Improving hand-washing performance – a crossover study of hand-washing in the orthopaedic department

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ABSTRACT

INTRODUCTION Effective hand-washing is essential for reducing the spread of infection in hospitals. We aimed to evaluate hand-washing performance of hospital personnel and to determine if this could be improved by education.

MATERIALS AND METHODS A total of 55 personnel working in the orthopaedic department were asked to clean their hands using an alcohol gel containing a clear fluorescent substance. They were unaware of the assessment method. Performance was assessed by examining their hands under UV light to identify areas that had been neglected. Subjects could visualise which areas they had missed and were then educated regarding hand-washing technique and retested after 7 days.

RESULTS Of the 55 subjects, 53 completed the study. Individual performance varied widely. Following a simple educational intervention, 49 out of 53 subjects improved from an average of 7.8% to 2.3% area missed ($P < 0.001$).

CONCLUSIONS We suggest that hand-washing effectiveness needs to be improved and that a simple educational intervention can be effective.

KEYWORDS

Hand hygiene – Education – Infection

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The importance of antiseptic hand-washing has been recognised for over 150 years.¹ During the antibiotic era, we have had the relative luxury of effectively treating infections with antibiotics. However, in recent years, we have seen the emergence of antibiotic-resistant organisms and the importance of hygiene within hospitals has re-emerged as a priority for the 21st century.

In the UK, it is estimated that 300,000 patients annually suffer from hospital-acquired infections which can result in a prolonged hospital stay with an increase in morbidity and mortality.² It is accepted that alcohol gel is the most effective antibacterial hand-washing agent and its use can reduce the spread of infection, including that of MRSA.^{1,3,4}

Following the publication of the 'Epic' evidence-based guidelines on hand hygiene, commissioned by the Department of Health,⁴ hospitals in the UK are now introducing alcohol hand rubs for routine use between patient contacts. Although research has demonstrated that hand-washing technique strongly influences the antimicrobial effectiveness of alcohol gel,⁵ there is a lack of research into the effectiveness of healthcare workers'

hand-washing technique. Furthermore, there have been no studies to examine ways of improving performance.

We examined the effectiveness of hand-washing by hospital staff and used a simple intervention to determine if performance could be improved, the null hypothesis being that there is no difference in hand-washing performance following a focused educational intervention.

Material and Methods

All staff ($n = 55$) who worked in the clinic area of an orthopaedic department in a city teaching hospital from 1–30 June 2004 were asked to participate in the study. This was a crossover study where subjects acted as their own controls. The only prior training subjects had received in hand-washing with alcohol gel was a poster campaign in the hospital over the preceding 12 months, which clearly described an effective method of hand-washing with the gel. Alcohol gel had also been available in every room and in the corridor of the clinic and ward area for at least 12 months.

Table 1 The performance of the subjects by age, sex and job description before (Wash 1) and after (Wash 2) educational intervention

Group	Mean area missed Wash 1 (95% CI)	Mean area missed Wash 2 (95% CI)	Wilcoxon signed rank test for matched pairs	Relative improvement
Overall (<i>n</i> = 53)	7.77% (5.82–9.72)	2.27% (1.28–3.26)	<i>P</i> < 0.001	70%
Male (<i>n</i> = 19)	10.1% (6.13–14.1)	3.74% (1.42–6.06)	<i>P</i> < 0.001	62%
Female (<i>n</i> = 34)	6.45% (4.34–8.56)	1.45% (0.6–2.3)	<i>P</i> < 0.001	77%
Nurses (<i>n</i> = 20)	5.26% (2.79–7.73)	0.72% (0.26–1.7)	<i>P</i> < 0.001	86%
Other staff (<i>n</i> = 16)	6.6% (4.64–8.56)	3.06% (0.88–5.24)	<i>P</i> = 0.008	48%
Doctors (<i>n</i> = 17)	11.8% (6.91–16.69)	3.36% (1.03–5.69)	<i>P</i> < 0.001	71%
> 38 years (<i>n</i> = 27)	7.67% (5.31–10.03)	1.67% (0.77–2.57)	<i>P</i> < 0.001	78%
< 38 years (<i>n</i> = 26)	7.9% (4.6–11.2)	2.89% (1.04–4.74)	<i>P</i> < 0.001	62%

Subjects were asked to clean their hands, as they usually would, using 1.75 ml of an alcohol gel containing a clear fluorescent substance. This volume is the equivalent of one application as delivered by the alcohol dispenser, which is the volume recommended by the manufacturer (Spirigel, Ecolab Limited). Hand-washing performance was assessed to identify missed areas by examining their hands under UV light. Participants were initially unaware of the nature of the alcohol gel and assessment technique. An assessor recorded the missed areas diagrammatically onto a proforma. This was recorded as Wash 1. The subjects were shown which areas they had missed under the UV light. They were then shown the technique required to cover these areas from a poster demonstrating six stages of hand-washing. These six stages aim to ensure all areas of the hands are cleaned. Subjects were retested in the same way 7 days later to assess the effectiveness of the intervention. This was recorded as Wash 2.

The same assessor was used throughout and the assessment technique was validated prior to the study commencing. A blinded assessor calculated the percentage area missed on the dorsum and the palmar aspect of each hand, from the proformas. Improvement in the area missed was assessed using Wilcoxon signed rank test for matched pairs.

Results

Fifty-three (96%) subjects completed the study. The study group consisted of 34 females and 19 males, with a mean age of 38 years. It included doctors (*n* = 17), nurses (*n* = 20) and other clinical and clerical staff (*n* = 16).

Wash 1 showed a wide variation in performance, the total area missed ranging from 0% to 34.7%. In Wash 2 (following education), 49 of 53 subjects improved their overall

performance. The reduction in mean total area missed from Wash 1 to Wash 2 was from 7.8% to 2.3% (*P* < 0.001; see Table 1).

Discussion

We are not aware of any previous hospital-based research which has examined healthcare workers' hand-cleaning technique, nor have there been studies to test the effectiveness of an educational programme. This study demonstrates that staff in our department are not achieving complete coverage of their hands with alcohol gel when hand-washing despite an educational poster campaign for the preceding 12 months. The initial mean area neglected (7.8%) may seem to be a small area; however, when this area is calculated for the author (DM) it equates to 42 cm². The improvement following training with a fluorescent gel and a UV light box demonstrates that this is a very effective teaching method. It is interesting to note that doctors had the poorest initial performance suggesting that they are the group of healthcare workers where this type of intervention is most required. This study is limited in long-term follow-up and it is not possible to say if individuals will retain their improved technique. Further periodic testing of the subjects is planned investigate this.

Conclusions

Alcohol gel is now the recommended form of hand antisepsis and effectiveness is dependent on technique; therefore, complete coverage of the hands with gel should be encouraged.^{4,5} Given the potentially catastrophic consequences of infection following surgery and the increasing problem of MRSA, it is essential that hospital

staff take every precaution to reduce the spread of infection. We suggest that hand-washing effectiveness by some hospital staff is inadequate and can be improved using a simple educational programme, which could be completed by all healthcare workers and students.

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