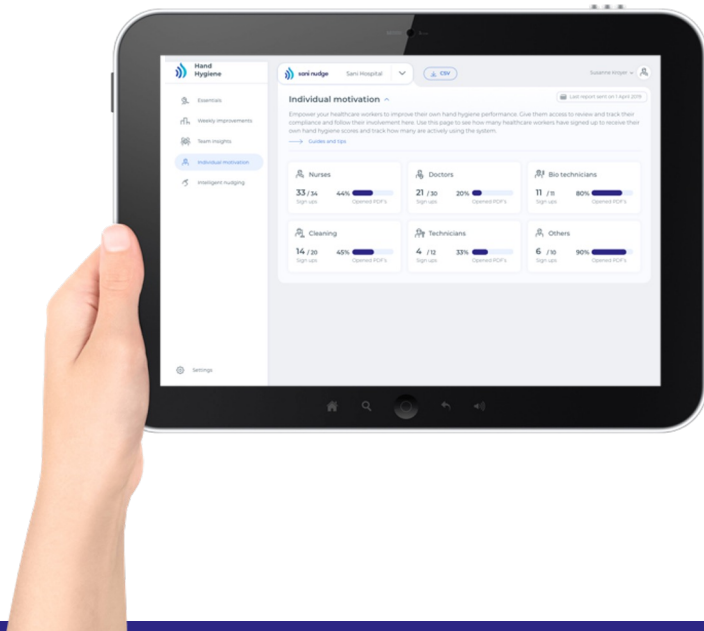


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# Individual Motivation

Just like fit-bit for your hand hygiene compliance.

Set goals and empower staff to understand and compare their compliance score with co-workers.



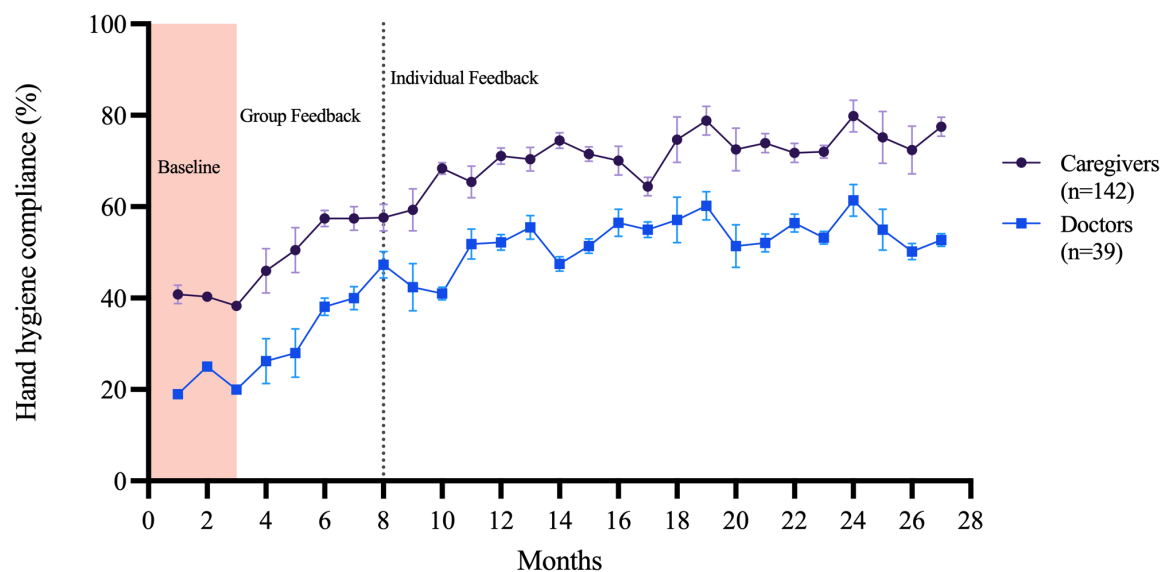
## New results!

A University hospital used EMS to improve the hand hygiene compliance significantly (figure).

The number of HABSİ cases was significantly reduced:

- Control period: 14 cases per 10,000 patient days
- Intervention period: 4 cases per 10,000 patient days
- Incidence rate difference of -9 per 10,000 patient days (95% CI, -16 to -2,  $P=0.01$ ).

The highest effect was seen on *S. aureus*.



### Publications:

J Hosp Infect. 2023 May;135:179-185.doi: 10.1016/j.jhin.2023.02.017. Epub 2023 Mar 17.

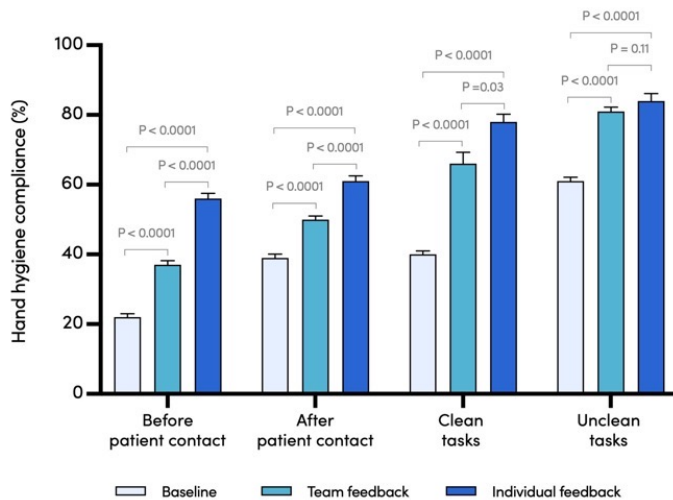
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# Clinically meaningful results

## 1. Hand Hygiene

Ensures the highest standards by doubling the healthcare organizations' HH levels<sup>1-3</sup>.

A cost-effective investment for the management and an essential tool in the COVID-19 and infectious disease toolbox<sup>1-6</sup>.



### Publications:

1. American Journal of Infection Control. 2020;49(6):733-739. [Link](#)
2. American Journal of Infection Control. 2020;48,8:S56-S57. [Link](#)
3. American Journal of Infection Control. 2020;48(5):527-533. [Link](#)
4. Journal of Hospital Infection. 2021;S0195-6701(21)00214-0. [Link](#)
5. Antimicrobial Resistance & Infection Control. 2021;10,130. [Link](#)
6. PLoS One. 2021 Sep 20;16(9):e0257684. [Link](#)

## 2. Infections

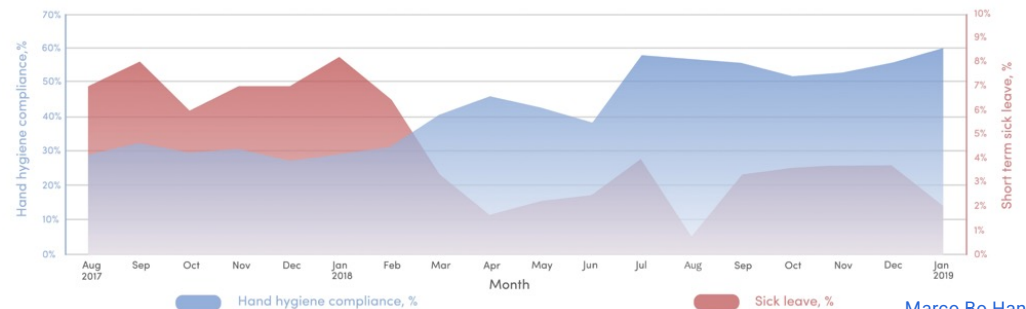
Protects patients and healthcare workers by reducing healthcare-acquired infections<sup>4</sup>.

Period	Control 1	Control 2	Intervention
	Jul 2018 – Jan 2019	Jul 2019 – Jan 2020	Jul 2020 – Jan 2021
Patients treated, no.	815	877	823
Incidence rates of HABSI per 10,000 patient days	14.7	19.1	0
P-value	0.008*	0.003**	Ref.

## 3. Absenteeism

Creates a safe and less stressed working environment by reducing staff absenteeism (short-term sick leave)<sup>5</sup>.

Hand hygiene compliance and short term sick leave of front-line healthcare workers



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# The use of EMS affords the NHS a cost-effective intervention



Guest JF et al. Modelling the costs and consequences of reducing healthcare-associated infections by improving hand hygiene in an average hospital in England. *BMJ Open*. 2019 Oct 1;9(10):e029971.

## Cost-Benefit

- Net benefit: **£33,800-2.4 million**
- If the reduction in HAIs is  $\geq 3\%$ , the cost of the EMS would be offset by the ensuing cost-reductions.
- For every £1 spent by the hospital on the EMS, they save  $\geq \text{£}1.10$

## Assumptions

- Probability of adult inpatients acquiring an HAI: 4.7%
- HAI prevalence of front-line HCWs : 1.72%
- Hand hygiene improvement: 20%
- HAI reduction using EMS: 5-25%
- EMS cost: £1.5

# Nudging study in AJIC

> [Am J Infect Control](#). 2023 May 18;S0196-6553(23)00362-0. doi: 10.1016/j.ajic.2023.05.006. Online ahead of print.

## Effects of light-guided nudges on healthcare workers' hand hygiene behavior

Anne-Mette Iversen <sup>1</sup>, Marco Bo Hansen <sup>2</sup>, Jan Alsner <sup>3</sup>, Brian Kristensen <sup>4</sup>, Svend Ellermann-Eriksen <sup>5</sup>

Affiliations + expand

PMID: 37209875 DOI: 10.1016/j.ajic.2023.05.006

### Abstract

**Background:** Hospital-acquired infections (HAIs) are the most frequent adverse events in healthcare and can be reduced by improving hand hygiene compliance (HHC) among healthcare workers (HCWs). We aimed to investigate the effect of nudging with sensor lights on HCWs' HHC.

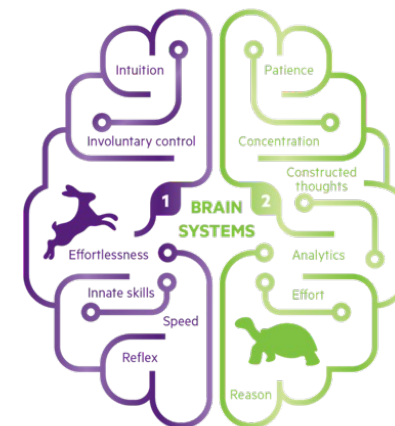
**Methods:** An 11-month intervention study was conducted in two inpatient departments at a university hospital. An automated monitoring system [blinded for reviewers] measured HHC. Reminder and feedback nudges with lights were displayed on alcohol-based hand rub dispensers. We compared baseline HHC with HHC during periods of nudging and used follow-up data to establish if a sustained effect had been achieved.

**Results:** A total of 91 physicians, 135 nurses, and 15 cleaning staff were enrolled in the study. The system registered 274,085 hand hygiene opportunities in patient rooms, staff restrooms, clean and unclean rooms. Overall, a significant, sustained effect was achieved by nudging with lights in relation to contact with patients and patient-near surroundings for both nurses and physicians. Furthermore, a significant effect was observed on nurses' HHC in restrooms and clean rooms. No significant effect was found for the cleaning staff.

**Conclusions:** Reminder or feedback nudges with light improved and sustained physicians' and nurses' HHC and constitutes a new way of changing HCWs' hand hygiene behavior.

**Keywords:** Hospital-Acquired Infection; Infection Prevention; compliance; electronic monitoring systems; nudging.

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### Publications:

[Am J Infect Control](#). 2023 May 18;S0196-6553(23)00362-0. doi: 10.1016/j.ajic.2023.05.006. Online ahead of print.

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sani nudge



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Winner of the National Hygiene  
Award or their success with the  
Sani Nudge solution

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- July 20, 2023  
[STEPS TOWARD ZERO CLABSI](#)  
Speaker: **Mohamed Adawee**, Sparrow Health, Michigan
- August 10, 2023  
[THE EMERGENCE OF ZONOSSES: DOWNSTREAM IMPACTS ON HUMAN HEALTH AND LONG-TERM CARE](#)  
Speaker: **Prof. Jason Stull**, The Ohio State University
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