

Rapid Evidence Synthesis: Behaviour change techniques for guideline compliance in infection prevention and control

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Rapid Evidence Synthesis:

Rapid Evidence Syntheses (RES) are produced by the National Institute for Health and Care Research (NIHR) Applied Research Collaboration Greater Manchester (ARC-GM). The methods used are based on a framework set out in Norman et al. 2022 and previously registered on the Open Science Framework (OSF).^{a, b}

RES use evidence synthesis approaches and draw on the GRADE Evidence to Decision framework^c to provide rapid assessments of the existing evidence and its relevance to specific decision problems. In the first instance they focus on evidence from guidance and existing evidence syntheses. They are undertaken in a real-time context of decision-making around adoption of innovative health technologies and are designed to provide a “good-enough” answer to inform decision problems in a short timescale. RES methods are flexible and adaptive. They have evolved in response to user feedback and differ depending on the nature of the assessment undertaken.

RES are not intended to serve as a substitute for a systematic review or rapid review of evidence.

We welcome feedback and are particularly interested to hear how you have used this Rapid Evidence Synthesis.

Please send any queries or comments to:

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This work was undertaken by the National Institute for Health Research (NIHR) Applied Research Collaboration Greater Manchester (ARC-GM). The views expressed are those of the authors and not necessarily those of the NIHR or the Department of Health and Social Care.

^a Norman, G. Rapid evidence synthesis to support health system decision making. *OSF registration*. 2020 [cited 2023]; Available from: osf.io/hsxk5

^b Norman, G., et al., Rapid Evidence Synthesis To Enable Innovation And Adoption in Health and Social Care. *Systematic Reviews*, 2022. 11: p. 250. <https://doi.org/10.1186/s13643-022-02106-z>

^c Alonso-Coello, P., et al., GRADE Evidence to Decision (EtD) frameworks: a systematic and transparent approach to making well informed healthcare choices. 1: Introduction. *BMJ*, 2016. **353**: p. i2016.

1. Summary

There is directly and indirectly relevant evidence from multiple high quality systematic reviews which include both RCTs and non-RCTs that interventions which include behavioural change techniques may be effective in producing modest improvements in adherence to clinical guidelines in aspects of infection control. There is some evidence that some interventions may be effective in achieving small improvements in patient outcomes. Directly relevant evidence is low certainty, meaning that further research may change the findings. Because of the repeated finding of variations in effectiveness, indirectly relevant evidence from other areas of healthcare practice and other types of interventions should be considered to be of low certainty even where the evidence itself is high quality.

- Overall behaviour change techniques (BCT) may improve healthcare workers' compliance with infection prevention and control (IPC) guidelines (low to moderate certainty evidence), but there is evidence that the effectiveness of interventions may be affected by multiple factors, some of which may be modifiable (moderate to high certainty evidence). There is theory-driven qualitative evidence synthesis to support the impact of factors such as credibility and actionability.
- There is evidence that particular combinations of interventions may be more effective than others in changing practice in IPC and more detailed evidence from wider reviews of BCT interventions on guideline compliance. Specifically, there is low certainty evidence for use of: multimodal interventions which include some, but not all, of the WHO-recommended strategies; multimodal interventions which contain all the WHO-recommended strategies plus some additional ones; performance feedback; education; cues.
- There is less evidence relating to the impact of BCT on patient outcomes. There is some moderate certainty evidence that performance feedback probably slightly reduces infection rates and that multimodal strategies including some of the strategies recommended by the WHO may slightly reduce infection rates (low certainty). Indirectly relevant evidence is that multimodal strategies with all the WHO recommended strategies may slightly reduce rates of colonisation (low certainty).
- The most relevant systematic review predates guidance and the publication of relevant RCTs and may benefit from being updated.

2. Methods

2.1 Description of the intervention

Guidelines on infection prevention and control (IPC) have been issued by the WHO, UK NICE, the CDC and other organisations. (1-6) The WHO states that core components include national level IPC programmes and IPC guidelines.(1) IPC education and training, surveillance, multimodal strategies and monitoring/audit and feedback on practices are also core. At the organisational level education, training; implementation strategies and monitoring with feedback are key to ensuring that policies, programmes and guidelines are followed.(7, 8) The CDC identifies the following facets of IPC: Basic IPC; antibiotic resistance; device-associated; procedure-associated; disease/organism-specific; personnel; and setting specific.(3) Within the basic IPC they further identify the following areas for guidance: disinfection and sterilization; hand hygiene; environmental infection control; isolation precautions. NICE sets out key statements which include the need for hand hygiene practices, continuous organisational improvement strategies in IPC and antimicrobial stewardship practices.(5) The review which supported NICE guidance was updated in 2014.(9) NICE guidance sits alongside the guidance of the 2008 Health and Social Care Act.(10)

Behaviour change techniques (BCT) are one type of intervention used to improve compliance with IPC guidelines, and may be a component of multimodal strategies. BCTs are systematic procedures included as an active component of an intervention designed to change behaviour.(11) They include a wide range of intervention types. Michie et al. identified 93 BCTs in 16 clusters. (12, 13)

2.2 Search

- We searched multiple sources and used an iterative snowballing technique to identify relevant existing evidence syntheses. We initially searched PubMed, the Cochrane Database of Systematic Reviews and Prospero as well as scanning the list of reviews produced by the Cochrane EPOC group and the websites of the WHO, NICE, CDC and RCN.
- PubMed search terms included behavior/behaviour with appropriate truncations; change; technique; “social norm*”; health; “healthcare staff”. We focused this search on systematic reviews. We used forward citation searching and reference checking of relevant identified reviews.
- All searches were conducted between 5 and 11 October 2021.

2.3 Key Questions

1. What is the effectiveness of behaviour change techniques for improving staff compliance with systemic infection prevention and control (IPC) guidelines in acute healthcare settings?

This is assessed using behavioural outcomes including compliance and engagement with IPC practice guidelines.

2. What effects do behaviour change techniques for improving staff compliance with systemic infection prevention and control (IPC) guidelines have on incidence of nosocomial systemic infections in acute healthcare settings?

2.4 Inclusion criteria

For both questions we included the following:

- Clinical and non-clinical staff in acute healthcare settings
- Interventions using behaviour change techniques to improve compliance with guidelines in infection control and prevention (for the prevention of nosocomial (hospital-acquired)) systemic infections. We will include intervention bundles and complex interventions provided that a behavioural change technique was one element of the bundle or intervention. For this RES we have interpreted IPC guidelines as any guideline which is applicable to IPC of systemic infections in the acute healthcare setting. We therefore excluded guidelines in areas such as prevention of surgical site infection. While guidelines on IPC include antibiotic stewardship we have not focused on this in this RES although we note key reviews in the area. In this we are aligned with the review we identified by Edwards et al. in this area.(14)
- Any alternative intervention, including usual care or none as a control condition. In the case of bundled or complex interventions behaviour change technique(s) should represent a systematic difference between the interventions.

A rapid evidence synthesis considers existing evidence syntheses in the first instance; evidence syntheses may include primary research studies with any design. If there is limited evidence for acute healthcare settings, we may look at all health and social care settings; if there is limited evidence for IPC we may look at all guideline compliance. In this instance, however, we identified a number of relevant evidence syntheses for the key questions.

3. Results

3.1 Effectiveness of behaviour change techniques in IPC – healthcare worker compliance and patient outcomes

Because of the nature of the evidence identified, with more limited reporting of patient outcomes, we have considered these questions together but clearly delineate where patient outcomes are considered. Because we identified several relevant systematic reviews which are relevant or partially relevant to our key questions, we have not considered additional primary studies although we have conducted some scoping to assess the likely size of this evidence base. We have focused on core IPC practices in acute healthcare where possible. If a wider evidence review is considered desirable, we are aware of reviews of relevant interventions in long term care facilities and those targeting antibiotic prescribing which are not included here.

A 2018 scoping review by Michie et al. highlighted the difficulty of identifying effective BCTs or combinations of BCTs for specific contexts.(13) All of the methods had limitations which meant that only weak conclusions were possible. This finding should be borne in mind when considering the evidence we have identified in IPC; the scoping review recommends the integration of findings from different methods of identifying potential BCTs for an intervention.

3.1.1. Review of BCT for IPC in acute healthcare

A 2012 review looked at use of behaviour change to optimise IPC in acute health care; although this review is not recent it is the most highly relevant to our question.(14) This included 7 intervention studies as well as 14 exploratory studies looking at barriers and facilitators in IPC. The review was limited to countries with developed healthcare systems and closely followed the PICO identified for this RES. Two of the included studies targeted IPC in general, two looked at patient isolation and three at hand hygiene. None of these studies was a randomised controlled trial (RCT); they were before-and-after, interrupted time series or observational studies with control conditions. The review found that all the intervention studies reported behaviour change, reduction in infection risk, or both. None of these studies explicitly incorporated psychological theory and only two contained elements of social marketing in the design, although five addressed sustainability. The strength of evidence is limited, not because of the conduct of the review but because of the designs of the included studies, which mostly lacked control groups. This should therefore be considered low certainty evidence which means that further research would be likely to change the findings.

We updated the MEDLINE search for this review to identify studies from the 2011 search date onwards and added an RCT filter to focus on intervention studies with a randomised design. This search returned over 384 records of which 64 appeared potentially relevant. Extending the search to multiple databases would be expected to double the number of records initially identified. There may be a case for conducting a rapid systematic review in this area, based on the results of this search; this would require some further scoping to determine if this would add to subsequent reviews which cover elements of the research questions. Some of the records identified related to

trials included by other reviews identified here.

3.1.2. Reviews of BCT in healthcare

The most recent general review by Tang et al (2021) looked at the impact of social norms interventions on clinical behaviours of healthcare workers, which is a wider scope than our question but included studies in IPC, specifically handwashing.⁽¹⁵⁾ Social norms interventions are a type of BCT which is sometimes included as a component of audit and feedback interventions. This review only included RCTs, including data from 106 trials. The review looked at five types of BCT: social comparison, information about others' approval, credible source, social reward and social incentive.⁽¹²⁾ The review looked at both compliance with desired clinical behaviour and patient-related health outcomes.

The review found that interventions were social norms interventions overall showed modest effectiveness in changing the clinical behaviour of healthcare workers and having a positive impact on patient outcomes. The review did not use GRADE but identified risks of bias and clearly reported other relevant factors in evidence certainty including possible publication bias, and differences between the studies. There is therefore low to moderate certainty that the interventions probably have the effects reported. However, there was variation in effectiveness depending on a number of factors including:

- Which group of healthcare professionals was involved: overall, interventions were on average effective with doctors and other healthcare workers but not with nurses or allied healthcare workers.
- The type of social norm intervention and how it was delivered (once vs repeatedly; via website, email, writing, mixed format or face to face): face to face appeared less effective than other delivery methods and interventions delivered once were more effective than those delivered repeatedly.
- The types of social norm interventions which were most effective when delivered alongside other BCTs were the use of a credible source, social comparison combined with social reward and social comparison combined with prompts and cues. Social comparison and either credible source or social support were also effective, on average.
- The type of behaviour targeted: while interventions were effective for a number of clinical behaviours there was no clear effect in handwashing. This was based on four RCTs.⁽¹⁶⁻¹⁹⁾

This was an up-to-date and well-conducted review and its findings and assessment of the evidence is likely to be reliable. Because of the findings that there is considerable variation in effectiveness related to multiple factors, caution is needed in extrapolating the findings for one type of clinical behaviour to another.

The variation in effectiveness of interventions mirrors that seen by a less recent Cochrane review of the impact of audit and feedback on professional practice and patient outcomes.⁽²⁰⁾ This found that

audit and feedback generally lead to small but potentially important improvements in professional practice but that their effectiveness seems to be dependent on baseline performance and how the feedback is provided. However, the findings here differed from Tang et al (15) which did not find that repeated interventions were more effective. This was a large review which was not directly relevant to the focus of this RES but which included studies examining antibiotic prescribing, often considered as a facet of IPC.(3) Overall this is indirectly relevant evidence.

3.1.3. Reviews of interventions for IPC

WHO guidelines are based on a systematic review conducted in 2012 and updated in 2015-16.(21) This included 92 studies including a range of quantitative and qualitative study designs. The review identified ten key components for organisation and implementation of monitoring for effective IPC programmes in hospitals. These included the use of multimodal and multidisciplinary programmes that include behavioural change. Other relevant components were education and training, auditing, surveillance and feedback, engagement of champions, and positive organisational culture. The recommendation for multimodal strategies and tools related to hand hygiene is based on 20 studies; other studies focused on catheter or central line-associated bloodstream infection prevention or prevention of ventilator-associated pneumonia. Recommendations related to hand hygiene were included in the judgement that the evidence was of intermediate quality and ease of implementation and applicability (to the EU) were rated as high because the range of approaches identified allowed adaptation to local considerations.

NICE guidelines are based on a review with a similar date.(9) This updates previous reviews from 2001 and 2007. The review gave rise to recommendations that resources for, and adherence to, hand hygiene guidelines should be audited and fed back on at regular intervals; that regular training in risk assessment and hand hygiene should be provided; and that local programmes in education, social marketing, audit and feedback should be refreshed regularly and promoted by senior managers and clinicians. All these recommendations were based on evidence graded class C or below. The review findings were based on previous systematic reviews,(22-26) ¹ but also six new studies of which two were cluster RCTs, and one a step-wedge RCT;(16, 17, 27) the others were interrupted time-series or controlled before-after studies. These were well-conducted and reported reviews which are likely to be reliable but may benefit from being updated in the specific area of interest to this RES.(9, 21)

The other systematic reviews identified assessed interventions specifically targeting respectively behaviour change techniques but included some relevant studies and are not further assessed as they were included in the review (9) which supported NICE guidance.(5) One of these reviews on hand hygiene has since been updated.(23) The updated review included 26 studies including 14 RCTs. The studies included in this review included those assessing multi-modal interventions which used different combinations of the strategies recommended by the WHO.(1, 7) These included behaviour change techniques alongside other components such as improved accessibility of alcohol-based hand rub. This review found low certainty evidence that the following may improve hand hygiene compliance:

- Multimodal interventions which include some, but not all, of the WHO-recommended

strategies

- Multimodal interventions which contain all the WHO-recommended strategies plus some additional ones
- Performance feedback
- Education
- Cues (e.g. signs)

There was also moderate certainty evidence that placing alcohol-based hand rub close to point of use probably produces a slight improvement in hand hygiene compliance.

This review also looked at change in infection rates which is a directly relevant patient outcome, and at colonisation rates, which is indirectly relevant to patient outcomes. For infection rates there was moderate certainty evidence that performance feedback probably slightly reduces both infection rates and colonisation rates. There was low certainty evidence that multimodal interventions which include some, but not all, of the WHO-recommended strategies may reduce infection rates. The evidence for other combinations of strategies was uncertain.

Much of the evidence on infection relates to *S. Aureus* infection so may not be directly relevant to other types of infection. Because WHO recommendations include multiple types of interventions this evidence is directly relevant to multimodal strategies where one or more components relates to behaviour change.

A recent systematic review looked at dissemination interventions for adherence to IPC guidelines.(28) This included only RCTs and assessed uptake of influenza vaccination and knowledge of IPC as well as hand hygiene compliance. The review found moderate certainty evidence that interventions assessed probably/may improve hand hygiene compliance, but that combined dissemination strategies probably/may not improve compliance when compared with single strategies.

3.1.4. Factors which impact effectiveness of interventions

A recent meta-synthesis of feedback interventions for clinical performance of healthcare professionals looked at the factors which influence their success and mapped these to generate a set of design recommendations for feedback implementation. (29) Key issues identified include baseline performance, credibility of the person delivering the feedback, number of times feedback is delivered, accessibility of feedback (verbal/written), inclusion of clear targets and an action plan. This qualitative review builds on prior mapping of BCT (12, 30) and seeks to explain the variation identified in the Cochrane review;(20) it may also be considered alongside the review by Tang which explored the variations in findings quantitatively.(15) The hypotheses explored here are not generated by studies in IPC specifically but are likely to be relevant to them. Broader explorations of behaviour change in healthcare were also identified.(31) All of this work is limited by the variation and limitations in the description of BCT interventions in the primary literature.(32)

We identified an older Cochrane review which looked at interventions designed to overcome barriers to change.(33) This found that interventions which have been tailored to prospectively identified barriers are more likely to improve professional practice than no intervention or

dissemination of guidelines. This finding was based on 26 RCTs; the review was subsequently updated with a revised scope.(34) The updated review included 32 cluster-RCTs and supported the previous finding that tailored interventions based on identified determinants of practice can be effective in improving implementation of recommended practice, but effects are not large and are variable. Variation in the methods used to identify determinants of practice was identified and the evidence from reviews of barriers and facilitators may be relevant here.(35) This review was well conducted and the included studies were generally well-conducted but this is indirectly relevant evidence since only a minority of studies addressed practice relevant to IPC and this related to antibiotic prescribing.

3.1.5. Barriers and facilitators to adherence

While not focused on interventions, we identified a recent Cochrane review which presented a rapid qualitative synthesis of the barriers and facilitators to healthcare workers adherence to IPC guidelines for respiratory diseases. (35) This provides qualitative evidence which can be considered alongside quantitative evidence on the effects of BCT interventions. The review used a previously published framework of organisational, environmental and individual factors to structure their analysis.(36) The review found that there were multiple barriers and facilitators involved in whether healthcare staff followed guidelines. The certainty of the evidence was assessed using GRADE-CERQual (the GRADE approach to qualitative research). Key barriers and facilitators which were relevant to this RES related to staff seeing the value of IPC guidance and workplace culture; it was common for healthcare workers to identify the importance of including all staff when implementing IPC guidelines: this included cleaning and kitchen staff, porters and other support staff. Communication and training (particularly mandatory training) were also identified as important. Other factors identified related to more practical issues such as layout, availability of equipment and facilities, although the impact of following guidelines on patients (such as patients finding use of PPE frightening, isolating or stigmatising) was also noted. All of these factors were based on evidence judged to provide moderate to high confidence. This is a rapid but well-conducted qualitative review and its findings are likely to be reliable.

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Appendix: Search strategy of Edwards 2012 – updated with RCT filter

Ovid MEDLINE(R) <1946 to September Week 5 2021>

- 1 antibiotic?.mp. or exp Anti-Bacterial Agents/ 907140
- 2 antimicrobial?.mp. 162919
- 3 (prescription* or prescrib* or steward* or polic* or guideline*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] 971155
- 4 1 or 2 975565
- 5 3 and 4 50408
- 6 (prudent adj3 (prescription* or prescrib*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] 123
- 7 infection control.mp. or exp Infection Control/ 80276
- 8 ((infection adj control) or (infection adj3 prevention) or (infection adj3 management)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] 53716
- 9 nosocomial infection?.mp. or exp Cross Infection/ 67220
- 10 hospital acquired infection?.mp. 3913
- 11 Methicillin Resistant Staphylococcus Aureus.mp. or exp Methicillin-Resistant Staphylococcus aureus/26571
- 12 MRSA.mp. 21999
- 13 clostridium difficile.mp. or exp Clostridium difficile/ 14751
- 14 C-diff.mp. 129
- 15 (control or prevention or management or guideline*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] 5255784
- 16 9 or 10 or 11 or 12 or 13 or 14 105733
- 17 15 and 16 48314
- 18 behavio?r change.mp. 14174
- 19 interven*.mp. 1029566
- 20 social marketing.mp. or exp Social Marketing/ 3709
- 21 marketing.mp. or exp Marketing/ 51741
- 22 (barrier? or obstacle? or encourage or empower? or enable?).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare

disease supplementary concept word, unique identifier, synonyms] 676596

23 motivation.mp. or exp Motivation/ 217870

24 exp Organizational Innovation/ or organisational change.mp. 27579

25 exp Staff Development/ or exp Education, Medical, Continuing/ or professional development.mp. 41982

26 education.mp. or exp Education, Medical/ or exp Education/ or exp Education, Medical, Continuing/ 1153576

27 clinical governance.mp. or exp Clinical Governance/ 1767

28 exp Hospital Administration/ or hospital management.mp. 274433

29 hospital administration.mp. 30952

30 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 3026420

31 health facility.mp. or exp Health Facilities/ 840738

32 health facilities.mp. 27079

33 community healthcare.mp. or exp Community Health Services/ 317878

34 community health care.mp. 1101

35 hospital?.mp. or exp Hospitals/ 1392789

36 (pharmacy or pharmacies or chemist?).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] 72410

37 exp Primary Health Care/ or exp Family Practice/ or exp Community Health Centers/ or health centre.mp. 247954

38 GP practice.mp.431

39 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 2108588

40 exp Health Personnel/ or healthcare professional?.mp. 572401

41 medical personnel.mp. or exp Medical Staff, Hospital/ or exp Medical Staff/ 33788

42 clinician?.mp. or exp Nurse Clinicians/ or exp Physicians/ 368840

43 doctor?.mp. 114945

44 physician?.mp. 551429

45 nurse?.mp. or exp Nurses/ 335571

46 clincial staff.mp. 0

47 executive?.mp. or exp Chief Executive Officers, Hospital/ 57524

48 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 1403385

49 5 or 6 or 7 or 8 or 17 163985

50 30 and 39 and 48 and 49 7742

51 limit 50 to (english language and yr="2011 -Current") 3838

52 randomized controlled trial.pt. 544957

53 controlled clinical trial.pt. 94420

54 randomized.ab. 464963

55 placebo.ab. 201630

56 drug therapy.fs.2380838

57 randomly.ab. 311359

58 trial.ab. 492752

59 groups.ab. 1923894

60 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 4692626

61 exp animals/ not humans.sh. 4892913

62 60 not 61 4024731
63 51 and 62 1366
64 randomized controlled trial.pt. 544957
65 controlled clinical trial.pt. 94420
66 randomized.ab. 464963
67 placebo.ab. 201630
68 clinical trials as topic.sh.197606
69 randomly.ab. 311359
70 trial.ti. 215785
71 64 or 65 or 66 or 67 or 68 or 69 or 70 1258167
72 exp animals/ not humans.sh. 4892913
73 71 not 72 1146756
74 51 and 73 384

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The information in this report is correct at the time of printing.

