A systematic review of hand hygiene improvement strategies: a behavioural approach
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CRD summary
The authors concluded that targeting combinations of behaviour change determinants improved hand hygiene behaviour the most, particularly when these included social influence, attitude, self-efficacy, or intention. The review was carefully conducted, but there were only a few randomised controlled trials, there were no long-term data, and the analysis was basic. The authors’ conclusions may not be reliable.

Authors' objectives
To assess the effects of strategies to improve hand hygiene in health care workers and to investigate the determinants of behaviour change.

Searching
MEDLINE, EMBASE, CINAHL, and The Cochrane Library, which includes DARE, were searched for articles from January 2000 to November 2009. Current Controlled Trials and ClinicalTrials.gov were searched, and references from a previous systematic review were considered (Naikoba, et al. 2001, see ‘Other Publications of Related Interest’). There were no language restrictions. The search terms were listed, with more detail in an online appendix.

Study selection
Studies were eligible for inclusion if they compared an intervention group with a control group or they compared a single group before and after an intervention. They had to include health care workers in hospital settings. Eligible interventions were strategies to improve hand hygiene behaviour; controls had to be another programme or no intervention (usual care). Eligible outcomes included any measure of hand hygiene behaviour in health care workers.

Over half of the included studies were in an intensive care setting; other settings included medical or surgical wards, emergency wards, and all hospital wards. Studies were conducted in Europe, the USA, Canada, Asia, or Australia. About two thirds of the studies targeted nurses, physicians and other health care workers, while a small proportion targeted only nurses. The primary outcome measure in most studies was hand hygiene compliance, which was measured unobtrusively in two thirds of the studies. A small number of studies based their intervention on barriers identified by practice research, such as skin irritation, workload, staff personal habits, and priorities. The most frequently addressed behaviour determinants were knowledge, awareness, action control and facilitation of behaviour. Social influence, attitude, self-efficacy, and intention were less frequently addressed, and behavioural maintenance was not addressed. A small number of studies focused on gaining senior management support and commitment and institutional priority for hand hygiene. Studies addressed between one and seven behaviour determinants in various combinations. There were no specific differences between controlled and uncontrolled studies in the extent determinants were targeted.

Two authors independently screened studies for inclusion. Differences were resolved by consensus or by consultation with a third reviewer.

Assessment of study quality
Quality was assessed, using a rating system adapted from Anderson and Shape, which covered study design, clear description of the intervention, sample size, validity and reliability of assessment instruments, and providing probability values or confidence intervals. Studies with less than three out of seven points were excluded. Studies that failed on validity of outcome assessment were also excluded. The remaining studies that scored three to five points were graded as moderate, and those that scored six or seven points were rated as high quality.

Two authors independently assessed methodological quality and any disagreements were resolved by discussion.

Data extraction
Data were extracted according to the Cochrane Effective Practice and Organisation of Care (EPOC) Data Collection Checklist, which included study objectives, study design, target population, outcomes measures, intervention components, analysis, and results. Interventions were classified according to the taxonomy of behavioural change,
defined by de Bruin et al., into nine categories (knowledge, awareness, social influence, attitude, self-efficacy, intention, action control, maintenance, and facilitation). The effect size was calculated as the relative difference between the outcomes of the intervention and the control groups in each study directly after the intervention.

Two pairs of reviewers, who were blind to the study results and trained in coding, independently coded the interventions. Differences in coding were resolved through discussion. It was unclear how many reviewers extracted the study characteristics.

**Methods of synthesis**
The data were presented and analysed at the level of the nine categories of behavioural change listed above. Inferences about effectiveness were only made for controlled studies. To combine the results across studies, the median effect size and the range were determined.

**Results of the review**
Forty-one studies were included. Sample sizes were not reported for most studies, as they used "hand hygiene opportunities" as the unit of analysis and these ranged from 211 to 12,216. Only three studies were randomised controlled trials; 28 were before-and-after studies; seven were before-and-after studies with a control group; and three were crossover studies. Six studies were rated as high quality and the remaining 35 were rated as moderate quality. Important quality limitations included uncontrolled design, no sample size justification, observations without a description of interrater reliability, and no description of test statistics.

Effectiveness was only evaluated in the 13 controlled studies. The median effect of the interventions ranged from 17.6 (range -8.8 to 61) for three studies addressing one behaviour determinant to 49.5 (range -8.6 to 429) for three studies addressing five behaviour determinants. There was a significant correlation between the number of determinants addressed and the median effectiveness, for up to five determinants (Pearson's r=0.96, p=0.009). The only study addressing seven determinants had a small effect (median 9.7), possibly because the baseline hand hygiene rates were already high.

Of the studies focusing on one determinant, a negative effect was seen for focus on action control, a median effect was seen for focus on awareness, and a larger effect was seen for focus on facilities. No clear pattern emerged for the studies focusing on several behaviour determinants, with respect to any individual determinants being particularly important.

**Authors' conclusions**
Targeting combinations of behaviour change determinants provided the best results in changing hand hygiene behaviour. Addressing determinants, such as knowledge, awareness, action control, or facilitation, was not enough and social influence, attitude, self-efficacy, or intention should also be addressed.

**CRD commentary**
The review question and inclusion criteria were clear. A comprehensive search was undertaken, with no language restriction. The review updated a previous review, so the search for studies published from the year 2000 onwards was appropriate. The last search was conducted at the end of 2009 and newer studies may be available. The important steps in the review process (study selection, quality assessment, and data extraction) were carried out in duplicate to minimise error and bias.

Study details were provided, but study quality was limited as more than half were uncontrolled and only three were randomised controlled trials. Many of the included studies also had substantial gaps in their descriptions of the intervention strategies and processes. Summarising the effect sizes using the median value for each subgroup may not have been appropriate, especially as there were substantial variations in the effect sizes reported by individual studies. Effectiveness was assessed in the 13 controlled studies only and the results for any one determinant or combination of determinants generally included only one study. The duration for most interventions was unclear and long-term follow-up was not reported.

This was a well conducted review, but the lack of randomised controlled trials and the basic analysis mean that the authors' conclusions may not be reliable. The long-term effects are uncertain.
Implications of the review for practice and research

Practice: The authors stated that a systematically designed strategy, targeting various barriers to change, with activities at different levels (individual, team, and organisation) was needed to achieve changes in hand hygiene behaviour.

Research: The authors stated that methodologically robust studies were required to evaluate the effectiveness of interventions for improving hand hygiene compliance. These should be adequately powered randomised controlled trials or interrupted time series studies. They should assess the effectiveness of team-based activities and focus on determining strategies for maintenance of hygiene behaviour. When designing a behaviour change strategy, the barriers and facilitators should be identified and targeted.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.