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Psychosocial and organizational factors relating to adherence to standard precautions

ABSTRACT

OBJECTIVE: To analyze the influence of psychosocial and organizational factors relating to adherence to standard precautions for preventing exposure to biological material in hospitals.

METHODS: A cross-sectional study was conducted among 270 medical and nursing professionals at a university hospital in the municipality of São Paulo, Southeastern Brazil, in 2002. After selection by means of simple random sampling, the participants answered a questionnaire on psychosocial variables in the form of a Likert scale. The construct validity was evaluated using factor analysis and the reliability, by means of Cronbach's alpha coefficient. The association between psychosocial factors and adherence to standard precautions were obtained by means of multiple logistic regression analysis, with backward elimination of nonsignificant variables.

RESULTS: The scales showed satisfactory validity and reliability (Cronbach's alpha between 0.67 and 0.82). Individual, work-related and organizational factors explained 38.5% of the overall rate of adherence to standard precautions. This overall rate of adherence was significantly associated with being a physician, receiving training in standard precautions at the hospital, downplaying the obstacles to following the standard precautions, taking the job more seriously, having feedback from safety practices and implementing managerial actions to support safety.

CONCLUSIONS: Individual, work-related and organizational factors together influenced the adherence to standard precautions. Programs for preventing occupational exposure to biological material need to take into account the obstacles to following standard precautions within clinical practice, and to emphasize organizational support policies for safety at work.

DESCRIPTORS: Health Personnel. Universal Precautions. Security Measures, utilization. Safety Management, standards. Health Knowledge, Attitudes, Practice. Scales. Reproducibility of Results. Cross-Sectional Studies.

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INTRODUCTION

To ensure prevention of occupational exposure to biological material, the standard precautions (SP)[a] recommend that healthcare professionals should consider all patients to be potentially infected when there is a possibility of contact with blood and other body fluids. The main recommendations include the use of personal protective equipment (PPE) whenever there is a possibility of contact with organic secretions, along with careful handling and proper disposal of sharp objetcs.[11]

Despite recognition of the importance of standard precautions, studies have shown that the adherence levels are unsatisfactory. For example, PPE is used inadequately and selectively,[3,9,16] needles are frequently recapped[16,20] and the level of adherence to standard precautions varies according to professional category.[3,8,16]

In the literature, studies have identified psychosocial factors that interfere with the adoption of standard precautions. For example, the way in which standard precautions interfere with work performance is perceived as a barrier or "obstacle",[6] as observed in reports from healthcare professionals who felt that they lost manual dexterity through using gloves during the procedure of venous puncture.[4,9,19] Other justifications for non-adherence that have been cited include: discomfort, inconvenience, "gloves increase the chances of needlestick injuries" or "gloves don't fit well".[5,7,10,19]

Another point relates to the belief among professionals that standard precautions do not reduce needlestick injuries, what justifies not using gloves while handling sharps.[10]

The particular dynamics of healthcare work may create a conflict of interests between meeting patients' needs and using PPE.[12] This is especially evident in urgency and emergency units. In these circumstances, the needs to provide medical care to patients may be so urgent that the worker's need to protect themselves takes on a distant and conflicting perspective. Accordingly, "insufficient time", "forgetfulness" and "precautions are not practical" have been indicated as reasons for non-adherence.[2,10]

Adherence to standard precautions may be influenced by the organizational safety climate. This is the shared perception among workers regarding the value attributed to safety at work.[6] Greater adherence levels have been correlated with management commitment to safety, performance feedback from colleagues and supervisors on safe work practices, the importance of training and the availability of PPE.[7,12,17]

With the aim of analyzing psychosocial factors that underlie the behavior of healthcare workers in relation to job and the organizational context, DeJoy et al[5,6,7] (1995;1996;2000) developed the Work System Model, which established that universal precautions compliance should be comprised at three levels. The first level represents the healthcare workers with his or her personal characteristics and professional experience. The second level represents the tasks and dynamics of the healthcare work, in which the care demands may compete with personal safety. The final level represents the organizational context, in which safety may have a cultural value and the management may support the use of standard precautions.

The present study had the objective of analyzing the influence of psychosocial and organizational factors on the compliance with standard precautions for preventing exposure to biological material in hospitals settings.

METHODS

This was a cross-sectional study conducted among healthcare workers exposed to biological risks in a university hospital in the municipality São Paulo, Southeastern Brazil, between May and July 2002. At that time, the population was composed of 264 physicians and 624 nursing staff, thus totaling 888 healthcare workers.

In 1992, the hospital study site implemented universal precautions. Subsequently, between 1998 and 1999, standard precautions was implemented by training for nursing staff. Only an explanatory booklet was made available for the physicians.

To carry out this investigation, a sampling plan was defined (simple random sampling) to identify differences between the two healthcare workers categories. Since the variance in the set of variables analyzed was not known *a priori*, the hypothesis taken was that the five alternatives for each question on the questionnaire would be equally likely. With a sampling error of 5%, a sample of 149 physicians and 221 nursing staff would be needed, thus totaling 370 healthcare workers. However, taking into account potential losses of 12.5%, 416 individuals were drawn.

For the draw, homogenous workers subgroups were formed for each job category (physicians and nurses), in terms of gender, age, time of working at the hospital and schooling level (only for the nursing staff).

To gather data, a questionnaire investigating demographic variables and psychometric scales that originated from Gershon et al[12] (1995) and DeJoy et al[5] (1995)

[a] The terms "standard precautions" and "universal precautions were taken to be synonymous, meaning the set of measures for preventing occupational exposure to blood borne pathogens. Although there are conceptual differences between the two protocols, their similarities of principles and foundations were the aspects of interest for the present study.

studies was used. The Likert scales, with five response choices (from strongly agree to strongly disagree), were subjected to transcultural adaptation in accordance with the steps described by Guillemin[14] (1995).

After carrying out a pretest with a preliminary version of the scales on a small sample of healthcare workers, the final version of the questionnaire was produced, which contained:

- sociodemographic variables: gender, age, educational level, time of working in the field, time of working at the hospital, total number of hours worked per week, how became aware of and training at the hospital;

- scales relating to "knowledge about occupational HIV transmission" (eight items); "perception of risk" (five items); "risk-taking personality" (six items); "efficacy of prevention" (three items); "barriers to standard precautions" (seven items); "workload" (three items); "safety climate" (17 items); "availability of personal protective equipment" (three items); "training for prevention of occupational exposure to HIV" (four items); and "standard precautions compliance" (13 items).

The present study proposes an explanatory model for compliance with standard precautions that analyzed the interaction between individual factors (sociodemographic factors, knowledge about occupational HIV transmission perception of risk, risk-taking personality and efficacy of prevention), work-related factors (barriers to following standard precautions and workload) and organizational factors (safety climate, availability of protection equipment and training for prevention of exposure to HIV).

The tested hypotheses were that compliance with standard precautions was influenced simultaneously by three factors (individual, work-related and organizational factors) and that the measurements instruments had adequate construct validity and reliability.

Out of the 416 questionnaires distributed, 293 were answered (70.4%), 213 (72.7%) by nursing staff and 80 (27.3%) by physicians. Among the physicians, 23 revealed that they did not know about standard precautions and so they were excluded from the sample. Thus, the total number of participants was 270 healthcare workers, 213 nursing staff and 57 physicians.

Among the nursing staff was a predominance of females (93.4%), while among the physicians 46.4% was male and 53.6% was female. There were differences between the two job categories in relation to educational level and number of hours worked per week (Table 1).

To analyze the construct validity, exploratory factor analysis was performed. This consisted of four stages: (1) identification of correlation between the factors ($r \geq 0.30$), using the principal components method with oblique rotation; (2) redefinition of the factor rotation method, for orthogonal rotation if there was no correlation between them ($r \leq 0.30$); (3) selection of the components with eigenvalues ≥ 1, noting the percentage of the variance explained by them; (4) confirmation of the previously defined theoretical dimensions, by observing the structured matrix (oblique rotation) or the rotated matrix (orthogonal rotation), considering only the items with a factor load ≥ 0.30, with regard to the originating factor.

To analyze the reliability, Cronbach's alpha coefficient (α) was calculated. Its amplitude ranged from 0 to 1. Scales with values closer to 1 indicated greater reliability. Thus, scales with $\alpha \geq 0.60$ were considered adequate.

Multiple logistic regression analyses, with backward stepwise elimination of non-significant variables, were performed to determine the influence of the individual, work-related and organizational factors (independent variables) on the compliance with standard precautions (dependent variable). Through this procedure, the analysis on the predictors for the dependent variable was performed in stages. In the first stage, using the "Enter" method, all the independent variables were considered simultaneously. Using the backward method, the subsequent stages sought to improve on the results of the preceding stage, by removing variables that were non-significant at the 5% level. In this way, the final result represented the explanatory model for the dependent variable without redundancy of parameters.

Two distinct approaches were used for predicting the dependent variable. First, "compliance with standard precautions" was considered a single-dimensional construct, by composing a global index. Second, some items were grouped to distinguish adherence in relation to the use of PPE or handling and disposal of sharps objects.

The SPSS software, version 11.0, was used for the statistical procedures.

This study was approved by the Teaching and Research Unit and the Research Ethics Committee of the University Hospital of the *Universidade de São Paulo.*

RESULTS

With regard to the question "How did you get to know about standard precautions?", the choices "at school or university" and "in a lecture at the hospital" were reported respectively by 39.4% and 30.8% of the nursing staff. On the other hand, among the physicians, most of them (73.2%) reported that they had heard about standard precautions at university. Likewise, regarding the question "Have you received training on standard precautions at the hospital?", the vast majority of the physicians (94.6%) reported that they had not, whereas most of the nursing staff (81%) reported that they had.

Table 1. Characteristics of healthcare workers in a university hospital. Municipality of São Paulo, Southeastern Brazil, 2002.

Variable	Nursing professionals		Physicians	
	n	%	n	%
Gender				
Female	197	93.4	30	53.6
Male	14	6.6	26	46.4
Total[a]	211	100	56	100
Age (years)				
Minimum	21		27	
Mean	37.7		37.8	
Maximum	60		52	
Schooling				
High school	121	62.4	-	-
University-level	53	27.3	26	46.4
Postgraduate level	20	10.3	30	53.6
Total[a]	194	100	56	100
Time of working in the field				
Minimum			4 years	
Mean	11.1 years		13.9 years	
Maximum	28 years		27 years	
Time of working at the hospital				
Minimum	2 months		4 months	
Mean	8.6 years		8.1 years	
Maximum	20.8 years		20.5 years	
Number of hours worked per week				
Minimum	12		10	
Mean	40.8		56.5	
Maximum	80		91	
How became aware of standard precautions				
At school or university	82	39.4	41	73.2
In a lecture at the hospital	64	30.8	1	1.8
Both of the above	51	24.5	3	5.4
Other	11	5.3	11	19.6
Total[a]	208	100	56	100
Training on standard precautions at the hospital				
Yes	166	81	3	5.4
No	39	19	53	94.6
Total[a]	205	100	56	100
Training time on standard precautions at the hospital				
Minimum	1 month		6 months	
Mean	2.4 years		6 months	
Maximum	15 years		6 months	

[a] The frequencies do not represent the total sample of nursing professionals (n= 213) and physicians (n= 57), since there were participants who did not answer all the questions.

Table 2. Factor and reliability analysis on the psychometric scales for which the healthcare professionals at the university hospital provided responses. Municipality of São Paulo, Southeastern Brazil, 2002.

Factor	Factor load
Knowledge about occupational HIV transmission (n = 269; α = 0.86)	
Applying pressure to a bleeding site without wearing gloves	0.7740
Getting stuck or cut with a contaminated sharp object	0.7730
Drawing blood from an HIV-infected person without wearing gloves	0.7470
Getting splashed or sprayed in the eyes or mouth with blood from an HIV-positive patient	0.7120
Getting HIV-positive blood on hands	0.6780
Dressing a wound of an HIV-infected person without wearing gloves	0.6270
Performing mouth-to-mouth cardiopulmonary resuscitation on an HIV-positive person	0.5970
Training on and availability of PPE (n = 266; α = 0.82)	
Employees are taught to be aware	0.812
I have had the opportunity to be properly trained to use PPE devices	0.757
In my unit, managers encourage employees to attend safety seminars	0.742
My hospital offers specific training on bloodborne pathogens	0.710
My unit has all the equipment and materials needed to protect me. [tradutor está correto]	0.642
All the necessary equipment and devices to avoid contact with HIV are available	0.582
Barriers to standard precautions (n = 260; α = 0.69)	
Sometimes there isn't enough time to use standard precautions	0.737
Following standard precautions makes my work harder	0.644
I can't always follow standard precautions because my patients' needs come first	0.614
The rush of daily activities often interfere with my being able to comply with standard precautions	0.612
Standard precautions keep me from doing my job to the best of my abilities	0.580
I can't get used to using personal protection equipment	0.525
Risk-taking personality (n = 263; α = 0.72)	
I prefer new and exciting experiences	0.842
I do dangerous things sometimes just for the thrill of it	0.742
I enjoy taking risks in my life	0.687
I prefer an exciting and unpredictable life	0.528
Workload (n = 269; α = 0.73)	
How often does your job require you to work very fast?	0.813
How often is there a lot of work to be done?	0.783
How often does your job require you to work hard?	0.754
Efficacy of prevention (n = 269; α = 0.67)	
If standard precautions are followed for all patients, my risk of getting HIV/AIDS is very low	0.757
I can reduce my occupational risk for HIV infection by complying with standard precautions	0.733
If I wear disposable gloves, I will be protecting myself from contamination with HIV	0.651
Perception of risk (n = 267; α = 0.68)	
My risk of becoming infected with HIV through my work is low	0.826
There's a high risk of pricking myself at work	0.767
In my work, I'm exposed to HIV infection	0.697

Total amount of variance explained by these seven factors = 54.91%
PPE: Personal protective equipment

Table 3. Results from factor and reliability analysis on the safety climate scale. Municipality of São Paulo, Southeastern Brazil, 2003.

Factor (number of cases; Cronbach's alpha)	Factor load
Management support for safe work practices (n = 256; α = 0.80)	
In this hospital, employees, supervisors and managers work together to ensure safer working conditions	0.441
In this hospital, all possible measures are taken to minimize hazardous job tasks and procedures	0.505
In this hospital, top level management gets personally involved in safety activities	0.799
My supervisor is concerned about my safety on the job	0.686
In this hospital, there is a safety committee	0.666
I feel free to report safety violations where I work	0.625
The protection of workers from HIV occupational exposure is a priority with management in this hospital	0.608
Safety Performance Feedback (n = 249; a = 0.69)	
In this hospital, unsafe work practices are corrected by supervisors	0.783
Employees are told when they do not follow standard precautions	0.656
My supervisor is supportive of my practicing standard precautions	0.651
In my facility, employees' compliance with standard precautions practices is part of their written evaluation	0.550
In this hospital, unsafe work practices are corrected by co-workers	0.425

Total amount of variance explained by these two factors = 47.57%

In the factor analysis, the scales were subjected to factor extraction until the most satisfactory result had been obtained. This is presented in Table 2, together with the coefficients of reliability.

The factors obtained confirmed the following constructs: "knowledge about occupational HIV transmission; "perception of risk"; "risk-taking personality"; "efficacy of prevention"; "barriers to standard precautions"; and "workload". A new factor was formed, grouping items from the initial scales of "training for prevention of occupational exposure to HIV" and "availability of PPE", which was named "training and structural support for safety". The total variance explained by these seven factors was 54.9%, with a coefficient $\alpha \geq 0.60$.

The scale for "safety climate" was analyzed separately, since the initial factor analysis showed that there was a correlation between two components. The final result from this analysis is shown in Table 3, together with the coefficients of reliability. The analysis revealed two new factors, named thus: "management support for safe work practices" and "safety performance feedback". The total variance explained by these two factors was 47.6%, with a coefficient $\alpha \geq 0.60$.

The scale for "compliance with standard precautions" was analyzed separately and no results were shown to be significant, since the items grouped did not have any theoretical affinity. For this reason, these results have not been presented.

Table 4 presents the results from the final explanatory model for compliance with standard precautions as a single-dimensional construct. The explanatory variables were: belonging to the job category of physicians (beta = -0.307; $p \leq 0.0001$); receiving "training on standard precautions at the hospital" (beta = 0.298; $p \leq 0.0001$); having a lower perception of "barriers to standard precautions" (beta = -0.384; $p \leq 0.0001$); and having a greater perception of "workload" (beta = 0.244; $p \leq 0.0001$), "safety performance feedback" (beta = 0.248; p = 0.001) and management support for safe work practices (beta = 0.141; $p \leq 0.05$). Together, these variables explained 38.5% of the variance [R^2 = 0.385; F(6.191) = 19.266; $p \leq 0.0001$].

Table 5 presents the final explanatory model for compliance with "use of PPE" and with "handling and disposal of sharps objects". The explanatory variables for use of PPE were: belong to the "job category of physicians (beta = -0.259; $p \leq 0.01$); receiving "training on standard precautions at the hospital" (beta = 0.197; $p \leq 0.05$); having a lower perception of "barriers to standard procedures" (beta = -0.322; $p \leq 0.0001$); and having a greater perception of "workload" (beta = 0.265; $p \leq 0.0001$), "safety performance feedback (beta = 0.226; $p \leq 0.01$) and "management support for safe work practices" (beta = 0.169; $p \leq 0.05$). Together, these variables explained 32.4% of the variance [R^2 = 0.324; F(6.198) = 15.337; $p \leq 0.0001$].

The explanatory variables for "handling and disposal of sharps objects" were: "knowledge about occupational HIV transmission" (beta = 0.176; p = 0.01); having a lower perception of "barriers to standard procedures" (beta = -0.129; p = 0.056); and having a greater perception of "safety performance feedback" (beta = 0.259; $p \leq 0.0001$). Together, these variables explained 13.4% of the variance [R^2 = 0.134; F(3.201) = 10.211; $p \leq 0.0001$].

Table 4. Final model from regression analysis on the variable "adherence to standard precautions" among healthcare workers at the university hospital. Municipality of São Paulo, Southeastern Brazil, 2002.

Variable	Standardized coefficient	t
Individual factors		
Job category	-0.307	-3.749***
Training on standard precautions at the hospital	0.298	3.709***
Work-related factors		
Barriers to standard precautions	-0.384	-6.473***
Workload	0.244	4.180***
Organizational factors		
Safety performance feedback	0.248	3.524**
Management support for safe practices	0.141	2.147*
$F(6.191) = 19.266$; $p \leq 0.0001$; $R^2 = 0.385$; adjusted $R^2 = 0.365$		

* $p \leq 0.05$
** $p = 0.001$
*** $p \leq 0.0001$
Job category: physicians = 0; nursing staff = 1.
Training on standard precautions in the hospital: no = 0; yes = 1.

DISCUSSION

This study showed the influence of psychosocial factors on compliance with standard precautions. It corroborated the hypothesis that adherence to standard precautions was influenced simultaneously by individual, work-related and organizational factors.

With regard to the limits of the present study, the number of participants was lower than what had been established in the sampling plan. For the nursing staff, the 213 valid responses made it possible to extrapolate the results to the population of nurses with a degree of confidence of 5.1%, i.e. close to the planned 5%. On the other hand, for the sample of physicians, the 57 valid questionnaires made it possible to extrapolate the results from the sample to the population of physicians with a sampling error of approximately 10%, i.e. a higher value than what was planned. Thus, it is possible that the standard errors of the means of the analyzed items were greater for the physicians than for nurses. However, the comparison between the sampling means obtained in the questionnaire items remains valid for the two job categories, given that it was sufficient to evaluate whether the groups had equal variance, for each item separately, in order to apply the mean difference test correctly.

The measurement instruments presented construct validity, thereby corroborating the second of the study hypotheses, since the factor analysis revealed factors that were compatible with the theoretical framework.

The conjoining of the constructs "training for prevention of occupational exposure to HIV" and "availability of PPE" in a single construct named "training and structural support for safety" was considered adequate, since the variables were complementary and characterized structural conditions that stimulated and supported the adoption of safe work practices.

The initial scale of "safety climate" was redefined by two new factors, "management support for safe work practices" and "safety performance feedback", which were compatible with the theoretical framework. The first factor brought together items relating to the management's commitment to safety at work, through defining actions and support policies. The second factor grouped items relating to control policies, in the form of feedback regarding standard precautions compliance and safe practices, carried out formally (appraisal by supervisors) and informally (by colleagues).

All the scales showed adequate reliability (second study hypothesis), since Cronbach's alpha coefficient was ≥ 0.60 (between 0.67 and 0.82).

On testing the proposed theoretical model, it was seen that individual, work-related and organizational factors had simultaneous influence on standard precautions compliance. In the first model (global index), the professionals with greater adherence belonged to the job category of physicians. They had received "training on standard precautions at the hospital"; they had a lower perception of "barriers to standard precautions" and a greater perception of "workload". They received "safety performance feedback" and perceived management support for safe work practices.

"Use of PPE" (second model) was explained by the same combination of variables. On the other hand, "handling and disposal of sharps" (third model) was

Table 5. Final model from multiple logistic regression in relation to "use of PPE" and "handling and disposal of sharps", among healthcare workers at the university hospital. Municipality of São Paulo, Southeastern Brazil, 2002.

Use of PPE	Standardized coefficient	t
Individual factors		
Job category	-0.259	-3.089**
Training on standard precautions at the hospital	0.197	2.398*
Work-related factors		
Barriers to standard precautions	-0.322	-5.285***
Workload	0.265	4.416***
Organizational factors		
Safety performance feedback	0.226	3.115**
Management support for safe work practices	0.169	2.497*
$F(6.198) = 15.337$; $p \leq 0.0001$; $R^2 = 0.324$; adjusted $R^2 = 0.303$		
Handling and disposal of sharps		
Individual factors		
Knowledge about HIV occupational transmission	0.176	2.592**
Work-related factors		
Barriers to standard precautions	-0.129	-1.923****
Organizational factors		
Safety performance feedback	0.259	3.846***
$F(3.201) = 10.211$; $p \leq 0.0001$; $R^2 = 0.134$; adjusted $R^2 = 0.121$		

PPE: personal protective equipment
* $p \leq 0.05$
** $p \leq 0.01$
*** $p \leq 0.0001$
**** $p = 0.056$
Job category: physicians = 0; nursing staff = 1.
Training on standard precautions in the hospital: no = 0; yes = 1.

explained by: "knowledge about occupational HIV transmission"; having a lower perception of "barriers to standard precautions"; and having a greater perception of "safety performance feedback".

Furthermore, the percentage of the variance explained in the proposed models (38.5% for the global index and 32.4% for the use of PPE) attained levels greater than in studies that used the same theoretical framework. In the study by DeJoy et al[5] (1995), the variables "job hindrances", "availability of PPE" and "performance feedback" explained 16% of the variance in universal precautions compliance. In 2000, DeJoy et al[7] again found that "availability of PPE", "job hindrances", "managerial priority regarding safety", "formal feedback" and "informal feedback" explained 18% of the variance in adherence to PPE.

In the present study, some of the significant variables showed great explanatory importance. Among the individual factors, the professionals with greater adherence belonged to the job category of physicians and had received training on standard precautions at the hospital.

At first sight, this result may seem paradoxical, since 94.6% of the physicians had not received training on standard precautions at the hospital, whereas 81% of the nursing staff reported that they had. The interpretation for this finding is that, if all other variables with significant influence on compliance were kept constant in the two job categories, the physicians were shown to have greater adherence. This means that between two healthcare workers, one a physician and the other a nurse, with equal scores for the factors of influence, the physician would have greater compliance with standard precautions. However, since the sample of physicians failed to reach the stipulated level in the sampling plan, it would only be possible to validate this interpretation by replicating this study with an adequately sized sample.

Moreover, receiving training on standard precautions at the hospital had a positive influence on the "global index" and "use of PPE". This result relates to the fact that the physicians had not received training on standard precautions at the hospital. Unfortunately, this is not an isolated fact. A study conducted in 153 hospitals in Iowa and Virginia (United States) to distinguish organizational programs relating to prevention

of occupational exposure to biological material found that 27% of the physicians had not received training on standard precautions. The authors of that study emphasized that training on safety at work was only rarely a requirement for physicians.[1] These data indicate the need to include physicians in future programs on standard precautions.

Among the work-related factors, the model predicted that professionals with strongly compliance see less intensively the barriers to standard precautions and more intensively the workload.

"Barriers to standard precautions", which has also been called "conflict of interests" in other studies, has shown significant importance in studies on compliance with standard precautions. According to DeJoy et al[5] (1995) and Murphy et al[18] (1996), universal precautions compliance was greater when the perception of "SP-related barriers" was lower. According to Michaelsen et al[17] (1997), non-adhering physicians had a perception of "conflict of interests" that was 2.3 times greater than that of adhering physicians. In another study, DeJoy et al[7] (2000) concluded that fewer "job hindrances" explained the "general compliance" and "compliance with PPE". Gershon et al[13] (2000) reported that "compliance with universal precautions was strongly associated with absence of "job hindrances".

In a contradictory manner, the perception of "workload" had a positive influence on "standard precautions compliance". A similar result was obtained by Johnson et al[15] (1995), who examined the relationship between "perception of job demands" and "job dissatisfaction", among a sample of physicians. Unexpectedly, those who reported a greater perception of job demands revealed lower levels of dissatisfaction.

These authors attributed their result to the particular nature of medical work, in which high demand may be perceived as stressful and at the same time, stimulating and exciting. Likewise, in the present study, high perceived job demands were considered to be associated with great responsibility and concentration, which in turn favored compliance with standard precautions.

With regard to organizational factors, perception of "training on and availability of protection equipment", "safety performance feedback" and "management support for safe work practices" favored "compliance with standard precautions". This result was similar to findings from other studies in which "availability of protection equipment" was correlated with "compliance with standard precautions", among nursing staff.[7,18] Formal and informal feedback explained "general compliance with universal precautions" and "use of PPE".[7] "Management support for safety programs" explained "compliance with universal precautions"[13] and "safety climate" explained workplace exposure incidents and adoption of safe practices.[9]

We conclude that the explanatory model for compliance with standard precautions indicated important supportive factors for drawing up programs for preventing occupational exposure to biological material. The first point in this regard concerns work-related factors. Identification of "barriers" as a factor of influence suggests that such points need to be discussed during training. This implies that cognitive, psychomotor and behavioral abilities need to be developed during training, in order to help professionals to overcome the SP-related barriers. For example, during such training, role-playing activities on overtaking the barriers to standard precautions could be useful.

The second point relates to the relevance of organizational factors in the explanatory model. This indicates that it is important to emphasize all of the structural support existing within the institution that favors the use of standard precautions i.e.: (1) adequacy of supply and availability of PPE; (2) managerial supervision and feedback regarding the use of standard precautions; and (3) institutional policies that support safety, such as keeping records of accidents to healthcare workers and providing follow-up, including post-exposure prophylaxis and availability of hepatitis B vaccination.

Thus, we hope that this explanatory model for compliance with standard precautions might provide support for broader understanding of this problem and guide development of more effective intervention strategies to biological risk management in hospitals settings.

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