E-learning may improve adherence to alcohol-based hand rubbing: A cohort study

Sussie Laustsen, MNSc,[a] Bo Martin Bibby, PhD,[b] Brian Kristensen, MD, PhD,[a] Jens Kjølseth Møller, MD, DMSc,[a] and Ane Marie Thulstrup, MD, PhD[c]
Aarhus, Denmark

Background: Since 2004, we have promoted alcohol-based hand rubbing (HR) with an e-learning program (ELP) among hospital staff. This study sought to determine whether an ELP improves adherence to correct HR.
Methods: This was a cohort study of staff members at Aarhus University Hospital, Skejby, Denmark who completed the ELP and were repeatedly observed for correct HR before and after clinical procedures in 2006 and/or 2007.
Results: Of the 496 participants, 13% completed the ELP in both 2006 and 2007, 29% completed the ELP only in 2006, 15% completed the ELP only in 2007, and 43% never completed the ELP. Compared with noncompleters, completers of the 2006 and 2007 ELP had a significantly higher adherence to correct HR both before clinical procedures (odds ratio [OR] = 1.54; 95% confidence interval [CI] = 1.11 to 2.13) and after clinical procedures (OR = 1.40; 95% CI = 1.03 to 1.89). Time since completing the ELP seemed to be inversely associated with adherence to correct HR.
Conclusion: Completion of an ELP may have a positive impact on the performance of correct HR. The demands of lifelong education and training of hospital staff may call for the use of an ELP as a supplement to existing efforts aimed at improving HR to help prevent health care–related infections.
Key Words: E-learning; alcohol-based hand rubbing; adherence.

(Am J Infect Control 2009;37:565-8.)

Nosocomial infections often are transmitted by direct contact, particularly by the hands of hospital staff. Hand hygiene, especially alcohol-based hand rubbing (HR), is considered a pivotal means of preventing such infections.[1] Several observational studies have focused on improving clinicians' adherence to clinical guidelines;[1] however, no clear recommendations for enhancing adherence to hand hygiene have been established.[2]

From the Department of Clinical Microbiology, Aarhus University Hospital, Skejby, DK-8200 Aarhus N, Denmark[a]; Department of Biostatistics, University of Aarhus, DK-8000 Aarhus C, Denmark, and Department of Occupational Medicine[b]; Aarhus University Hospital, Aarhus Sygehus, DK-8000 Aarhus C, Denmark.[c]

Address correspondence to Sussie Laustsen, Department of Clinical Microbiology, Aarhus University Hospital, Skejby, Brendstrupgaardsvej 100, DK-8200 Aarhus N, Denmark. E-mail: sussie.laustsen@ki.au.dk.

S. Laustsen received support for data collection, analysis, and interpretation and writing of the report from the Lundbeck Foundation, the Sister Marie Dalgaard Foundation, the Danish Nurses' Organization Research Foundation, and the Research Foundation at Aarhus University Hospital, Skejby. The funding sources were not involved in the author's work, and none of the authors reports any conflicts of interest relevant to this study.

0196-6553/$36.00

doi:10.1016/j.ajic.2009.01.002

An e-learning program (ELP) may be instrumental to ensuring lifelong education and training of hospital staff, because it involves no prefixed time of educational activity and no collision with work shifts, and it can be continually updated as new knowledge emerges.[3-5] ELPs are traditionally used to improve theoretical knowledge,[6-8] but less evidence is available of their effects in other contexts, such as adherence to hand hygiene. Since 2004, our hospital has promoted HR through a campaign and an ELP. The ELP is an interactive online program based on clinical indications for hand hygiene.[1] A test with multiple-choice questions is included. All hospital staff members are encouraged to complete the test annually. Because one of the most challenging hand hygiene–related tasks is ensuring hand hygiene before a procedure,[9,10] this was made an important part of our ELP. An English demo version of the ELP is available at www.auh.dk/sks/test/handhygiene/engelsk_demo5/index.html.

The aim of this study was to analyze the impact of the ELP on adherence to correctly performed HR.

METHODS

The study was performed in 2006 and 2007 at Aarhus University Hospital, Skejby, a 447-bed Danish tertiary referral teaching hospital. It was a cohort study comparing completion and noncompletion of an ELP with subsequent adherence to correctly performed

HR. Variables included completion of the ELP and adherence to correct HR before and after a clinical procedure in 2006 and/or 2007. To identify the status of the ELP, a list of completers was printed before observations of HR were carried out in 2006. The date of completion of the ELP was registered in 2007. The observers were blinded to whether or not the observed staff member had completed the ELP, and the observed staff members were unaware of the study of the ELP at the time of observation.

The study population included hospital staff members from 10 different bed wards who participated in a 1-year follow-up study on adherence to correct HR in 2006 and 2007, as described previously.[11] Two trained external observers (S.L. and E.L.H.) recorded structured observations of HR done by staff performing clinical procedures involving patients and patient surroundings. The observers recorded whether or not HR was performed in the correct situations and assessed the quality of the HR technique. Even though Sax et al[12] described 5 indications for hand hygiene, we grouped data into just 2 categories, before a procedure and after a procedure, since these indications were not published when the study was initiated. Interobserver agreement was good ($\kappa = .89$ in 2006; $\kappa = .92$ in 2007).[11]

We identified staff completing the ELP through personal logon codes and by name tags worn during observations. Temporary staff and students were excluded because of the cohort design. The ELP was unchanged, and no other interventions to improve hand hygiene were implemented during the study period.

The ELP is an interactive online program available on the hospital network's computers. It is based on updated information and includes videos and images of clinical situations in which hand hygiene is required. The ELP test takes 10 minutes to complete, and each staff member is requested to complete it annually. The test comprises 21 multiple-choice questions, 14 of which are related to HR. After answering a question, the respondent immediately receives an explanation on-screen of why the answer is correct or incorrect. The respondent may correct wrong answers during the test. Successful completion of the ELP is registered when the respondent has answered all 21 questions correctly and exits the ELP in the authorized manner.

The study was approved by the Regional Committee on Biomedical Research Ethics (2005-2.0/33) and the Danish Data Protection Agency (2005-41-358).

Statistical analyses

All analyses were performed using Stata version 10.1 (StataCorp, College Station, TX). Adherence to correct HR is presented as a proportion. Logistic regression was used to estimate the impact of ELP completion on correct HR adherence. Possible effect measure modification was investigated by including all pairs of potential confounders in the analyses. Data are presented as crude odds ratios (ORs) with 95% confidence intervals (CIs), and multivariate analysis was used to adjust for sex, hospital location, various hospital staff category, professional qualifications, and correlation between observations corresponding to the same staff member. Four groups were compared: staff completing the ELP in both 2006 and 2007, only in 2006, and only in 2007, and those not completing the ELP.

Table 1. Adherence to correct alcohol-based hand rubbing among different subgroups of 496 staff at Aarhus University Hospital, Skejby

	Proportion of respondents, n (%) (n = 496)	Opportunities for HR, n (%) (n = 22,906)	Adherence to HR, n (%)
ELP			
Completed in 2006 and 2007	64 (12.9)	3652 (15.9)	2550 (69.8)
Completed in 2006	145 (29.2)	7382 (32.2)	5005 (67.8)
Completed in 2007	74 (14.9)	3240 (14.1)	2103 (64.9)
Never completed	213 (42.9)	8632 (37.7)	5351 (62.0)
Sex			
Male	107 (21.6)	3314 (14.5)	1868 (56.4)
Female	389 (78.4)	19,592 (85.6)	13,141 (67.1)
Profession			
Nurse	295 (59.5)	15,735 (68.7)	10,576 (67.2)
Physician	88 (17.8)	2471 (10.6)	1410 (57.1)
Other staff	113 (22.8)	4,700 (20.5)	3023 (64.3)
Ward			
Medical	155 (31.3)	7441 (32.5)	4825 (64.8)
Surgical	205 (41.3)	9732 (42.5)	6338 (65.1)
Intensive care	136 (27.4)	5733 (25.0)	3846 (67.1)
Year			
2006 before procedure	—	5522 (24.1)	3267 (59.2)
2006 after procedure	—	5574 (24.3)	3622 (65.0)
2007 before procedure	—	5655 (24.7)	3701 (65.5)
2007 after procedure	—	6155 (26.9)	8041 (68.6)

ELP, e-learning program; *HR*, alcohol-based hand rubbing.

RESULTS

The number of observed indications for HR was 22,906 performed by 496 hospital staff members. Adherence to correct HR was 62.3% before clinical procedures and 68.6% after clinical procedures.[11] Table 1 summarizes adherence to correct HR among subgroups.

The cohort of 64 staff members completing the ELP in both 2006 and 2007 had significantly higher