

Safety Climate and Use of Personal Protective Equipment and Safety Medical Devices among Home Care and Hospice Nurses

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Abstract: Use of personal protective equipment (PPE) and safety medical devices is mandated for healthcare workers to reduce the risk of infection with human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) from exposure to patients' blood. Research has shown that a strong safety climate may promote increased use of PPE. Therefore, the objective of this study was to examine the association between safety climate and use of PPE among homecare/hospice nurses in North Carolina. To this end, a mail survey was conducted in 2006. The response rate, adjusted on the assumption that the proportion of eligible nurses from among those who did not return the questionnaire or could not be contacted was similar to the proportion among those who did return the questionnaire, was 69% (n=833 eligibles). The percentage of nurses who used the specified PPE was two to three times greater among nurses who had a strong safety climate. Safety climate was only weakly associated with using safety devices. These results suggest that improving safety climate may be a powerful tool for increasing use of PPE.

Key words: Blood exposure, Epidemiology, Home care, Needlestick and sharps injuries, Nurse, Safety climate, Survey, Risk

Introduction

Use of personal protective equipment (PPE) and safety-engineered medical devices (safety devices) is mandated by the Occupational Safety and Health Administration (OSHA) for healthcare workers who may be exposed to patients' blood¹, the purpose of which is to prevent infection with human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV)². The responsibility for providing the PPE and safety devices and for ensuring that healthcare workers use them in

appropriate situations rests with the employer. However, because the patient's home is not subject to the control of the home healthcare/hospice agency, employers of nurses who provide care in the patient's home are exempt from the requirement to ensure that the nurses use PPE and safety devices in this setting³. Perhaps in part because of this arrangement, home care and hospice nurses remain at high risk for HIV, HBV, and HCV infection from exposure to patients' blood^{4–7}.

Safety climate is defined as employees' shared perceptions regarding safety within their work organization⁸. It has been associated with use of PPE and safety devices in a variety of work settings^{9, 10}. However, the association of safety climate with PPE and safety device use among nurses who provide care in patients' homes has, to our knowledge, not been examined in any previous study. This

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question is important because of the high risk of infection these nurses face, the absence of employer responsibility for enforcing use of PPE and safety devices in home care/hospice, and the considerable difference between the work and working conditions of home care/hospice nurses and hospital-based nurses¹¹⁻¹⁴). Therefore, the purpose of the present study is to report on this association among home care and hospice nurses in North Carolina, a largely rural state. Furthermore, this paper builds on previous studies of this population, which found that use of PPE varied according to whether the nurses did or did not have to rush during patient visits and did or did not often visit homes in which selected adverse conditions were present¹⁵).

Subjects and Methods

The North Carolina Study of Home Care and Hospice Nurses was a mail survey, conducted in 2006, of registered nurses listed in the licensing database of the North Carolina Board of Nursing as working in home care or hospice in non-administrative positions. The questionnaire can be obtained from the author upon request. SAS 9.2 (SAS Institute, Cary, NC, USA) was used to calculate percentages, ratios, and confidence intervals. Complete details of the study design have been published previously⁴). This study was approved by the Institutional Review Board of Weber State University.

Safety climate

Items that are applicable to home-care nursing (as opposed to hospital-based nursing) were selected from Gershon *et al's*¹⁶) safety climate scale. The eight items, which cover a broad range of subcategories, include support for safety programs, senior management support for safety, communication and feedback about safety, and training and education. The eight items were as follows:

1. The protection of workers from occupational blood exposures is a high priority with management.
2. Reporting blood exposures helps management protect nurses from future blood exposures.
3. Employees, supervisors, and managers all work together to ensure the safest possible working conditions.
4. Employees are encouraged by management to make suggestions for improving worker safety.
5. My supervisor often discusses safe work practices with me.
6. When a new device is introduced, there are procedures in place to ensure I've been correctly trained

to use the new device.

7. Supervisors correct unsafe work practices.
8. Employees are taught to be aware of and to recognize potential health hazards at work.

Response options were numbered 1 (labeled "strongly disagree") to 5 (labeled "strongly agree"). These eight items were highly correlated (Cronbach alpha = 0.94) and were combined into a dichotomous composite measure (equivalent to a median split) indicating a strong (combined score >3) or weak (≤ 3) safety climate. Thus, a weak safety climate was defined as one in which the nurses perceived little support for programs designed to ensure their safety, little support from senior management for their safety, poor communication and feedback about their safety, and/or insufficient training and education regarding their safety.

Personal protective equipment

Use of PPE was measured by posing patient care scenarios in which use of the equipment was indicated to prevent blood exposure. The form of the question was, "The last time you..." The scenarios were (1) irrigated a deep wound (regarding wearing safety goggles), (2) provided ostomy care (regarding wearing a fluid-impermeable apron), and (3) cleaned up large amounts of bloody diarrhea or other bloody body fluid (regarding wearing a surgical mask with eye protection). Nurses could indicate that they always used the equipment when performing that procedure, or they could indicate a reason for not using the equipment on the specified occasion. Additional analyses of these data were presented previously¹⁵).

Having to rush

Nurses were asked whether they would agree with the statement, "I always have enough time during a home visit so that I don't have to rush." Responses were indicated on a 5-point scale ranging from "strongly disagree" to "strongly agree." In order to be consistent with previous analyses, this variable was dichotomized as nurses reporting the two higher agreement values (equivalent to "agree" and "strongly agree") vs. those reporting the lower three values (equivalent to "neutral", "disagree," and "strongly disagree"). Additional analyses of these data were presented earlier¹¹).

Adverse conditions in the home

Characteristics of homes visited was assessed by four items that asked how often the nurse visited homes with unrestrained pets; unsupervised, unruly children; poor

Table 1. Percent of nurses who always use selected items of PPE when performing the indicated procedure, by procedure and level of safety climate, North Carolina, 2006

Procedure and level of safety climate	n	%	Ratio*	95% CI of ratio
Use safety goggles when irrigating a deep wound				
Strong safety climate	232	44.8		
Weak safety climate	15	15.2	3.0	1.8–4.8
Use fluid-impermeable apron when providing ostomy care				
Strong safety climate	121	21.4		
Weak safety climate	8	7.9	2.7	1.4–5.4
Use surgical mask with eye protection when cleaning up large amounts of bloody diarrhea/bloody body fluid				
Strong safety climate	176	46.6		
Weak safety climate	16	22.9	2.0	1.3–3.2

CI: confidence interval, PPE: personal protective equipment. *Comparing strong with weak safety climate.

lighting; and “cluttered homes where I have to clear a space around the patient to place my medical supplies.” Response options were “never,” “sometimes,” “usually,” and “always.” Consistent with previous analyses, a dichotomous summary measure was constructed that indicated whether the nurse usually/always visited homes with at least one of these characteristics. Additional analyses of these data were presented earlier¹¹.

Safety devices

The use of safety devices was measured by six questions that referred to the last time the nurse used a particular type of device and asked whether the device had the appropriate safety feature; for example: “The last time you used an IV catheter, did it have a shielded or a blunted stylet?” The 6 types of devices asked about were winged steel needle (was it shielded?), lancet (retracting/shielded?), syringe (sliding shield, hinged cap, or retracting needle?), IV catheter, straight needle (hinged cap/shield?), and blood tube holder (hinged cap?). Response options were “yes” and “no.” Additional analyses of these data were presented previously¹⁷.

Results

Based on the assumption that the proportion of eligible nurses from among those who did not return the questionnaire or could not be contacted was similar to the proportion among those who did return the questionnaire, the adjusted response rate was 69% (n=833 eligible nurses). Participants were primarily white (91%), female (96%), and age 36–55 yr (63%).

Eighty-five percent of nurses worked for an employer that had a strong safety climate. The percentage who

reported always using the specified type of PPE was 41% (wears safety goggles when irrigating a deep wound), 20% (wears a fluid-impermeable apron when providing ostomy care), and 44% (wears a surgical mask with eye protection when cleaning up large amounts of bloody diarrhea or other bloody body fluid). Fifty-five percent of nurses agreed that they have enough time (i.e., do not have to rush) during a visit; 63% usually/always visited homes with at least one of the specified adverse conditions. The percentage who used the specified safety device was 85% (winged steel needle), 76% (lancet), 82% (syringe), 85% (IV catheter), 70% (straight needle), and 57% (blood tube holder).

The percentage of nurses who always used the specified PPE in the indicated scenario was two to three times greater among nurses who worked in an agency with a strong safety climate compared to nurses who worked in an agency with a weak safety climate (Table 1). Among both nurses who did and did not report having to rush during visits, the percentage who used the specified PPE (n=4 – 148) was greater among those who had a strong safety climate (Table 2). Similarly, among both nurses who did and did not report usually or always visiting homes with at least one adverse condition, the percentage who used the specified PPE was greater among those who had a strong safety climate (Table 3).

Safety climate was only weakly associated with using safety devices (Table 4). The percentage of nurses who used a device with a safety feature was 1.2 to 1.8 times greater among nurses who worked in an agency with a strong safety climate compared to those who worked in an agency with a weak safety climate.

Table 2. Percent of nurses who always use selected items of PPE when performing the indicated procedure, by procedure, level of safety climate, and whether the nurse has to rush during home visits, North Carolina, 2006

Procedure and safety climate	Has to rush			Does not have to rush		
	n	%	95% CI*	n	%	95% CI*
Use safety goggles when irrigating a deep wound						
Strong safety climate	84	37.5	32.8–42.2	148	50.7	46.4–54.9
Weak safety climate	8	11.1	5.7–16.5	7	25.9	13.7–38.2
Use fluid-impermeable apron when providing ostomy care						
Strong safety climate	46	18.5	15.0–22.1	75	23.8	20.3–27.3
Weak safety climate	4	5.5		4	14.3	
Use surgical mask with eye protection when cleaning up large amounts of bloody diarrhea/bloody body fluid						
Strong safety climate	64	39.0	33.5–44.6	112	52.8	47.8–57.8
Weak safety climate	12	22.6	14.3–31.0	4	23.5	

CI: confidence interval, PPE: personal protective equipment. Ratios were not calculated because of small numbers in several cells. *In order to be consistent with previous publications and to facilitate comparisons with them, these confidence intervals have been corrected for the finite population (i.e., all eligible nurses in North Carolina).

Table 3. Percent of nurses who always use selected items of PPE when performing the indicated procedure, by procedure, level of safety climate, and whether the nurse visits homes with adverse conditions*, North Carolina, 2006

Procedure and safety climate	Usually or always			Seldom or never		
	n	%	95% CI†	n	%	95% CI†
Use safety goggles when irrigating a deep wound						
Strong safety climate	138	42.2	38.2–46.2	94	49.2	44.0–54.5
Weak safety climate	11	14.9	8.9–20.9	4	16.0	
Use fluid-impermeable apron when providing ostomy care						
Strong safety climate	68	19.2	16.1–22.2	53	25.2	20.9–29.6
Weak safety climate	7	9.1	4.3–13.9	1	4.2	
Use surgical mask with eye protection when cleaning up large amounts of bloody diarrhea/bloody body fluid						
Strong safety climate	101	41.9	37.3–46.5	75	54.7	48.6–60.9
Weak safety climate	13	23.6	15.3–32.0	3	20.0	

Ratios were not calculated because of small numbers in several cells. CI: confidence interval, PPE: personal protective equipment. *Conditions counted were unrestrained pets, unruly children, poor lighting, and clutter. †In order to be consistent with previous publications and to facilitate comparisons with them, these confidence intervals have been corrected for the finite population.

Discussion

Although the number of respondents reporting a weak safety climate and using the selected items of PPE is small, the results of this study—that safety climate was associated with use of PPE by nurses in the home care setting—is consistent with the findings of studies among nurses in hospital settings^{9, 18)} as well as among non-healthcare workers¹⁹⁾. Thus, improving safety climate appears to be a powerful tool that management can use to increase employee use of PPE among home care/hospice nurses²⁰⁾. Future research should address the factors that determine a strong safety climate and how a strong safety

climate promotes use of PPE^{21–24)}.

A strong safety climate in itself will not ensure complete use of PPE by all nurses. It has repeatedly been shown, both in populations of healthcare workers and in others, that factors other than safety climate are also important for PPE use. These include provision of PPE by the employer^{15, 25–28)} and various aspects of organizational culture^{29–31)}. Improving employer compliance with safety legislation may also help³²⁾; Scharf *et al.*³³⁾ found that most home care agencies had only partially implemented the requirements of the Bloodborne Pathogen Standard¹⁾.

The direction of causality in the association between safety climate and use of PPE can not be determined from

Table 4. Percent of nurses who always use safety medical devices when using that type of device, by type of device and level of safety climate, North Carolina, 2006

Type of device and level of safety climate	n	%	Ratio*	95% CI of ratio
Winged steel needle				
Strong safety climate	578	88.1		
Weak safety climate	79	69.9	1.3	1.1–1.4
Lancet				
Strong safety climate	474	78.5		
Weak safety climate	62	58.5	1.3	1.1–1.6
Syringe				
Strong safety climate	552	84.8		
Weak safety climate	76	65.5	1.3	1.1–1.5
IV catheter				
Strong safety climate	473	87.4		
Weak safety climate	65	70.7	1.2	1.1–1.4
Straight needle				
Strong safety climate	454	74.2		
Weak safety climate	45	43.7	1.7	1.4–2.1
Blood tube holder				
Strong safety climate	366	59.8		
Weak safety climate	36	34.0	1.8	1.3–2.3

CI: confidence interval, IV: intravenous. *Comparing strong with weak safety climate

the present study. Furthermore, from the available data we can not rule out the possibility of a spurious association caused by a tendency among respondents to answer positively (or negatively) to both the safety climate and PPE questions. Finally, the scale used to measure safety climate has not been validated, although it was derived from an instrument whose construct validity has been established³⁴⁾. Future research should focus on how to improve measures of safety climate for the home care setting³⁵⁾.

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