USING ELECTRONIC SYSTEMS TO MONITOR HAND HYGIENE: STRATEGIES TO PROMOTE UPTAKE

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OBJECTIVES: AFTER THIS PRESENTATION YOU SHOULD BE ABLE TO:

1. State the importance of hand hygiene monitoring

2. Provide an overview of hand hygiene monitoring approaches currently available

3. Describe the advantages and limitations of electronic monitoring

4. Describe how electronic monitoring systems are used in contemporary health care

5. Discuss strategies to promote acceptability and uptake of electronic monitoring: reported challenges and solutions

6. Debate the value of investing in an electronic monitoring system

IMPORTANCE OF HAND HYGIENE

- Most healthcare-associated infection (HCAI) is transmitted via hands

- Hand hygiene breaks the chain of infection by removing transiently-carried pathogens

- Logically hand hygiene should reduce risk of HCAI

- Designing studies to demonstrate that hand hygiene achieves reduction in HCAI is methodologically challenging

- A rigorous Cochrane systematic review demonstrated modest ability of campaigns to increase hand hygiene adherence short-term & some evidence of impact on infection rates (Gould et al 2017)

BUT

- Hand hygiene is inexpensive compared to other infection prevention measures

- Everybody can do it

- Theoretically effective: evidence from laboratory & observational (non-experimental studies) (Pittet et al 2006)

- Makes sense: logically should break the chain of infection

- Patients, public, managers like to see it being done

AND HAND HYGIENE SHOULD HELP REDUCE RISKS FROM OTHER PATHOGENS

- Influenza, norovirus, rotavirus … hands thought to play a role in transmission

- Emergent pathogens → future pandemics: hands likely to play a part in transmission

  Monitoring hand hygiene has never been more important

OBJECTIVE 1: IMPORTANCE OF HAND HYGIENE MONITORING

- CLINICAL PRACTICE: assesses adherence to hand hygiene protocols → feedback to clinicians → continuous quality improvement

- EDUCATION: identifies need for specific areas of improvement: individuals, wards, organizations, professional groups, what interventions are helpful/not helpful

- MANAGEMENT: used as a key indicator of quality of healthcare, patient safety

- RESEARCH: hand hygiene adherence is widely used as a proxy for infection rates in clinical studies

OBJECTIVE 2: OVERVIEW OF HAND HYGIENE MONITORING METHODS

1. Self-reported behaviour

2. Manual: direct observation → overt & covert

3. Product consumption: assessing uptake of soap, alcohol products, other consumables

4. Close circuit television (CCTV)

5. Electronic systems

SELF-REPORT

- Cheap and straightforward

- Wildly inaccurate: health workers over-estimate levels of adherence: Larson et al 1986, 2004 (US) Jenner et al 2005 (UK), Al-Wazzan et al 2011 (Middle East)

DIRECT OVERT OBSERVATION: 'GOLD STANDARD'

- Can detect all hand hygiene opportunities & events in the sequence of care

- Can be applied to all World Health Organization's Five Moments

- Can see who is adhering/who is not; look at each Moment

- Can intervene & improve performance in 'real time'

DIRECT OBSERVATION: LIMITATIONS
(JEANES ET AL 2019)

- 'Snapshot' picture at 1 point in time: accuracy affected by sampling bias (who it's possible to observe, finite observation period → usually brief)

- Poor vantage e. g. bedside curtains, single rooms, bathrooms

- Methods not standardized: training & validation, 'drift', revalidation & quality control of auditors → bias and inaccuracies

- Education in 'real time' may be unwelcome (Fuller et al 2012)

- Labour-intensive: costly

- Hawthorne effect: main challenge (Drey et al 2020)

HAWTHORNE EFFECT

- 1st described at Hawthorne Electrical Plant in US circa 1932
- Applied to hand hygiene: presence of auditor stimulates increased frequency of hand hygiene episodes

SYSTEMATIC REVIEW (Purssell et al 2020)

- Hawthorne effect in hand hygiene definitely exists
- Very wide range - 6.9% to 65.3%
- Most marked in critical care units
- Enormous variation between wards in same hospital → pooling data across whole organization is not informative

CONSEQUENCES OF HAWTHORNE EFFECT

- Reduced accuracy of hand hygiene monitoring: adherence over-estimated

- Clinicians dismiss findings and importance of monitoring

- If clinicians do believe the findings they are complacent and don't try to improve performance

- Managers, service-users are mislead

- Ethical implications associated with constantly generating & feeding back information that is not a valid depiction of practice

- Wastes everybody's time

- Wastes money

DIRECT COVERT OBSERVATION: 'SECRET SHOPPER'

- Not transparent: promotes health worker distrust and resentment

- Often fails → health workers become aware of what is happening (Whitby et al 2009)

- Not possible if part of a campaign to improve hand hygiene adherence

- Not supported in WHO guidelines for hand hygiene (2009)

PRODUCT CONSUMPTION: PROXY MEASURE

- Can reveal trends in uptake of product over time

- Cheap and straightforward

- Does not monitor number of hand hygiene opportunities → can't calculate rate of adherence

- Data are pooled for entire organization: can't identify individual performance

- Inaccurate: products used for other purposes, spillages, theft (drinking), 'gaming'

- Level of product consumption does not always correlate with hand hygiene adherence measured by other methods

CLOSE CIRCUIT TELEVISION

- Direct visualization of hand hygiene opportunities and events necessary

- Vantage: cameras need careful positioning

- Need to switch off system to preserve patient modesty (e.g. bathrooms, bedpans) → data loss

- Further data loss if system is not switched back on again

- Auditor needs to examine footage → make judgements of when hand hygiene opportunities and events occurred

- Generates large volumes of data requiring interpretation

ELECTRONIC MONITORING SYSTEMS (EMSS)

- Numerous types available: level of sophistication varies

2 main types:

1. Passive systems: simple counting, usually for limited number of locations
2. Interactive systems: detailed data for whole organizations, departments, individuals

ADVANCED, INTERACTIVE SYSTEMS

- Real-time locating systems (RTLSs): health workers wear badges/tags that communicate wirelessly with dispensers fitted with sensors.

- Dispensers/sensors located throughout clinical areas

- Employ wireless technologies: W-Fi, ZigBee, radio-frequency identification, infra-red etc.

- Hand hygiene opportunities and events detected when entering & leaving room/patient zone

- Some systems deliver audible or visual cue: bleep or flashing light when hand hygiene opportunities are registered and acted on

HOW INTERACTIVE EMSS WORK

- Each health worker wears a badge/tag

- Wearable device registers when a hand hygiene opportunity occurs

- Also registers when a hand hygiene event occurs

- System calculates % of hand hygiene events for the individual health worker, ward, organization

- For many systems adherence is continuously tracked on iPad or other visual device in 'real time'

ADVANTAGES OF EMS

- Eliminate Hawthorne effect → greater accuracy

- Comprehensive picture of hand hygiene activity (if everybody is included)

- Vantage is not a problem

- Don't need to be switched on/off for patient modesty: no related data loss

- Yield more data than manual observation → more efficient

- Generate standardized data continuously → can examine trends over time → investigate factors that might influence performance e.g. outbreak of infection, introduction of new product, policy, educational campaign

- Data available for individuals, wards, organizations

LIMITATIONS OF EMS

- Poor acceptance by health workers: know they are identifiable, worry about who can access data, how data will be used

- Poor acceptance by managers: adherence often much lower than levels reported by manual audit

- Data loss: system failure AND problems with tags/badges e.g. opting out, loss, sharing, forgetting

- Can't usually capture Moments 2 (before aseptic technique), 3 (after blood/body/fluids) BUT these reflect circa 20% hand hygiene opportunities (Boyce 2011)

- Can't intervene in 'real time' to improve adherence: infection prevention team still needs to visit wards → investigate changes in adherence, educate

- Cost: purchasing, installing and maintaining system

OBJECTIVE 4: DESCRIBE HOW EMSS ARE USED IN CONTEMPORARY HEALTH CARE

Three types of study:

Group 1

Primary aim: undertake research on phenomena related to hand hygiene/monitoring e.g. impact of hand hygiene campaign, Hawthorne effect

Group 2

Primary aim: evaluate functionality of a specific EMS, sometimes with secondary aims: e.g. research on Hawthorne effect or other phenomenon

Group 3.

Organization-wide implementation of a specific EMS

EXAMPLES OF RESEARCH STUDIES USING EMSS

- Evaluate effectiveness of a hand hygiene campaign on hand hygiene adherence (Fisher et al 2013)

- Establish existence of Hawthorne effect (Filho et al 2014, Srigley et al 2014, Hagel et al 2015, Kovacs-Litman et al 2016)

- Explore health workers' attitudes towards use of EMS (Tarantini et al 2019)

EVALUATION OF SPECIFIC EMS

- Often undertaken during final stages of EMS development → used to refine system, explore acceptability & uptake

- Usually in conjunction with manufacturer, often at company request

- Cost usually borne by company

CHARACTERISTICS OF EVALUATION STUDIES

- Usually small scale: duration finite, 1-2 wards

- Undertaken in many different types of wards

- Undertaken in many different countries, healthcare systems

- Staff included vary: nurses, doctors, ward-based staff, ward-attached staff, peripatetic staff, occasional visitors

- EMSs evaluated differ: cues/no cues, type of cues, method of presenting data etc.

- Accounts of implementation not usually detailed

- Little information about how wards were selected

EVALUATION STUDIES: CONCLUSIONS

- EMSs generally well-accepted

- Wards & EMSs too heterogeneous to combine findings

- Too little known about ward selection to generalize findings: 'good' wards & less 'good' wards → possible publication bias

- Little discussion of challenges and failures: Benudis et al (2019)

EVALUATION STUDY EXAMPLE: GOULD ET AL (2020)

- 31 bed medical ward in London teaching hospital
- Ward carefully chosen: considered 'good', strong nursing leadership, history of technological innovation
- 18 month study: ceased with pandemic & ward reconfiguration
- Interactive EMS without visual or audible cues
- Hand hygiene event registered if health worker was in patient zone for 10 s or more
- Anonymized individual feedback (phone), group feedback (displayed on iPad) & discussed at daily ward meeting
- Participative approach to implementation: close involvement between company, infection prevention team, university, ward

FINDINGS: QUANTITATIVE

- 84% concordance between manual audit and EMS

- 'Missing' hand hygiene events explained by health worker occupying patient zone for less than 10s (workflow issue) or not wearing tag

- Initial adherence 24% when manually assessed by unobtrusive auditor not previously known to staff

- Adherence Î 44% → 57% → 68% → 76% as staff became increasingly aware of auditor: clear Hawthorne effect: EMS recording remained constant

Gould et al 2020

FINDINGS: QUALITATIVE

- EMS very well accepted

- Perceived benefits: opportunity to take part in innovative study, belief that EMS contributed to ability to deliver high quality care, anonymized group feedback

- Realistic attitude: emergencies trump need for hand hygiene (e.g. falls)

- Disliked: receiving feedback/encouragement to improve after 12 hour shift, concerns about workflow issues leading to data inaccuracies: hand hygiene opportunity registered when entering patient zone to observe patient only, supervising students, 'hovering' at periphery of patient zone

Kelly et al 2021

EVALUATION STUDY: LESSONS LEARNT

- Nobody opted out BUT data loss:

  1. Staff turnover

  2. More comprehensive approach to inclusion: ward-based staff, ward-attached, peripatetic staff, students?

- How typical is this ward?
- Study involved close collaboration throughout and investment of emotional labour

CONCLUSIONS

Information from evaluation studies have constraints → have to consider specific nature of ward & how far findings can be generalized to others

BUT

Generate valuable information about acceptability, uptake & pointers for success

ORGANIZATION-WIDE IMPLEMENTATION

- A lot is at stake

- Considerable investment already taken place: choosing system, cost of purchase & installation

- Face ongoing maintenance costs

- Acceptability & uptake are important for long-term success

OBJECTIVE 5: STRATEGIES TO PROMOTE EMS UPTAKE IN THE REAL WORLD

- Limited information: few reports available, short-term only

- Currently 2 publications (US):

    Edmisten et al 2017

    McMullen et al 2022 (December)

EDMISTEN ET AL (2017)

- 3 hospitals in Florida offering acute care including critical care and emergency services
- Approx. 200 beds per hospital
- Centrally administered: same policies and top-level management
- Interactive wireless system with cues

EDMISTEN ET AL (2017): CHALLENGES

- Low levels of adherence when EMS initially installed: artefact (badge position on uniform) AND real (poor initial hand hygiene adherence)

- Loss of badges: HR issued individual badges to each member of staff

- Problems downloading reports from vendor: vendor corrected system

- Badges cumbersome: vendor re-designed badges

- Safety concerns: long-term exposure to radiofrequency → concerns explored and addressed

- Workflow issues: hand hygiene opportunities identified by EMS did not always concord with clinical decision-making

EDMISTEN ET AL (2017): PROMOTING ACCEPTANCE

- Collaborative environment: ongoing communication between clinical staff, managers, EMS vendor
- Leadership commitment: ward managers include hand hygiene in team meetings, senior managers provide visible support e.g. ward visits
- Use data to drive improvement: e.g. weekly feedback at ward and individual level, posting data on wards, reviewing past 100 events to reveal real and hidden challenges e.g. workflow issues
- Consistent and constant messaging e.g. include in organization's overall patient safety program at staff induction, continuing professional development programs
- Staff empowerment e.g. put in place mechanisms to consider and address staff concerns
- Patient involvement e.g. discuss purpose of EMS with patients, visitors, encourage questions about iPad dashboard on ward wall

MCMULLEN ET AL (2022)

- 12 acute hospitals forming part of chain across US
- Ranged from 58 beds in 3 units → 900 beds in 26 units
- Existing manual audit suggested high levels of adherence BUT concerns over accuracy
- Interactive EMS with audible cues
- 3 year implementation program
- Baseline data → EMS 'live' → intervention to promote uptake → continuous data collection
- Goal of 80% adherence set

MCMULLEN ET AL (2022): COMPONENTS OF INTERVENTION TO PROMOTE UPTAKE

- General information about importance of hand hygiene

- Information about how EMS worked

- Health worker's role: importance of badge-wearing at all times, badge maintenance, action to take if lost or damaged

- Individual performance feedback

- Monthly ward/department feedback

MCMULLEN ET AL (2022) FINDINGS & CHALLENGES

- 80% adherence goal achieved within 3 years NOT related to use of audible cue (literature on cue use is mixed)

- Main issues: health worker skepticism about accuracy and value of data related to workflow issues: EMS and clinical decision-making not always in accordance

- Same challenges identified across hospital chain → leaders met regularly to discuss concerns, involved vendor, staff

- Infection prevention team investment of time in hand hygiene-related work DOUBLED with introduction of EMS

MCMULLEN ET AL (2022): CONCLUSIONS

- EMS data obliged managers to accept that manual audit data were inaccurate and that low adherence was a real problem

- EMS data provided detailed information on hand hygiene adherence valuable to managers

- Use of EMS can help increase hand hygiene adherence in conjunction with intervention to promote uptake

- Correct use of EMS demands investment of time from staff, managers, infection prevention team and support from vendor

MAKING SENSE OF THE LITERATURE: EVALUATION AND IMPLEMENTATION STUDIES

Types of challenges

- Manager skepticism: unwillingness to invest in EMS

- Health worker skepticism: technology-related (e.g. size of badges/tags), how data might be used, workflow issues → collectively translate into reluctance to 'buy into' EMS → badge/tag losses, sharing etc.

- Scale of input required from infection prevention team

LESSONS FROM EVALUATION & IMPLEMENTATION STUDIES

- EMSs are not 'magic': multiple challenges, some easily reconciled, others more enduring e.g. workflow issues that can result in staff reluctance

- EMSs are monitoring tools that improve accuracy of hand hygiene data, can identify trends over time

- EMSs can help increase hand hygiene adherence when used in conjunction with hand hygiene campaigns

ADDRESSING CHALLENGES

- Manager skepticism: emphasize limitations of manual audit (Jeanes et al 2019), evidence of Hawthorne effect (Purssell et al 2020)

- Technology-related: 'teething' problems related to specific EMSs and solution through liaison with vendor and system refinement

- Health worker reluctance of how data might be used: overcoming 'housekeeping' issues e.g. badge/tag loss → HR involvement, clear ground rules

- Health worker reluctance & data protection issues: patient safety vs. punitive action when individual's adherence persistently low → major HR decision of when to intervene

- Workflow issues: need to explore each individually, may need to 'live with' some limitations

- Input required from infection prevention team: further research needed → does input from IPC team reduce over time?

OBJECTIVE 6: DEBATE THE VALUE OF EMSS: KEY QUESTIONS WHEN CONSIDERING IMPLEMENTATION

- Do all stakeholders agree that better hand hygiene data are needed? How will those data be used? What are the perceived benefits?

- Are stakeholders willing to work with vendors to identify and resolve 'teething' problems? Will vendor be willing to contribute time and expertise? Choice of vendor/EMS important

- Debate how to address ongoing poor adherence and agree at what point to take action and what the action will be

- Debate whether possible increase in IPC team time is feasible & justifiable. Will the IPC team be willing to find the best way of using EMS?

- Workflow issues: need to be investigated on individual basis: some may have to be acknowledged and accepted e.g. emergencies

POST-SCRIPT

The world changes, healthcare evolves, infection prevention moves on to meet changing needs & so do approaches to evaluating hand hygiene …

ATTITUDES HAVE CHANGED

1990: Watching health workers wash hands is unacceptable!

1991: Watching health workers wash hands is a waste of time!

1993: So you've learnt how to observe hand hygiene – fancy wasting 3 years doing that!

2000: Importance of hand hygiene recognised internationally (Pittet et al 2000)

2009: WHO guidelines for hand hygiene and hand hygiene audit published

2015: Expertise observing hand hygiene emerging as a very important skill

March 7, 2023	*(European Teleclass)* **AUTOMATING THE SURVEILLANCE OF HEALTHCARE-ASSOCIATED INFECTIONS: MAKING SENSIBLE SENSE OF ELECTRONIC HEALTH RECORD DATA** Speaker: **Dr. Maaike van Mourik**, University Medical Center, Utrecht, The Netherlands
March 9, 2023	**HOMECARE & HOSPICE – STANDARDIZING INFECTION SURVEILLANCE** Speaker: **Mohamed Adawee**, Sparrow Health, Michigan
March 23, 2023	**THE ENVIRONMENT, THE TICK, AND THE PATHOGEN – IT'S AN ENSEMBLE** Speaker: **Jannelle Couret**, University of Rhode Island
April 4, 2023	*(FREE European Teleclass)* **RESPIRATORY INFECTION PREVENTION: PERCEPTIONS, BARRIERS AND FACILITATORS** Speaker: **Dr. Pierre Parneix**, Hôpital Pellerin, CHU de Bordeaux, France
April 12, 2023	*(South Pacific Teleclass)* **UNINTENDED CONCEQUENCES OF INFECTION PREVENTION AND CONTROL MEASURES DURING THE COVID-19 PANDEMIC** Speaker: **Dr. Moi-Lin Ling**, SingHealth, Singapore

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