

Poor hospital infection control practice in hand hygiene, glove utilization, and usage of tourniquets

Suzan Sacar, MD,^a Huseyin Turgut, MD,^a Ilknur Kaleli, MD,^b Nural Cevahir, MD,^b Ali Asan, MD,^a Mustafa Sacar, MD,^c and Koray Tekin, MD^d
Denizli, Turkey

Background: Hospital-acquired infection often occurs because of lapses in accepted standards of practice on the part of health care personnel. The aim of this study is to attract attention on poor hospital infection control practice in venepuncture and use of tourniquets and emphasize the importance of hand hygiene.

Methods: Overall compliance with hygiene during usage of tourniquets and routine patient care before and after implementation of a hospital infection control measures was evaluated.

Results: According to the questionnaire, only 26.9% of respondents always washed their hands both before and after venepuncture. In the second step of the study, based on direct observation, hands were washed both before and after venepuncture on only 41 (45.1%) occasions. Failure to remove gloves after patient contact was observed on 23.1% occasions.

Conclusion: Our survey reveals poor infection control practice in hand hygiene, glove utilization, and usage of tourniquets and the implementation of infection control measures produced a moderate improvement in compliance with them. (Am J Infect Control 2006;34:606-9.)

Despite their best intentions, health care workers sometimes act as vectors of disease, disseminating new infections among their unsuspecting patients. However, attention to simple preventive strategies may significantly reduce disease transmission rates.¹ Hand hygiene, either by handwashing or hand disinfection, remains the simplest and most effective measure for preventing hospital-acquired infections.² Venous blood sampling and intravenous cannulation are the most common invasive procedures in hospitals. Tourniquets are often used indiscriminately on successive patients, regardless of any known infective status.³

The aim of this study is to attract attention on poor hospital infection control practice in venepuncture and use of tourniquets and emphasize the importance of hand hygiene. We also attempted to promote hand hygiene by implementing a hospital-wide program.

METHODS

Collection of tourniquets

Thirty-six tourniquets were obtained and replaced with the new ones at the Pamukkale University Hospital, Denizli, Turkey, over a 2-week period (February 9-February 22, 2004) (period 1; P1). After a year of the implementation of infection control measures, these new tourniquets were gathered again to make a microbiologic investigation (February 7-February 20, 2005) (period 2; P2).

Microbiologic investigations

The tourniquets were visually inspected for any bloodstain. In addition, an area of the tourniquet in contact with the patient's skin, approximately 1 cm from the buckle, was pressed by rolling onto a blood agar plate. *Staphylococcus aureus* and methicillin-resistant *S aureus* (MRSA) were identified by standard laboratory protocols.⁴

Infection control practice data

A questionnaire survey was conducted to determine characteristics of tourniquet usage during period 1. In addition, simple infection practice was surveyed, including frequency of handwashing and use of gloves, in relation to venepuncture. The questionnaire was distributed to the medical staff in emergency, surgical, and internal medicine departments and intensive care units and laboratory phlebotomists.

From the Department of Infectious Diseases and Clinical Microbiology,^a Department of Microbiology and Clinical Microbiology,^b Department of Cardiovascular Surgery,^c and Department of General Surgery,^d Pamukkale University, Faculty of Medicine, Denizli, Turkey.

Address correspondence to Suzan Sacar, MD, Pamukkale University Faculty of Medicine, Department of Infectious Diseases and Clinical Microbiology, Denizli, 20070, Turkey. E-mail: suzansacar@yahoo.com.

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The second step of the study, consisting of implementation of infection control measures, was begun after the end of the questionnaire. One sink was located inside every patient room, together with unmedicated soap and paper towels. Dispensers of hand antiseptic solutions were placed in high-risk areas. The most prominent components were an educational program to the health care personnel by the members of the infection control program that reemphasized infection control measures, repeated every 3 months, and a visual display with A3-size color posters that emphasized the importance of handcleansing. The same health care workers were observed during period 2 by the specialists and residents in infectious diseases to see whether the recommended infection control measures for prevention of hospital-acquired infections were being properly carried out and whether there was an increase in the compliance to them. The observers recorded potential opportunities for hand hygiene according to recommended guidelines⁵ and the actual number of episodes of handwashing and handrubs. The observations were made taking care that the health care personnel observing were as unobtrusive as possible.

Statistical analysis

Differences among the groups were evaluated using Fischer exact test. Differences were considered statistically significant when $P < .05$. Data were analyzed by statistical software (SPSS for Windows 11.0; SPSS, Chicago, IL).

RESULTS

Bloodstaining

Overall, 6 of 36 (16.7%) tourniquets in period 1 and 1 of 36 (2.8%) tourniquets in period 2 had visible bloodstains. The departments with the highest rates were the surgical and intensive care units (Table 1).

Microbiologic investigations

S aureus was isolated in 28 (77.8%) of the 36 tourniquets in period 1. However, there were 2 different isolates of *S aureus* in 6 of these tourniquets, so a total of 34 *S aureus* colonies were isolated. Nineteen (55.9%) of the colonies isolated were methicillin-sensitive, 15 (44.1%) were MRSA. Of 6 tourniquets having visible bloodstains, 3 (50%) had isolation of MRSA. Coagulase-negative staphylococcus and gram-negative bacillus was isolated from 13 and 2 tourniquets, respectively.

In 12 (33.3%) of 36 tourniquets in period 2, there was an isolation of *S aureus*. Ten (83.3%) of the colonies isolated were methicillin-sensitive, 2 (16.7%) were MRSA. Rate of MRSA positivity was statistically

significantly lower when compared with the rate of old tourniquets ($P < .05$). Coagulase-negative staphylococcus and gram-negative bacillus was isolated from 5 and 1 tourniquet, respectively.

Infection control practice/questionnaire

Ninety-three health care workers completed the questionnaire. None of those commented that they specifically used a different tourniquet when the patient was known to have MRSA.

According to the questionnaire, handwashing was undertaken both before and after venepuncture by 75.3% of respondents; 48.4% of the respondents did this occasionally and only 26.9% of them always did this. Fourteen percent said they would only wash their hands after venepuncture and, of these, 61.5% said this was either always or more often than not.

When questioned about wearing gloves for venepuncture, 35.5% always wore gloves, and 28% said they did not wear gloves or did so only occasionally. Wearing gloves before performing any procedure and patient contact was always undertaken by 35.5%. Changing of the gloves between the contact of 2 different patients was done only by 51.6%. According to 41.9% of the health care workers, there was not a risk of a transmission of an infection from them to a patient. On the contrary, according to 97.8% of the health care workers, there was a risk of a transmission of an infection from a patient to them. Lapses in recommended standards during observation are summarized below.

Hand hygiene: before or after venepuncture (91 occasions). On 41 (45.1%) occasions, health care personnel washed their hands both before and after venepuncture. On 21 (23.1%) occasions, health care personnel washed their hands only after venepuncture. On 79 (86.8%) occasions, soap and water were used for hand decontamination.

Use of gloves (112 occasions). On 53 of 91 (58.2%) occasions, health care personnel did not wear gloves for venepuncture. Failure to remove gloves after patient contact or between dirty and clean body site care on the same patient was observed on 24 of 112 (21.4%) occasions.

DISCUSSION

The main result of this study is that there is a poor infection control practice in hand hygiene, glove utilization, and usage of tourniquets, and the implementation of infection control measures produced a moderate improvement in compliance with them.

Our survey reveals that there is a substantial reservoir of potentially pathogenic bacteria on reusable tourniquets in the lack of infection control measures. This reservoir exists in areas of hospitals in which critically

Table 1. Departments sampled and distribution of bloodstained tourniquets

Department	Number sampled (%)	Tourniquets with visible blood stains, n (%)		Bloodstained tourniquets attributable to departments (%)		MRSA isolated from the tourniquets attributable to the department, n (%)	
		P 1	P 2	P 1	P 2	P 1	P 2
Intensive care units	11 (30.6)	2 (18.2)	-	33.3	-	5 (45.5)	1 (0.9)
Internal medicine units	11 (30.6)	-	-	-	-	5 (45.5)	-
Surgical units	9 (25)	2 (22.2)	-	33.3	-	3 (33.3)	1 (11.1)
Emergency	3 (8.3)	1 (33.3)	1 (33.3)	16.7	100	1 (33.3)	-
Phlebotomy units	2 (5.5)	1 (50)	-	16.7	-	1 (50)	-
Total	36 (100)	6 (16.7)	1 (2.8)	100	100	15 (100)	2 (100)

P 1, Period 1; P 2, period 2.

ill, injured, immunocompromised, and postoperative patients are being treated. The high number of tourniquets with visible bloodstains (16.7%) should be a cause for concern, and obvious disregard for cleanliness of tourniquets is surprising. This would be of particular concern if tourniquets with fresh blood contamination were used over open wounds, cuts, or areas of skin that were debrided or severely eczematous and therefore susceptible to cross infection by bloodborne pathogens.

MRSA is one of the most epidemiologically important antibiotic-resistant pathogens that cause hospital-acquired infections. Currently, almost half of nosocomial *S aureus* infections are resistant to methicillin.⁶ According to 2 different studies,^{3,7} *S aureus* colonies were isolated from the tourniquets examined, at a rate of 5% and 24%, respectively, none of them being MRSA. In the first step of our study, the rate of *S aureus* and especially MRSA-positive tourniquets was higher than the abovementioned studies. However, the highest rate of MRSA positivity on tourniquets was reported by Berman et al⁸ as 58%. Therefore, it seems beneficial to recommend the use of disposable tourniquets because of the potential risk of cross infection. Despite that disposable tourniquets are not present in our country, changing the old tourniquets with new ones at least once a year and implementation of infection control may well lead to less contamination of this frequently used medical equipment as shown by our study and may further decrease the theoretic risk of cross infection via tourniquets.

Handwashing is the best recognized means of preventing cross contamination in hospitals. It is simple to perform, but poor compliance with handwashing, especially in intensive care units was shown.⁹ Although 75.3% of respondents said that they washed their hands both before and after venepuncture, this result should be interpreted with caution because the subjects were aware of the general aims of the study.

The second step of the study, based on direct observation, confirms this vision. Alcohol handrubs were not always available in our institution despite the efforts of the Hospital Infection Control Committee. Unfortunately, there were the same problems with the materials for hand drying. However, despite this, the Hospital Infection Control Committee and the health care personnel in our institution did heighten efforts to improve compliance with the hospital infection controls.

Gloves serve as 2-way protection, preventing both transmission of infections to patients from health care personnel and also protecting health care personnel from acquiring infections from infected body surfaces, body fluids, or blood of patients.¹⁰ However, gloves supplement rather than replace handwashing.¹ In our study, it was observed that the health care workers used gloves predominantly for their own protection. There was significant noncompliance in changing the gloves after patient contact or between dirty and clean body site care on the same patient.

Many health professionals are visibly upset when their poor hygiene practices are exposed and are offended when it is suggested that they may be potential vectors of disease and are spreading virulent microorganisms among their patients.¹ In our study, the rate of the health care workers thinking that there is not a risk of transmission of infection from them to a patient was very high.

In conclusion, our survey reveals poor infection control practice in hand hygiene, glove utilization, and usage of tourniquets, with a high frequency of MRSA contamination of tourniquets in the lack of infection control policies. Following the implementation of infection control measures, compliance with infection control practices became better but not to desired levels. It appears that more work needs to be undertaken among the health care workers in our facility to increase awareness of and execution of infection policies and the benefits of handwashing and glove

usage. Individual commitment, implementation of health care educational and motivational programs, and full logistic support is likely to be successful in reducing hospital-acquired infections.

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