

## CLINICAL SCHOLARSHIP

# Perceived Knowledge of Blood-Borne Pathogens and Avoidance of Contact With Infected Patients

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**Key words**

Blood-borne pathogens, infected patients, knowledge about blood-borne pathogens, handwashing, avoidance of therapeutic contact

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Accepted: August 18, 2008.

doi: 10.1111/j.1547-5069.2009.01246.x

**Abstract**

**Purpose:** To examine the relationship between nurses' knowledge of blood-borne pathogens (BBPs), their professional behavior regarding handwashing, compliance with standard precautions (SPs), and avoidance of therapeutic contact with BBP-infected patients.

**Design:** This cross-sectional design study took place in a regional medical center in Central Israel during 2003.

**Methods:** Of the 180 participants, 159 (88.3%) were women with an average educational level of 16.40 years ( $SD=2.66$ ). The mean age of the sample was 39.41 ( $SD=10.1$ ). Data were collected using a structured questionnaire including sociodemographic information, level of knowledge concerning three BBPs (human immunodeficiency virus [HIV], hepatitis B virus [HBV], and hepatitis C virus [HCV]), level of compliance with SPs, understanding of SP principles, and avoidance of therapeutic contact with BBP-infected patients.

**Findings:** Levels of HIV-related knowledge were significantly higher than were those of HBV- and HCV-related knowledge. Only 96 participants (54.5%) stated that all patients should be treated as BBP-carriers. The understanding of the basic principle of SPs did not influence the relationship between perceived knowledge and self-reported compliance with SPs; 77.3% of the sample reported that they avoid therapeutic contact with BBP-infected patients. The level of perceived knowledge did not contribute to the nurses' avoidance of care of BBP carriers.

**Conclusions:** Perceived knowledge of BBPs has a weak effect on compliance with SPs and willingness to care for BBP-infected patients.

**Recommendations:** Nurses must identify their preconceptions when caring for BBP-carriers. Further research on this issue is needed to attempt to understand the forces acting on our nursing staff, in order to ensure appropriate care of BBP-infected patients.

**Clinical Relevance:** Our study indicated some reluctance among nurses to care for patients with blood-borne pathogens. This appears to be the result of value systems and not a lack of knowledge, indicating a need to integrate a psychoeducational approach to education of nurses.

In the last 2 decades, the issue of professional behavior has been a focus of discussion in the infection-control (IC) community. Many investigators have examined levels of knowledge on the prevention of nosocomial

pathogen transmission, rates of compliance with standard precautions (SPs), and their effect on professional behavior (Askarian, Honarvar, Tabatabaee, & Assadian, 2004; Creedon, 2005; Rondahl, Innala, & Carlsson, 2003;

Van de Mortel, 2003). However, less research has been focused on the relationship between knowledge of blood-borne pathogens (BBPs), understanding of basic assumptions of IC principles, and compliance with SPs. In this study, we examined the relationship between levels of perceived BBP-related knowledge, understanding of basic principles of and compliance with SPs, and self-reported avoidance of therapeutic contact with BBP-infected patients.

## **Perceived Knowledge of Infection Control, BBPs, and Standard Precautions**

Numerous investigators have examined perceived knowledge of IC and found inconsistent results (Bennett & Mansell, 2004; Maupome, Acosta-Gio, Borges-Yanez, & Diez-De-Bpnilla, 2000; Sood, Midha, & Awasthi, 2002; Stein, Makarawo, & Ahmad, 2003; Van de Mortel, 2003). Hand hygiene is considered the most important measure in reducing the transmission of nosocomial pathogens in healthcare settings, and yet compliance is often poor among healthcare workers. Lack of knowledge of guidelines for hand hygiene, lack of recognition of hand-hygiene opportunities during patient care, and lack of awareness of the risk of microbial cross transmission contribute to lack of hand-hygiene compliance (Pittet, 2000; Pittet et al., 2004). Researchers have reported that even in operating rooms the compliance rate of nurses with SPs is less than 100%, with a mean compliance rate of 72.1% (Osborne, 2003) or 29%–70%, depending on the type of precaution (Doebbeling et al., 2003). Self-reported compliance with SPs have been found to be a useful tool in exploring the related issues (Angtuaco et al., 2003; Chan et al., 2002; Doebbeling et al., 2003).

In 1995 the Centers for Disease Control and Prevention (CDC) introduced the concept of SPs aimed at protecting both healthcare workers and patients from infection with BBPs in healthcare settings. SPs should be applied to all patients receiving medical care regardless of their presumed infectious status and each patient is to be regarded as a potential BBP-carrier (Garner & the Healthcare Infection Control Practices Advisory Committee [HICPAC], 1996; Siegel, Rhinehart, Jackson, Chiarello, & the HICPAC, 2007). Therefore, therapeutic contact with any patient, whether recognized or not recognized as a BBP carrier, requires implementing SPs appropriate to the risk of exposure.

Chan et al. (2002) found deficit in knowledge of the basic principles of SPs among 306 nurses in Hong Kong. In response to the statement “Universal [standard] precautions should be applied to all persons regardless of

their infectious status,” 75.5% of the participants responded “True.” To the question “Universal precautions are applicable to patients with HIV and HBV only,” 84.6% replied “False.” Many investigators have reported the contribution of training and education to knowledge (Calabro, Weltge, Parnell, Kouzekanani, & Ramirez, 1998; Creedon, 2005) and compliance with hand hygiene and SPs (Creedon, 2005; Cromer et al., 2004; Huang et al., 2002). They have generally reported effects that are temporary and require constant reinforcement.

## **Avoidance of Care of BBP-Infected Patients**

BBP infections are surrounded by taboos and stigmas, which indicate challenges for healthcare staff. Stigma is a social construct associated with the recognition of a difference that is based on a characteristic and the subsequent unworthiness of the person that has it (Dovido, Major, & Crocker, 2000). As a consequence of stigmatization and fear of contracting HIV, as well as a lack of knowledge, nursing staff sometimes decline caring for patients with HIV/AIDS (Rondahl et al., 2003). Health professionals admit to the existence of AIDS-related stigma and prejudicial attitudes among themselves and in health care scenarios (Kemppainen, Dubbert, & McWilliams, 1996; Ruiz-Torres, Cintron-Bou, & Vars-Diaz, 2007). Rondahl et al. (2003) investigated attitudes toward HIV-infected patients and the desire to refrain from caring for these patients among 165 registered nurses and nursing students. Thirty-six percent of nurses and 26% of students stated that they would refrain from caring for these patients. Shaikh, Khan, Ross, & Grimes (2007) found very low knowledge scores regarding HIV/AIDS and a high rate of fear and prejudice toward HIV-infected people among Pakistani medical students. Martin & Bedimo (2000) examined willingness to care for patients with HIV/AIDS among 628 advanced nurses. They found that 21% to 31% of respondents were very to somewhat uncomfortable in providing care for these patients 18% of the nurses indicated that they would not provide health care to HIV-infected individuals and would refer care to other providers. In a further study, 22% of respondents reported that they had “considerable” to “very strong” objections to treating HIV-infected patients. Twenty-four percent of the sample reported that they had difficulty working in the same environment as a person with HIV (Maupome et al., 2000).

In contrast to the large body of research on refraining from nursing HIV-infected patients the perceptions of healthcare workers (HCWs) on avoiding care of HBV- or HCV-infected patients remain largely unexplored (Butt, 2008). Our clinical experience has led us to believe

that patients infected with HBV and HCV suffer from some level of stigmatization and avoidance of care by nurses. Therefore, we hypothesized that nurses would report on some level of avoidance of care of HBV- and HCV-infected patients and that nurses who have more knowledge will report higher compliance with SPs and professional behavior. The present study was aimed at examining the relationship between nurses' knowledge of BBPs, their professional behavior regarding handwashing and compliance with SPs, and avoidance of therapeutic contact with BBP-infected patients.

## Methods

### Design and Setting

This cross-sectional design study was conducted in a regional medical center in Central Israel from September through November 2003. To determine the sample size, the PC-SIZE program (Dallal, 1985) was used. A sample of  $n=160$  was considered adequate to allow detecting a correlation coefficient 0.3 with 80% power and a Type 1 error rate of .05. The study participants were sampled in clusters. From each hospital clinical division two-three clinical departments (clusters) were randomly selected (13 departments total). All individuals within the cluster were included in the sample 240 questionnaires distributed randomly to nurses in different wards by head nurses in the hospital. Over the course of 3 months, 180 questionnaires (75%) were returned via intrahospital regular mail. At the beginning of the study, permission from the medical director of our medical center, who gives the final approval for all studies conducted in the hospital, was obtained. (In Israel, permission from the ethics committee is not required when questionnaires to staff are under consideration).

### Sample

The sample consisted of 180 nurses. In the sample, 159 (88.3%) were women and 21 (11.7%) were men, with an average educational level of 16.40 years ( $SD=2.66$ ); 92.5% were registered nurses, 61% university graduates. The mean age was 39.41 ( $SD=10.1$ ) and years of experience ranged from 1 to 44 years ( $M=14.9$ ,  $SD=10.1$ ). One hundred and thirty three (75.1%) nurses worked full time; 15.3% in internal medicine wards, 14.8% in delivery rooms and gynecology, 16.5% in emergency departments (EDs), 7.4% in surgical wards, 10.8% in intensive care units (ICUs), 5.7% in operating rooms (ORs), 8.0% in pediatric wards, and the rest in other hospital departments.

### Instrument

A structured questionnaire was built by the researchers consisting of six parts: One scale indicated sociodemographic information; three scales indicated level of knowledge on three BBPs (HIV, HBV, and HCV); one scale indicated the self-reported level of compliance with SPs; and two parts indicated understanding of SP principles and avoidance of therapeutic contact with BBP-infected patients. One outside nursing researcher specializing in different aspects of infection control and two physicians specializing in infectious diseases tested the face validity and comprehensibility of the instrument. All judges had to be in full agreement for any item to be included, and their comments were taken into account in constructing the final questionnaire. A pilot study was conducted ( $n=20$ ) for evaluating the data-collection process and usefulness of the questionnaire. After the pilot study, the tool was revised.

Sociodemographic information was collected via 10 items addressing age, gender, family status, level of education, and academic degree, origin, profession, seniority, workplace, and job position of participant. HCWs were asked to report if they were personally acquainted with an infected HCW. Identifying information was not included in order to guarantee anonymity and compliance.

Knowledge relating to BBPs was examined using three scales comprised of six items each for HBV, HCV, and HIV. Each scale showed perceived knowledge relating to transmission, diagnosis, symptoms, treatment, prognosis, and prevention of BBPs (Table 2). Participants were asked to rank their knowledge on a scale of 1 (not at all) to 5 (very much). The mean score of all items was considered the level of knowledge. The Cronbach alpha score for internal consistency reliability for three scales ranged from .87 to .93.

Compliance with standard precautions was indicated by seven statements (Table 3). Participants were asked to rank their level of compliance with the SPs noted in each

**Table 1. Pearson Correlation Matrix for Relationship Between Study Variables ( $n=180$ )**

Variables	1	2	3
1. Perceived knowledge on BBP	—		
2. Agreement with basic principle of SP	.35 <sup>a</sup>	—	
3. Compliance with handwashing and SP	.23 <sup>a</sup>	.08	—
4. Avoidance of contact with BBP-infected patient	-.05	.04	.01

Note. <sup>a</sup> $p < .01$ . 1=Perceived knowledge on BBP ( $M=4.15$ ,  $SD=.56$ ); 2=agreement with basic principle of SP ( $M=8.36$ ;  $SD=2.46$ ); 3=compliance with handwashing and SP ( $M=4.46$ ,  $SD=.49$ ); 4=avoidance of contact with BBP-infected patient ( $M=4.31$ ,  $SD=3.02$ ).

**Table 2. An Example of the Questionnaire Section Indicating the Level of Perceived HBV-Related Knowledge**

Items		None		Average		Extensive
1)	Way of contamination	1	2	3	4	5
2)	Diagnosis	1	2	3	4	5
3)	Signs and symptoms	1	2	3	4	5
4)	Treatment	1	2	3	4	5
5)	Prevention	1	2	3	4	5
6)	Prognosis	1	2	3	4	5

Note. Participants were asked to rank their level of knowledge on Hepatitis B

item on a scale of 1 (not at all) to 5 (always). The mean score of all items was considered the level of compliance with SPs. The Cronbach alpha for this questionnaire was .70.

The perception of the basic principle of the SP approach was indicated by the question, "In your opinion, should every patient be treated as a BBP carrier?" Participants were asked to rank their answers on a scale from 1 (definitely do not agree) to 10 (definitely agree).

The nurses' avoidance of therapeutic contact with a BBP-infected person was measured by one question: "Does fear of possible contamination lead you to avoid contact with patients who are highly suspected to be infected by a BBP?" Participants were asked to rank their answers on a scale from 1 (never) to 10 (very frequently).

## Findings

### Perceived knowledge of BBPs

As shown in **Table 1**, the respondents had high levels of perceived knowledge of BBPs. To examine the differences in levels of perceived knowledge and attitudes, we used a *t* test for paired samples. Levels of HIV-related

knowledge were significantly higher than were those of HBV- and HCV-related knowledge ( $t=5.13$ ,  $p<.001$ ;  $t=7.09$ ,  $p<.001$ , respectively). Likewise, the levels of HBV-related knowledge were significantly higher than were those of HCV-related knowledge ( $t=3.30$ ,  $p<.001$ ). Participants who reported personally knowing an infected HCW had a higher level of perceived knowledge of BBPs ( $t=2.53$ ,  $p<.05$ ) and higher levels of hepatitis-related knowledge ( $t=2.60$ ,  $p<.01$ ).

### Agreement With Basic Principles and Compliance With SPs

In all, 96 nurses (54.5%) stated that all patients should be treated as BBP carriers; only 3 (1.7%) disagreed with this principle and the rest of the sample agreed in varying degrees. As shown in **Table 1**, the overall level of self-reported compliance with handwashing and SPs was high, with an average compliance of 4.46 of 5 (89.2%). The relationship between perceived knowledge of BBPs and compliance with SPs was weak. A higher level of perceived knowledge of BBPs was associated with higher agreement with the principle of SPs ( $r=.35$ ,  $p<.01$ ) and with higher compliance with SPs ( $r=.23$ ,  $p<.01$ ).

In order to examine the mediating effect of an understanding of the principle of SPs, we tested a partial correlation between perceived knowledge of BBPs and self-reported handwashing and compliance with SPs, controlling for the variable of the perception of the basic principle of the SP approach (partial correlation). There was no change in significance or strength of the relationship between knowledge and compliance. In other words, the understanding of the basic principle of SPs did not influence the relationship between perceived knowledge and self-reported compliance with SPs.

The seniority of the participants was negatively associated with the tendency to define every patient as a potential carrier of BBPs ( $r= -.24$ ,  $p<.01$ ). Therefore, the longer participants worked in hospitals the less their agreement with this basic principle of SPs.

### Avoiding Caring for BBP-Infected Patients

A majority (77.3%) of the sample reported that they avoided therapeutic contact with BBP-infected patients or patients suspected as being infected by BBPs at varying levels of frequency, while 5.7% of them reported that they avoided this contact in almost all cases. The remaining 40 (22.7%) of the respondents reported that they did not avoid contact. As shown in **Table 1**, there was a weak relationship between perceived knowledge of BBPs and avoidance of therapeutic contact with BBP-infected patients. In other words, the level of perceived knowledge

**Table 3. Items of Handwashing and Standard Precautions Compliance Tool (Self-Reporting)**

Items
1. I wash my hands before contact with the patient.
2. I wash my hands after contact with the patient.
3. I wash my hands before and after I wear gloves.
4. I wash my hands when I pass from contaminated to clean area.
5. I change gloves between patients.
6. I wear goggles [when indicated].
7. I wear a gown [when indicated].

Note. Participants were asked to give an estimate as to the level of their compliance to standard precautions.

did not contribute to nurses' avoidance of care of BBP carriers.

## Discussion

Our study was limited by many factors including possible sampling bias as a result of sampling technique and the fact that both knowledge and compliance were measured by self-reporting and not by objective examination. Many studies have indicated that actual levels of compliance regarding SPs among healthcare workers are relatively low. In our study, nurses reported relatively high levels of SP compliance. Of importance to note is that our data were from self reports made by our respondents and that the finding of a high level of self-reported compliance with SPs is not necessarily reflective of actual compliance in the clinical field (Henry, Campbell, & Maki, 1992). Therefore the likelihood exists that our data might be an overestimate of our respondents' true compliance with SPs.

In this study, we hypothesized that an association exists between subjective knowledge regarding BBPs and nurses' professional behavior as represented by compliance with SPs, on the one hand, and willingness to care for BBP-infected patients, on the other. The results, however, did not support this claim. This was different from the findings of Askarian et al., (2004) who found a linear correlation between actual knowledge and compliance with SPs. Our findings could be explained by the possibility that nurses' professional behaviors are influenced more by their' personal beliefs and attitudes and less by professional knowledge.

Pittet (2004) has proposed that to improve HCWs' compliance with practices, infection-control teams need to learn from the behavioral sciences that individual characteristics such as attitudes, beliefs, and personality traits influence professional behavior. This is consistent with the literature that emphasizes the weakness of the cognitive approach to destigmatization and the importance of interventions on the affective level. Education and the imparting of information alone can actually strengthen existing stereotypes and stigmas. Any cognitive intervention should indicate emotional aspects and personal attitudes of the HCWs (Haghighat, 2001). Educational programs should indicate issues such as awareness of guidelines for hand hygiene and low compliance with these guidelines in clinical practice of most nurses and recognition of opportunities for hand hygiene associated with high risk of cross-transmission, together with regular knowledge-promoting tasks (Pittet, 2004).

Although the relatively weak relationships between knowledge of BBPs and compliance with SPs, the finding that agreement with basic principles did not contribute

to this relationship is interesting. We believe that the understanding of this principle is critical for complying with SPs. However, this study indicated that the understanding of the basic principle of SPs did not influence the relationship between perceived knowledge and compliance with SPs. A possible explanation of this finding could be related to the influence of other mediating and moderating factors, including attitudes that we did not take into account in performing this study. Another possible explanation could be related to the weak association of knowledge and behavior as we found in the case of knowledge and avoidance of care. It seems that views and attitudes play a central role and influence compliance more than knowledge does. Future researchers should explore this point.

In this study, nurses reported a relatively high level of avoidance of therapeutic contact with patients infected with BBP (or suspected as being infected; 76.8% reported avoiding patient care at some level). This is a high percentage if we compare it to the 36% of professionals whom Rondahl et al. (2003) found would refrain from caring for HIV-infected patients if the possibility existed. As mentioned earlier, most of the literature on willingness and readiness to care for such patients is about people with AIDS. Maze (2006) found that demographic characteristics showed limited influence on values, and that none of the factors of age, level of education, gender, nursing certification, or values was significantly associated with the willingness of registered nurses to serve patients on the periphery of society.

The literature on caring for people with AIDS addresses homophobia, stigmatization, prejudice, and fear of contagion (Robinson, 1998) as affecting the readiness of HCWs to provide care. In this study, because [ceb4] we referred to all three BBPs as one group, it could be that the effect of the stigmatization of HIV-affected responses, weighted the others negatively. However, stigmatization of HBV and HCV also exists (Cormier, 2005; Grundy & Beeching, 2004; Mohamed et al., 2004; Zacks et al., 2006). We found our results to be highly disturbing, indicating intolerance for patients with BPPs. We presume that this intolerance could have a negative effect on the quality of patients' care, which is the central focus of nursing (Kyle, 1995). We recommend further research on the subject in order to understand the forces acting on our nurses and methods to improve it.

## Conclusions and Recommendations

The results of our study led us to conclude that nurses are avoiding therapeutic contact with infected patients. Furthermore, our results did not show that perceived knowledge explained the professional behavior of nurses

in this context and so, on the basis of the current literature (Pitett, 2004), we recommend exploring the psychoeducational approach of focusing and reflecting on personal views on infection-control related issues as an integral and important component of any IC-enhancing program. The program should incorporate initial ongoing and informal education, core principles of adult ethics and duty (Dols & Bradley-Magnuson, 1996; McCann & Sharkey, 1998) and extensive encouragement of expression of emotional burdens, fears, and worries. A need exists for educational interventions at the affective and behavioral level that affect feelings and attitudes.

## Acknowledgements

The authors acknowledge Mary Rosenberg for help in editing the manuscript.

### Clinical Resources

- The Health Resources and Services Administration (HRSA), HIV/AIDS bureau, Caring for the Underserved: <http://hab.hrsa.gov/default.htm>
- Foundation with Hope. Stigma, Hate and Fear: <http://hateamongstus.net/Home/index.htm>
- HBV advocate organization: <http://www.hbvadvocate.org/index.asp>
- Hepatitis C information central: <http://www.hepatitis-central.com/>
- AIDSMAP, information on HIV and AIDS: <http://www.aidsmap.com/>

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