CONCISE COMMUNICATION

Hand Hygiene and Glove Use Behavior in an Italian Hospital

Angelo Pan, MD; Placido Mondello, MD;
Klara Posfay-Barbe, MD, MS; Patrizia Catenazzi, RN;
Annise Grandi, RN; Silvia Lorenzotti, MD;
Andrea Patroni, MD; Nadia Poli, RN;
Laura Soavi, MD; Giuseppe Carnevale, MD

In an Italian hospital, we observed that hand hygiene was performed in 638 (19.6%) of 3,253 opportunities, whereas gloves were worn in 538 (44.2%) 1,218 of opportunities. We observed an inverse correlation between the intensity of care and the rate of hand hygiene compliance ($R^2 = 0.057$; $P < .001$), but no such association was observed for the rate of glove use compliance ($R^2 = 0.014$; $P = .078$). Rates of compliance with hand hygiene and glove use recommendations follow different behavioral patterns.

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Hand hygiene is a simple and effective measure to prevent transmission of pathogens. Compliance with hand hygiene recommendations by healthcare workers (HCWs) is generally disturbingly low (ie, 20%-40%),[1-6] with few studies reporting adherence rates greater than 50%.[7] Significant differences in compliance have been observed between the various HCW professions, with higher rates of adherence reported among nurses, particularly in those in pediatric and intensive care units.[5] Glove use, recommended in case of contact with biological fluids, has been shown to modify hand hygiene compliance and perception,[8] although data regarding glove use in relation to hand hygiene are limited. We report an analysis of compliance with hand hygiene and glove use recommendations in an Italian hospital.

METHODS

This observational study was performed at the Istituti Ospitalieri di Cremona Italy, an 850-bed community hospital in Cremona, Italy, with a staff of 1,478 HCWs. Written hand hygiene guidelines have been available at the hospital since 1995, although no educational seminars on this topic have been performed. Observation of hand hygiene was performed by 6 trained investigators, using the methods of Pittet et al.[5] The percentage of hand hygiene opportunities during which hand hygiene was performed was observed during 20-minute intervals for randomly selected HCWs and recorded on dedicated charts. Opportunities for hand hygiene were defined as situations in which published guidelines available when the study was performed recommended performance of hand hygiene.[9] Compliance with hand hygiene guidelines was defined as washing hands with soap and water or rubbing hands with an antiseptic solution.

We evaluated the following opportunities for hand hygiene: (1) before and after contact with a patient, (2) between contact with different body sites on the same patient, (3) before and after obtaining blood samples, (4) before and after positioning urinary catheters, (5) before and after caring for skin, (6) before and after contact with biological fluid, (7) before and after indirect contact with patients, and (8) after interruption of routine hospital activities. Hand hygiene was considered necessary when gloves were used for patient care. Washing gloved hands between 2 opportunities was considered to be noncompliant with hand hygiene guidelines, as was failure to remove gloves after patient contact or between contact with dirty and clean body sites on the same patient.

Hand hygiene opportunities were divided into the following categories of cross-contamination risk: (1) high risk, defined as opportunities before contact with a patient (ie, skin, central venous catheter, and urinary catheter) or between contact with dirty and clean sites on the same patient; (2) medium risk, defined as opportunities after contact with a patient, with body fluids, or after patient care; and (3) low risk, defined as opportunities after indirect contact with patients or hospital maintenance. Ward, HCW occupation, patient care type, and intensity of patient care (as measured by the activity index, defined as the number of hand hygiene opportunities per hour for each observation period) were also analyzed.

Glove use compliance was evaluated for the following hand hygiene opportunities in which gloves could be worn: (1) before patient contact, (2) between contact with dirty and clean sites on the same patient, (3) before contact with body fluids, (4) before activities involving a patient's skin, (5) before obtaining blood specimens, (6) before positioning urinary catheters, and (7) before manipulating central venous catheters. Correlations between glove use compliance and ward, HCW occupation, and hand hygiene compliance were analyzed.

Data were recorded in a dedicated database prepared with Microsoft Access. χ^2 tests were performed and odds ratios (ORs) with 95% confidence intervals (CIs) calculated to compare rates of hand hygiene and glove use compliance. Univariate analysis was used to examine the associations between variables and adherence to hand hygiene and glove use, and multivariate analysis was performed with logistic regression models. The relationship between continuous variables (hand hygiene or glove use and intensity of care) was evaluated by linear regression. All analyses were performed with SPSS statistical software, version 11.0 (SPSS). All tests were 2 tailed, and P values less than .05 were considered statistically significant.

RESULTS

During 257 observation periods involving 1,639 HCWs, we recorded 3,253 opportunities for hand hygiene. The overall

TABLE. Compliance With Hand Hygiene and Glove Use Recommendations, According to Healthcare Worker (HCW) Occupation and Hospital Ward

Variable	Hand hygiene				Glove use			
	No. (%) of opportunities	No. (%) of opportunities with compliance	Univariate OR for noncompliance (95% CI)	Multivariate OR for noncompliance (95% CI)	No. (%) of opportunities	No. (%) of opportunities with compliance	Univariate OR for noncompliance (95% CI)	Multivariate OR for noncompliance (95% CI)
Overall	3,253 (100)	638 (19.6)	…	…	1,218 (100)	538 (44.2)	…	…
HCW occupation								
Nurse	2,289 (70.4)	514 (22.5)	1	1	880 (72.2)	407 (46.3)	1	1
Physician	524 (16.1)	81 (15.5)	1.58 (1.23-2.05)	1.73 (1.33-2.26)	176 (14.4)	33 (18.8)	3.7 (2.5-5.56)	3.23 (2.13-4.76)
Nursing assistant	271 (8.3)	23 (8.5)	3.12 (2.01-4.84)	2.82 (1.81-4.38)	92 (7.6)	61 (66.3)	0.44 (0.28-0.68)	0.44 (0.28-0.7)
Physiotherapist	77 (2.4)	7 (9.1)	2.90 (1.32-6.34)	3.65 (1.60-8.30)	37 (3.0)	12 (32.4)	1.79 (0.88-3.57)	1.79 (0.81-3.85)
Other	92 (2.8)	13 (14.1)	1.76 (0.97-3.19)	1.83 (1.00-3.34)	33 (2.7)	25 (75.8)	0.27 (0.12-0.62)	0.35 (0.15-0.8)
Hospital ward								
Medical wards	1,345 (41.3)	253 (18.8)	1	1	483 (39.7)	234 (48.4)	1	1
Surgical wards	1,078 (33.1)	178 (16.5)	1.17 (0.95-1.45)	1.12 (0.90-1.38)	400 (32.8)	168 (42.0)	1.3 (0.99-0.69)	1.22 (0.92-1.59)
Pediatric wards	212 (6.5)	60 (28.3)	0.59 (0.42-0.81)	0.56 (0.40-0.79)	88 (7.2)	8 (9.1)	9.09 (4.35-20)	6.67 (3.13-14.29)
Intensive care wards	346 (10.6)	89 (25.7)	0.67 (0.51-0.88)	0.66 (0.50-0.88)	132 (10.8)	86 (65.2)	0.5 (0.34-0.75)	0.49 (0.32-0.74)
Other	272 (8.4)	58 (21.3)	0.85 (0.62-1.18)	0.68 (0.48-0.96)	115 (9.4)	42 (36.5)	1.64 (1.08-2.5)	1.11 (0.69-1.79)

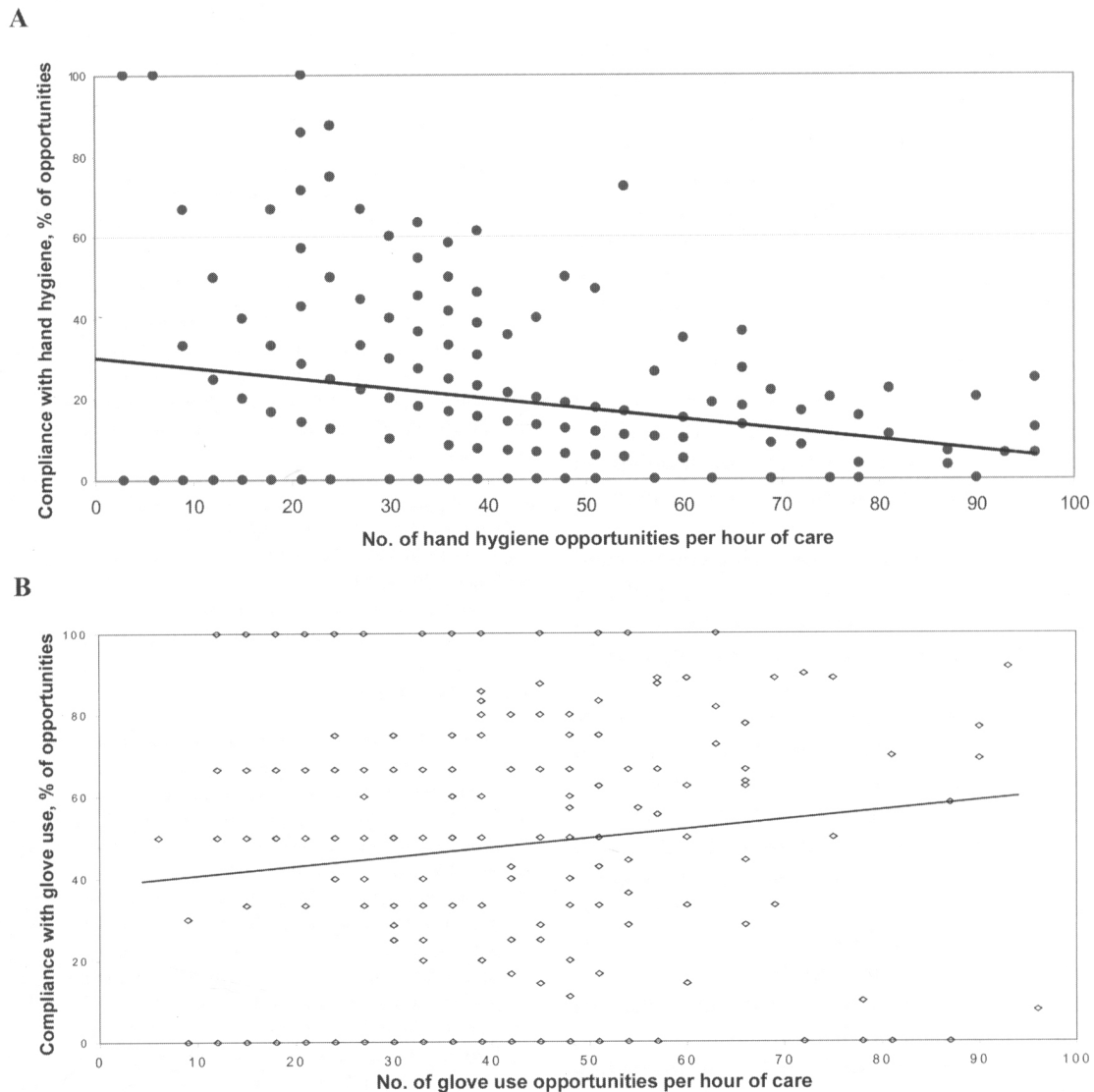NOTE. CI, confidence interval; OR, odds ratio.

A

B

FIGURE. Compliance with hand hygiene and glove use recommendations, according to the activity index, defined as the number of patient care opportunities per hour. *A,* An inverse correlation was observed between the rate of hand hygiene compliance and the activity index, as indicated by the *solid bar,* showing the linear association between hand hygiene opportunities and compliance ($R^2 = 0.057$; $P < .001$). *B,* No such correlation was observed between the rate of glove use compliance and the activity index, as indicated by the *solid bar* ($R^2 = 0.014$; $P = .078$).

adherence to hand hygiene was 19.6% (638 of 3,253 opportunities). Adherence during 1,250 high-risk opportunities was 11.7%, compared with 29.6% during the 1,133 medium-risk opportunities and 18% during 870 low-risk opportunities. The highest rates of hand hygiene adherence were observed among nurses (22.5%) and in pediatric wards (28.3%) (Table). Multivariate analysis showed that conditions closely associated with noncompliance with hand hygiene were being a physiotherapist (OR, 3.65 [95% CI, 1.60-8.30]) and performing a high-risk procedure (OR, 3.30 [95% CI, 2.65-4.1]).

HCWs used gloves in 538 (44.2%) of 1,218 opportunities.

The rate of glove use compliance was highest among nursing assistants (66.3%) and in the intensive care unit (65.2%) and lowest in pediatric wards (9.1%) (Table).

No correlation was observed between hand hygiene compliance and glove use compliance. Hand hygiene was performed on 88 (12.9%) of 680 occasions during which gloves were used and in 63 (11.7%) of 538 opportunities in which gloves were not used (OR, 0.89 [95% CI, 0.63-1.26]; $P = .52$). Although an inverse correlation was observed between intensity of care and hand hygiene adherence, this relationship was not observed for glove use compliance (Figure).

DISCUSSION

Our study shows that adherence to hand hygiene in an Italian hospital is low, hand hygiene and glove use follow different behavioral patterns (hand hygiene is inversely correlated to intensity of care, whereas glove use is not), and compliance with gloves use is greater than compliance with hand hygiene recommendations. Furthermore, we observed that glove use does not reduce the rate of hand hygiene adherence and that rates of adherence to hand hygiene and glove use recommendations are highest and lowest, respectively, in pediatric wards.

To our knowledge, this is the first report of a systematic analysis on hand hygiene in Italy that used the methods of Pittet et al.[5] Our findings show that adherence to hand hygiene is low and that, in accordance with previously published data,[5] it is lowest during high-risk opportunities and when the intensity of care is higher.

Similar to previous studies, we observed a high rate of hand hygiene compliance and a low rate of glove use in pediatric wards.[5,6] Because children generally pose a reduced risk of cross-transmitting bloodborne and multidrug-resistant pathogens and are viewed by many individuals as "uncontaminated," this behavior may indicate that, in Italy, glove use is perceived by HCWs as a self-protective practice, rather than as a practice that reduces the risk of cross-transmission.

The rate of glove use compliance in our study (44%) is intermediate between the rates reported by Pittet et al.[5] (12%) and Girou et al.[8] (94%). We observed that the rate of glove use compliance is higher than the rate of hand hygiene compliance and, interestingly, that the rate of glove use compliance does not inversely correlate with the intensity of care: self-protection is believed to be easier and faster through glove use than through performance of hand hygiene.

There are limitations to this study, including the mildly obtrusive study method, which could overestimate compliance with hand hygiene and glove use, and the lack of distribution of workload among staff members. However, our use of standardized methods makes our data comparable with data from other studies. Furthermore, since we did not assign unique identifiers to each HCW we observed, we could not, at the individual HCW level, compare overall compliance with compliance during care of patients with unique infection control requirements, such as contact precautions. Such an analysis should better identify parameters and behaviors related to hand hygiene and glove use compliance and could be an interesting area for future investigations. In conclusion, the results of our study, as well as informational campaigns on hand hygiene, such as the international World Health Organization "Clean Care Is Safer Care" campaign,[10] which is aimed at increasing the use of alcohol-based solutions worldwide, may help improve awareness of and compliance with hand hygiene recommendations.

From the Istituto di Malattie Infettive e Tropicali, Spedali Civili, Università di Brescia, Brescia, (A.P., S.L., A.P., L.S.), the Divisione di Malattie Infettive (A.P., P.M., G.C.), the Direzione Sanitaria (P.C., A.G., N.P.), and the Presidio Ospedaliero Oglio-Po (A.G.), Istituti Ospitalieri di Cremona, Cremona, Italy; and the Hôpital des Enfants, Hôpitaux Universitaires de Genève, Genève, Switzerland (K.P.-B.).

Address reprint requests to Angelo Pan, MD, Clinica di Malattie Infettive e Tropicali, Spedali Civili- Università degli Studi di Brescia, Piazzale Spedali Civili 1, 20123 Brescia, Italy (ange.pan@tiscali.it).

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