



# Workplace violence intervention effectiveness: A systematic literature review <sup>☆</sup>

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## ABSTRACT

This is a systematic review of literature published since 1992, to determine the effectiveness of interventions in preventing workplace violence and to suggest interventions that need further evaluation research. The health care industry is the topic of 54% of the papers, the retail industry is the topic of 11% of the papers, and the remaining papers address the workplace in general or other situations. This finding drives the organization of this review: the first group of papers discussed in this review evaluates interventions to prevent workplace violence in the retail industry – mostly to prevent robbery and violence to retail workers. Singly or in combination, environmental designs in the retail industry, such as increased lighting to improve visibility and a limited cash-handling policy, can make workers safer, but more research is needed to overcome the barriers to implementation of environmental designs, especially in small businesses. The second group of papers in this review is about interventions to prevent violence to health care workers – mostly training and techniques of dealing with combative patients. Training health care workers to better cope with violent patients and to avoid injury is becoming standard practice, but research is needed to identify specific aspects of training and patient management programs that are most effective.

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## 1. Introduction

Previous literature reviews have, in some limited ways, described the relative effectiveness of workplace violence interven-

tions from the 1970s to recent times. (Anderson, 2004; Barish, 2001; Cabral, 1996; Casteel and Peek-Asa, 2000; Erickson, 1996; Farrell and Cubit, 2005; Flannery, 1996; Flannery et al., 1998; Fletcher et al., 2000; Kraus et al., 1995; Kraus and McArthur, 1996; Lipscomb et al., 2002; Morrison, 2003; Peek-Asa, 2001; Runyan et al., 2000; Stirling et al., 2001). Most of these papers include a review of incidence, prevalence, and risk factors and focus on specific workplace settings. They may describe multiple approaches to interventions, but they often include intervention effectiveness only as a secondary consideration. There has been no systematic

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review of the whole body of workplace violence literature from roughly 1992 to the present. This article attempts to provide that review and to answer several questions about the current state-of-the-art in workplace violence interventions. According to the literature, what interventions have been demonstrated to work to reduce workplace violence incidents of various types? Which interventions have yielded mixed or no reliable results in the studies? Where are the gaps, and what research efforts are needed to fill them?

Deriving answers to these questions is critical, given the recent evidence of the devastation due to workplace violence. Although US workplace homicides have declined by 6.2% annually over 1993–2002, the decline was not similar for all industries, with the smallest decline in the health services industry (Hendricks et al., 2007). The most recent data indicate that there were 610 workplace homicides recorded in 2007 in the US, a 13% increase from 2006 (USDOL, 2008a).

In 2007, there were 16,840 non-fatal injuries due to assault and violent acts (by persons), with a median of 5 days away from work, for a rate of 1.8 per 10,000 full-time workers. This represents a 5% increase from 2006. Sixty four percent of the assaults and violent acts (by persons) occurred in the education and health care services (USDOL, 2008b). The National Crime Victimization Survey estimates an average 1.7 million violent victimizations to workers per year in the US between 1993 and 1999 (Duhart, 2001).

Violence in the workplace can take various forms, ranging from abusive language, threats, and bullying to physical assault and homicide. The highest rates of occupational violence incidents occur in occupations involving retail sales, law enforcement, teaching, health care, transportation and private security (Peek-Asa et al., 2001). Nursing assistants in long-term care have the highest incidence of assaults among all workers in the US (Gates et al., 2005). Convenience store clerks are at high risk for incidents of assault and homicide, most often associated with robbery or attempted robbery (Peek-Asa et al., 2004). In addition to criminal intent incidents, violence can occur in hostile customer/client confrontations, coworker vs. coworker conflict, and personal relationship incidents involving domestic violence expressed in the workplace. The continuing harmful consequences of workplace violence, which often draws intense media attention, indicate the need for interventions that work to make workplaces safer. However, over 70% of US workplaces do not have a formal program or policy that addresses workplace violence (USDOL, 2006). The modern workplace violence literature describes some intervention evaluations, while many other interventions have been adopted because of an urgent need to address the problem but are untested and unproven.

## 2. Methods

A review of the modern literature requires a recognition that workplace violence is not of a uniform type. For research purposes, this article categorizes workplace violence into four types (Bowie et al., 2005; Howard, 1996; Peek-Asa et al., 1997) according to the relationship between the violence perpetrator and the victim, as follows:

- *Type I:* External/intrusive violence: workplace violence events of criminal intent by unknown assailants, as in a robbery. Also includes terrorist acts, protest violence, mental illness or drug related aggression and random violence.
- *Type II:* Consumer related violence: workplace violence events involving customer/patient/client and family violence against staff; includes vicarious trauma to staff and staff violence to clients/consumers as in terrorist acts.

- *Type III:* Relationship violence: worker-on-worker violence (including bullying) involving current or former co-workers and managers; includes domestic violence and sexual harassment at work and third party violence.
- *Type IV:* Organizational Violence: against staff, consumers/clients/patients; against other organizations or communities. Terrorist acts condoned or sponsored by organizations.

This review also incorporates an alternate typology (Merchant and Lundell, 2001) by category of intervention (note that individual studies may evaluate a mix or combination of interventions):

1. *Environmental:* lighting entrances and exits and using security hardware and other engineering controls—e.g., cash-drop boxes in convenience stores and bullet-proof glass.
2. *Organizational and administrative:* developing programs, policies, and work practices to promote a safe working environment—e.g., eliminating solo work at night in convenience stores.
3. *Behavioral/interpersonal:* training staff to anticipate, recognize, and respond to conflict and actual violence in the work place—e.g., management of aggressive or potentially violent patients in a health care setting.

The following databases were searched: PubMed, PsycINFO, the Cumulative Index to Nursing & Allied Health Literature (CINAHL), Canadiana (Canadian Centre for Occupational Health & Safety, <http://ccinfoweb.ccohs.ca/bibliographic/search.html>), NIOSHTIC, NIOSHTIC-2, HSELINE, CISILO, and OSHLINE. Databases were searched by use of the following groups of (English language) terms (and terms with similar endings). Group one: “violence”, “homicide”, “murder”, “battery”, “assault”, “aggression”, “belligerence”, “bully”, “bullies”, “threatening”, or “rape”. Group two: “workplace”, “coworker”, “occupational”, or “employee”. Group three: “prevention”, “deterrence”, “avoidance”, “intervention”, “program”, “reduction”, “training”, or “educational”. Group four: “evaluation”, “assessment”, “appraisal”, “effective”, or “outcome”. Searches that connected these four groups with a logical “and” were identified for initial review. The search criteria deliberately did not include occupation or industry, in order to determine the major fields of application for the published intervention evaluation research.

References were included in this review if the following criteria were met: 1. in the English language; 2. published since 1992; and 3. indicated an evaluation of a workplace intervention to prevent occupational violence. Some papers discussing or evaluating post-incident activities taken to improve recovery or aid in the prevention of post-traumatic stress are only briefly noted for the reason that the emphasis of this review is on the primary prevention of violence, not the treatment of its consequences. Likewise, this review does not focus on the evaluation of emergency response programs in response to workplace violence nor on training programs where the evaluation consists of determining the effectiveness of educational efforts in terms of increasing knowledge as measured by pre-/post-tests of learning accomplishments; unless these studies evaluate the changes in the injury incidence, they are of limited interest for this review.

Although much has been developed regarding the criteria for evaluating interventions (Shannon et al., 1999) many of the papers found in the search lack sufficient detail and information to fully determine the quality of the study. Intervention effectiveness is defined as in Shannon et al. (1999) as the degree to which an intervention causes an effect under realistic workplace conditions. For most of the papers, only a general assessment of the quality of the paper is possible. This review has adopted criteria from the Center for Evidence Based Medicine (Phillips et al., 2001) [see Table

6 of the Supplementary material] using a grading system based on the type of study design starting at the top level with a *systematic review of homogeneous randomized controlled trials* progressing to papers that represent *expert opinion without explicit critical appraisal, or based on physiology, bench research or “first principles”*. Strict randomized controlled trials are rare in occupational intervention evaluation research, but there are many papers that consist of *expert opinion*. In between these two ends of the spectrum, are questions of internal validity, external validity, and experimental or survey design, sample size, potential sources of bias and confounding, and other concerns that allow some determination of the strength of the evidence offered by any particular study (or meta-analysis or review paper). This review notes strengths and deficiencies of the sort mentioned above in evaluating the effectiveness of an intervention. The Supplementary material tables include the actual grade (according to the Center for Evidence Based Medicine) assigned to each of the papers reviewed.

### 3. General Results

This review identified nearly 100 papers which were categorized by type of study or study design. The health care industry is the focus of 54% of the papers, and the retail industry is the focus of 11%, with the remainder addressing the workplace in general or other situations. This finding drives the organization of this review. Section 4 will examine the major papers that evaluate interventions to prevent workplace violence in the retail industry – mostly concerning environmental designs to prevent robbery and its violent consequences to retail workers. Section 5 will examine the research concerning interventions to prevent violence to health care workers – mostly training and techniques of dealing with combative patients in emergency rooms, geriatric or nursing homes and mental health facilities.

Multiple types of violence are discussed in 35% of the papers; however, 41% of the papers discuss Type II violence, 23% discuss Type III, 19% discuss Type I, and 17% discuss Type IV. Review papers represent 14% of the total; cohort studies represent 11%; case-control studies represent 7%; cross-sectional and uncontrolled studies represent 36%; and expert opinion papers represent 31%. While space will not permit a discussion of every paper, the complete list and additional tables (that indicate the types of violence, the intervention category notes on the population studied and the prevention strategy considered) are available as electronic Supplementary material tables.

### 4. Environmental design interventions in retail settings

#### 4.1. Comments on selected studies

The modern literature demonstrates that environmental design interventions have been the most effective in preventing and reducing workplace violence injuries inflicted by strangers in the commission of criminal acts. Most of these violence incidents occurred in retail settings. For example, an evaluation of a crime prevention through environmental design (CPTED) model included multiple components and identified 16 studies that evaluate one or more of the components (Casteel and Peek-Asa, 2000). Nearly all the studies demonstrated a decrease of 30–84% in the number of stores robbed. Three of the studies examined workplace injury and homicide, and two of these studies found that CPTED provided effective reduction in workplace injury from assaults (86% in liquor stores and 35% in retail and service). The findings of the CPTED evaluation were consistent with an earlier literature review of studies that focused on robbery in the retail industry (Erickson, 1996). That earlier review found that environmental interventions

that prevent robbery are effective but that more widespread implementation of violence deterrence programs is needed.

Similarly, two cohort studies addressed Type I violence by evaluating environmental interventions in the retail business. One of those was a pilot study of the CPTED model in 22 retail liquor stores in Santa Monica, CA (Casteel et al., 2004). There was a statistically significant decrease in robbery, shoplifting, and all other types of crime in the nine stores in which the intervention was made, while the rates of these crimes actually increased in the comparison stores. The case stores saw a 33% decrease in assault incidents and a 53% decrease in injuries, but the decreases in assaults and injuries were not statistically significant.

A larger cohort study evaluated a CPTED-based program tailored to the needs of small businesses in Los Angeles, CA (Peek-Asa et al., 2004). Stores with high compliance to the workplace violence-prevention program experienced a statistically significant 5% decrease in violent crime—total number of robberies, attempted robberies, assaults, and batteries. The intervention group consisted of 314 small businesses that were provided with individual consultation, printed materials, and training by a brochure and a video; and the non-intervention group consisted of 96 small businesses for comparison.

Loomis et al. (2002) evaluated the effectiveness of both environmental and administrative interventions to prevent workplace homicide in a North Carolina case-control study. The 105 case businesses in this study were defined as workplaces in which a worker had been killed on the job. The control businesses were matched on a 2:1 ratio; the controls consisted of businesses that were open during the same time period and that operated in the same industry. The study concluded that different prevention interventions may be required for robbery-related and non-robbery homicides. It found that the highest risk factors for workplace homicide were such social environmental characteristics as length of time in business at the current location, whether only one worker was on duty, and whether a business is open at night or on Saturday. The same matched case-control data were used in an earlier study of risk factors for workplace homicide (Loomis et al., 2001). A more recent study of employers' policies demonstrated a five-fold increase in homicide risk for workplaces that allowed firearms (Loomis et al., 2005).

A large sample study of 400 convenience stores in metropolitan Virginia found that social and environmental risk factors were significant predictors of robbery risk (Hendricks et al., 1999). The multivariate analysis identified the cash-handling policy, employee training, counter location, and good external visibility as having significant effects. In addition, the study found that having only one worker on duty was not associated with a significant increase in robbery risk.

A California study of 278 worksites where a fatal or non-fatal violent injury occurred found that over half the injuries were robbery-related (Schaffer et al., 2002). The multivariate analysis of the matched case-control study revealed that business establishments that stayed open for 24 h and that had a history of a previous violent event had nearly a three-fold risk for a violent event.

Finally, a reanalysis of a cross-sectional sample of 110 Florida convenience stores used a logic regression model to adjust for confounding in the evaluation of environmental design factors (Amandus et al., 1995). The major conclusion was that the evaluation of environmental designs is affected by local crime risk factors. For example, certain local crime factors, such as the county crime rate, confound the evaluation of such environmental factors as a store's cash-handling policy. However, after adjustments for confounding effects, this study found that the odds of robbery were greater for stores that had concealed access/escape routes, that had the cash register located on the side nearest the back of the store, and that had a poor cash-handling policy.

#### 4.2. Summary about environmental design interventions in retail settings

Environmental designs have been demonstrated in the literature to deter robbery and violence, consequently reducing the incidence of injury and homicide at work. Multiple environmental designs, implemented as a group, demonstrate the best approach to reducing the victimization of retail workers. Even single interventions—most notably the use of a limited cash-handling policy, along with drop safes, unobscured visibility, and effective lighting to eliminate stealth in criminal activity—have demonstrated effectiveness in reducing workplace violence.

The failure to accept and implement preventive measures (i.e., the failure to recognize the importance and value of environmental designs) in many smaller businesses has limited efforts to make an impact that reduces injury and homicide rates in the workplace (Peek-Asa et al., 2004). It is clear that the local social and economic environment is influential in determining the effectiveness of environmental crime prevention interventions. It is necessary to develop a better understanding of how to modify environmental interventions to accommodate the local social conditions that influence robbery and violence against retail employees.

### 5. Intervention effectiveness in the health care industry

#### 5.1. Comments on selected studies

In 1995, a systematic review of English language articles in US peer-reviewed journal articles from 1980 to 1994 found that a patient management strategy was associated with decreased levels of Type II violence in health care settings (Kraus et al., 1995). Other literature reviews address specific subtopics, such as the effect of legislation and regulations on workplace violence (Barish, 2001) and a guide for use by occupational health nurses to increase awareness of violence when treating workers in the long haul trucking industry (Anderson, 2004). A few reviews are intended to inform practitioners about the problem of workplace violence and the role of the professional in assisting employers to implement prevention. A guide for mental health professionals that reviews the types of workplace violence, legal implications, and the role of mental health professionals also discusses threat assessment and clinical implications (Fletcher et al., 2000). A 1996 systematic review on workplace violence examined four areas: corporations and industry, police and corrections, schools and colleges, and health care settings (Flannery, 1996). A literature review on the risk factors for type III violence considers literature on preventive interventions to reduce stress created by management styles based on threats and intimidation of employees (Cabral, 1996). Other systematic reviews focus on epidemiology and risk factors for workplace violence; they indicate that this knowledge should drive the formulation of specific countermeasures (Kraus and McArthur, 1996).

In 2001, a systematic literature review of Type II violence toward healthcare workers (Stirling et al., 2001) in emergency departments reported three effective interventions: K-9 security dog teams, metal detectors, and the installation of a security system, that includes metal detectors, cameras, and security personnel. The authors note the limited number of studies that evaluate interventions. A workplace violence-prevention systematic review that included a survey of administrative and behavioral interventions (Runyan et al., 2000) found nine studies reporting intervention evaluations focused on patient (Type II) violence against health care workers. Of these nine, six addressed interventions in psychiatric facilities and evaluated training programs on the management of patients' violent and aggressive behavior; two of the nine addressed management strategies in hospitals.

In a review of the literature, four commercially available programs to manage violent patients in psychiatric facilities were identified and evaluated (Morrison, 2003). These programs have some claims of success, although they lack scientific credibility. More recently, in a systematic review of 28 aggression management programs for nurses (Farrell and Cubit, 2005), it was reported that most programs address personal safety, physical techniques, and risk assessment, but these programs are not successful in ameliorating the consequences and effects on victims.

Two cohort studies evaluated training effectiveness in terms of increased student knowledge and awareness (Beech and Leather, 2003) and staff confidence in dealing with aggressive patients (Ishak and Christensen, 2002). Both studies indicate that formal training in violence prevention can have positive effects, but they did not investigate any decrease in workplace violence injury to the staff.

Other studies regarding Type II violence among healthcare workers examined the frequency of assaults that occurred before-and-after a training intervention. The results were mixed, and the question of training effectiveness remains unanswered. The highest estimate of training effectiveness was a 46% decrease in the frequency of assaults in a study of certified nurse assistants (CNAs) in two Midwestern nursing homes (Fitzwater and Gates, 2002). The estimates are questionable, because there were only 10 CNAs recruited as a convenience sample in each of the nursing homes.

Wilkinson (1999) studied training effectiveness in a hospital caring for about 40 patients with advanced dementia. Training consisting of a one-day workshop that was provided to 32 staff members and a special staff nurse (an advanced psychiatric practice nurse) was hired to provide teaching in-patient care for all shifts. Data on patient-to-staff assaults were compared for the 12-month period prior to the training and for 11 months after training. The results showed a two-fold increase in the frequency of assaults experienced on the job. The limited sample size and restricted setting of this study make it difficult to generalize the results to other situations.

A study of 138 nursing assistants in long-term care homes in Ohio, found that a violence-prevention intervention consisting of nine 1-h group sessions made no statistically significant difference on the incidence of assaults (Gates et al., 2005). Some other studies had severe limitations, such as a small sample size (Whittington and Wykes, 1996) or bias due to increased reporting of assaults as a result of training (Arnetz and Arnetz, 2000).

A well designed study (Ore, 2002) of disability service workers in Australia (358 intervention group subjects and 358 non-intervention group subjects) evaluated a 5-day course on responding to assaults. This study showed an 11% increase in assaults post-training but described problems due to non-response to the postal survey instruments and reporting bias. It was noted that the results could be affected by response bias as a consequence of the tendency that employees with strong feelings, either positive or negative, would be more likely to complete and return a mail survey.

Several papers addressed type II violence in a large study of risk factors for violence among nurses in Minnesota [the Minnesota Nurses Study, (Gerberich et al., 2005, 2004)]. A nested case-control study with 310 cases and unmatched controls (3:1 ratio) was conducted within a sample survey of 6,300 randomly selected nurses (Nachreiner et al., 2005a). Cases were more likely to work in geriatrics settings. Case nurses who reported experiencing a physical assault during the previous year were slightly more likely to have received violence-prevention training than controls (48% vs. 43%). Failure to find a protective effect of training may be a consequence of misclassification due to a mixture of specific training topics and unmeasured quality of the training.

In another study utilizing the Minnesota Nurses Study, the association of work policies related to violence prevention and physical

assault was evaluated (Nachreiner et al., 2005b). Among eight different policy components, there were two that significantly reduced the risk of violence by one-half ( $OR = 0.5$ ). The effective interventions consisted of a written workplace policy that addressed: 1. 'zero tolerance' for violence (i.e., that violence is not tolerated at any level) and 2. inclusion of a published list of types of prohibited violent behaviors (assault, threat, sexual harassment, verbal abuse).

Four separate studies (Flannery et al., 1998; Hunter and Love, 1996; Martin, 1995; Morrison et al., 2002) addressed the problem of aggression against health care workers and staff in psychiatric care settings. These studies evaluated interventions that primarily consist of organizational and management policies (which may include an educational or training component for staff). These outcome studies all utilized a before-and-after study design evaluation, but they lack an independent control group, in contrast to cohort study designs.

Martin (1995) evaluated an eastern Pennsylvania teaching hospital that instituted an aggression management program to decrease injuries in one hospital psychiatric department. The program consisted of developing a team approach to aggression management and educating staff in verbal and physical management of the aggressive patient. After a two-year follow-up, the effectiveness of the intervention was demonstrated by fewer injuries to staff, less missed time from work, and increased cost savings. Hunter and Love (1996) investigated a 1,000-bed psychiatric hospital for men in California, and found that a multi-disciplinary team that analyzed violent mealtime events and recommended specific changes in the dining environment were able to reduce aggressive behavior. The team that used total quality management techniques reduced aggressive incidents by 40%, and 70% nursing staff hours per day were saved by the environmental control procedures.

Flannery et al. (1998) studied three state psychiatric hospitals in Massachusetts that implemented an assaulted Staff Action Program designed to assist employee victims of assault. Although not designed as a pre-incident (primary) intervention, the pre-implementation rate of assaults (per 100 patients per month) was eight to ten times higher than the rate one year after the program was in effect.

Morrison et al. (2002) evaluated an aggression management plan that was developed to manage high-risk patients in a 285-bed hospital for seriously mentally ill patients. The program consisted of both administrative and clinical efforts in a maximum security psychiatric facility to reduce violence and staff injuries. Data suggest that the intervention was effective in reducing staff injuries and incidents of aggression and violence, although results were not similar for different wards (with different types of patients).

Five separate outcome studies (Deans, 2004; Fernandes et al., 2002; Goodridge et al., 1997; Parkes, 1996; Paterson et al., 1992) addressed the problem of aggression against health care workers and staff in health and psychiatric care settings. The outcome studies evaluate employee training interventions. Fernandes et al. (2000) evaluated the prevention and management of aggressive behavior program, a 4-h training event for emergency department staff, and they compared survey responses from baseline, and 3-month and 6-month follow-up periods. The number of violent patient-staff interactions initially decreased by 50% at 3 months, but the number returned to near baseline at 6 months. The results suggest that this training program's transient preventive effects might need periodic reinforcement to achieve workplace safety.

Goodridge et al. (1997) evaluated of a one-day workshop on abuse prevention training for nursing assistants in a Winnipeg long-term care facility and found a statistically significant decrease in conflict with residents. An Australian study by Deans (2004)

demonstrated that a one-day training program for emergency department nurses could reduce the number of aggressive situations by 50%. Although this study was conducted at a major regional hospital in Victoria, Australia, the sample size was limited to 40 nurses in the pre-test and 22 nurses (55%) in the follow-up post-test.

Paterson et al. (1992) showed that reducing stress, by improving the staff's cognitive efficiency and emotional control, can lead to reduced violence. A 10-day in-service training course in management of violent patients demonstrated that the course reduced stress in handling violent situations. Although this study compared two groups of nurses, the sample sizes were small (group sizes of 12 and 13), and attempts to generalize the results would be questionable. In another study using an unusual study design, Parkes (1996) evaluated the effectiveness of training during a 4-day course in-patient control and restraint in a 44-bed, medium security psychiatric unit. By comparing the nature of 149 incidents post-training to the characteristics of 149 incidents pre-training, a slight increase in the number of injuries to staff was found (51 pre-training, 68 post-training). Some specific deficiencies in the training were noted, suggesting that a comprehensive approach to managing violent patients is needed and that the approach should not be limited to physical restraint techniques.

Two other studies (Gale et al., 2002; Perkins and Leadbetter, 2002) provide some evaluation of training interventions in Type II workplace violence. Gale et al. (2002) conducted a New Zealand mail survey of psychiatric units and found that staff training was associated with an increased risk of assault and attack and that de-escalation training was associated with increased risk of attack ( $p = 0.001$ ). This cross-sectional study design is vulnerable to unobserved confounding bias and the counter-intuitive results may have been a result of a reporting bias.

Perkins and Leadbetter (2002) evaluated an aggression management training intervention in a Scottish school for learning disabled children. It included about 150 pupils and 80 staff. Using a pre/post 6-month follow-up design, the study found a significant increase in the use of de-escalation techniques. Among staff, there was some indication of a decrease in physical effects (health problems) incurred in dealing with aggressive behaviors, but this result was not quantified or tested for statistical significance.

## 5.2. Summary about training in the health care industry

The most important industry for preventing workplace violence is the health care industry, where the most common problem concerns the patient-health care provider relationship. Patients developing aggressive and violent behavior can be explained as consequences of illness and the stress of being sick and needing care (feelings of helplessness, deterioration of physical status, depression and mental illness exacerbated by physical illness, loss of social support, financial losses, and other consequences of poor or failing health).

Health care workers who treat individuals experiencing a life-threatening or life-altering crisis are clearly at risk for assault and other types of violence. Training in the management of patients who present a potential risk for violence seems a natural and appropriate preventive measure. However, there is much variability among studies in the types and effectiveness of training, and thus the literature is not definitive that training reduces injury from violence among health care workers.

Research is needed to identify the essential components of a training program or patient management protocol that offers nurses and other health care workers protection from violence. More information is needed not only on the most effective training regimens but also on accurate predictors of patient violence. Research efforts could be applied to specific situations to determine when special

measures are appropriate for preventing assault. Such work should also focus on practical methods to implement these measures to enhance and not impede the mission of health care providers.

## 6. Conclusion

This systematic literature review has identified health care and retail as two major industries where interventions to prevent workplace violence have been evaluated. The quality of the evaluations has been variable, with a few studies demonstrating careful attention to study design and quantitative details leading to credible results. Clearly, many of the promising preliminary results should be verified through well controlled and well designed follow-up studies.

This attempt to identify all studies that evaluate workplace interventions to prevent violence has its limitations. This topic is clearly an area of active research and new results are appearing in the literature with each new issue of peer-reviewed journals that focus on occupational and workplace safety. On any day, rechecking pubmed with a simple search using the phrase “workplace violence intervention evaluation” will yield new additions to the literature. Although this review has attempted to identify the research papers that actually conducted intervention evaluations, no doubt some may have been missed. Despite these limitations, this review identifies the major industries and the types of interventions that have been evaluated. The final conclusions as to which interventions should be universally adopted, and which have been proven to reduce workplace violence, are evolving. Clearly, environmental designs in the retail industry setting and violence-prevention training for healthcare workers are being accepted as important and useful interventions. Additional research can facilitate implementation of environmental designs and pinpoint the essential elements of educational programs for healthcare workers to further reduce workplace violence.

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## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.ssci.2008.12.001.

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