

# Reducing MRSA Cross-Contamination In An Acute Surgical Unit: Is There A Place For Alcohol-Based Gel?

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## Citation

N Sandiford, R Sutcliffe, R Al-Ghnaniem, H Khawaja. *Reducing MRSA Cross-Contamination In An Acute Surgical Unit: Is There A Place For Alcohol-Based Gel?*. The Internet Journal of Orthopedic Surgery. 2006 Volume 6 Number 1.

## Abstract

**Background:** Cross-contamination is an important source of MRSA infections in surgical patients and is preventable by effective hand decontamination. Although use of alcohol-based alcohol gels improve compliance with hand hygiene amongst health care workers (HCWs) in intensive care units, there is no evidence that they are effective in acute surgical wards.

**Methods:** This was a prospective study in a 57-bed acute surgical unit (general and orthopaedic). Alcohol-based gel dispensers (Spirigel®) were attached to each bed for a 12 month period. The installation and annual maintenance costs were estimated. The incidence of MRSA colonization, bacteraemia and significant infection rates were compared in the 12 month periods before and after introduction of Spirigel® as well as compliance amongst HCWs.

**Results:** Initial installation of Spirigel® and dispensers at each bedside cost £5.07 and annual running costs were estimated at £25.92. MRSA colonization rates were similar before and after introduction of Spirigel®. Rates of MRSA bacteraemia and significant infections decreased from 15 to 6.5 per 1000 patients. 48/70 (69%) of HCWs responded to the questionnaire. 46% reported that Spirigel® caused an uncomfortable feeling and 23% felt that it was more irritating than handwashing. 73% felt that Spirigel® improved compliance with hand hygiene. Overall satisfaction with the product was 75%.

**Conclusion:** Introduction of Spirigel® at each patient's bedside in an acute surgical unit improves compliance with hand hygiene amongst health care workers. Preliminary data suggests that this translates into a reduction in MRSA bacteraemia and significant infection rates although longer follow-up is required to confirm this finding.

## INTRODUCTION

Methicillin resistant staphylococcus aureus (MRSA) infection has been a major public health issue in the United Kingdom for the last five years [1], and colonization rates amongst health care workers (HCW) are as high as 19% [2,3]. Cross-infection occurs by both contact and airborne routes [1], and is associated with prolonged hospitalization and increased morbidity and mortality, particularly in critically ill and surgical patients [4]. Although the importance of hand hygiene has been known for decades, infection rates have remained high due to poor compliance with handwashing [5]. Use of alcohol-based hand gel has been shown to improve hand hygiene compliance and reduce hospital-acquired infections in a critical care setting [6], but its benefit has not been established on acute surgical wards. The principal aim of this study was to evaluate the feasibility and cost of introducing alcohol-based gel dispensers to an acute surgical

unit. The effect of alcohol-based gels on hand hygiene compliance and MRSA infections were also examined.

## METHODS

This was a prospective study in a 57-bed acute surgical unit (general and orthopaedic) in a district general hospital carried out over a 12 month period (June 1st 2004 to May 31st 2005). At the beginning of the study period, bottles of alcohol-based hand gels (Spirigel, Adams Healthcare, UK) were secured to the end of each patient's bed using custom made plastic brackets and replaced when empty. Prior to and during the study period, HCWs were alerted to the availability of Spirigel by verbal communication and posters. Ward visitors were also advised to use Spirigel before and after contact with patients. At the end of the study period, the opinions of HCWs regarding compliance with Spirigel was assessed using a questionnaire (see Table 1).

**Figure 1**

Table 1: Survey of compliance and satisfaction with Spirigel amongst health care workers

Statement	Positive responses
You use waterless, alcohol-based hand gels at home	2/48 (4%)
You believe that hand hygiene reduces cross-infection	44/48 (92%)
You were aware that the use of Spirigel® was part of a study	30/48 (63%)
Overall you were satisfied with Spirigel®	36/48 (75%)
Spirigel® dispensers were conveniently located	43/48 (90%)
Spirigel® caused a sticky, uncomfortable feeling	22/48 (46%)
Spirigel® caused more skin irritation than handwashing	11/48 (23%)
Spirigel® is as effective as or superior to handwashing	44/48 (92%)
Using Spirigel® is faster than handwashing	42/48 (88%)
Availability of Spirigel® dispensers improved your compliance with hand hygiene?	43/48 (90%)
You are more likely to comply if your superiors comply	25/48 (52%)

The cost of installation and maintenance of Spirigel was estimated. The incidence of new hospital-acquired MRSA colonizations, MRSA bacteraemias and significant MRSA infections during the study period were compared with rates from the preceding 12 month period (June 1st 2003 to May 31st 2004). The presence of a new case of hospital-acquired MRSA was defined as a positive swab (nasal, axillae or groin) in patients after 48 hours of admission, having had negative swabs on admission. A community-acquired MRSA case was defined as a positive swab within 48 hours of admission. A significant MRSA infection was present when MRSA was cultured from clinically infected sites (e.g. wound, sputum).

## RESULTS

(1) Cost and feasibility The total cost of installation of Spirigel bottles (@ £2.82 each) and brackets (@ £2.25 each) was £288.99 (£5.07 per bed). The annual estimated running cost was £1478 (average of 9.2 bottles of Spirigel per bed per annum) or £25.92 per bed per annum. At the end of the study period Spirigel bottles and brackets were absent from 9 beds (16%). This occurred as a result of exchange of bed ends (with attached brackets) between beds from different wards whilst patients were in the operating theatre.

(2) MRSA infection The number of both elective and emergency admissions during the 12 month periods before and after introduction of alcohol-based hand gels onto acute surgical wards were similar (Table 2).

**Figure 2**

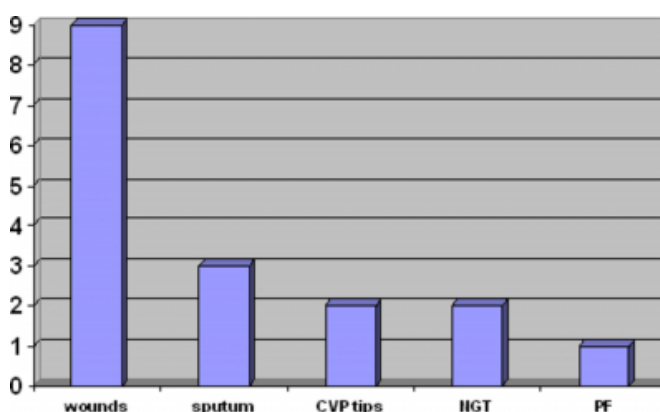
Table 2: Effect of Spirigel on MRSA infection

	Pre-Spirigel® (June 2003 – May 2004)	Post-Spirigel® (June 2004 – May 2005)	Paired T test
<b>Hospital admissions</b>			
Elective	341	378	
Emergency	814	836	
Total	1168	1221	
<b>Total MRSA cases (per month)</b>			
Hospital-acquired	3.5 ± 2.3	3.5 ± 1.4	0.5
Community-acquired	1.6 ± 1.6	2.5 ± 1.6	0.06
Total	5.1 ± 2.3	6.0 ± 0.2	0.18
<b>MRSA infections (per month)</b>			
Bacteraemia	2.2 ± 1.8	3.6 ± 2.3	0.04
Significant infections	1.2 ± 1.4	0.4 ± 0.6	0.03

The incidence of total MRSA cases pre- and post-Spirigel were 51 and 59 per 1000 patients, respectively (Table 2). However, the incidence of MRSA bacteraemia and significant MRSA infections reduced from 15.4 to 6.6 per 1000 patients (see Table 2). Significant MRSA infections were present in wounds (n = 9), sputum (n = 3), central venous catheter tips (CVP)(n = 2), nasogastric tubes (NGT) (n = 2) and peritoneal fluid (PF) (n = 1) (Figure 1). 15% of total MRSA infections (pre- and post-Spirigel ) developed in patients with community-acquired MRSA.

**Figure 3**

Figure 1: Sources of significant MRSA infections



(3) Compliance 48 out of 70 (69%) HCWs responded to the questionnaire (Table 1), including 14 nurses (29%) and 23

doctors (48%). The majority (92%) of respondents were aware that hand hygiene reduced cross-infection. Only two respondents (4%) used alcohol-based hand gels at home. Although a significant proportion of HCWs reported that use of Spirigel was associated with an uncomfortable feeling (46%) and was more irritating than handwashing (23%), overall satisfaction with the product was good (75%). This may reflect the perception that Spirigel was quick and easy to use, and 73% of respondents believed that availability of Spirigel improved compliance with hand hygiene. In those HCWs who felt that Spirigel did not improve compliance, 5 cited skin irritation as a factor, and 3 felt that Spirigel use was slower than standard handwashing.

## DISCUSSION

Availability of alcohol-based hand rubs has been shown to improve compliance with hand hygiene amongst health care workers, particularly in the intensive care setting [6,7]. Prevention of cross-contamination in a busy surgical unit with a high throughput and limited availability of space is a major challenge. Our results indicate that implementation of alcohol-based hand rubs (Spirigel) at patients' bedsides in this environment is not only cost-effective, but also improves compliance with hand hygiene amongst HCWs (Table 1). The effect of compliance by senior members of staff on other HCWs is significant, as shown previously [8,9]. This study assessed compliance subjectively, which may be subject to bias and is a criticism of its design. Assessment of compliance by an independent observer is an alternative method, but is labour intensive and may bias the data in favour of improved compliance [7]. Failure to assess quality and/or duration of hand decontamination in any study makes interpretation of data difficult [10].

After Spirigel was introduced, the rate of MRSA infections (including bacteraemia) amongst hospitalized patients decreased by 56% during the 12 month study period. Although this data is promising, our study was not controlled, and the observed reduction in MRSA may have been due to an increased awareness amongst HCWs during the study period. Longer follow-up may help to clarify this. Despite evidence that alcohol-based hand rubs improve compliance compared to handwashing and may reduce cross-contamination [7,11,12,13,14], several reports have questioned their efficacy in terms of both microbial decontamination and reduction of infection [15,16,17], and further studies are needed to evaluate this.

The continued prevalence of MRSA amongst surgical patients is a major cause for concern and has financial implications for the NHS in addition to physical and psychological consequences for the patient [18]. In the absence of a global approach to preventing cross-contamination, isolated measures such as bedside alcohol hand rubs will have only a limited impact on the incidence of MRSA. In our study, 9 beds (16%) were without Spirigel bottles or brackets due to detachment and replacement of bed-ends by operating department personnel onto different beds from wards not involved in the study. This highlights an additional source of cross-contamination, since the majority of surgical patients are transferred to other departments and/or wards during their inpatient stay. Unfortunately, efforts to reduce bed occupancy rates, reduce throughput, isolate patients and/or segregate elective and emergency patients are impossible to achieve without extra resources.

## CONCLUSION

Introduction of alcohol-based hand gel bottles at each patient's bedside is cost-effective and improves compliance with hand hygiene amongst HCWs in an acute general surgical unit. Although preliminary data suggests that this measure may also reduce rates of MRSA infection, long term follow-up is required to confirm this. Availability of alcohol gel is unlikely to have a significant impact on MRSA infection rates unless it is part of a hospital-wide policy that includes other measures directed at reducing cross-contamination.

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