Changing hand hygiene behavior: Nudging concepts

Marco Bo Hansen, MD, PhD

Supporting zero-harm for patients and staff.

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 Lancet Respiratory Medicine, Editorial. Antimicrobial resistance-what can we learn from climate change? Lancet Respir Med. 2016 Nov;4(11):845.
Centers for Disease Prevention and Control. Hand Hygiene in Healthcare Settings. https://www.cdc.gov/handhygiene/
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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

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

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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 constrains, 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.

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.

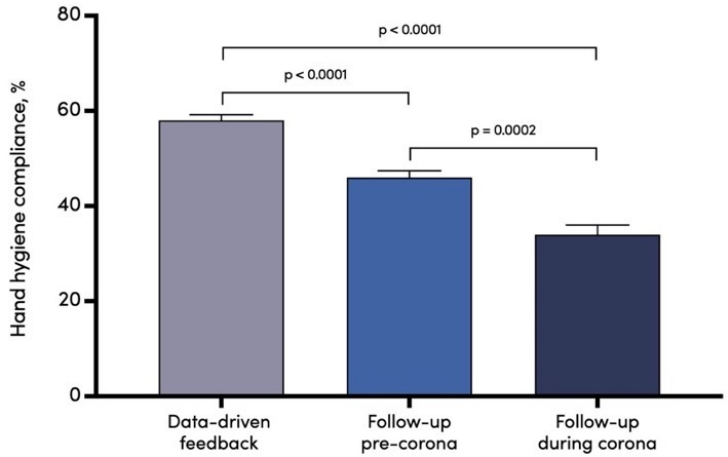

Fig. Hand hygiene compliance of the healthcare workers by periods (phases 1, 2, and 3)

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.

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

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National Patient Safety Goal: Monitoring of Hand Hygiene. Goal 7- 07.01.01. Comprehensive AccreditationManual for Hospitals Standards FAQs. Joint Commission website. http://www.jointcommission.org/

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."

EDITORIAL

'My Five Moments': understanding a user-centred approach to hand hygiene improvement within a broader implementation strategy

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Accepted 16 December 2021

Linked

► http://dx.doi.org/10.1136/bmjqs-2020-011911

Check for updates

To cite: Allegranzi B, Kilpatrick C, Sax H, *et al*. *BMJ Qual Saf* Epub ahead of print: [please include Day Month Year]. doi:10.1136/bmjqs-2021-013680

Between 2006 and 2009, WHO elaborated and issued the concept of 'My Five Moments for Hand Hygiene' in healthcare[1–4] in collaboration with the pioneering infection prevention and control (IPC) research group at the University of Geneva. The primary objective of this approach is to facilitate behavioural change and prioritise hand hygiene action at the exact times needed to prevent the transmission of pathogens and avoid harm to patients and health workers during care delivery. Importantly, the Five Moments approach overcomes some relevant barriers to hand hygiene practices identified before its launch, such as long lists for hand hygiene action without any consideration of the dynamics of patient, health worker and environmental interactions.[5] The originality of the concept was to take both microbial transmission risk and human factors into account, and present an effective way to clean hands at the point of care within busy health workers' schedules and empower them to understand where hand hygiene opportunities occur within their workflow.

In addition to providing a scientific background to the Five Moments,[2 4] WHO included recommendations ranked according to the United States Centers for Disease Control and Prevention/Healthcare Infection Control Practices Advisory Committee system on indications for hand hygiene within the WHO guidelines on hand hygiene in healthcare.[3] Based on evidence evaluation and consensus by experts representing key stakeholders (including those in the field of IPC and practising clinicians), these recommendations were reflected in the Five Moments. Importantly, the Five Moments approach was pilot tested before publication in a wide range of countries and settings with different resources and cultures, as part of the WHO multimodal hand hygiene implementation strategy and toolkit.[6] This strategy has been shown to contribute to significant hand hygiene compliance and knowledge improvement across different professional categories, as well as a reduction in healthcare-associated infections and the spread of antimicrobial resistance.[6 7]

Since then, the Five Moments have been included in numerous hand hygiene implementation and monitoring resources by WHO[8] and others,[9] and adopted worldwide with adaptations to different settings and interpretations of the concept.[10] However, in this issue, Gould *et al*[11] highlight concerns around the Five Moments, questioning its inclusiveness of stakeholders' views, easiness of implementation and adaptation and other limitations. Furthermore, feedback to WHO has suggested that it would be of added value to develop an approach to understanding where to start with the use of the WHO implementation tools, including those associated with the Five Moments, and how to adapt them to local conditions. Implementation initiatives to date have embraced the following five aspects, which are potentially key elements to help drive forward such an approach[12] and may help overcome some of the concerns expressed by Gould *et al*.[11]

ADAPTATIONS

Adaptations to local contextual factors and a range of situations are known to contribute significantly to successful

National Patient Safety Goal: Monitoring of Hand Hygiene. Goal 7- 07.01.01. Comprehensive AccreditationManual for Hospitals Standards FAQs. Joint Commission website. http://www.jointcommission.org/

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

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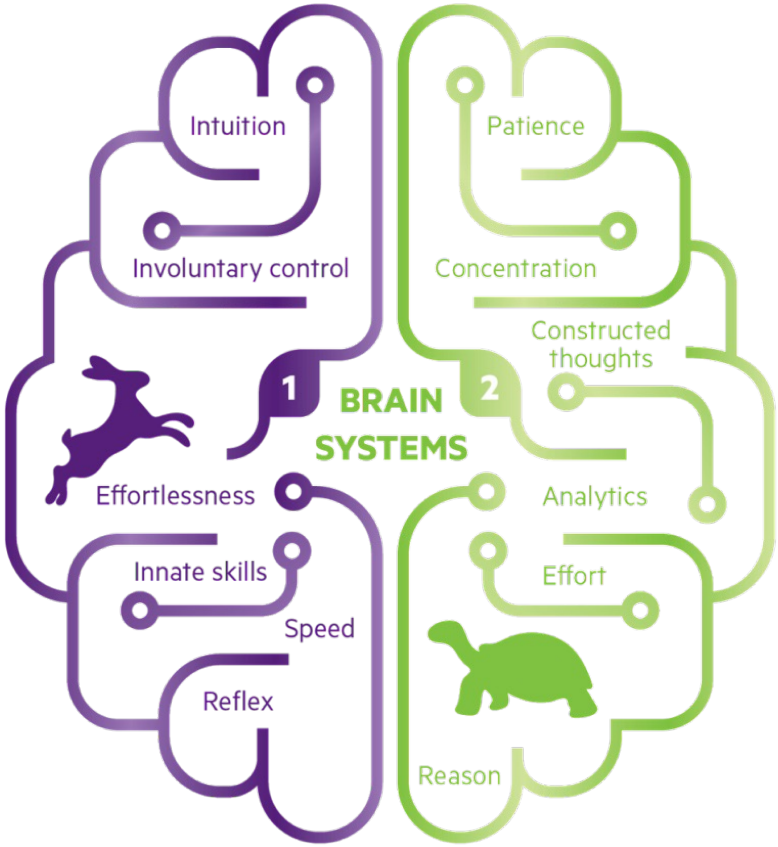
Intuition
Involuntary control
Patience
Concentration
Constructed thoughts
1
BRAIN SYSTEMS
2
Effortlessness
Analytics
Innate skills
Speed
Reflex
Effort
Reason

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.

Thaler, R.H. and C.R. Sunstein, Nudge improving decisions about health, wealth, and happiness. 2008, New Haven, Conn: Yale Univ. P.
Caris, M.G., et al., Nudging to improve hand hygiene. Journal of Hospital Infection, 2018. 98(4): p. 352-358.


Triamin
Disinfection
31
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Behavioral Design in healthcare

Nudging

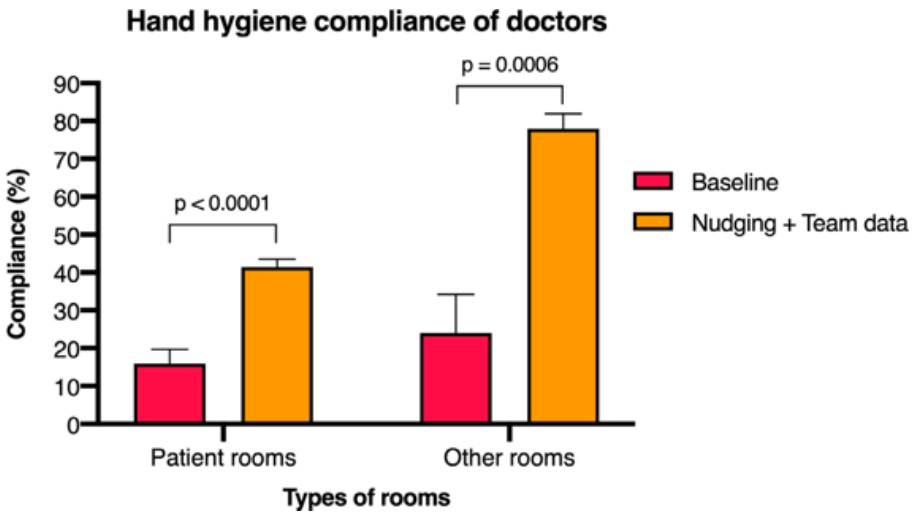
Feedback

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.

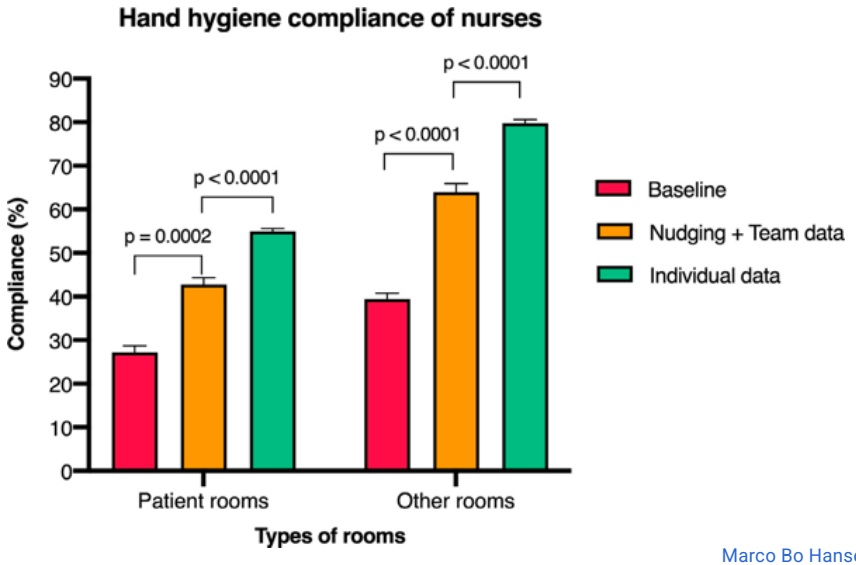
Results

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.



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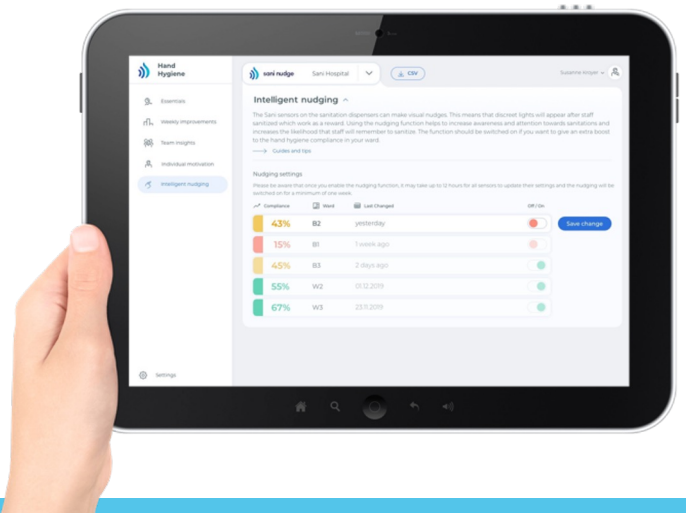
Intelligent Nudging

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.




SÆBE
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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

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 gastroenterlolgy (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 (C6)	41	896

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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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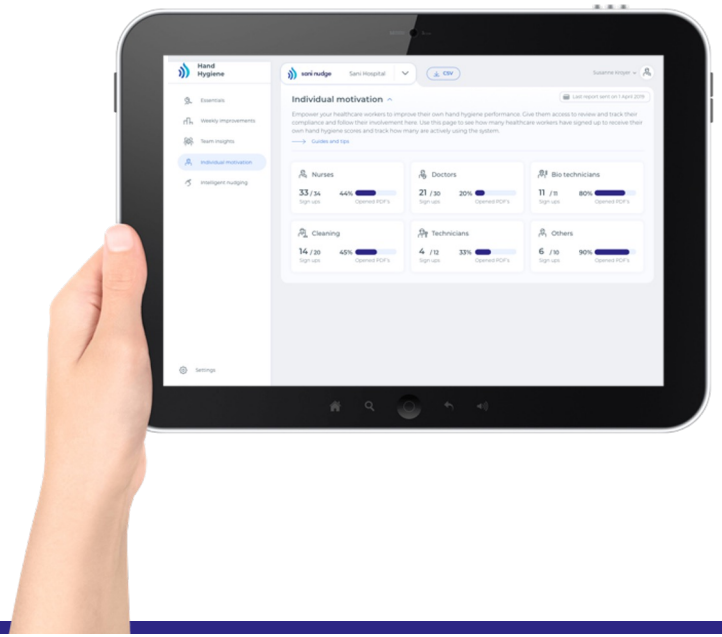
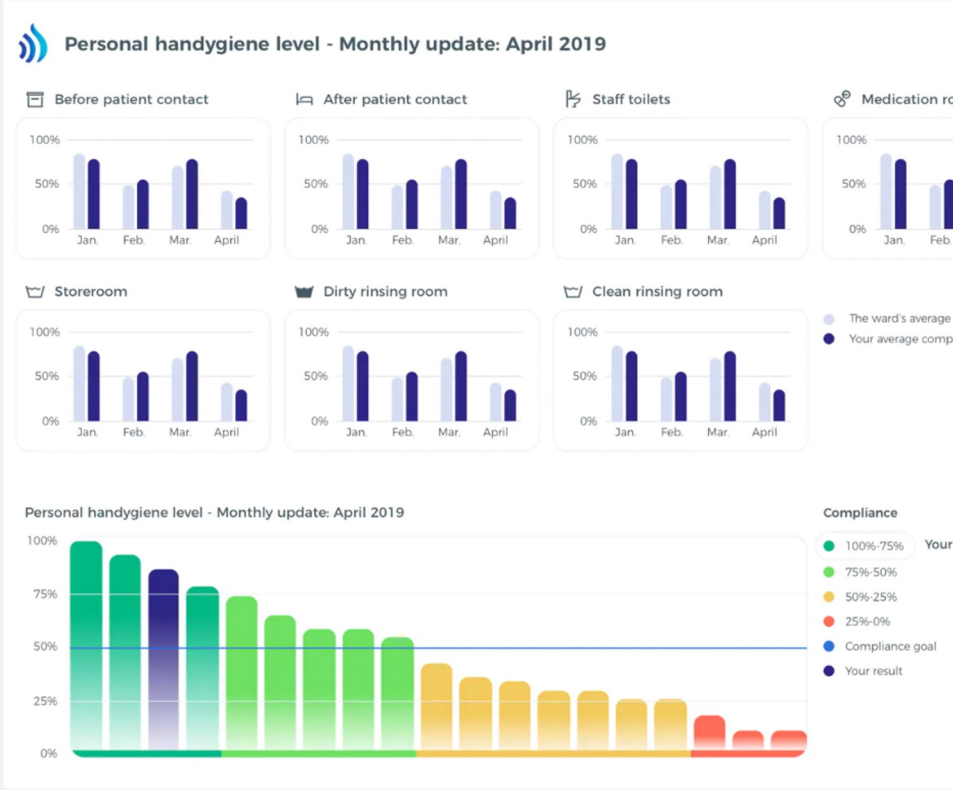
Individual Motivation

Just like fit-bit for your hand hygiene compliance.

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





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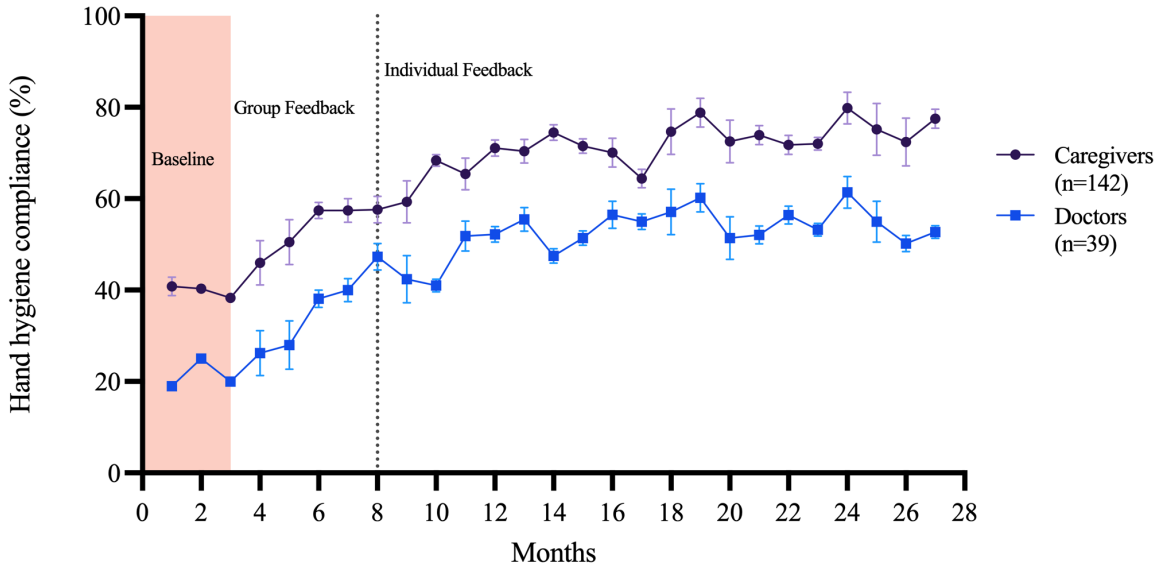
New results!

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

The number of HABSI 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***.



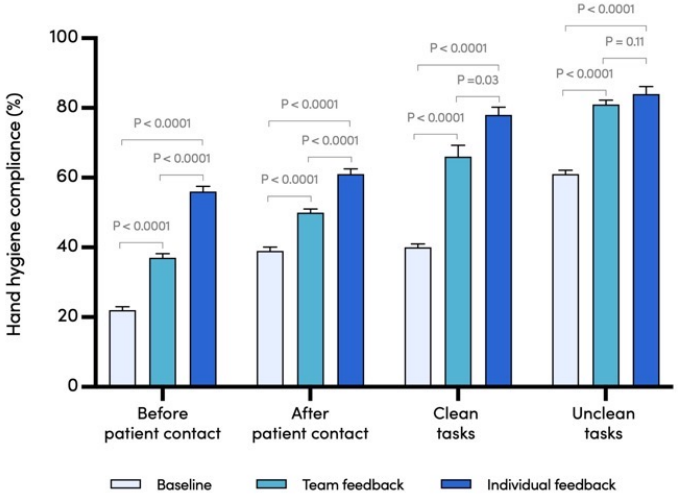
Publications:
J Hosp Infect. 2023 May;135:179-185.doi: 10.1016/j.jhin.2023.02.017. Epub 2023 Mar 17.

Clinically meaningful results

1. Hand Hygiene

Ensures the highest standards by doubling the healthcare organizations' HH levels[1-3].

A cost-effective investment for the management and an essential tool in the COVID-19 and infectious disease toolbox[1-6].



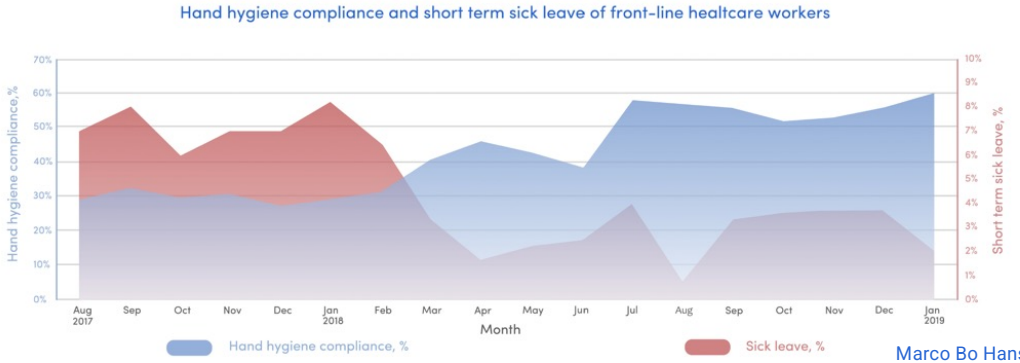
2. Infections

Protects patients and healthcare workers by reducing healthcare-acquired infections[4].

Period	Control 1 Jul 2018 – Jan 2019	Control 2 Jul 2019 – Jan 2020	Intervention 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)[5].



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

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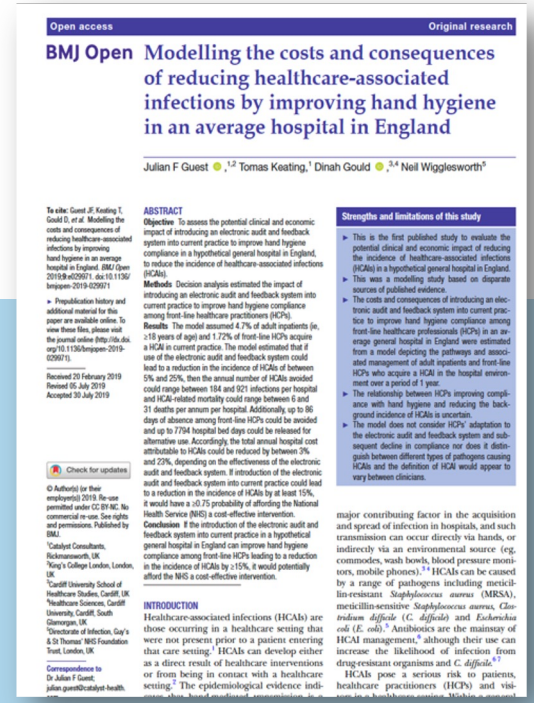
The use of EMS affords the NHS a cost-effective intervention



Open access Original research

BMJ Open

Modelling the costs and consequences of reducing healthcare-associated infections by improving hand hygiene in an average hospital in England

Julian F Guest ,[1,2] Tomas Keating,[1] Dinah Gould ,[3,4] Neil Wigglesworth[5]

To cite: Guest JF, Keating T, Gould D, *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;**9**:e029971. doi:10.1136/bmjopen-2019-029971

► Prepublication history and additional material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2019-029971).

Received 20 February 2019
Revised 05 July 2019
Accepted 30 July 2019

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ABSTRACT

Objective To assess the potential clinical and economic impact of introducing an electronic audit and feedback system into current practice to improve hand hygiene compliance in a hypothetical general hospital in England, to reduce the incidence of healthcare-associated infections (HCAIs).

Methods Decision analysis estimated the impact of introducing an electronic audit and feedback system into current practice to improve hand hygiene compliance among front-line healthcare practitioners (HCPs).

Results The model assumed 4.7% of adult inpatients (ie, ≥18 years of age) and 1.72% of front-line HCPs acquire a HCAI in current practice. The model estimated that if use of the electronic audit and feedback system could lead to a reduction in the incidence of HCAIs of between 5% and 25%, then the annual number of HCAIs avoided could range between 184 and 921 infections per hospital and HCAI-related mortality could range between 6 and 31 deaths per annum per hospital. Additionally, up to 86 days of absence among front-line HCPs could be avoided and up to 7794 hospital bed days could be released for alternative use. Accordingly, the total annual hospital cost attributable to HCAIs could be reduced by between 3% and 23%, depending on the effectiveness of the electronic audit and feedback system. If introduction of the electronic audit and feedback system into current practice could lead to a reduction in the incidence of HCAIs by at least 15%, it would have a ≥0.75 probability of affording the National Health Service (NHS) a cost-effective intervention.

Conclusion If the introduction of the electronic audit and feedback system into current practice in a hypothetical general hospital in England can improve hand hygiene compliance among front-line HCPs leading to a reduction in the incidence of HCAIs by ≥15%, it would potentially afford the NHS a cost-effective intervention.

Strengths and limitations of this study

- This is the first published study to evaluate the potential clinical and economic impact of reducing the incidence of healthcare-associated infections (HCAIs) in a hypothetical general hospital in England.
- This was a modelling study based on disparate sources of published evidence.
- The costs and consequences of introducing an electronic audit and feedback system into current practice to improve hand hygiene compliance among front-line healthcare professionals (HCPs) in an average general hospital in England were estimated from a model depicting the pathways and associated management of adult inpatients and front-line HCPs who acquire a HCAI in the hospital environment over a period of 1 year.
- The relationship between HCPs improving compliance with hand hygiene and reducing the background incidence of HCAIs is uncertain.
- The model does not consider HCPs' adaptation to the electronic audit and feedback system and subsequent decline in compliance nor does it distinguish between different types of pathogens causing HCAIs and the definition of HCAI would appear to vary between clinicians.

INTRODUCTION

Healthcare-associated infections (HCAIs) are those occurring in a healthcare setting that were not present prior to a patient entering that care setting.[1] HCAIs can develop either as a direct result of healthcare interventions or from being in contact with a healthcare setting.[2] The epidemiological evidence indi-

major contributing factor in the acquisition and spread of infection in hospitals, and such transmission can occur directly via hands, or indirectly via an environmental source (eg, commodes, wash bowls, blood pressure monitors, mobile phones).[3 4] HCAIs can be caused by a range of pathogens including meticillin-resistant *Staphylococcus aureus* (MRSA), meticillin-sensitive *Staphylococcus aureus*, *Clostridium difficile* (*C. difficile*) and *Escherichia coli* (*E. coli*).[5] Antibiotics are the mainstay of HCAI management,[6] although their use can increase the likelihood of infection from drug-resistant organisms and *C. difficile*.[6 7]

HCAIs pose a serious risk to patients, healthcare practitioners (HCPs) and visi-

Cost-Benefit

- Net benefit: **£33,800-2.4 million**
- If the reduction in HAIs is ≥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 ≥£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

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.

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

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Affiliations + expand

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

Abstract

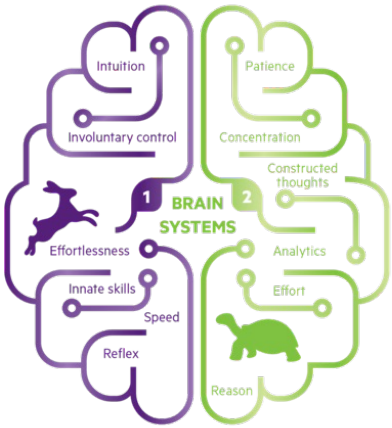
Background: Hospital-acquired infections (HAIs) are the most frequent adverse events in healthcare and can be reduced by improving hand hygiene compliance (HHC) among healthcare workers (HCWs). We aimed to investigate the effect of nudging with sensor lights on HCWs' HHC.

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

Let's connect!

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