PROMOTING THE HEALTH OF HEALTHCARE WORKERS: EVALUATING PATIENT VIOLENCE IN HEALTHCARE

by

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Abstract

Introduction:

The high rate of violence in the healthcare sector supports the need for greater prevention efforts. This study had two main objectives: 1) identify risk factors for violence province-wide and 2) investigate the effectiveness of a violence risk assessment system in reducing the risk of violence in an acute care hospital in British Columbia.

Methods:

Study 1: Data was extracted for a one-year period from the Workplace Health Indicator Tracking and Evaluation (WHITE ™) database for all employee reports of violent incidents for four of the six British Columbia Health Authorities. Risk factors for violence were identified through comparisons of incident rates (number of incidents/ 100,000 worked hours) by work characteristics, and by regression models.

Study 2: Hospital violence incident rates (number of incidents/ 100,000 worked hours) were calculated pre, during and post implementation of the Alert System, a violence risk assessment system, at one acute care hospital. Then, using a retrospective case control study design, multivariable conditional logistic regression was used to model the effect of the Alert System (flag status yes or no) on the risk of a patient violent incident.

Results:

Study 1: Across health authorities, three groups at particularly high risk for violence were identified: very small healthcare facilities, the care aide occupation, and pediatric departments in acute care hospitals.

Study 2: The violent incident rate decreased during the Alert System implementation period, but subsequently returned to pre-implementation levels. In the case-control analyses, patients flagged for violence were associated with an increased rather than decreased risk for violence.

Conclusions:

Study 1: The specific risk factors that put health care groups at an increased risk of violence should be examined so that targeted prevention or intervention efforts can be implemented. The identification of high-risk groups supports the importance of a province-wide surveillance system.

Study 2: Although useful at identifying violent patients, the Alert System does not appear to provide the resources or procedures needed by health care workers to prevent a patient from progressing to a violent incident once flagged.

These studies suggest that violence in healthcare should be studied and prevented using a multifaceted approach.

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Co-Authorship Statement

Chapters 2 and 4 consist of manuscripts prepared for scientific publication. All co-authors participated in the identification and design of the research program. I performed all data collection, preparation, research and manuscript preparation. M Koehoorn and I created a data analysis plan; I performed all data analyses. All co-authors provided considerable conceptual guidance, suggestions, and manuscript editing.

Chapter 1: Introduction

Rationale

The well-being of health care workers and a healthy work environment are critical components of an effective health care system; services provided by workers directly affect the delivery of care. Therefore, it is essential that experienced workers are able to stay on the job and able to work effectively in good working environments. Despite the increasing recognition of the severity and impact of workplace violence in the health care sector and the impact on the retention of experienced workers, there are few studies that have investigated risk factors for violence as part of a multi-factor model of risk, or the impact of workplace strategies and interventions that mitigate violence in the workforce.

Workplace Violence

Definition

This study adopted the definition of workplace violence as ascertained by WorkSafeBC (formerly the Workers' Compensation Board of British Columbia) which states: "The Occupational Health and Safety (OHS) Regulation, section 4.27, defines violence as 'the attempted or actual exercise by a person, of any physical force so as to cause injury to a worker.' Violence also includes 'any threatening statement or behaviour which gives a worker reasonable cause to believe that he or she is at risk of injury (WCB, 2000).' "

The Nature and Extent of Violence in the Workplace

Workplace violence is a serious problem. Although much has been published on workplace violence in the United States (U.S.), little data are available comparatively on the Canadian experience (*Canadian Initiative on Workplace Violence*, 2000). However, the Canadian Initiative on Workplace Violence found that workplace violence is on the rise in Canada and that violence increases significantly in public sector organizations where interfacing with the public is required (2000).

Violence is the leading cause of fatal occupational injuries for women in the U.S. and the first, second, or third leading cause of death among all workers depending on the geographic area (Simonowitz, 1996). In the United States, nearly 1,000 workers are murdered, and 1.5 million are assaulted in the workplace each year (OSHA, 2000).

Studies and reviews on workplace violence suggest that healthcare workers are at a high risk for violence (e.g. Boyd, 1995; Flannery, 1996; Islam, Edla, Mujuru, et al., 2003; LaMar, Gerberich, Lohman, et al., 1998). Healthcare work is associated with a high risk of violent incidents usually as a result of interactions with patients and the public. For example, in a study of all work sectors, LaMar et al. (1998) found that health service workers had the second highest rate of violence after social service workers. Approximately 40% of all violence-related workers' compensation claims occur among health care workers, although these workers make up less than 5% of the workforce in British Columbia (B.C). These workers also lose more days of work due to acts of violence than any other occupational group (WCB, 2000). A study of workplace violence across all occupations in B.C. (Boyd, 1995) found the risk for time loss claims due to violence among health care workers was almost as high as the risk for violence among police officers, with risks for both these occupations being more than twice the risk for other occupations, with a workers' compensation claim rate of 250 claims per 1000 workers.

The Nature and Extent of Violence in Health Care

Surveys indicate that nursing is a high-risk occupation for violent incidents (e.g. McCall & Horwitz, 2004). A 1995 national study found 80% of Canadian nurses reported some form of violence during their career (physical assault, verbal or written threats of assault, emotional abuse, verbal sexual harassment, sexual assault)(Shamian & Villeneuve, 2000). A study by Poster (1996) found that over 45% of Canadian and 61% of UK psychiatric nurses had been assaulted at work. In a more recent survey of 9,000 nurses in Alberta and BC, 38% reported having experienced violence in the last five shifts worked, and more than 20% in some jurisdictions reported physical assault (Shamian & Villeneuve, 2000).

A survey of violent incidents in an emergency department in BC revealed that all levels of personnel (including nurses, security personnel, admitting clerks, social workers, and physicians) had experienced some form of abuse on the job, with an astounding 92% having experienced some form of physical assault during their career (Fernandes et al., 1999). A recent study from Gerberich et al. (2004) found that adjusted rates (95% CI) for physical and non-physical violence were 13.2 (12.2-14.3) and 38.8 (37.4 to 40.4) incidents per 100 person years respectively. During a three-month follow-up study of health care workers in Winnipeg (Yassi, 1994), 66 health care workers reported 102 aggressive incidents. Fifty-nine percent of incidents involved physical abuse and 41% verbal abuse. Although differences in data collection methods and denominators make it difficult to compare rates, it is clear that violence in the healthcare setting is ubiquitous; the majority of healthcare workers are estimated to experience some form of violence during their career. This pervasive climate of violence in healthcare poses risks for both healthcare workers and healthcare organizations.

Lack of Reporting

Despite the pervasiveness of violence, it is widely under-reported, generally with only the most serious of incidents being reported (Erickson & Williams-Evans, 2000; Fernandes et al., 1999; Yassi, 1994; Yassi & McLean, 2001). Studies suggest that between 46-70% of violent incidents in healthcare are not reported (Duncan et al., 2001; Estabrooks et al., 2000). Reasons for not reporting include acceptance of a culture of violence in hospitals or a belief that violence is part of the job, the incident was not associated with a physical worker injury or the incident is not believed to be serious, reporting time constraints, a belief that to report would be admitting performance failure, a lack of management support resulting in no administrative action after an incident is reported, and fear of retaliation (Barrett, 1997; Brinton et al., 2001; Graydon, Kasta, & Khan, 1994; Lanza, 1992). Under reporting of violent incidents is problematic for both workers and policy makers. Complete documentation of each incident is necessary to identify the actual nature and extent of violent incidents as well as the risk factors associated with the incidents so that proper prevention and intervention approaches can be put in place.

Conceptual Model for Violence Against Healthcare Workers

Appendix I illustrates a conceptual model for patient violence in healthcare, and factors that influence the occurrence of violence. This model was originally developed by Lee et al., (1999) based on published literature as well as knowledge of injury mechanisms and then modified to include additional risk factors. Major risk factor categories are summarized below.

Patient and Workers Risk Factors for Violence in Health Care

In their discussion on educating health care workers on violence, Fernandes et al. (2002) note several patient characteristics that have been related to violence. Potential risk factors for aggressive behavior include a history of aggression; chemical dependency, intoxication, or withdrawal; loss or grief; physiologic factors (e.g., hypoxia, electrolyte imbalance, head injury); and psychological factors (e.g., dementia and psychosis). Additional studies have demonstrated other patient factors associated with an increased risk for violence including: a diagnosis of schizophrenia or bipolar disorder, history of assault, being admitted to the hospital for a longer time, a history of smoking (Chou et al., 2001); younger age, male gender, psychiatric diagnosis (Kling et al., 2005); and the type of unit a patient is admitted to (psychiatry or emergency) (Duncan et al., 2001).

Health care workers have little control over these factors, and triggers are usually needed for an aggressive incident to occur. For instance, Fernandes hypothesized that fuel (risk factor) and match (trigger) resulted in aggressive behavior (Fernandes et al., 2002). Health care workers can potentially have more control over these triggers. Examples of triggers are physiologic stressors (e.g., hunger, sleep deprivation), violation of personal space/lack of privacy, environmental stressors (e.g., excessive wait for service, excessive noise levels), pain, perceived disrespect, anxiety, and frustration or fear (e.g., loss of control, not knowing what is happening) (Fernandes et al., 2002).

In addition to patient variables, worker, environmental, and administrative factors have also been examined. Worker or staff variables include: younger age of the nurse, a decreasing quality of relationships among hospital staff (Duncan et al., 2001), the amount

of job experience a healthcare worker has, lack of training in violence prevention and working alone (McPhaul & Lipscomb, 2004). Environmental factors that have been associated with an increase in violence include poor lighting (Gerberich et al., 2005), spatial density (Chou et al., 2001), and poor environmental design (McPhaul & Lipscomb, 2004). Administrative factors that have been identified include: providing less quality of care to patients, the degree of hospital restructuring, and an increased patient to nurse ratio (Duncan et al., 2001).

With more studies being conducted on this topic, inconsistencies are starting to emerge. Results on the association of violence with the sex of a patient or the length of stay of a patient have not been consistently demonstrated in published research. Yassi (1994) found that male patients were more likely to be violent, while Winstanley and Whittington (2002) found that female patients were more often violent. Winstanley and Whittington (2002) also found that patients with a shorter length of stay were more likely to be violent (mean length of stay at the time of the assault was 3.1 days) whereas Lee et al., (1999) found that patient violence was significantly associated with a longer length of stay in the hospital.

These studies suggest that identifying individual risk factors is not enough. As discussed by Fernandes et al. (2002), triggers for violence should be studied in addition to risk factors in order to consider the multifactorial nature of violence in healthcare.

Although inconsistencies exist, several studies have found key worker and patient factors associated with a higher risk for violence. These include working in a nursing profession, working in the psychiatric or emergency department, and working with patients diagnosed with a psychiatric disorder or dementia. These variables should to be taken into consideration when planning programs or interventions that address violence in healthcare.

Care Setting and Risk of Violence

Although there is a high risk for violence towards healthcare workers in all settings, acute care, long-term care (LTC), home care, and psychiatric care experience different reasons for the higher rates of violence. These differences are associated with the environment in which care is provided, the patient population, and type of care provided to the patients. Because of these differences, it is essential to examine if the same or different factors are associated with patient violence in different healthcare settings or facilities.

A) Nursing Homes/LTC:

Gates, Fitzwater, and Meyer (1999) surveyed nursing assistants in nursing homes and found that violence was a frequent occurrence: 59% stated they were assaulted at least once a week, 16% stated they were assaulted daily and 51% indicated that they had been injured at least once due to violence. In a study of several types of healthcare facilities, Gerberich et al (2004) found that the risk for violence was highest in nursing homes and long term care facilities with increased odd ratios for both physical and non-physical violence (Odds Ratio (OR)=2.6 and 1.5 respectively) compared to medical/surgical units.

Nursing homes or long-term care facilities are largely composed of elderly residents with declining functional abilities as well as cognitive impairments including dementia, which can create situations in which it is difficult to provide care. Risk factors for violence in long-term care largely arise due to direct and frequent contact with caregivers. Gates et al. (1999) summarized that high-risk activities include bathing, changing, dressing, feeding and turning.

B) Home Care:

With growing closures of hospital and nursing home beds, patients are increasingly being cared for in the home requiring an increased need for homecare services. Jarrell (1997) notes that home healthcare workers work in a less standardized, predictable, or controllable environment, which increases the workplace risks to home care workers.

Researchers suggest that there is a lack of scientific data to properly estimate the frequency with which violence is occurring in the home healthcare setting (Fazzone, Barloon, McConnell, & Chitty, 2000), but Distasio (2000) provides several predictors of home care patient violence including psychiatric diagnosis, dementia, legal status, and previous history of violence. Home care workers can also be put in potentially dangerous situations when visiting a home in a high crime area; going to an isolated home or a home with poor access to exits, no phones or bad lighting (Fazzone et al., 2000; Flannery, Rosen, & Turner, 1998; Gellner, Landers, O'Rourke, et al., 1994).

C) Psychiatric or Mental Health Settings:

The healthcare systems in North America are continuously moving away from providing mental healthcare to patients in large hospitals to treating patients in outpatient or community settings. Psychiatric patients with mental impairment or psychiatric disorders including schizophrenia or personality disorders are often experiencing co-morbid substance abuse problems. Patients treated in psychiatric or mental health hospitals or units are unique in their diagnoses and needs, and require specific medical, psychological, or social intervention.

Rates of patient violence are high in mental health and psychiatric settings (Quanbeck, 2006). In a study of nurses in British Columbia and Alberta, Hesketh et al. (2003) found that 20% of nurses in hospital psychiatric units experienced physical violence and 43% experienced verbal threats at least once within the last five shifts. In this study, psychiatric nurses were more likely to report an incident of violence than any other nursing group (Hesketh et al., 2003). Using surveillance to monitor the incidents of violence in Australia, (Benveniste, Hibbert, & Runciman, 2005) 28% of violent reports were from mental health units, which had the highest proportion of incidents. In a series of studies of nurses in Minnesota, psychiatric departments were found to have an elevated risk for both physical violence (OR=2.1), and non-physical violence (OR=2.8) compared to medical or surgical departments (Gerberich et al., 2005; Gerberich et al., 2004).

In a review of studies on patient assaults in psychiatric settings (Flannery, 2005; Flannery, Laudani, Levitre, & Walker, 2006; Quanbeck, 2006), the common precipitants to assaults included staff restrictions on patient behaviors, denial of services, acute psychosis, excessive sensory overload, provocation by others and younger age. No gender differences were found. Flannery also studied a triad of patient risk factors: previous violence towards others, substance abuse, and personal victimization and found that a combination of these characteristics were associated with 61% of subsequent assaults (Flannery, Hanson, Corrigan, et al., 2006). Characteristics that have also been noted to contribute to violence in previous studies or reviews include: history of aggression, substance use disorders, a diagnosis of schizophrenia or a psychotic disorder and a low staff to patient ratio (Chou et al., 2001; Flannery, 2001; Trenoweth, 2003).

D) Acute Care:

Despite the diverse patient population in acute care hospitals, violence from patients in this setting is still a frequent occurrence. Based on self-reported questionnaire data among health care workers, the prevalence of physical violence ranged from 38% in the last 5-shifts (Shamian & Villeneuve, 2000) to 74% of workers in the past year (May and Grubbs, 2002). The prevalence of verbal violence was over 80% in most studies regardless of the time frame (Cameron, 1998; May and Grubbs, 2002).

Studies in acute care hospitals have found that the areas with the highest rates of violence are Emergency, Medical and Psychiatric units (Brinton et al., 2001; Duncan et al., 2001;Hesketh et al., 2003; Whittington & Wykes, 1996; Winstanley & Whittington, 2004; Yassi, 1994; Yassi, Tate, Cooper, et al., 1998), although these findings are not universal among studies in acute care. Other studies have found the Intensive Care Unit (Findorff, McGovern, Wall, et al., 2004) to be at high risk. Yassi (1994) found that security personnel had the highest rate of assaults among all acute care hospital staff and psychiatric nurses reported the highest rate among nursing staff. In their study of wards in general hospitals, Winstanley and Whittington (2002) found that characteristics significantly associated with violence on inpatient wards included: being female, over the age of 70 year, and in restricted areas where few people have access. May and Grubbs

(2002) found that violence was more likely to occur in the evening. The only variable that seems to be relatively consistent among acute care studies was an antecedent patient diagnosis or condition of psychiatric illness or altered mental state (e.g. dementia, confusion, substance abuse)(May & Grubbs, 2002; Whittington, Shuttleworth, & Hill, 1996; Zernike & Sharpe, 1998).

Summary

Taken together, studies on violence in the entire healthcare sector suggest that the highest risk of violence for workers comes from: patients with a history of violence, patients with a psychiatric diagnosis, and patients in Emergency and Mental Health settings. Using data from the Workplace Health Indicator Tracking and Evaluation (WHITE™) database, a surveillance system of incident reporting used by four of six health care authorities in British Columbia, Paper#1 will build upon the previous research by investigating risk factors for workplace violence in health care using a population-based database comprehensive for occupational groups and work settings for comparison purposes.

Effects of Violence

Injury to the healthcare worker as a result of violence can lead to costly workers' compensation claims as well as days lost at work. Liss and McCaskell (1994) examined workers' compensation claims for acts of violence in healthcare workers in the province of Ontario. Approximately 100 claims per year were accepted, and the nature of injury was most frequently strains and sprains, and contusions. These authors found that approximately 2,500 days were lost per year due to acts of violence in healthcare and costs were estimated at about $300,000 per year (Liss & McCaskell, 1994). Yassi (1994) found that in an acute care hospital, the total injury rate among workers due to violence was 1.9 injuries per 100, 000 paid hours. The injury rate associated with violence was highest in security personnel at 16.8 injuries per 100,000 paid hours followed by psychiatric nurses at 6.5 injuries per 100 000 paid hours. In this study, bruising and crushing were the most common reported injury, followed by strains and sprains.

While the majority of violent events may not result in serious injury, the psychological effects, such as posttraumatic stress and burnout, can be considerable and long lasting (Mezey & Shepard, 1994). In one study of the emergency department at St. Paul's Hospital in Vancouver, 48% of survey respondents reported impaired job performance for the rest of the shift or week following an incident of violence (Fernandes et al., 1999). In the same study, 73% of respondents reported being afraid of patients as a result of violence and almost half hid their identities from patients. Similarly, 74% had reduced job satisfaction because of violence in the workplace. The same study also found that violence has an effect at the organizational level and is associated with issues of retention and nurses choosing to leave their profession. Of previous employees surveyed for the St. Paul's study, 67% reported that they had left the job in part because of violence. Violence in the workplace can also result in low worker morale, reduced trust of management and coworkers, and a hostile working environment (NIOSH, 2002).

Findings have shown that consequences of verbal abuse, which is more prevalent in the health care industry, to be greater than for physical violence (Gerberich et al., 2004). Gerberich et al. (2004) found that the effects of non-physical violence to be: restricted or modified work, quitting, transferring and obtaining a leave of absence. Furthermore, individuals who experience nonphysical violence over time may be at risk for adverse mental health outcomes such as acute stress disorder or post-traumatic stress syndrome (Brewin, Andrews, Rose, et al., 1999).

Direct acts of violence can also cause psychological trauma, including hyper-vigilance, sleep disturbance, exaggerated startle response, intrusive recollections, the avoidance of daily activities, depression, and disruption of the victim's sense of control and meaningful purpose in life (Flannery, 1996). While problems are more likely to occur when a violent act is committed directly to a health care worker, similar problems can also result from witnessing direct acts of violence; in the absence of injury, some assaulted staff have been found to experience moderate to severe reactions for six months to one year (Van der Kolk, 1987).

These effects can lead to considerable time loss from work for a health care worker; the second most common reason for a nurse to lose time from work based on claim data is a violent incident and the resulting physical and/or psychological injuries (WCB, 2000). Furthermore, a link between the quality of care provided by nurses and the prevalence of emotional abuse in hospitals has also been documented (Duncan et al., 2001). Nurses who reported completing fewer tasks necessary for quality nursing care were more likely to have experienced emotional abuse on the job. Arnetz and Arnetz (2001) found an association between staff reported violence and patient ratings of the quality of healthcare services offered. The outcome of a violent event can manifest itself in a number of ways in a worker ranging from injuries and time-loss to psychological trauma and reduced quality of patient care. Given the rising need for health care services in Canada and the detrimental effect of widespread violence, prevention programs are warranted to avoid or decrease these effects to improve the functioning of the healthcare system.

Violence Prevention Programs

Due to the nature of healthcare work, a violence prevention program is an important component of occupational health and safety programs in the health care sector. Organizations such as WorkSafeBC in B.C. and the Occupational Safety and Health Administration in the U.S. (OSHA) have produced handbooks designed to help healthcare organizations implement or maintain effective workplace violence prevention programs (OSHA, 2003; WCB, 2000). These handbooks propose a 5-step model for the creation of a violence prevention program.

Step 1: Establishing a violence prevention working group and enlisting support:
The purpose of this step is to elicit participation for all levels of the organization so that input is representative of all workers and that policy and procedures developed are beneficial for all workers. To ensure the best outcome from the program, front-line workers and management should work together to come up with solutions.

Step 2: Conducting a risk assessment:
Conducting a risk assessment includes determining what prevention/intervention measures are already in place, identifying potentially hazardous conditions, and determining the risk of future violent incidents. This includes reviewing procedures, operations, or areas where there are hazards or identifying where the may occur.

Step 3: Developing and implementing control measures:
After conducting the risk assessment, risks can be identified and control measures can be used to reduce risks. These can include policies, procedures, or work environment arrangements. If the violent event cannot be prevented, post-incident response can reduce the effect of the violent incident.

Step 4: Providing education and training:
Two forms of education and training are proposed: core education and training that is of benefit to all workers, and risk specific education and training most likely to be at risk or are exposed to specific risk factors. Education and training can help make staff aware of potential hazards and how to protect themselves and coworkers when risks are present.

Step 5: Conducting an annual review:
Program reviews are important to ensure that current activities are effective and creating the desired effect or if improvement or changes are needed.

Effective and well-designed violence prevention programs have the potential to decrease the number or severity of violent incidents. However, the high rate of violence and especially among some subgroups support the need for even greater prevention and intervention efforts.

Intervention for Violence in Health Care

Although the literature clearly identifies many prevention methods, there is a paucity of evaluations published on these interventions and no studies have been identified that

incorporate the five steps of a violence prevention program advocated by occupational health and safety agencies as outlined above.

A recent literature review on preventing violence in healthcare (Cvitkovich, 2005) found that prevention and mitigation strategies identified in the literature can be divided into two categories: 1) before-incident interventions including environmental design, administrative controls, violence management strategies (training); and 2) post-incident interventions including some form of psychological debriefing (counselling, Critical Incident Stress Debriefing or Cognitive Behaviour Therapy) and incident reporting / tracking / analysis. A combination of these strategies has been deemed to be the best way of preventing violence (Cvitkovich, 2005).

A total of 21 published studies were identified that evaluated interventions in health care settings (additional studies that identified factors that reduced the risk for violence as well as studies whose purpose did not include assessing an intervention but discussed aspects of interventions were identified but not subsequently discussed). Of these, 18 could be categorized as before-incident interventions and 3 as post-incident interventions. The majority of the before-incident intervention studies evaluated the effect of education and training programs (that teach healthcare workers physical and/or verbal methods for interacting with or restraining violent or aggressive patients) on the risk of violent incidents (Arnetz & Arnetz, 2000; Carmel & Hunter, 1990; Cowin et al., 2003; Fernandes et al., 2002; Hunter & Love, 1996; Hurlebaus, 1994; Infantino & Musingo, 1985; Lehmann, Padilla, Clark, & Loucks, 1983; Martin, 1995; Nachreiner et al., 2005a; Ore, 2002; Parkes, 1996; Phillips & Rudestam, 1995; Rankins & Hendey, 1999; Whittington & Wykes, 1996). These interventions have generally been successful in reducing incidents of violence or aggression over a short-term follow-up period. For those that found a reduction, (Fernandes et al., 2002; Hunter & Love, 1996; Infantino & Musingo, 1985; Phillips & Rudestam, 1995; Whittington & Wykes, 1996; Williams, 1996) violence was reduced by 31 to 40% over a 2 week to 24-month follow up period. The interventions were also successful in creating other positive short-term outcomes such as a reduction in worker injuries (Carmel & Hunter, 1990) and increased knowledge in the

trained healthcare workers (Cowin et al., 2003; Hurlebaus, 1994; Lehmann et al., 1983). Mixed results were found by Nachreiner et al (2005a) who investigated the effect of seven different training programs and found a protective effect for three programs but an increased risk for violent incidents associated with the remaining four. Organizational culture was suggested as an explanation for this difference. Others (Arnetz & Arnetz (2000); Martin (1995); Ore (2002); Parkes (1996)) have also reported an increase in violence, injury, or worker's compensation costs after the implementation of the intervention, although this increase may, in part, be explained by increased recognition and reporting of incidents post-intervention rather than an actual increase in violence.

Two of the before-incident interventions implemented environmental or administrative controls (Drummond, Sparr, & Gordon, 1989; Rankins & Hendey, 1999) and one examined the effect of administrative controls already in place (Nachreiner et al., 2005b). Drummond et al (1989) implemented a system where patients who were noted to be at high risk for violence based on previous history had their charts 'flagged' for the purpose of notifying staff of the potential risk so they could take proper precautions. It was found that after being 'flagged', these patients had 90% fewer violent incidents. Rankins and Hendey (1999) evaluated the implementation of a security system in an emergency department and reported a significant increase in confiscated weapons although there was no reduction in assaults. In a study of the effect of workplace violence policies Nachreiner et al (2005b) found that the odds of physical assault decreased for health care facilities having zero tolerance policies and having policies regarding types of prohibited violent behaviors; a non significant decrease in risk was found for 'flagging' patient charts and having instructions on how to report physical violence.

For the post-incident interventions, Flannery and colleagues (1998) evaluated the impact of crisis intervention after a violent incident and found that there was a significant decrease in the mean number of assaults post intervention. The authors suggest that crisis intervention may work to decrease assaults by improving staff's attention to early warning signs of loss of control, which can result in preventive de-escalation interventions. Deans (2004) examined the impact of organizational support after

experiencing a violent event and found that organizational support improved perceived professional competence in healthcare workers following a violent incident. Alternatively, Nhiwatiwa (2003) found an increase in psychological symptoms three months after a single education session for previously assaulted nurses. The common aspect of these interventions that worked in reducing violence (and other related features of patient violence) was increased awareness among workers on the manifestation of patient violence.

In summary, evidence exists that interventions can reduce violent incidents although there may be a period post-implementation associated with increased reporting due to increased awareness and longer-term evaluations of the impact of the programs on risk do not exist. The elements of interventions with some evidence of leading to favorable outcomes include identification of patients with a previous history of violence and increase awareness among workers of patient violence.

Prediction of Violence

There is emerging research on risk assessment tools that assess a patient's potential of becoming violent. The purpose of these systems is to notify healthcare workers of the potential risk for violence from patients so that workers can take precautions to prevent or reduce the impact of a violent event. These include both clinical judgement and rating scales (McNiel & Binder, 1995; Needham, Abderhalden, Dassen, et al., 2004; Woods & Almvik, 2002). For example, as discussed above, Drummond, Sparr, and Gordon (1989) implemented a system where patients who were identified to be at high risk for violence were 'flagged' on their patient chart with the purpose of notifying staff of the potential risk in order for them to take proper precautions. Precautions included, for example, having security on standby, patient confinement to one area of the hospital, a 'show of force' and searching for weapons. It was found in this study that after being 'flagged' as compared to before they were 'flagged', patients had 90% fewer violent incidents. The Bröset Violence Checklist (Linaker & Busch-Iversen, 1995) is a patient assessment system that has been studied in acute care psychiatric wards and psychiatric hospitals. This system evaluates patients on six behaviours; confusion, irritability, boisterousness,

physical threats, verbal threats and attacking objects. Almvik, Woods, and Ramussen (2000) found that demonstrating two or more of these behaviours was predictive of a violent patient event in the next 24 hours. The authors also reported a sensitivity of 63% and a specificity of 92% for the Bröset Violence Checklist.

McNiel and Binder (1995) evaluated a violence assessment tool, which incorporated both clinical judgment and scores on the Brief Psychiatric Rating Scale and the Overt Aggression Scale and found a sensitivity of 67% and specificity of 69%. Both studies concluded that the psychometric properties of their tool were satisfactory although, as pointed out by Almvik and colleagues, it is difficult to assess what is an acceptable level of sensitivity and specificity.

Limitations of Previous Intervention Studies

While the above findings indicate that violence in healthcare can be prevented, there are many limitations embedded in these studies that need to be overcome in order to be confident in conclusions from evaluation studies.

The most common limitation of intervention studies is non-randomization of participants. Only two of the reviewed intervention studies (Arnetz & Arnetz, 2000; Nhiwatiwa, 2003) randomized their participants. Randomization of participants, most commonly of workers to control and intervention groups reduces differences between the two groups, which then minimizes the risk of bias in relation to the outcome of interest. Randomization is extremely difficult in workplace studies especially within health care. As such, several studies attempted to control for biases and confounding through the inclusion of a control group, although many studies did not use a control group in their evaluation (Carmel & Hunter, 1990; Drummond et al., 1989; Flannery et al., 1998; Lehmann et al., 1983; Martin, 1995). Lack of a control group may result in biased results if it includes the effect of other influences on the results. Six of the previous studies evaluating interventions for violence in health care relied on the distribution of questionnaires to infer the result of these interventions (Arnetz & Arnetz, 2000; Cowin et al., 2003; Hurlebaus, 1994;

Lehmann et al., 1983; Nhiwatiwa, 2003; Ore, 2002). This form of evaluation is subject to recall bias as well as non-response bias.

Other limitations include attrition (Arnetz & Arnetz, 2000) and loss to follow up which reduces the comparability between groups. The evaluations from Hurlebaus (1994), Lehmann et al (1983), and Whittington and Wykes (1996) included short follow-up periods ranging from immediately after the intervention to 28 days post intervention. Short follow-up periods do not allow inferences about the sustainability of the effects of the intervention. Further studies were unable to control for confounders, such as seasonal variation in violent incidents (e.g. Arnetz & Arnetz, 2000; Fernandes et al., 2002), which may bias the results. Small sample sizes (e.g. Nhiwatiwa, 2003) lead to lack of study power and may also lead to bias in the results of the study.

Summary

Studies from the health care industry suggest that violence is a major problem with serious consequences to the worker, organization and patient care. While the scale of the problem is beginning to be understood, the full extent is poorly estimated due to underreporting and a lack of a comprehensive incident reporting system. Additionally, results are largely incomparable due to different reporting and tracking mechanisms, different denominators used to calculate rates, different rate calculations, and studies focusing solely on one type of healthcare facility or occupational group. For these reasons, it is difficult to extrapolate findings to places outside the areas studied. Unless the true nature and extent of the problem is understood it will be difficult to address or intervene.

The following studies will begin to fill in gaps in the literature on the nature and risk factors for violence in the healthcare sector as well as on programs to prevent violence. The first study will examine rates and risk factors for violence across the province of British Columbia, and all types of healthcare facilities and occupational groups will be examined in this study using a province-wide reporting system. This will allow for the

calculation of comparable rates across and within healthcare facilities and occupational groups in order to identify areas of high risk.

The second study will focus on the effect of a patient risk assessment tool and 'flagging' system (called the Alert System) on patient violence in an acute care hospital. The methodology of the second study will improve on many of the biases and limitations from previous studies. Due to the use of administrative data rather than questionnaire data, recall bias, which is a prevalent bias in the literature on violence in health care, will not limit the results of this study. Attrition and loss to follow up will not be a factor in this study due to the retrospective study design. Because of the longitudinal design, the follow up period will be a sufficient length of time with approximately 2 years of follow up. This study's sample size of 173 violent incidents improves on the sample sizes of previous intervention studies, some of which utilized as few as 40 participants. A suitable comparison group of non-violent patient, matched on unit of admission and gender will be used, and issues of adequate study power will also be addressed. This study will add to the literature on violence prevention program evaluation, especially evaluation in acute care hospitals, as well as adding to the almost non-existent literature that examines administrative controls in the prevention of violence. Furthermore, anecdotal evidence suggests that 'flagging' systems are common in hospital settings, however there are only two published studies on the effects of these systems (Drummond et al., 1989; Nachreiner et al., 2005b).

Study Purpose

The overall purpose of the current study is to a) investigate worker and workplace risk factors associated with an increased risk of patient violence in British Columbia health care workplaces and to b) investigate the effectiveness of a violence-reduction intervention in reducing the risk of a worker-patient violent incident in one acute care hospital.

STUDY 1:

The purpose of this study is to describe patient violence in the healthcare sector in British Columbia using the Workplace Health Indicator Tracking and Evaluation (WHITE™) database. The objectives of this study are to examine differences in violence rates by worker (age, gender), occupation and workplace groups (health care sector, health authority, size of facility). Based on the literature, it is hypothesized that there will be higher rates of violence in work groups that have a higher number of psychiatric patients.

STUDY 2:

The purpose of this study is to investigate the effectiveness of a violence reduction intervention on patient violence in a large acute care hospital in Vancouver. The objectives of this study are to investigate the effect of the Alert System (yes/no for a patient flag for violence) on the risk of patient violence in a multi-variable model. It is hypothesized the there will be a protective effect with an odds ratio of approximately 0.70 for those patient flagged by the Alert System compared to patients not flagged by the Alert System. This is comparable to the results found by Nachreiner et al., 2005b.

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[1]Chapter 2: Characterizing Violence in Healthcare in BC

Introduction

Work-related violence among healthcare workers is not a new concern in the healthcare industry. However, the full extent of the problem is poorly understood due to underreporting, inconsistent definitions, and different data collection methods, which makes it difficult to generalize the findings beyond the immediate study populations to inform prevention policies and procedures. Despite study differences, it is clear that violence is prevalent within many healthcare organizations and occupations. The prevalence of self-reported physical violence among acute care nurses ranged from 38% in the past 5 shifts (Shamian & Villeneuve, 2000) to 74% in the past year (May & Grubbs, 2002) in previous studies. Verbal abuse is more common than physical violence in acute care settings with over 80% of nurses reporting this form of violence either in the past 15-shifts (Cameron, 1998) or the past year (May & Grubbs, 2002). While studies tend to focus on nursing personnel, violence is experienced by other occupations including security personnel (Yassi, 1994), unit assistants, physicians (Fernandes et al., 1999), and patient care assistants (Findorff, McGovern, Wall, et al., 2004) across hospital departments.

In addition to the acute care sector, long-term care (LTC) as well as psychiatric and mental health facilities have also been found to be at particularly high risk for violence (Boyd, 1995; Gerberich et al., 2004). In LTC, Gates, Fitzwater, and Meyer (1999) found that 59% of surveyed nursing assistants stated they were assaulted at least once a week. In a survey of nurses in British Columbia and Alberta (Hesketh et al., 2003), 20% of nurses in hospital psychiatric units experienced physical violence and 43% experienced verbal threats at least once within the last five shifts. Using surveillance to monitor the incidents of violence in Australia, Benveniste and colleagues (2005) reported that the highest proportion of violence incidents at 28% of all reports in a 2-year period occurred in the mental health unit.

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[1] A version of this chapter has been submitted for publication. Kling RN, Yassi A, Lovato CY, Smailes E, & Koehoorn M. Characterizing Violence in Healthcare in BC.

Previous studies have focused on identifying specific occupations or units within the health care facilities at high risk of work-related violence. However comparisons across studies and thus across different occupations and different sub-sectors in health care are difficult to make due to different definitions, methods of data collection and reporting. Data collected from multiple health care organizations in a consistent manner using an injury surveillance system can potentially reveal differences that would not otherwise be possible to detect and thus help to prioritize prevention efforts (Benveniste, Hibbert, & Runciman, 2005), including the magnitude of the problem within the industry, examining temporal trends (Fine, 1999), and identification of specific workplace risk factors and/or high risk groups (Hanrahan & Moll, 1989).

Purpose:

The purpose of this study is to use an injury surveillance system in the Canadian province of British Columbia. The objectives of this study are to calculate rates of work-related violence and to compare these rates across geographic health authorities, and across facility, department and occupational groupings to identify high-risk areas, adjusted for covariates including age and gender. It is hypothesized that psychiatric/mental health departments, facilities, and sectors, as well as occupations within these areas, will be at an increased risk for violence while the community healthcare sector will be at a decreased risk for violence. The investigation of the risk of violence by 'peergroup' (administrative grouping of health care facilities based on size of facility and type of care) is for exploratory purposes.

Methods

Data was extracted from the Workplace Health Indicator Tracking and Evaluation (WHITE ™) database for all employee reports of violence incidents. The WHITE database is a web-based system for incident tracking and case management. This database was created to centralize information that can be used to identify work-related injuries and illnesses, provide information on corrective measures that can be used to

reduce or eliminate workplace injuries or illnesses, and to follow up and evaluate the effectiveness of occupational health and safety programs. Information captured in this database includes: a description of the incident, demographics of the worker filing the report, factors that contributed to the incident including the location of the incident and the circumstances surrounding the incident, as well as information on the nature of the injury sustained (Alamgir, Swinkels, Yu, et al., 2007). The WHITE database was implemented in four of the six provincial Health Authorities (HA) in BC (considered the employer for all health care facilities in their region): Northern Health Authority (NHA), Interior Health Authority (IHA), Fraser Health Authority (FHA), and Vancouver Island Health Authority (VIHA). All employees paid by the Health Authorities are covered by this database while contracted workers are not covered. The worker's manager or supervisor records incidents in conjunction with the worker by asking the reporting worker questions contained on an incident report form that includes the same questions and fields as in the WHITE database. This form is then forwarded to the Occupational Health & Safety Department of the relevant health region where it is entered into the WHITE database. This database is currently maintained by the Occupational Health and Safety Agency for Health British Columbia (OHSAH) and data were provided to the researchers with consent by the British Columbia Health Authorities included in this database for research purposes. No personal identifiers were included in research database. Further information on WHITE can be found in Alamgir, Cvitkovich, Yu, et al., (2007) and Alamgir, Swinkels, Yu, et al., (2007).

All available reports that have been recorded in WHITE were extracted for a one-year follow-up period for each HA. The start of the one-year follow-up varied for the participating HA due to different internal reporting procedures for data extraction (January 2004, August 2004 (N=2) and November 2004). For confidentiality purposes none of the HA's are identified by name and are further identified by number.

Incident data included: nature of injury (e.g. musculoskeletal injury, bruise, eye irritation, allergic response), cause of injury (e.g. blood and body fluid exposure, latex, noise, ergonomic factors, psychological trauma), care activity at time of injury (e.g. patient care,

sharps handling, bending), contributing factors (e.g. limited workspace, working alone, fatigued, language barrier), and corrective action taken (e.g. training, environment modification). Data on the health care worker involved in the incident included: age, gender, hire date, work status (full time, part-time and casual status), occupation, acute care department, worksite, healthcare sub sector, and health authority. Worksites were recategorized for the analysis into 'peer' groups used by the provincial Ministry of Health for statistical reporting based on comparable number of patient beds, community served and primary type of care provided. Acute care department/non acute department was categorized by type of department in acute care hospitals versus all other departments. Occupations were also recategorized into occupational groups for the analysis (for example, all therapists such as physical therapists, occupational therapists were grouped into health science professionals). Aggregate denominator data on worked hours were available for the entire workforce in the four participating health authorities from the WHITE database (submitted by employers) stratified by gender, age categories, and by occupation, department, sub sector and health authority groupings (and could be constructed for the 'peer' group variable from these counts). Worked hours are defined as regular paid hours including overtime hours but excluding sick time, vacation days, and workers' compensation lost time.

Statistical analysis:

Rates of violent incidents were calculated per 100,000 worked hours. Univariate relationships were examined using Poisson Regression Models and variables with at least one category demonstrating statistical significance of at least $p \leq 0.05$ were entered into the final multivariable model. The PROC GENMOD procedure in SAS V 9.1 (SAS Institute Inc., 2002) was used to calculate unadjusted and adjusted rate ratios (RRs) and 2-sided Wald 95% confidence intervals around the estimates. Trend tests were also conducted for variables that could be examined continuously. Reference groups were defined for this study as the group with the hypothesized lowest incident rate. Spearman's Rank Correlations were used to assess correlations among the variables deemed appropriate to enter in the multivariable model; variables with correlations ≥ 0.50 were entered into separate models. As a result of high correlations, three multivariate models

were constructed, one to look at the effect separately of acute care department, one for sub-sector and another for peer-group. All models were adjusted for work status, age, gender, health authority, date of hire at worksite, and occupation.

Results

Injury Rates:

The overall injury rate for the one-year period in WHITE was 1.52 violent incidents per 100,000 worked hours.

Description of Violent Incidents:

There was a total of 28,143 work-related injury incidents reported by workers in the WHITE database by the included HAs. Of these, 2,495 (8.9%) were coded as violent or aggression incidents. The incident involved a patient 73.7% of the time and another worker 18.7% of the time. The majority of the injuries resulting from a violent/aggressive incident were musculoskeletal injuries (29.3%) and bruises/contusions (28.7%) and psychological trauma (14.7%). Of note, 22.7% of reported violent incidents did not involve a physical injury to the worker. Patient-related factors were most often cited as contributing to the violent/aggressive incident at 76% of the time. The activity being done at the time of the incident most often involved patient handling (29.5%) and patient care (21.9%). The patient handling activity cited most often was holding or assisting during a procedure (11.7%) and the patient care activity noted most often was washing or bathing (9.5%). Hitting/kicking/or beating was the most common form of physical assault (36%). Verbal threats were reported as 20% of all violence/aggression. See Appendix II for Tables of descriptive statistics on the nature and type of violence incidents.

Rates:

All rates are reported in Table 2.1. Overall, across all work characteristics, the psychiatric department in acute care hospitals was found to have the highest rate of all the variables examined, with 8.3 incidents per 100,000 worked hours. This was followed by the very

small healthcare facility peer group (4.3 incidents per 100,000 worked hours) and then the long-term care sector (3.9 incidents per 100,000 worked hours).

Poisson Regression Models:

All variables were initially investigated at the univariate level. Female workers were found to be at a higher risk for violence (RR=1.53) compared to male workers (Table 2.1). This result was not maintained in any of the adjusted models.

In the univariate models, workers employed part time or casually were at an increased risk (RR=1.23 and 1.74 respectively) compared to full time workers. An increased risk of violence incidents remained for part-time status but not casual status in the final adjusted models (Table 2.1), although the confidence intervals for part-time status included '1'. The observed relationship with younger age and risk of violence remained although the effect size was reduced in the adjusted models.

Compared to workers with more than 20 years experience in their current job, the risk of violence tended to increase with decreasing amount of experience with the exception of those working 11-15 years in their current job (RR=1.76) in the univariate models. The pattern for years of experience remained in the adjusted models with an observed increased risk among those with less than 20 years of experience, but the effect was only significant for those with 1-5 years and 11-15 years (years of experience was not significant in the model adjusted for peer group).

Initially, all Health Authorities were at a significant increased risk for violence compared to HA 4 (RR range of 1.46 to 1.69). The adjusted models found that there was a significantly higher rate of violence in HA 2 compared to HA 4.

Compared to management/clerks/maintenance workers, occupations at the highest risk for violence or aggression at the univariate level were care aides (RR=12.55) followed by licensed practical nurses (LPNs) and registered nurses (RN's). Facility support workers (e.g. cleaners, cooks, dieticians) did not have an elevated risk for violence (RR=0.93).

Across all models, RNs (RR=6.45), LPNs (RR=8.64), and care aides (RR=10.05) had high risks of violence compared to workers in administrative occupations. Health services workers (e.g. activity worker, porter, nutritionist, program coordinator) and other workers (including student nurses and doctors as well as unlisted and unclassified occupations) also had a significant 3-fold increased risk of violence compared to administrative occupations.

Model 1

Model 1 did not adjust for subsector or peergroup. In acute care hospitals, the psychiatry department (RR=13.64), pediatric department (RR=5.35), and float staff (RR=5.02) were at a significant increased risk for violence compared to administrative departments. Significant increased risks were also found for the emergency department, general medicine, rehab and extended care, the intensive care unit and surgery. In the adjusted models, the psychiatry department (RR=6.29, 95% CI=3.95-10.01) and pediatric department (RR=2.22, 95% CI=1.05-4.67) remained at a significant increased risk for violence. Although other departments had an increased or decreased risk of violence, none of these risks were significant in the adjusted models.

Model 2

Compared to the community/public health sector, the long-term care sector and acute care sector were found to be at a significant risk for violence (RR=2.96 and 1.30 respectively) at the univariate level within health care sub-sectors. Long-term care remained significant in the adjusted model and was associated with a three-fold increased risk of violence compared to the community/public health sector (RR=3.02, 95% CI=2.36-3.86). The risk was also elevated for the acute care sector but the RR was not as high (RR=1.77, 95% CI=1.40-2.23). The corporate sector (e.g. corporate offices, regional services, administration) and unspecified sectors (facilities not classified as belonging to a particular sector) were not associated with an increased risk of violence.

Model 3

When looking at peer grouped facilities at the univariate level, the smallest sized hospitals were found to have the largest increased risk for violence (RR=6.59) followed by extended or elder care facilities (RR=5.33) and mental health and addictions facilities (RR=3.49) compared to health centers. Very small health care facilities had an almost seven-fold increased risk of violent or aggressive incidents (RR=6.58) compared to outpatient health centres/units in the adjusted model. Extended care/elder care facilities (RR=4.37) and mental health facilities (RR=4.14) had more than a four-fold increase risk of violence. All other peer-grouped facilities were found to be at a significant increased risk (approximate two-fold increased risk) except for home support in the adjusted model.

Table 2.1 Risk Factors Associated with Work-related Violent Incidents among health care workers in British Columbia, Poisson Regression Model Results (N Total=868)

Variable	N (%)	Rate (incidents/100,000 productive hours)	Unadjusted Results RR, (95% CI)	Adjusted Results (Model 1) RR, (95% CI)	Adjusted Results (Model 2) RR, (95% CI)	Adjusted Results (Model 3) RR, (95% CI)
Work Status						
Casual	238(27)	2.20	1.23(1.05,1.45)	0.94(0.80,1.12)	1.03(0.86,1.22)	0.93(0.79,1.10)
Part time	228(26)	1.56	1.74(1.48,2.04)	1.16(0.97,1.38)	1.21(1.00,1.45)	1.20(1.00,1.44)
Full time (reference)	399(46)	1.27	1.00	1.00	1.00	1.00
Age (years)						
< 30	94(11)	2.24	2.48(1.74,3.55)	1.90(1.31,2.78)	1.80(1.21,2.66)	2.19(1.49,3.21)
30-39	181(21)	1.79	1.98(1.43,2.76)	1.68(1.20,2.37)	1.73(1.22,2.45)	1.83(1.30,2.58)
40-49	295(34)	1.52	1.69(1.23,2.32)	1.50(1.08,2.06)	1.49(1.07,2.07)	1.65(1.19,2.28)
50-59	254(29)	1.37	1.52(1.10,2.09)	1.40(1.01,1.94)	1.45(1.04,2.01)	1.50(1.08,2.08)
60+ (reference)	44(5)	0.90	1.00	1.00	1.00	1.00
Gender						
Female	781(90)	1.61	1.53(1.23,1.91)	0.99(0.79,1.24)	0.99(0.78,1.25)	1.04(0.83,1.31)
Male (reference)	87(10)	1.05	1.00	1.00	1.00	1.00
Health Authority						
1	326(38)	1.54	1.46(1.19,1.80)	1.12(0.89,1.41)	1.16(0.92,1.47)	1.03(0.82,1.30)
2	100(12)	1.78	1.69(1.29,2.20)	1.46(1.10,1.93)	1.98(1.43,2.75)	1.48(1.11,1.98)
3	320(37)	1.70	1.61(1.31,1.99)	1.21(0.97,1.53)	1.28(0.99,1.65)	1.20(0.95,1.52)
4 (reference)	122(14)	1.06	1.00	1.00	1.00	1.00
Time Since Hire at Worksite (years)						
<1	67(8)	1.74	1.79(1.25,2.56	1.42(0.96,2.10)	1.34(0.89,2.02)	1.19(0.80,1.76)
1-5	387(45)	1.62	1.67(1.25,2.22	1.51(1.11,2.07)	1.51(1.09,2.08)	1.29(0.94,1.76)
6 -10	132(15)	1.41	1.44(1.05,1.98	1.23(0.88,1.70)	1.24(0.88,1.74)	1.13(0.81,1.57)
11-15	141(16)	1.71	1.76(1.29,2.41	1.48(1.08,2.04)	1.49(1.07,2.08)	1.38(1.00,1.90)
16-20	87(10)	1.40	1.43(1.02,2.01	1.36(0.97,1.91)	1.33(0.93,1.90)	1.29(0.92,1.82)
>20 (reference)	54(6)	0.97	1.00	1.00	1.00	1.00

Variable	N (%)	Rate (incidents/100,000 productive hours)	Unadjusted Results RR, (95% CI)	Adjusted Results (Model 1) RR, (95% CI)	Adjusted Results (Model 2) RR, (95% CI)	Adjusted Results (Model 3) RR, (95% CI)
Occupation						
RN	347(40)	1.97	6.62(4.63,9.46)	6.39(4.43,9.22)	6.45(4.37,9.52)	5.34(3.59,7.94)
LPN	79(9)	3.23	10.85(7.23,16.29)	8.19(5.39,12.43)	8.64(5.56,13.42)	9.57(6.13,14.93)
Care aide	320(37)	3.74	12.55(8.77,17.96)	9.55(6.54,13.95)	10.05(6.72,15.05)	10.93(7.35,16.25)
Facility support	10(1)	0.28	0.93(0.46,1.88)	0.75(0.37,1.53)	0.82(0.40,1.69)	1.27(0.60,2.69)
Health Sciences professional	18(2)	0.30	1.02(0.58,1.82)	0.98(0.55,1.75)	1.07(0.59,1.94)	1.17(0.63,2.19)
Other	14(2)	0.74	2.47(1.32,4.61)	3.22(1.70,6.08)	3.21(1.62,6.38)	2.63(1.38,5.03)
Lab/imaging	9(1)	0.46	1.53(0.73,3.20)	1.43(0.68,3.01)	1.58(0.74,3.35)	2.26(0.95,5.38)
Health Services worker	38(4)	0.95	3.19(2.00,5.09)	3.19(1.99,5.12)	3.76(2.29,6.16)	3.28(2.02,5.34)
Management/clerk/ maintenance (reference)	33	0.30	1.00	1.00	1.00	1.00
Acute care department						
ICU	17(2)	1.44	2.38(1.30,4.37)	1.01(0.53,1.89)		
ER	42(5)	2.37	3.92(2.42,6.36)	1.62(0.97,2.71)		
Rehab/extended care	52(6)	1.78	2.93(1.84,4.67)	1.07(0.66,1.73)		
General Med	122(14)	1.89	3.12(2.05,4.73)	1.26(0.81,1.96)		
Surgery/OR	44(5)	1.27	2.09(1.30,3.38)	0.81(0.48,1.34)		
Psych	77(9)	8.26	13.64(8.80,21.14)	6.29(3.95,10.01)		
Pediatric	10(12)	3.24	5.35(2.59,11.05)	2.22(1.05,4.67)		
Maintenance	16(18)	0.35	0.57(0.31,1.06)	0.58(0.30,1.11)		
Lab/Imaging	16(18)	0.33	0.54(0.29,1.00)	0.65(0.32,1.35)		
Health Services/other	46(5)	0.84	1.38(0.86,2.22)	0.72(0.44,1.19)		
Float staff	20(2)	3.04	5.02(2.81,8.95)	1.27(0.70,2.33)		
Non acute department	374(43)	1.95	3.22(2.18,4.76)	1.18(0.78,1.79)		
Admin/HR/Finance (reference)	27(3)	0.61	1.00	1.00		
Sub sector						
Acute	493(57)	1.30	1.30(1.04,1.63)		1.77(1.40,2.23)	
Corporate	7(1)	0.31	0.31(0.14,0.67)		0.67(0.31,1.45)	
LTC	271(31)	3.85	3.85(3.04,4.88)		3.02(2.36,3.86)	
Unspecified	5(1)	0.71	0.71(0.29,1.75)		1.04(0.42,2.56)	
Community/public health (reference)	92(11)	1.00	1.00		1.00	
Peer group						
Large and teaching hospital	68(8)	1.09	1.67(1.08,2.58)			2.52(1.59,4.02)
Not so large	135(16)	1.35	2.06(1.38,3.08)			2.75(1.81,4.17)
Pretty big	151(17)	1.26	1.94(1.30,2.88)			3.04(2.00,4.63)
Medium	24(3)	1.39	2.14(1.24,3.67)			3.07(1.75,5.40)
Medium small	38(4)	1.32	2.02(1.25,3.28)			2.30(1.38,3.85)
Small	34(4)	1.68	2.57(1.57,4.22)			2.99(1.81,4.95)
Very small	15(2)	4.30	6.59(3.53,12.29)			6.58(3.49,12.41)
Extended/elder care	271(31)	3.49	5.35(3.65,7.84)			4.37(2.94,6.51)
Specialty hospital	4(1)	0.86	1.23(0.43,3.50)			3.37(1.15,9.89)
Mental health and addictions/diagnostic hospital	31(4)	2.3	3.47(2.09,5.75)			4.14(2.46,6.95)
Home support	13(1)	0.85	1.30(0.68,2.51)			1.16(0.59,2.25)
Health center/health unit (reference)	29(3)	0.65	1.00			1.00

Secondary Analysis of Contributing Factors and Activities

We investigated the details of violent incidents reported by workers in the highest risk groups identified in the final adjusted models with occupational group (Table 2.2). More RNs and LPNs noted patient handling tasks (assisting during a procedure, repositioning) as the activity at the time of the incidents, while care aides more often noted patient care tasks (washing, dressing, changing) as the activities being conducted at the time of the incident. A lower proportion of RNs noted the patient being confused as a contributing factor compared to LPNs and care aides.

Table 2.2 Contributing factors and activities associated with violence incidents in British Columbia among select occupational groups, 2004-2005

	RN (%)	LPN (%)	Care aide (%)	Health services workers (%)
Contributing factors				
Patient aggressive	65	72	71	49
Patient resistive	40	45	43	8
Patient unbalanced	15	14	16	5
Patient made unexpected movement	28	34	38	16
Patient confused	19	40	35	8
Activity				
No injury	20	6	10	41
Repositioning	9	10	10	3
Transferring	6	8	12	3
Preventing a fall	8	7	2	0
Assisting during a procedure	21	20	13	8
Washing	3	12	22	3
Dressing	2	2	12	3
Changing	6	8	14	3

Discussion

This study provides evidence that violence is pervasive in health care but also that it occurs outside areas known to be at high risk for violence within the health care industry, given a comprehensive surveillance system.

Rates of violent incidents, calculated to be comparable within and between groups, identified many high risk areas including psychiatric departments in acute care hospitals, very small hospitals, the long term care sector and care aides. Being able to calculate comparable crude rates of violence across so many variables is important to aide in identifying priority areas to target interventions, but additional multivariate modeling is important in order to take into account potential confounding factors in identifying areas of high risk.

The adjusted Poisson regression models identified three high-risk groups for which there is little published evidence: very small healthcare facilities, the care aide occupation, and pediatric departments in acute care hospitals. The multivariate analyses found that the relative risk of violence for care aides far exceeded the risk found for any other variable modeled. Future research should look at what the specific risks put care aides at greater risk. The pediatric department was found to have an increased risk of violence second only in magnitude to the psychiatric department. Due to the patient population of this department, the causes and contributing factors may differ than that of the rest of the hospital patient population. Targeted and specific prevention and intervention methods may be needed in these departments in order to lower the risk of violence. This study also found that very small hospitals to be at a larger risk for violence than mental health facilities. Facilities grouped in this manner has not been previously studied, with the bulk of research being conducted at mental health or psychiatric facilities, therefore reasons for the increased risk are only hypothesized (see discussion below). Further research, as well as prevention resources, should be allocated towards these facilities.

Violent incidents comprised 8.9% of all incidents reported by workers in four of six provincial health authorities in the WHITE incident surveillance system over a one-year follow-up period. This is similar to the data from the Australian Incident Monitoring System (AIMS), which reported that 9% of incidents were due to violence (Benveniste et al., 2005). Physical injuries resulting from the violence as reported in the WHITE database was higher (23% of all violence reports) than that reported in the Australian Incident Monitoring System (5%). Differences between the two reporting systems may be due to underreporting, definition differences, error in data entry or true differences in risks.

The majority of previous research, as with this study, found that patients are the primary source of violence and aggression (e.g. Hesketh et al., 2003; Ryan & Maguire, 2006). Although this form of violence is most commonly reported, other forms of violence in healthcare are prevalent including worker-to-worker violence in this study (Farrell, Bobrowski, & Bobrowski, 2006; Hegney, Eley, Plank, et al., 2006). In their survey of healthcare sector violence, Farrell et al (2006) found that doctor to nurse aggression to be the most distressing form of violence.

Peergroup

Rates of violence were highest in very small healthcare facilities. There is a paucity of information on the risk of violence in very small facilities, however it is recognized that the risk for violence is high in rural areas (Fisher et al., 1996; Tolhurst et al., 2003) and that women in small workplaces have been found to be at higher risk for injuries (Eakin, 1995). These facilities may be situated in small, as well as growing communities. Facilities located in small communities may not be equipped with the funding or resources, such as security departments, necessary to make violence prevention a priority. Facilities located in growing communities may be seeing an influx of patients from surrounding areas and may not have yet acquired the resources necessary to handle the resulting increase in patients.

Mental health and extended care and elder care facilities as well as the long-term care healthcare sector were also found to be at a significant increased risk for violence. Using methodologies different to this study, similar risks have been found by Boyd (1995) and, Gerberich et al (2005, 2004). An increase in violence within these sub-groups have been purported to be from the unique cognitive impairments and diagnoses found in psychiatric and long term care patients, creating situations in which it is difficult to provide care and for which preventative strategies are challenging.

Health centers and health units were found to have the lowest risk for violence. These are outpatient centers and the patient population seen in these facilities would not be the same as the patient population in acute care hospitals. Services in these facilities are largely for primary health care (the provision of first contact services), as well as for community, and public health services. Patients treated in these facilities are more ambulatory, likely with less severe illnesses and other forms of morbidity than patients in acute care and other facilities.

Occupation

Previous research has collectively found that nursing and direct patient care personnel are the healthcare occupations at highest risk for violence (e.g. Fernandes et al., 1999; Gerberich et al., 2005; Whittington, Shuttleworth, & Hill, 1996; Yassi, 1994). However, few have attempted to investigate the risk among all healthcare occupations typically represented in the health care sector. This study found care aides to be the occupation at highest risk for experiencing violence compared to all other occupational groups, a result similarly found by Findorff et al (2004) who found patient care assistants to be at a higher risk for violence than nurses when adjusting for patient contact. Despite this, few studies have investigated the risk for care aides, even though these workers are employed in a variety of high-risk areas including acute care departments as well as rehabilitation, extended care, and mental health facilities; nor have the specific risk factors that place this group of workers at higher risk for violence been identified. Although it could be hypothesized that care aides are involved in very high-risk tasks where patients feel the most vulnerable. This study began to look at these risk factors and found that care aides

noted more often than RNs or LPNs that they were conducting patient care activities, such as washing or dressing, when the violent event took place.

Health services workers, including occupations such as activity workers, assisted living workers, security officers and porters, were also found to be at an increased risk for violence. Security officers have been previously implicated for risk (Yassi, 1994) but other occupations within the health services category, including activity workers, are often not investigated.

Due to small cell sizes, several occupations including students, doctors, and unclassified and unlisted occupations were included in a group labeled as 'other'. This group was found to have consistent significant increased risk for violence. At this time the specific occupations included in this group that were at highest risk for violence could not be identified; future studies over a longer follow-up period could calculate stable estimates and identify the subgroups at risk within this 'other' category.

Acute Care Department

In the adjusted multivariate model, the only acute care departments that remained significant were the psychiatric and pediatric department. Studies and reviews frequently implicate psychiatric or mental health departments as being high risk (Brinton et al., 2001; Duncan et al., 2001; Gerberich et al., 2004; Hesketh et al., 2003; Yassi & McLean, 2001), which was substantiated in this study, in addition to the pediatric department, which has also been previously found to be at risk by Yassi (1994). Other departments frequently found to be at high risk for violence that weren't substantiated in this study include: the Emergency Department (Benveniste et al., 2005; Gerberich et al., 2004; Kwok et al., 2006) the Intensive Care Unit (Findorff, McGovern, Wall, et al., 2004) as well as general Medical Units (Findorff et al., 2004; Hesketh et al., 2003; Winstanley & Whittington, 2004; Zernike & Sharpe, 1998). Elevated risks were found for these departments in the current study at the univariate level, but were not significant in the final adjusted models. This can potentially be due to small cell sizes, but the loss of significant effects associated with department in the final adjusted model may mean that

what you do (occupation) is more important than where you do it for most workers with the exception of psychiatric and pediatric departments which confer an additional risk independent of occupation. Pediatric patients may be more vulnerable and have less self-restraint when ill, leading them to lash out without realizing that their actions are inappropriate.

Age

The risk of violence increased with decreasing age, which is similar to other studies that have found younger workers to be at an increased risk for violence (Duncan et al., 2001; Gerberich et al., 2004; LaMar, Gerberich, Lohman, et al., 1998). Older workers are likely more experienced at violence intervention and diffusion techniques than younger workers, although this may not be the case in this study population, as this same pattern was not demonstrated when looking at time since hired in the current occupation. Another explanation is that older workers may be less likely to report an incident of violence after experiencing many acts of violence throughout their career.

Time Since Hire

Workers employed in their current position between 1-5 years and 11-15 years were found to be at a significant increased risk for violence, however significance was not found for the intervening years of experience, nor was the test for trend significant. As well, the effect for 1 to 5 years and 11 to 15 years was no longer significant in the model adjusted for peer group. It is unclear why certain groups and not others, compared to the most experienced workers have different levels of risks; these results may be due to the moderate correlation found between this variable and age ($r=0.37$) or perhaps due to chance findings. The fact that this variable loses significance at all lengths of time when adjusted for peergroup may suggest that it is the type and size of facility that puts a worker at more risk for violence rather than the amount of experience a worker has.

Healthcare workers employed for all lengths of time were at a non significant increased risk compared to those working longer than 20 years in their current job which suggests that, like older workers, staff employed for longer may be better able at preventing

violent incidents from happening due to more experience at their job. Gerberich et al., (2005) similarly examined the effect of time since hired in the current position and found a small non-significant decrease in risk per 10 years employed in the current department. This result substantiates the result from this study and suggests that the variable of time since hire in the current position is measuring something different than age as a different risk pattern is seen in each variable.

Work status

Part time workers were found to be at a small increased risk for violence compared to full time workers, which has been formerly found by Hegney et al (2006). One previous study from Duncan et al (2001) found casual job status predicted less emotional abuse than part time or full time status. Part time workers may be at a higher risk than full time workers because there is less continuity of patient care; part-time workers would see the same patient less than a full time worker and may be unfamiliar with a patient's specific needs and likewise, a patient would be less familiar with a part-time worker and the boundaries that worker has. An increased risk was not maintained for casual workers in the final adjusted models suggesting that casual workers may be more like full-time as many work full-time hours, and that risk associated with this status are associated with occupation, department or work setting.

Gender

When adjusted for occupation, this study found that the gender of the worker was not associated with violence. Previous studies that have just looked an unadjusted rate of violence have found an increased rate in male workers (Liss & McCaskell, 1994; McKenna, Poole, Smith, et al., 2003; Vanderslott, 1998). Gender may be confounded with variables such as occupation or department, and as such gender may be less important than the work tasks, healthcare department or facility worked in.

Strengths and Limitations:

There are a few potential limitations of this study. Under-reporting as well as inconsistent and differential reporting patterns may have influenced the results of this study. For

example, certain occupations, departments or units may have different training or policies in place that influence reporting patterns, although it has been previously discussed that underreporting is non-differential or random in nature (Whittington & Wykes, 1996). In spite of this, underreporting is a widely acknowledged problem and limitation in the violence literature (Erickson & Williams-Evans, 2000; Yassi, 1994). Reasons for not reporting include a belief that violence is part of the job, the incident was not associated with a physical worker injury or the incident is not believed to be serious, time constraints, a belief that to report would be admitting performance failure, a lack of management support resulting in no administrative action after an incident is reported, and fear of retaliation (Barrett, 1997; Graydon, Kasta, & Khan, 1994; Lanza, 1992). All these factors will influence the extent and patterns of violent incident reporting.

Due to small cell sizes, variables within this database had to be recategorized. Categorizing this large dataset may have lead to misclassification of some of the data, which could have either strengthened or weakened the risk estimates seen in certain variables. For example, in the occupation category labeled 'other', unlabelled occupations were included in this group. Some potentially high-risk groups may therefore unknowingly be included in this category. However, it is more likely that low risk groups were included in high-risk categories, which would attenuate the risk estimate.

The short time frame resulted in too few incidents to make more finite comparisons, for example, comparing the risk for RN's in acute care compared to RN's in LTC.

Different data collection periods from the four health authorities may have created a bias as one HA was largely sampled in 2004, another largely from 2005, with the remaining HAs straddling 2004 and 2005. It was hypothesized that violence across BC is steadily increasing each year, and this may explain why the risk for HA 4 Authority (data largely from 2004) was lower then the other HA's.

Although not necessarily a limitation, it is important to note that while there is the risk for violence to all workers in the healthcare industry from the public or co-workers, the

reference groups in this study, and subsequently the risk ratio comparisons, are in reference to groups with minimal patient contact. This is especially true for occupational and departmental comparisons.

There are also many strengths of this study and data set. Having information on the entire workforce size for denominator data as well being able to investigate a complete population rather than an individual occupation or healthcare facility is an asset not often seen in previous studies. This study also had detailed information on exposure groups to try to understand the risks by occupation or by place (sector, department, HA, peer group).

Future directions:

A national surveillance system within healthcare would be an important step in gaining a deeper understanding of the risks for violent incidents. As suggested by Lanza et al (2006), databases such as WHITE can look for subgroups of risk, rather than identifying larger risk groups; for example, looking at which subpopulations of nurses are at risk rather than concluding that nurses in general are at high risk. This would begin to help set priorities for prevention efforts. Future studies using WHITE should examine these risks. As well, comparison of rates for similar units/departments from one facility to another will eventually be possible once WHITE has been in place in the BC healthcare system for longer period of time. Future studies using WHITE should also examine its effect at assessing the effects of intervention or prevention efforts and this system can also be used to assess the progress of individual workers after an intervention.

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Chapter 3: Description of the Alert System – Violence Intervention (Patient Risk Assessment) Tool

Stakeholders at Vancouver General Hospital (VGH), a large acute care organization, requested that action be taken to mitigate violence at their hospital. A risk assessment and patient 'flagging' system called the Alert System is one of the steps that Vancouver General Hospital undertook in order to reduce workplace violence.

The Alert System: Background

A program logic model for the Alert System is demonstrated in Appendix III. Logic models visually demonstrate the theory and assumptions underlying the program, connecting the program activities and processes with outcomes (W.K. Kellogg Foundation, 2004). Using a logic model throughout the program helps organize program management, planning and evaluation (W.K. Kellogg Foundation, 2004). The Alert System is an assessment tool for patient risk of aggression. The purpose of this system is to identify patients who are likely to become violent. It was designed to be used by registered nurses to assess patients on the day they are admitted into the hospital or presented to the emergency department. If the patient displays risk factors for aggression a 'V' (referred to herein as a 'flag') is placed in their chart as well as on their wristband. A flag will automatically be initiated if they have one of the following characteristics:

- Have a history of aggression
- Are currently being physically threatening or aggressive
- Are currently being verbally threatening or aggressive

A patient may also be flagged if they display three or more of the following characteristics:

- Shouting/demanding
- Drug/alcohol intoxication/Potential for Withdrawal
- Suffering auditory or visual hallucinations

- Threatening to leave
- Confusion/Cognitive Impairment
- Suspicious
- Withdrawn
- Agitation

Patients are reassessed every three days by nursing staff for risk factors for violence and are also reassessed upon discharge from the hospital; if no risk factors are being displayed the flag will be removed. The Alert System was implemented in April 2003 in response to a Workers' Compensation Board of British Columbia order and is now a component of the VGH violence prevention program. All nursing staff were trained on the use of the tool when the Alert System was first introduced and now, all new nursing staff are trained on orientation. Some results on how workers are using the Alert System at Vancouver General Hospital as well as its effectiveness at correctly identifying patients with a propensity for violence or aggression are presented below.

The Alert System: Mechanism for the reduction of aggressive incidents and resulting injury

The purpose of the Alert System is to warn a health care worker of a patient's potential for violence or aggression before a violent or aggressive incident actually occurs. This warning allows a health care worker the option of taking precautions to prevent or attenuate a violent incident when treating a flagged patient. These precautions potentially include: wearing a personal alarm, having the Code White team nearby, not having sharp objects in the patient's room or not entering the patient's room alone (see schematic below). While this was the proposed use of the Alert System, in actuality this tool is not used in this manner. Workers often do not take all the steps outlined below and sometimes do not assess a patient at all during their hospital stay.

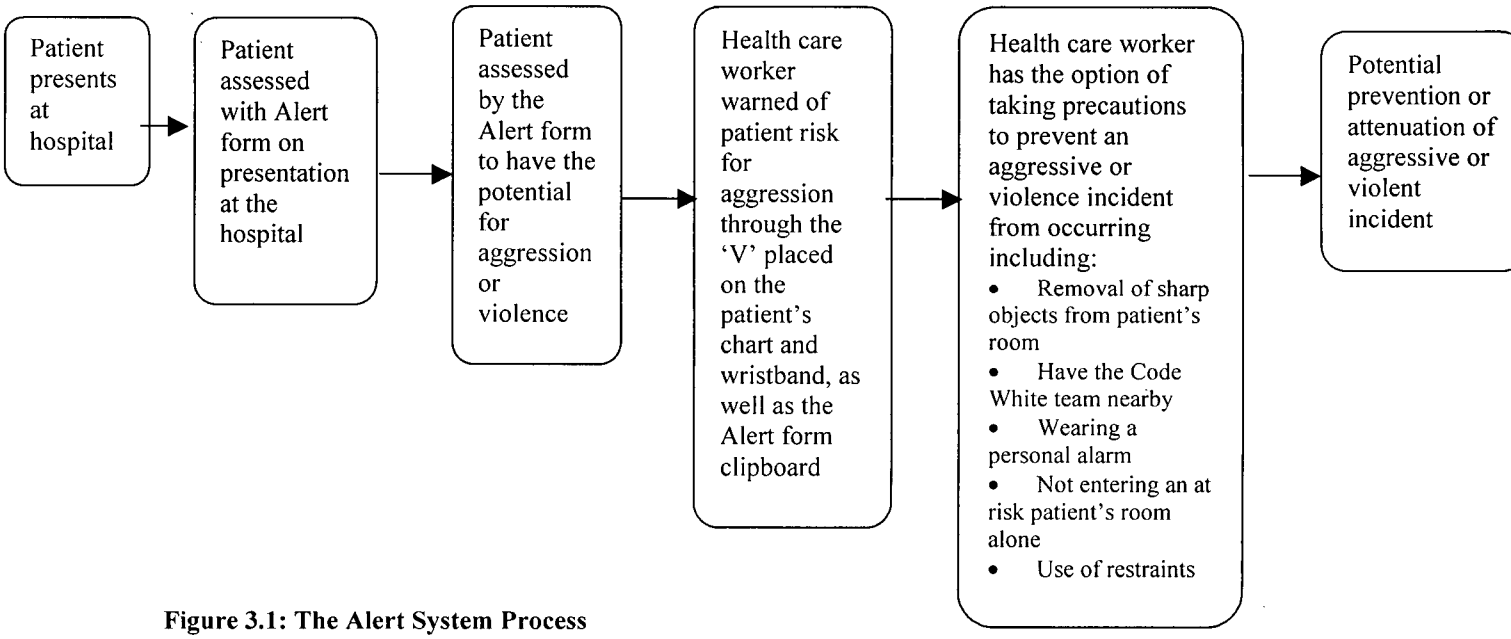

Figure 3.1: The Alert System Process

The Alert System: Previous Research

The implementation of the Alert System has been previously examined (Kling et al., 2006). One hundred seventeen charts for patients with a violent incident between August 1, 2003, through December 31, 2004 were reviewed and compared with 161 charts for patients with no violent incidents, randomly chosen from the same time period. Overall, use of the Alert assessment form for violent and non-violent patients was 75.7% and 35.4%, respectively. In a majority of the case-patients, they were flagged before the incident thus giving workers prior warning of their potential for violence; however, a smaller proportion of case patients were not flagged prior to the violent incident (Table 3.1). The assessment form was found to have moderate sensitivity (71%) and high specificity (94%).

Table 3.1 Use of the Alert System

	Case-Patients (n = 107)	*Control-Patients (n = 161)*
Alert assessment form completed	81/107 (75.7%)	57/161 (35.4%)
Alert assessment form completed in time frame	48/81 (59.3%)	33/57 (57.9%)
Alerted (i.e. 'Flagged' with a 'V' on chart/wristband)	34/48 (71%)	2/33 (6%)
Not Alerted	14/48 (29%)	30/32† (94%)

**Total number of patients was 268.*

†It was not recorded on one patient's chart whether the patient had been flagged for violence.

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[2]Chapter 4: The Use of a Violence Risk Assessment Tool to Prevent Violence in Healthcare

Introduction

Workers' Compensation data suggests that approximately 40% of all violence related workers' compensation claims in British Columbia come from health care workers, although these workers make up less than 5% of the workforce in this province; these workers also lose more days of work due to acts of violence than any other occupational group (WCB, 2000). Unique to the health care sector, many violent incidents occur between workers and patients. Healthcare workers must interact closely with their patients/clients and families, often under the most difficult circumstances for both the workers and the patients.

The high rate of violence in health care, and the impacts it has on the worker, the patient and the workplace, supports the need for greater prevention and intervention efforts (e.g. McPhaul & Lipscomb, 2004; NIOSH, 1996; OSHA, 2003). Studies to date have focused on the effects of a worker education or training program on violence (Arnetz & Arnetz, 2000; Carmel & Hunter, 1990; Cowin et al., 2003; Fernandes et al., 2002; Ore, 2002). The evidence that does exist suggests that education and training programs have generally been successful in reducing violence or aggression in the short term (usually 6 to 12 month follow-up periods); however, some (Arnetz, Ore) have been associated with an increase in violence post intervention, likely due to improved recognition and reporting of incidents post intervention.

Despite the identification of preventive measures for violence specific to health care (see OSHA, 2003), few studies have been published that investigate the effect of these methods on risk reduction. Limited research suggests that, in addition to education and training, security systems and personnel, and video monitors (Lavoie, Carter, Danzl, et

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al., 1988; Lee, Gerberich, Waller, et al., 1999; Rankins & Hendey, 1999) zero tolerance policies (Nachreiner et al., 2005) organizational support (Deans, 2004; Schat & Kelloway, 2003) increased staffing (Lehmann, McCormick, & Kizer, 1999) and carrying cell phones or personal alarms (Gerberich et al., 2005) can be effective in reducing the risk of violence.

In one study (Drummond et al., 1989), a system was implemented where patients who were noted to be at high risk for violence were 'flagged' for the purpose of notifying staff of the potential risk so they could take proper precautions. The flag also included directives for how to interact with the patient and preventive techniques known to work with the particular patient. It was found that for one year after being flagged, these patients had a mean of 90% fewer violent incidents compared to one year previous to being flagged. Similarly, Nachreiner et al (2005) provided some evidence that hospitals with a policy of 'flagging' high-risk patient charts had a decreased risk for violence. Anecdotal evidence suggests that 'flagging' systems are common in healthcare despite the lack of published evidence on their effectiveness. Therefore more studies are needed to assess the usefulness of this method.

Purpose:

The purpose of this study was to investigate the effectiveness of a violence reduction intervention on patient violence in a large acute care hospital in Vancouver. The objectives of this study were to investigate the effect of the Alert System a) on the hospital-wide violent incident rate, as well as on the occupation and department specific rates; and b) on the individual-level risk of patient violence using a case-control study and regression model. For the multi-variable analyses, it is hypothesized the there will be a protective effect with an odds ratio of approximately 0.70 for patients identified as at an increased risk for violence using the Alert System compared to patients not identified as at risk by the Alert System. This result is comparable to the results found by Nachreiner et al (2005).

Methods

The Alert System (Violence Prevention Intervention):

A detailed description and assessment of the Alert System has been previously reported in Kling et al (2006) and in Chapter 3. The Alert System was implemented in April 2003 in a large acute care hospital in British Columbia. It is a risk assessment form used by nursing personnel to assess patients upon admission to the hospital in order to identify those at an increased risk of violence based on patient characteristics such as a prior history of violence, suffering hallucinations, or drug or alcohol intoxication. If identified as at-risk for violence, a flag is placed on the patient to caution staff of a patient's potential for violence before it occurs. The forewarning is intended to allow workers to take precautions to prevent or attenuate a violent incident when treating a flagged patient. These precautions potentially include: wearing a personal alarm, having the Code White team nearby, not having sharp objects in the patient's room or not entering the patient's room alone. While this is the proposed mechanism for use of the Alert System, in actuality it is not always used in this manner. Previous results (Kling et al., 2006) suggest that only a subset of the patient population is assessed using the Alert System upon admission to the hospital and probably represents those already perceived to be at some risk for violence. As a result, the case-control phase of this study was limited to the subset of the patient population that were assessed using the Alert System upon hospital admission to evaluate if those who were assessed and subsequently flagged had a decreased risk of a violent incident compared to those who were assessed but not flagged for violence.

Study design:

This study involved two phases. The first phase was a descriptive analysis and comparison of the rate of work-related violent incidents in the hospital for periods defined as pre-intervention implementation, intervention implementation and intervention continuation periods for the Alert System. Numerator data on violent incidents was obtained from Worker Incident Reports coded for violence available through the Occupational Health and Safety (OH&S) Department database for the period April 1,

2001 to March 31, 2005. Aggregate denominator data on paid hours (defined as hours on the job) was extracted from the Human Resources Department by occupational group, hospital unit and four-week periods for the same follow-up period.

The second phase was a retrospective case-control study to investigate the effect of the Alert System (flag status yes or no) on the risk of a patient violent incident. Eligible cases were all patients with a Patient Incident Report coded for a violent incident between August 1st 2003 to March 31st 2006. These reports are filed with the OH&S Department by the health care worker(s) involved in the patient-related violent incident. The controls were defined as patients from the general patient population who did not have a Patient Incident Report during the study period, matched by gender, month of admission and the hospital unit (e.g. neurology). Cases and controls that had not been assessed using the Alert System upon admission to the hospital were excluded from the study population.

In order to assess 'exposure' (defined here as having been flagged for violence), patient charts were pulled for all cases and controls and reviewed by the principal investigator (Kling) to confirm the patient had been assessed using the Alert System, to determine flag status for violence and the date of assessment. Previous work has demonstrated the feasibility of this chart review approach (Kling et al., 2006). The primary explanatory variable was flag status (yes/no). Cases with a flag assessment date following admission date but on the same day of a violent incident were excluded from the analyses as the temporality of the 'exposure' and outcome were questionable (in other words the Alert System was not used as recommended upon admission and it appeared that the violent incident prompted a subsequent Alert assessment). Cases who were assessed after the violent incident date were also excluded from the analyses. Models were run with and without cases whose admission date, assessment date and violent incident date occurred on the same day to assess the effect of including these questionable cases on the final results given the temporality of the assessment and violent incident were uncertain but plausible, as Alert was used as recommended on admission date.

Patient data on covariates was also collected from the patient chart and included age (continuous variable in years), length of stay (continuous variables in days), and type of diagnosis (categorical variable based on the text based field indicated in the patient's chart). The research database did not include personal identifiers associated with patients. For descriptive purposes data was also available for the matched variables of sex, date of admission and hospital unit.

Statistical analysis:

For the first phase of the study, rates of violent incidents were calculated per 100,000 hours worked. Rates were calculated and compared for the pre-implementation (December 6, 2002-March 31, 2003), implementation (April 1-June 19, 2003) and intervention continuation (June 20-September 11, 2003) periods for the hospital overall, and by occupation group and hospital unit. It is hypothesized that the implementation and intervention continuation periods would be associated with a reduction in the work-related violence incident rate and that this effect would be differential for some occupational groups and hospital units at high risk for violence. To assess the impact of seasonal trends, rates were also calculated for three-month periods for two years before and after the study periods.

For the second phase of the study, Chi-squared tests (Rothman & Greenland, 1998) were used to assess differences in study characteristics by case or control status at the univariate level. Proc Logistic was used in SAS (version 9.1, SAS Institute Inc., 2002) to calculate odds ratios (OR) to assess the univariate association between the flag status, study covariates, and the risk of a violent incident. Multivariate Conditional Logistic regression (using Proc PHREG in SAS) was used to calculate hazard ratios (abbreviated HR) to test if there is a protective effect of the flag status, adjusted for age, length of stay, and diagnoses. Two multivariate models were run – one for all cases defined as having an Alert assessment date that preceded the violent incident date or occurred on the same date but coincided with the admission date. The second model excluded all cases for which the assessment date and violent incident date occurred on the same day.

Power calculation:

For the case-control study, sample size calculations assumed an alpha=0.05, power=0.80 and a 1:4 case to control match ratio. In order to detect an OR=0.50 (protective effect for the intervention of flag status yes), 125 cases were needed; to detect an OR=0.67, 330 cases were needed; and to detect an OR=0.75, approximately 600 cases were needed.

Ethical Considerations:

Ethics approvals for this study were obtained from both the University of British Columbia's Behavioural Ethics Board and the Ethics Committee of Vancouver Coastal Health Authority.

Results

Phase I: Comparison of Violent Incident Rates:

Compared to the three month period prior to implementation, the violent incident rate at the hospital decreased in the implementation period from 1.6 incidents per 100,000 worked hours to 1.1 incidents per 100,000 worked hours, and was maintained in the intervention continuation period; however, an increasing trend was observed after that period although there was fluctuation in the rate depending upon the follow-up period, and the lower rate during the implementation period was consistent with the rate observed during the same three month window (April to June) a year prior to the implementation period. This same overall pattern was observed for rates among high risk departments (psychiatry, emergency, surgery, neurosciences, medicine, extended care unit and intensive care unit [ICU]).

For patient care workers, the rate decreased in the implementation period from 3.26 to 2.01 incidents per 100,000 productive hours but was not maintained thereafter (Table 4.1). This is in contrast to support workers, who saw their violence incident rate increase during this time. This may be suggestive of an effect of the Alert System as the Alert

System is targeted to, and used largely by direct patient care workers and not support workers.

The comparison of rates by three month periods over three years appears to suggest some seasonal or temporal fluctuations in the rates with lower rates observed for many of the April to June follow-up windows (although not observed for the 2001 follow-up window) which may suggest that any observed reduction during the Alert System implementation year may be do to a seasonal or periodic trend in rates; the Alert System may have an effect over and above the trend but this is not clear based on the current analysis and not sustained given the return to prior levels.

Table 4.1 Rate of reported violent incidents per 100,000 productive hours

	Hospital	Occupation		Department	
Date		Patient care workers	Support workers	All high risk[1]	Support/Lab/ Outpatient
April 1-June 21, 2001	2.46	5.54	1.31	4.73	0.27
June 22- Sept 13, 2001	2.45	5.14	1.6	4.2	0.28
Sept 14-Dec 6, 2001	2.17	3.93	1.53	3.4	0.79
Dec 7- March 31, 2002	1.84	3.98	1.26	3.41	0.45
April 1-June 20, 2002	0.97	2.36	0	1.91	0
June 21-Sept 12, 2002	1.29	2.68	0.85	2.4	0
Sept 13-Dec 5, 2002	1.66	3.28	1.34	2.94	0
Dec 6- March 31, 2003 (pre-implementation)	1.62	3.26	1	2.89	0.41
April 1- June 19, 2003 (implementation)	1.09	2.01	1.48	1.27	0.64
June 20-Sept 11, 2003 (intervention continuation)	1.11	2.36	0.76	1.79	0.33
Sept 12-Dec 4, 2003	1.77	3.34	0.35	2.06	1.3
Dec 5-March 31, 2004	2.45	4.81	1.4	3.63	0.25
April 1-June 17, 2004	1.46	3.08	0.4	1.61	1.46
June 18- Sept 9, 2004	1.61	2.93	1.13	2.17	0.35
Sept 10-Dec 2, 2004	3.56	6.45	2.79	4.31	1.67
Dec 3-March 31, 2005	2.66	5.1	1.49	3.21	1.6
April 1-June 16, 2005	3.43	6.65	1.11	5.52	0.92

[1] All high-risk departments: Psychiatry, Emergency, Neurology, Medicine, Extended Care, and Intensive Care

Results Phase II: Case control Study:

A total of 173 cases and 634 controls (total N=807) were included in the study, for a final matching ratio between cases and controls of 1: 3.7. Two hundred and fifteen cases were originally identified; 42 were excluded because they were not assessed at all by the Alert System, and an additional 15 were excluded because they were assessed after the violent incident. An additional 50 cases were assessed the same day as the violent incident and the temporality of the flag and the violent incident could not be determined. In the first univariate and multivariate model all these cases were removed for a total of 109 cases. Of the 50 cases where temporality could not be determined, a subset of 11 of these cases, where the violent incident and assessment occurred on the same day as admission were added to the second univariate and adjusted models for a total of 129 cases. Of the control patients (selected because they matched on gender and unit), 219 had to be excluded post hoc because they were not assessed by the Alert System. To investigate if cases or controls were differentially excluded, chi-square tests found no significant differences between cases and controls in the final study sample on the matched variables of gender, admission date, admission unit (Table 4.2). Significant differences were found between cases and controls for non-matching variables of age, length of stay in the hospital, and diagnosis (Table 4.3).

Table 4.2 Characteristics of Matching Variables

Matching variables	**Case (n %)**	**Control (n %)**
Gender*		
Male (reference)	132 (76.3)	482 (76.0)
Female	41 (23.7)	152 (24.0)
Hospital Unit*		
Acute Medicine (reference)	42(24.3)	168(26.5)
Psychiatry	56(32.4)	207(32.6)
Emergency	15(8.7)	75(11.8)
Neurology	7(4.0)	33(5.2)
Surgery, Day bed	32(18.5)	69(10.9)
Spine/Orthopedics/ Burns and plastics	8(4.6)	38(6.0)
Intensive Care/Palliative	6(3.5)	14(2.2)
Tuberculosis/respiratory	7(4.0)	30(4.7)

*p>0.05 Chi-Square

Table 4.3 Univariable and Multivariable Logistic Results for Case-Control Study of the Effect of Prevention Program on Risk of Patient Violence

Study variable	Case (n %)	Control (n %)	Univariate1[2] OR (95% CI)	Univariate2[2] OR (95% CI)	Multivariate[2] HR (95% CI)	Multivariate[2] HR (95% CI)
Covariates						
Age-mean years*	49.7	52.5	0.98(0.97-0.99)	0.98(0.97- 0.99)	0.98(0.97- 1.00)	0.98(0.97- 1.00)
Length of Stay-mean days*	27.1	11.5	2.67(2.14-3.31)	2.15(1.79- 2.57)	2.33(1.84- 2.95)	1.87(1.53- 2.29)
Diagnoses[1] *						
Internal/medical/ (ref)	48(27.7)	228 (36.0)				
Mood/personality disorder	25(14.5)	111 (17.5)	2.71(0.87-8.35)	3.27(1.28-8.33)	2.81(0.79- 9.94)	3.29(1.14- 9.50)
Schizophrenia/psychiatric disorder due to drugs	44(25.4)	114 (18.0)	3.80(1.31-11.05)	4.71(1.94-11.43)	1.49(0.42- 5.28)	2.06(0.72- 5.87)
Neurological	20(11.6)	34(5.4)	5.31(2.21-12.78)	4.61(2.12-10.0)	3.12(1.09- 8.97)	1.86(0.73- 4.74)
Trauma	15(8.7)	48(7.6)	1.30(0.33-5.02)	1.84(0.64-5.34)	1.08(0.20- 5.65)	1.54(0.42- 5.56)
Other-major illness/cancer	21(12.1)	99(15.6)	1.22(0.56-2.63)	1.33(0.66-2.70)	0.79(0.30- 2.08)	0.64(0.28- 1.48)
Alerted (assessed as high risk for violence)*						
No (reference)	53 (31.0)	564 (89.4)				
Yes	120 (69.0)	67 (10.6)	9.90(6.16-15.92)	10.49(6.85-16.06)	6.28(3.68- 10.71)	7.74(4.81- 12.47)

*Chi Square significant difference at $p<0.05$; T-test significant difference at $p<0.05$

[1]Categorized into groups of similar diagnoses due to small cell sizes

[2]The first set of univariate models and multivariate model includes cases where assessment date occurred before the violent incident date. The second set of models adds additional cases where admission, assessment, and the violent incident occur on the same date.

Regression Analyses:

Alert Status

Being flagged following an assessment was associated with a 10-fold increased risk of a violent incident compared to those who were not flagged in the univariate model (Table 4.3). The effect was stronger in the model that excluded cases where temporality was an issue. The effect was reduced in the models that adjusted for covariates such as length of

stay and diagnoses but was still significantly elevated with odds ratios of 6.28 and 7.74 respectively for the two study samples.

Covariates

An increase in patient age of one year was associated with a 2% decrease in the odds of a violent incident at the univariate level (OR=0.98). This effect remained in the final adjusted model.

Length of stay, when entered as a continuous variable, was found to have a significant two-fold increase in risk of violence per day of a patient's hospital stay at the univariate level. This variable remained significant at almost the same level of risk in all adjusted models.

Patients diagnosed with a neurological disorder were found to be significantly associated with violence in all univariate levels with an approximate three-fold increase in the odds of an incident compared to patients with an internal medical diagnosis (e.g. having a respiratory or digestive disorder). Having a diagnosis of schizophrenia or a psychological disorder due to drug use was also found to be significant in all models compared to internal medical diagnoses, with an HR=3.8 and 4.7 respectively in the univariate models. Having a neurological diagnosis, compared to internal medicine diagnoses, remained significant in the adjusted model that included cases that were assessed and violent on the same day (HR=3.1) but not when these cases were excluded from the adjusted model. Being diagnosed with schizophrenia did not remain significant in any of the adjusted models but having a mood or personality disorder was elevated in the adjusted models and significant in the model that excluded cases where temporality was an issue (HR=3.3).

Sub analyses - Time to incident:

For all patients with a violent incident, the mean length of time before the incident was investigated to assess, at the descriptive level, if being flagged by the Alert System may delay the incident from happening compared to patients with a violent incident who were

not flagged by the Alert System. For all patients with a violent incident regardless of flag status, the mean length of stay between admission and violent incident was 14.3 days (Table 4.4). For patients who were flagged, there was a longer mean length of stay prior to their incident (15 days) compared to patients were not flagged (13 days). Longer lengths of stay before the violent incident in flagged patients compared to non-flagged patients were seen in patients diagnosed with schizophrenia, and internal medical disorders but not in any of the other diagnoses. In high-risk departments (psychiatry, emergency, neurology, TB) there was a longer length of stay before the violent incident in flagged patients compared to non-flagged patients (17 compared to 7 days); however this was not seen in lower risk departments (surgery, spine/orthopedics, ICU, medicine). Although longer lengths of stay before the violent incident were observed in certain categories, any delay appears to be associated with a longer length of stay in the hospital. T-tests found no significant differences between any mean lengths of stay before the violent incident or between any mean lengths of stay in the hospital in alerted versus non-alerted patients.

Table 4.4 Mean length of stay before the violent incident in case patients

	Alert System Status Mean length of stay in days between admission and violent incident *		**Alert System Status Mean length of hospital stay in days ***		**Alert System Status Number of cases**	
	Alerted	**Not Alerted**	**Alerted**	**Not Alerted**	**Alerted**	**Not Alerted**
	Mean	**Mean**	**Mean**	**Mean**	**N**	**N**
All	15	13	33	28	64	45
Diagnosis Type						
Mood/personality disorders	8	9	14	23	7	13
Schizophrenia	14	4	33	30	22	6
Internal/medical	23	14	46	20	16	13
Neurological	13	13	34	32	9	6
Trauma	11	24	34	56	2	3
Other-major illness	10	33	25	36	8	4
Department						
High risk[1]	17	7	35	26	39	23
Low risk[2]	11	19	30	30	25	22

* All T-tests non -significant at $p<0.05$

[1]High risk departments: psychiatry, emergency, neurology, TB

[2]Low risk departments: surgery, spine/orthopedics, ICU, medicine

Discussion

Phase I: Comparison of Rates:

This study found a decrease in the overall hospital rate of violence during the Alert System implementation and post three-month implementation periods compared to the pre-implementation period, but the rate returned to pre implementation levels within 6 months and it is not clear if the observed decrease can be attributed to the implementation of the Alert System or natural variation in the rates. However, the observed decrease if attributable to the Alert System was not maintained over the longer term. The subsequent return to pre-implementation rates (and even higher) may be the result of increased reporting due to more awareness and understanding of patient violence gained in the Alert System training courses, or it could represent a lack of use of the program after an initial heightened awareness of the program, a common intervention effect reported in other studies (e.g. Fernandes et al., 2002). Generally, it was difficult to tease apart the effect of the intervention over a potential periodic increasing then decreasing rate trend observed, but any potential effect of the Alert System may need to include regular update training and awareness to ensure the observed benefits in the implementation period are sustained.

Phase II: Intervention study:

Contrary to our hypothesis, being flagged by the Alert System was not found to be protective against violent incidents unlike previous studies that have assessed 'flagging' systems (Drummond et al., 1989; Nachreiner et al., 2005); rather, being flagged was associated with a significant increased risk for violence after adjustment for known risk factors. This finding suggests that the Alert System may be very good at correctly identifying (i.e. flagging) those patients at risk for a violent incident, but as an intervention system it does not provide the resources or procedures needed by health care workers to prevent a patient from progressing to a violent incident once flagged. An alternate explanation may be that the Alert System changes how workers interact with patients and increases the likelihood the patient will become violent, perhaps by

increasing a workers anxiety about working with a flagged patient; there may have been increased reporting for flagged patients; or, the flag may create a false sense of security in workers.

As discussed in Nachreiner et al (2005), organizational culture may impact a workers behavior and how they respond to violence policies (OSHA, 2003). It may be that the Alert System works in correctly identifying high-risk patients, but if management or supervisors do not support the use of the Alert System or prevention measures for high-risk patients then individual workers may be less willing to take precautions. It may also be that the work environment does not provide some of the resources recommended for reducing the risk of violence among high-risk patients such as the continual presence of staff highly trained in physical and verbal de-escalation (Ore, 2002). Alternately, workers may be taking all the appropriate steps, but it may not be possible to prevent all violent incidents among high-risk patients, especially patients with neurological, psychiatric or traumatic injuries. A recent qualitative study substantiates that this may be happening as workers reported that they plan violent prevention interventions when treating high risk patients even though these patients may go on to be violent (Pryor, 2006).

Although the Alert System does not appear to have a protective effect for violence, previous focus group data from healthcare workers at this hospital (see Kling et al., 2006) suggest that workers still find this system useful. Participants reported that they like the risk communication aspect of this system; before the Alert System, workers only communicated risk of patient violence through word of mouth. The Alert System allows workers to be more readily aware of the potential risks when treating flagged patients. Although not the focus of this study, it is possible that the Alert System may not reduce the number of incidents but rather the severity of incidents including the severity of physical and emotional injuries incurred by the health care workers. Employee Incident reports are limited with regards to data fields on severity although future work could investigate the risk of workers' compensation claims resulting in lost work time. Workers also find it helpful when a patient is flagged after a violent incident, because there is a greater chance of them becoming violent again. Participants also made it clear

that although they are taking precautions, a flag does change how they interact with a patient by changing the way they may care for that patient. They noted that, for example, they won't put flagged patients in a private room, but they will put the patient where there are more people around, empty the room of sharp objects or other hazards, or have security on standby when treating high risk patients, which may help with secondary prevention of the severity of an injury. These comments from workers advise that a multifactorial process for the assessment and prevention of violence may be warranted.

This study identified other risk factors associated with violence. The risk of violence increased with increasing length of stay in all models. A previous study from Lee et al (1999) found that patients admitted to the hospital for 1-4 weeks, compared to patients admitted for 1 day, had an RR=8.8 for being violent. Patients with longer lengths of stay may be more ill and stressed over their condition or stressed over being away from home for so long, which would contribute to the risk of violence. Also, a longer length of stay may give a patient with violent tendencies more opportunities to act out as a result of more interactions with health care workers.

The age of a patient no longer remained significant in any of the adjusted models. This is likely due to adjusting for patient diagnosis in the models because certain diagnoses, such as cancer, are age related. Similarly, in a model adjusted for unit and gender, Chou, Lu, & Chang (2001) also found that the age of a patient was no longer associated with violence.

Studies in acute care hospitals typically identify patients with psychiatric conditions or altered mental states to be at an increased risk for violence (e.g. May & Grubbs, 2002; Whittington, Shuttleworth, & Hill, 1996; Zernike & Sharpe, 1998). This study was able to distinguish between two categories of psychiatric disorders: mood/personality disorders and schizophrenia, which few studies have done. Clinicians and researchers felt that it is important to distinguish between psychiatric disorders as they do not want to perpetuate a belief that all psychiatric patients are violent. Two of the adjusted models found an increased risk for violence among patients diagnosed with a mood or personality disorder. A review on psychiatric long-term care patients by Flannery (2001)

suggested that female patients diagnosed with a personality disorder might be at an increased risk for violence. However this finding has not been duplicated in studies on acute care populations. Previous studies that have been able to distinguish between psychiatric diagnoses found that schizophrenic patients (Tam, Engelsmann, & Fugere, 1996) and patients with drug or alcohol intoxication (Flannery, 2001; Tolhurst et al., 2003) are more likely to be violent, however, this was not substantiated in this study. One adjusted model also found that patients with a neurological disorder, including brain trauma or dementia, were more likely to be violent. It is well known in the medical literature that brain trauma and dementia are associated with violence and aggression (Galski, Palasz, Bruno, et al., 1994; Pryor, 2006; Pulsford & Duxbury, 2006).

In the adjusted models, patients with schizophrenia were no longer at an increased risk for violence. Being flagged may lower the risk of violence in schizophrenic patients. Although length of stay may also have influenced this outcome as people with schizophrenia have a longer length of stay on average.

Length of stay before violent incident:

We subsequently investigated if Alert might have an effect on the length of time between admission date and date of violence incident among the violent cases as a result of workers taking measures to stop the incident from happening. Due to small cell sizes this study was unable to assess the effect the Alert System had on the severity or costs due to violence, but we investigated at the descriptive level if this had merit and might be worthy of investigation in more detail in future studies. The average length of stay in all violent patients before the incident was 14 days, however this is in part driven by several patients with lengths of stay of over 50 days before the violent incident. This contrasts with a mean length of stay of 3.1 days before a violent incident in another study in an acute care hospital (Winstanley & Whittington, 2002). This difference may be a result of identifying cases in the current study associated with an incident report, which may have identified more serious incidents, while Winstanley & Whittington (2002) used a third party observer to identify any incident (not just those reported) which would tend to capture a wider range of incidents. In the current study, cases that were flagged for

violence had a longer period of time between admission and violence (2 days on average, although not statistically different) compared to cases that were not flagged. This suggests that there may be some benefit associated with the Alert System but procedures to ultimately prevent any violence may be limited among patients at highest risk of violence. In particular, the cases (and controls) for this study were a subset of the patient population who may have been at the highest risk for violence having been assessed for violence upon admission. Given the Alert System is not used systematically for all patients, health care workers are probably pre-selecting at-risk patients for assessment based on a perception of violence risk or prior history of violence. Health care workers may not feel it is necessary to go through the assessment process for patients who are generally considered low risk, especially with time constraints.

There was a delay in the violent incident of 10 days on average in flagged patients admitted to high-risk departments (psychiatry, emergency, neurology, TB/respiratory) compared to non-flagged patients in high-risk departments. This delay was not seen in lower risk departments (surgery, spine care/orthopedics, ICU, medicine), and, in fact, there was an eight-day delay in violent patients not flagged by the Alert System compared to those who were flagged in these departments. This difference may be due to the differences in the patient population in these departments as well as preconceived notions workers have about these patients. Previous qualitative data from focus groups collected from this hospital (see Kling et al., 2006) suggests that workers distinguish between two types of violent patients: 1) patients who are repetitively violent, i.e. patients who fit the profile of being repetitively violent such as those with a history of aggression or drug or alcohol intoxication; and 2) patients who are more randomly violent such as those with dementia or someone confused and agitated after coming out of anesthesia. Patients in the first category are most likely to be admitted to the high risk departments while patients in the latter category are more likely to be admitted to low risk departments. This delay in flagged patients admitted to high-risk departments might be because workers are more likely to pay attention to a flag in these departments. The focus groups suggested that workers do not like flagging patients they would put in the randomly violent category and pay less attention to the flag because violence is more

random, and less easy to predict or control in this population. No delay was found in the low risk departments because workers either did not or could not take preventative measures to stop violence in these patients. If preventative measures are being taken they are either happening more often, or are more successful in high-risk departments. Workers should be encouraged to take steps to prevent violent incidents from randomly violent patients if methods exist, or if not, research should identify methods that are successful in preventing violence in these patients.

Limitations:

There are several study limitations that may have influenced the outcome of this study. With respect to phase 1 of this study, violent incident rates may be inaccurate due to the widespread under reporting of violent incidents (Wells & Bowers, 2002; Yassi, 1994), however this would not affect the trend in the incident rate. This study saw violent incident rates decrease during the Alert System implementation period then subsequently increase and it couldn't be assessed if this is due to heightened reporting or violent rates returning back to normal levels or potentially the rate changes were due to natural trends. Also, cell sizes were too small to assess this limitation through looking at individual departmental rates.

Reporting patterns may have influenced this study. Being flagged may have increased the risk for violence, but this may also increase a worker's likelihood to report the incident if a patient is flagged. This study identified cases through reports for patient violence, therefore if workers are more likely to report violence for flagged patients, this is differentially increasing the population of flagged cases in this study.

There appeared to be a bias towards assessing patients at higher risk for violence (completion of Alert assessment process) rather than the entire acute care population, and results can only be applied to similar patient populations. It may be that the process of this system is more successful when used for the entire patient population rather than very high-risk populations. Through assessing the entire population, the Alert System

may flag more medium level risk patients for whom intervention efforts may be successful.

This study also could not assess if the worker took any precautions to prevent an incident in flagged patients. Future studies on flagging/flagging systems should take this into account and should also document what precautions are most effective at preventing violent incidents.

Despite the limitations, this study improves from previous intervention studies. This is one of the few studies that have attempted to address study power. The case control methodology allowed the identification of a highly comparable group of control patients rather than a convenience sample through matching cases to controls by unit of admission. Also, by using administrative data, biases inherent in using questionnaires were eliminated.

Conclusion

This study did not substantiate previous studies that have found that 'flagging' systems decrease the risk of violence. However, the decrease in the violent incident rate in the intervention implementation period, as well as the delay in violent incidents in flagged patients and focus group feedback, suggest that the presence of the Alert System is having an effect on violence at this hospital. This system is successful in identifying those who go on to become violent but the hospital needs to think about how best to intervene once these patients are flagged. Assessing the violence risk of a patient, and flagging or flagging high- risk patients are easy steps to take during the admission process, and workers have communicated that this system is important for increasing awareness and communication around patient risk of violence. Therefore it is suggested that this process continue as part of the violent prevention program, but as part of a more multifactorial violence prevention strategy such as one advised by OSHA or WorkSafeBC who propose a 5-step model for the prevention of violence in healthcare through the creation of a violence prevention program (OSHA, 2003; WCB, 2000).

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Chapter 5: Discussion and Summary

Summary of Key Findings

The purpose of the two preceding studies was to identify factors associated with the risk for violence in the healthcare sector in British Columbia. The first study used an injury surveillance system, applied in four of the six BC health authorities, to identify risk factors for violence province-wide. The second study investigated the effectiveness of a violence risk assessment system in reducing the risk of violence in an acute care hospital in BC.

The first study identified three groups at particularly high risk for violence in British Columbia: care aide occupations, pediatric departments in acute care hospitals, and very small healthcare facilities. The second study found that being flagged as high risk for violence by a risk identification tool was associated with an increased risk for violence in patients, after adjustment for demographic and diagnostic characteristics. Being diagnosed with a mood/personality disorder or a neurological disorder, and having a longer length of stay in the hospital were also associated with an increased risk of violence. This study suggests that it is possible to pre-identify patients at high risk to become violent, but that effective methods of preventing violence in this population is either not known or is not being used for these high-risk patients.

Both studies substantiate that violence in healthcare is widespread and is not contained to groups consistently shown in the literature as being high risk. It is clear that psychiatric hospitals and patients are at an increased risk for violence and as such, there is a wide literature base that focuses on these groups (e.g. Flannery, 2005). Research is continually needed, in all areas of healthcare where workers interact with patients, which seeks to identify and eliminate factors that put workers at risk.

Risk factors for violence do not exist in isolation; rather, they are part of a series of interacting factors at multiple levels (individual, workplace, industry) whose ultimate outcome is a violent incident. Many of these interacting factors are included in the conceptual model in the introduction chapter. This study strengthens the validity of this model by substantiating that many of the factors included in this model are indeed associated with violent incidents. This study found that larger, organizational factors identified at the top of the model are associated with the occurrence of violence. Certain Health Authorities, healthcare sectors (long term care and acute care), healthcare facilities (very small facilities, extended care facilities, and mental health facilities), and acute care departments (psychiatric and pediatric) were found to be at an increased risk for violence. Also identified were certain worker characteristics that influence the risk of violence. Increased risks for violence were found for: younger age of the worker and moderate to high levels work experience. Unlike many studies, this study did not substantiate that the gender of the worker influences the risk for violence. If this continues to be found in other studies, it may be warranted to remove this factor from the model. Other risk factors associated with the worker that were included in this model are: worker occupation (e.g. care aides, LPNs, RNs), work status (part time workers) and work task (e.g. patient handling). This study also substantiated certain patient characteristics included in the model as leading to an increased risk for violence: younger age, mental health and neurological diagnoses, and a longer length of stay. Like the gender of the worker, patient gender was not found to be associated with the risk for violence. This study also examined the mediating effect of an administrative control, a patient 'flagging' system on the risk of violence and found that it successfully identified patients who would have a violent incident but did not prevent the incident itself. .

Although this study examined many factors included in the conceptual model, this model demonstrates the importance of understanding how they work together to influence the outcome of violence. Future studies should continue to assess the interacting effect of the risk factors identified in this model, as well as understanding how the risk mediators influence outcomes of violence other than incidents or injury. Also, despite a fairly integrated and comprehensive model, violence is still pervasive and on the rise and there

is a need for a more systematic approach to the problem such as the occupational hygiene paradigm.

Recognition, Evaluation and Control of Violence in Healthcare

Identifying and eliminating risks is an integral aspect of the occupational hygiene paradigm of 'recognition, evaluation, and control' of workplace hazards. Through these steps, the specific factors that lead to or cause a worker's exposure, as well as information on the workplace processes that influence exposure are identified. This information is assessed for the selection and application of appropriate exposure control strategies. Completing the steps of recognition, evaluation and control to assess risks to workers are necessary in healthcare because worksites in this industry, as well as related occupations, vary in purpose, size, and complexity. Because of this, risks will also vary. Workplace violence control strategies should be designed to specifically target the unique nature and varied needs of each organization (WCB, 2000). The steps of this paradigm can be illustrated through steps taken in the current study as well as in findings from the published literature.

Recognition:

The step of recognition involves the identification of potential hazards to workers in the workplace. Identifying violence as a problem in healthcare can be done through many methods including: worker complaints, third party observation or walk-throughs, focus group discussions and using occupational health monitoring systems such as injury reports, provincial reporting systems, or Workers' Compensation data. In this step it is also important to document the outcomes of violence.

Violence in healthcare is widely recognized as being a problem, with articles published, dating back to the 1960's, that discuss violence as a risk factor in hospitals and healthcare (Ekdawi, 1967; Lange, 1966). Current estimates suggest a range in prevalence of violence in all healthcare workers to be between 20-91% (Alexander & Fraser, 2004; Fernandes et al., 1999; Shamian & Villeneuve, 2000) with the variance dependent upon

the definition of violence and the reporting time period. In British Columbia, it has been reported that over 40% of violence-related workers' compensation claims occur among healthcare workers (WCB, 2000). The current study found a province-wide rate of violence in the healthcare sector of 1.52 violent incidents per 100,000 worked hours with the rate jumping to a high of 8.3 incidents per 100,000 worked hours in psychiatric departments of acute care hospitals.

In addition, the outcomes of violence are also well recognized and documented. The outcome of a violent event can be manifest in a number of ways in a worker ranging from injuries, workers' compensation costs and time-loss (Lee, Gerberich, Waller, et al., 1999; Liss & McCaskell, 1994; WCB, 2000) to psychological trauma and presenteeism (Mezey & Shepard, 1994) and wanting to leave the profession (Fernandes et al., 1999). Violence has also been shown to reduce the quality of care given to patients (Arnetz & Arnetz, 2001; Duncan et al., 2001). These effects can be considerable to the worker, patient and organization. Within the recognition step it is important to assess if a hazard poses an actual risk to workers; a hazard may exist but if it does not affect workers then it is not necessary to control that risk. However, it is clear that there are significant risks associated with violence.

Recommendations:

Even though the frequency of violence in the healthcare sector is acknowledged, it is still necessary to keep track of violence rates and patterns: through the use of ongoing, population-wide surveillance, rates can be tracked over time and compared in order to identify high rates or patterns in the rates. It is also necessary, as demonstrated by this study, to examine and compare rates at the level of the health authority, and major groupings of facilities, occupations, and departments, in order to study the major trends and risk areas, but also at the level of individual facility, occupation and department so that individually high risk areas can be targeted for further study. Surveillance systems can also be used to monitor the effect of local or broader policy and procedural changes that may not have been specifically put in place to address violence but may have had a resulting effect.

Evaluation:

Once a potential risk is documented as a hazard to workers, the evaluation step is then taken to assess the nature and extent of the hazard; whom it affects, factors that influence workers exposure, and the outcomes of being exposed to that hazard. These hazards can be assessed through many methods such as: expert inspection of the workplace; qualitative methods including worker interviews and focus groups; and quantitative methods such as surveys, workplace incident reports or workers' compensation data, and examining current policies and procedures. Through these methods, numerous risk factors have either been shown scientifically or identified by experts as associated with an increased risk of violence. Table 1 summarizes identified risk factors; separated by worker population, study method, and setting.

Table 5.1 Summary of risk factors for violence in healthcare

Citation	Study population	Patient risk factors	Employee risk factors	Facility/Department/ location risk factors	Policy/ Environment/ other risk factors
Questionnaire					
Anderson (2002)	Acute care	Drugs, gangs			Poor staffing, long hours worked, no training, easy access to triage; Hospital location
Gerberich, Church, McGovern, Hansen, Nachreiner, Geisser et al. (2004)	Population based	Geriatric patients	LPNs, male workers	Nursing home/long term care facility; intensive care, psychiatric/ behavioural or emergency.	
Gerberich, Church, McGovern, Hansen, Nachreiner, Geisser et al. (2005)	Population based			Emergency and psychiatric department; nursing homes or long-term care facilities	Each additional hour of shift duration; environments not "bright as daylight"
Lee, Gerberich, Waller, Anderson, & McGovern et al. (1999)	Population based	Mental illness; patients with more than 1- to 4-week and more than 4-week lengths of stay	The perception that administrators considered assault to be part of the job; having received assault prevention training in the current workplace		A high (>5) vs. low (<2) patient/ personnel ratio

Citation	Study population	Patient risk factors	Employee risk factors	Facility/Department/ location risk factors	Policy/ Environment/ other risk factors
Lanza, Kayne, Hicks, & Milner (1994)	Acute and psychiatric			Ward corridors and dayrooms	Crowding rather than total number of patients per ward; Most assaults occurred during meal times and afternoons
May & Grubbs (2002)	Emergency and ICU	Cognitive dysfunction, patients, substance abuse			
Chou, Lu, & Chang (2001)	Psychiatric	History of aggression, psychotic disorder, shorter time since admission	Younger age, no training in prevention of assaults		
Arnetz, Arnetz, & Soderman (1998)	Acute hospital	Practical nurses			
Findorff, McGovern, Wall, Gerberich, & Alexander (2004)	Acute hospital	Patient care assistants, Moderate and high patient contact.			
Whittington, Shuttleworth, & Hill (1996)	Acute hospital	Younger age, shorter National Health Service experience and attendance at violence training	Postoperative confusion, receiving treatment and delayed treatment		
Winstanley & Whittington (2004)	Acute hospital	Staff nurses		Medical department, surgery, Accident and Emergency	
Fernandes, Raboud, Christenson, Bouthillette, Bullock, Ouellet et al. (2002)	Emergency department		History of aggression; chemical dependency, intoxication, or withdrawal; loss or grief; physiologic factors (e.g., hypoxia, electrolyte imbalance, head injury); and psychological factors (e.g., dementia and psychosis)		
Lehmann, McCormick, & Kizer (1999)	VA center	Nursing personnel	Diagnosed as having psychoses, substance use disorders, or dementia	Psychiatric units, long-term-care units and admitting or triage areas	
Tolhurst, Baker, Murray, Bell, Sutton, & Dean (2003)	Rural general practitioners		Drug and alcohol intoxication and psychological disorders		
Administrative data					
Boyd (1995)	Population based	Nurse's aides		Acute care and long term care hospitals	

Citation	Study population	Patient risk factors	Employee risk factors	Facility/Department/ location risk factors	Policy/ Environment/ other risk factors
Benveniste, Hibbert, & Runciman (2005)	Population based		Mental health conditions, dementia	Mental health units and emergency	
Islam, Edla, Mujuru, Doyle, & Ducatman (2003)	Population based	Night shift workers			
Tam, Engelsmann, & Fugere (1996)	Psychiatric		Schizophrenia	Locked inpatient unit	During the daytime, after the first week of admission
Yassi (1994)	Acute care	Psychiatric nurses, male staff members and security personnel			
Current study	Population based	Care aide		Very small hospitals, pediatric departments	
Current study	Acute care		Mood/personality disorders, neurological disorders, longer lengths of stay		Flagged as a high risk patient to become violent
Reviews					
Distasio (2000)	Home Care		Psychiatric diagnosis, dementia, legal status, and previous history of violence		
Gates, Fitzwater, & Meyer (1999)	Long term care	Patient care tasks: bathing, changing, dressing, feeding and turning			
Flannery (2004)	Psychiatric	More experienced nurses	Psychiatric diagnosis		
Flannery (2005)	Psychiatric		Excessive sensory overload, and provocation by others		Staff restrictions on patient behaviors, denial of services
NIOSH (2002)	General		Drug and alcohol use	Transporting patients	Understaffing, long waits for service, lack of staff training, lack of violence prevention policies, inadequate security, poor environmental design, unrestricted movement of the public within the healthcare setting, working alone,
Simonowitz (1996)	General		Young and male patients		Shortage of trained staff, isolated work with clients

Citation	Study population	Patient risk factors	Employee risk factors	Facility/Department/ location risk factors	Policy/ Environment/ other risk factors
Wells & Bowers (2002)	General Hospital	General nurses			
Yassi & McLean (2001)	General		Patients who refuse to follow hospital rules, patients frustrated over illness	Waiting room in emergency	Understaffing, wait times, absence of security personnel
Risk assessments: multiple methods					
Brinton, Boyd, Cheveldave, Govorchin, Hudson, Logie (2001)		Staff who attend to patients; code white and security teams; other staff (lab and diagnostic)		Emergency and psychiatry	

Common risk factors identified from these studies that are associated with an increased risk for violence include being a member of the nursing staff; psychiatric nursing staff, patients or departments; and under- or inadequate staffing. Risk factors that are consistently identified regardless of differences in study designs lend credence to these as important factors, but many risk factors may be specific to the different types of work environments in health care given the numerous risk factors identified. The current study additionally found, using administrative data, that risk factors for patient violence examined for all settings and healthcare workers include: care aide, very small hospitals, and pediatric departments. Risk factors identified in an acute care hospital included: being flagged as a high-risk patient to become violent, patients with mood or personality disorders, patients diagnosed with a neurological disorder, and patients with longer lengths of stay in the hospital.

Even though numerous risk factors have been identified, more study in this area is warranted. Risks are not static and are influenced by interactions among the environment, patient, worker, and organization. Furthermore, study biases including inconsistent definitions of violence, lack of reporting, and poor sample sizes make it difficult to extrapolate or compare risks. Future knowledge would benefit from publications using a risk assessment methodology. A complete risk assessment is one of the most reliable methods of identifying risk factors. This process uses many study methods in order to

identify risks, which can then help reduce biases inherent in using only a single study methodology. Only one unpublished study to date (Brinton et al., 2001) has been identified that completes an entire risk assessment to target the most at-risk populations. Future studies should duplicate this method to help in accurately identifying the most important risks to workers.

Recommendations:

The purpose of identifying risk factors for violence is so that they can be targeted in order to implement interventions. Based on the risk factors identified above, control measures should be aimed at addressing violence related issues applicable to nursing staff; psychiatric nursing staff, patients or departments; pediatric departments; and very small health facilities.

It is important for workers and policy makers to be aware of the broad range of risks, but also specific risk factors associated with the type of health care workplace, the department or unit and occupational groups. Future studies looking to identify and eliminate risk factors that contribute to an increase in violence should adopt the model used by Brinton et al (2001). Control measures are often costly and time consuming therefore it is important to identify and target factors that would be most effective in reducing risks in each individual situation.

Control:

Hazard control is one of the primary goals of occupational hygiene. WorkSafeBC, the provincial workers' compensation system, states that 'When risks of injury from violence are identified, the OHS Regulation requires employers to eliminate them. If that is not possible, employers must put in place policy, procedures, and work environment arrangements to minimize the risk to staff' (WCB, 2000); in other words, where risks are identified, it is necessary to diminish these risks through the use of control measures. This step involves looking at options for control measures for each hazard identified, deciding on control measures, and implementing the control measures (WCB, 2000).

Control measures are a necessary step in preventing or reducing a worker's exposure to hazards but at the same time it is important to recognize that certain control measures are more appropriate to adopt than others. A hierarchy of controls has been established as follows: controlling the source, environmental controls, administrative controls then personal protective equipment (PPE) such that control at the source is the most favorable and PPE the least favorable solution to occupational health/hygiene issues. Controlling at the source considers substituting or containing the hazard. This is followed by engineering controls, which entails isolating the worker from the hazard. Administrative controls involve restricting exposure through the modification of work practices. Using PPE involves a barrier between the worker and the hazard. Table 2 summarizes findings from published interventions and control measures for violence in healthcare by hierarchy of control from a variety of healthcare settings:

Table 5.2 Controls measures for violence in healthcare

Hierarchy of controls	Control Method	Study method	Population	Outcome
1. Controls at the source				
Nelstrop, Chandler-Oatts, Bingley, Bleetman, Corr, Cronin-Davis et al. (2006)	Seclusion and restraints	Systematic review	Psychiatric	Insufficient evidence was available to determine whether seclusion and restraint are safe and/or effective interventions for the short-term management of disturbed/violent behaviour in adult psychiatric inpatient settings
Lipscomb, McPhaul, Rosen, Brown, Choi, Soeken et al. (2006)	Mixed interventions	Mixed methods	Psychiatric	Followed the OSHA guidelines focusing on controlling workplace violence via environmental modification, review of policy and procedure, and training. From pre to post intervention: physical assault decreased, improvements in management commitment, environmental design, and staff teamwork and cooperation.
2. Engineering Controls				
Lee, Gerberich, Waller, Anderson, & McGovern et al. (1999)	Security	Questionnaire	Population based	Presence of security personnel and video monitors decreased the risk of violence.
Hunter & Love (1996)	Cutlery substitution	Administrative	Psychiatric	Substitution of plastic for metal cutlery eliminated all silverware related violence and reduced nursing staff hours.
Rankins & Hendey (1999)	Security	Administrative	Psychiatric	Significant increase in weapons confiscated after implementation of a security system. No significant change in assaults.
Lavoie, Carter, Danzl, & Berg (1988)	Security	Questionnaire	Acute	Presence of security is a deterrent for violence.

Hierarchy of controls	Control Method	Study method	Population	Outcome
3. Administrative controls/education and training				
Nachreiner, Gerberich, McGovern, Church, Hansen, Geisser et al. (2005b)	Policy	Questionnaire	Multiple	Odds of physical assault decreased for: zero tolerance policy and having policies regarding types of prohibited violent behaviors; non-significant decrease for: flagging charts, how to report physical violence.
Deans (2004)	Policy	Questionnaire	Multiple	Organizational support improved perceived professional competence following a viol incident.
Schat & Kelloway (2003)	Policy	Questionnaire	Multiple	Instrumental support was found to moderate effects of violence on emotional well-being, somatic health and job related affect; informational support moderated effect on emotional well-being.
Beech & Leather (2003)	Education/ training	Questionnaire	Multiple	Student nurses could identify more risk factors for violence.
Nachreiner, Gerberich, McGovern, Church, Hansen, Geisser et al. (2005a)	Education/ training	Questionnaire	Multiple	At the univariate level there was an increased risk for violence due to training; at the multivariate level there was a non significant protective effect for certain types of training while 4 education/training topics increased the risk for violence.
Lehmann, Padilla, Clark, & Loucks (1999)	Policy	Questionnaire	Psychiatric	On inpatient psychiatry units, an inverse correlation was found between expenditures on staffing and the frequency of assaultive incidents.
Lanza Kayne, Hicks, & Milner (1994)	Policy	Questionnaire	Psychiatric	There appeared to be an inverse relationship between assault frequency and number of staff. Degree of patient acuity seemed to be inversely related to assault frequency.
Calabro, Mackey, & Williams (2002)	Education/ training	Questionnaire	Psychiatric	At post-test, there were significant increases for knowledge, attitude, self-efficacy, and behavioral intention to use the training techniques.
Cowin Cowin, Davies, Estall, Berlin, Fitzgerald, & Hoot (2003)	Education/ training	Questionnaire	Psychiatric	Non-significant increase in de-escalation knowledge.
Hahn, Needham, Abderhalden, Duxbury, & Halfens (2006)	Education/ training	Questionnaire	Psychiatric	No significant attitude changes occurred in the intervention group at post-test.
Nhiwatiwa (2003)	Education/ training	Questionnaire	Psychiatric	Education group showed greater rather than less distress levels at 3-month after education.
Ore (2002)	Education/ training	Questionnaire	Psychiatric	Intervention group had a higher number of injuries and higher workers' compensation costs.
Phillips & Rudestam (1995)	Education/ training	Questionnaire	Psychiatric	Didactic and physical skills training led to larger decrease in assaults compared to groups with no training.
Carmel & Hunter (1990)	Education/ training	Administrative	Psychiatric	No decrease in violence rates but decrease in violence injury post training in wards with more trained staff.
Infantino & Musingo (1985)	Education/ training	Administrative	Psychiatric	Employees attending the training were significantly less likely to be assaulted than those not attending. There were no significant differences in reported assault-related injuries between trained and non-trained.
Martin (1995)	Education/ training	Administrative	Psychiatric	There was an overall increase in incidents; but a decline in severity of assaults, missed work days and costs.
Bowers, Nijman, Allan, Simpson, Warren, & Turner (2006)	Education/ training	Administrative	Psychiatric	Training was associated with an increase in violence.

Hierarchy of controls	Control Method	Study method	Population	Outcome
Parkes (1996)	Control and restraint training	Administrative	Psychiatric	Small increase in number of staff injuries (non significant).
Flannery, Everly, & Eyler (2000)	Crisis intervention	Administrative	Psychiatric	Decreased risk of assaults.
Whittington & Wykes (1996)	Education/ training	Other	Psychiatric	Researchers prospectively followed research participants before and after intervention. Reported violence fell by 31% after training (the reduction was captured by hospital reports as well). Attendees more likely than control to be assaulted.
Arnetz & Arnetz (2000)	Education/ training	Questionnaire	Acute care	Intervention groups reported an increase in violence post intervention, but better awareness of risks and how to deal with aggressive patients.
Hurlebaus (1994)	Education/ training	Questionnaire	Acute care	Education increased objective knowledge, but did not increase feelings of safety or confidence.
Drummond, Sparr, & Gordon (1989)	Flagging	Administrative	Acute	Patients at high risk for repeated violence were identified; the number of incidents declined by 91.6%, and visits to the medical center for any reason decreased by 42.2%.
Current study	Flagging	Administrative	Acute	Increased risk for violence from flagged patients
Fernandes, Raboud, Christenson, Bouthillette, Bullock, Ouellet et al. (2002)	Education/ training	Questionnaire	Emergency	Education significantly decreased the number of verbal and physical assaults at the 3-month post-test. Violent incidents increased by the 6-month post-test but still below the original level.
Fitzwater & Gates (2002)	Education/ training	Questionnaire	Long term care	After a 4-hour education intervention, participants reported fewer physical assaults by residents and increased levels of knowledge and confidence in their ability to manage residents' aggressive behavior.
Lehmann, Padilla, Clark, & Loucks (1983)	Education/ training	Questionnaire	VA hospital	Workshop increased knowledge, but reported assaults increased
4. Personal protective equipment				
Gerberich, Church, McGovern, Hansen, Nachreiner, Geisser et al. (2005)	Personal protection	Questionnaire	Population based	Risks were decreased when carrying cellular telephones or personal alarms.

The majority of studies on violence prevention in healthcare revolve around education and training in violence prevention policies, identifying risk factors for violence, minimizing risk factors, as well as verbal and physical de-escalation techniques. These studies show that, while education and training is an essential aspect to violence prevention, they do not necessarily decrease the rate or risk factors for violence, especially over the longer term. Increased knowledge rather than decreased violent incidents is the most consistent outcome demonstrated in these studies. Other promising

tolerance policies, and increasing organizational support for violence prevention but there should be a multifaceted approach to the problem that combines education/training with work environment changes and policies and procedures in order to have an impact.

The current study adds to the violence intervention literature base. This study found, using administrative data, that patients flagged by the Alert System, a patient violence risk identification tool, were at a higher risk of violence compared to patients not flagged by the Alert System. It appears as if the Alert System is successful at identifying those at risk of having a violent incident but does not address how to intervene to prevent an incident from happening via other controls. This again demonstrates the need for a multifaceted approach to the problem.

The tables above suggest that there are few evidence-based methods to prevent violence with workplace controls. It is also clear that there is a need to tailor interventions to the specifics of the worksite and a need for a multifaceted intervention strategy to address patient, work and workplace factors in combination based on the conceptual model of violence. The hierarchy of controls states that control from the source is the most favorable method. However, in healthcare this is especially difficult. The only identified methods of controlling at the source are turning violent patients away and denying care, or using chemical or physical restraints. Neither of these methods are viable options because workers cannot deny care to patients, and policies of not using chemical or physical restraints are increasingly being implemented. The Alert System, as well as most of the interventions above, does not focus on how to prevent violence from the source. With these interventions, such as 'flagging' systems, or education and training, the onus is on the worker to integrate what they have learned in order to stop the event from occurring. Mayhew and Chappell (2005) discuss that staff training alone is one of the least preferred methods of controlling violence. The causes of violence are multifactorial, and the authors suggest that simple or quick solutions are unlikely to effectively prevent violence. Interventions such as increasing staffing, or having zero tolerance policies are starting to move up the chain of desirable controls and should be part of a violence

prevention plan, however research and practice should start to increasingly focus on identifying evidence-based environmental and administrative controls.

More studies such as the one from Lipscomb et al (2006) should be conducted that take into account the 5-steps models suggested by OSHA (OSHA, 2003) and WorksafeBC (WCB, 2000), summarized in the introduction chapter, for preventing violence. Studies using the 5-step model can allow for more comprehensive intervention and prevention efforts through targeting the specific needs of the facility while also allowing for a more rigorous assessment of the effectiveness of the various components of prevention efforts.

Recommendations:

Even though it is necessary to continue the surveillance of violent incidents and study contributing risk factors, there is sufficient evidence on the burden of violence and consistent risk factors to take action on controls.

In order to see true and long lasting effects of interventions, any initiatives should be multifaceted and organization-wide, using qualitative and quantitative methods of investigation. For example, this study found that the Alert System successfully identified violent patients but did not prevent the violent incident from happening. Flagging high risk patients is not enough to prevent violence but should be used as a component of a broader violence prevention plan; it is likely that a comprehensive solution will be needed to prevent violence in these patients however more research is needed on what these procedures should be.

Looking at the workplace as a whole through a conceptual model such as one in the introduction chapter can help demonstrate how neither risk factors nor interventions exist on their own, but as part of a larger framework of fluid interactions. Desired program outcomes that not only include a reduction in violent incidents, but also for example a reduction in workers' compensation costs and time loss, should also be built into the conceptual model. After reviewing violence interventions, Farrell and Cubit, (2005) concluded that most programs don't address the breadth and depth of violence, such as

organizational costs, absenteeism, presenteeism, property damage, security costs, litigation costs, reduces job satisfaction, recruitment and retention. Using OSHA's framework of creating violence prevention programs may be costly and time consuming but in the long run this framework is the method most likely to work in maintaining a reduction in violent incidents which would translate into a reduction in injuries and costs, and would likely offset any costs from using this framework, and improve the health and wellbeing of workers.

As highlighted by Lipscomb et al (2006), a multifactorial intervention program should include aspects of environmental modifications, new policies and procedures, as well as education and training. Based on evidence from the literature of interventions shown to be successful at reducing violence, under these three categories the violence prevention program at the hospital under investigation should included the use of security personnel and video monitors; zero tolerance policies, policies against certain violent behavior, increased organizational support and increased staffing levels; flagging systems; personal alarms; as well as a thorough education and training program. Another promising yet largely unstudied area is the effect of organizational culture and its role in violence prevention. However, a multifactorial approach is likely not enough to significantly prevent many cases of violence in healthcare as none of the prevention approaches adequately address the root causes of violence. The acute care hospital that was investigated in the intervention study uses many of the intervention methods outlined above as part of their violence prevention program (see Appendix III) and is experiencing increasing rates of violence over time. It is counterintuitive that rates are on the rise despite using a wide range of evidence-based approaches violence is on the rise. In light of this, violence prevention in healthcare may benefit from a community-wide approach that also takes into account socioeconomic and psychosocial influences on violence such as homelessness, and domestic disputes.

It is likely not possible prevent most instances of violence in the healthcare system if only factors within the system are examined and external factors aren't accounted for. For example, it cannot be denied that a large amount of violence is coming from psychiatric

patients and individuals with drug and alcohol addictions who use the acute care system as their primary care facility. Perhaps if there is a better system in place for treating psychiatric patients with improved case management then there may be less violence from these individuals. Another issue to examine is that violence may also be on the rise in the community as a whole, which then filters into healthcare settings. Looking at violence prevention from this perspective may need to include an examination of the general roots and causes of violence in the community in order to assess and identify methods of prevention. Conceptual models should perhaps have a more nested approach, looking at how violence occurs not just in healthcare, but also in the community as a whole, and how these two settings interact in order to make larger scale prevention recommendations.

Although this approach may be useful, it will likely be time consuming to put in effect. A more direct approach could be used concurrently to address the issue of violence. Kerr & Mustard (2007) discuss a healthcare community approach for creating healthy healthcare workplaces. These authors suggest that improvements in leadership, role clarity, trust, respect, values and workplace safety culture, workplace support, empowerment, burnout or stress, job satisfaction, and participatory approaches to interventions and workload can be considered required ingredients of successful workplace health initiatives (Kerr & Mustard, 2007). Though indented to address various factors that contribute to the health and safety of healthcare workers, they can be applied specifically to the prevention of workplace violence.

Challenges of doing occupational intervention research

Zwerling et al (1997) suggests that few employers or regulatory agencies will implement injury prevention interventions unless evidence of their effectiveness can be shown. More evidence on the longer-term impacts of interventions and multi-faceted interventions is warranted but unlikely to increase in frequency due to the challenges inherent in occupational intervention research. This study encountered many challenges, several of which have been discussed in the literature.

1. Planning:

The first challenge encountered by this study was the lack of planning to evaluate the implemented intervention. Often, interventions are put in place due to workers' compensation orders, worker complaints, or suggestions from joint occupational health and safety committees, without planning a possible evaluation of the intervention. Evaluating the effect the intervention has on the workplace is a necessary step for many reasons: interventions can be costly and if shown to be ineffective then their continuation would be unnecessary. And the current evaluation highlighted the need for a more sophisticated approach to workplace violence beyond 'flagging' the patient.

It is important that the intervention and evaluation should be planned simultaneously. Without a proper plan in place to evaluate the intervention before it is implemented, possibilities for an unbiased analysis diminish and the opportunity to collect essential data can be missed. For example, a unique study from Whittington and Wykes (1996) bypassed the use of administrative or survey data and instead used an expert observer and contacted wards directly to estimate the frequency of assaults pre and post intervention. A method such as this would only be possible if the evaluation was pre-planned. In this study, the opportunity to collect independent data on the nature and extent of violence, and potential covariates and confounders at the time of patient assessments, as well as any information on controls used by workers on flagged patients at the time of violent incidents was negated.

2. Underreporting/reporting biases and the use of administrative data:

Although a study design comparing violence rates has its own inherent limitations, under- and inconsistent reporting of violent incidents to an administrative database makes it difficult to conduct a study of this type as well as interpret the generated results.

In the current intervention study, small cell sizes due to too few violent incidents over the follow-up periods by departments or occupations made it difficult to analyze and

compare changes in rates over time. It is likely that underreporting contributed to these small cell sizes; anecdotal evidence suggests that violence is even documented in a patient's chart at a higher frequency than is reported.

It is also possible that there are differential reporting patterns to administrative databases within health authorities, hospitals, occupations or departments. If an intervention is being studied, this makes analyzing and interpreting rate changes difficult. If rates change, it is hard to determine if this change is due to an intervention, if it is because there is increased reporting due to increased awareness or if an independent event or occurrence influenced the rate during the measurement period. Ore (2002) discusses that using injury reports to measure outcome can be misleading because increases in reports can be due to increased knowledge gained from intervention while decreases in reporting can be from workers being further deterred from reporting. Because of the difficulties in relying on injury reports, multiple analysis methods should preferentially be used in order to most accurately assess the effect of the intervention.

3. Study design issues:

Designing an unbiased intervention implementation and evaluation is also challenging, even if it is pre-planned. In a review of violence prevention studies, Runyan, Zakocs, and Zwerling (2000) found most published study methodologies to be insufficient, using one-group, pre- and post test designs and few attempted to control for biases in selecting study subjects, secular trends or coincident variables besides the intervention.

Randomized controlled trials are said to be the 'gold standard' of intervention evaluation, however, in workplace settings, this is not a foolproof method. As pointed out by Zwerling et al (1997), how do researchers randomize an intervention within an organization or group of workers where there is interaction among workers and the non-randomized participants and control participants are still likely to be aware of what is going on? In workplace settings there can also be study group contamination and population turnover can also bias the results of randomized controlled trials. Zwerling et

al (1997) discusses that a quasi-experimental study using a comparison group that provides an estimate of the incidence of the outcome being measured with matching or restriction of controls provides a reasonable alternative to randomization. In this study, such a control group was used, however this is not often the case in intervention studies.

Also, information from workers is essential to include in the study design. Irrespective of whether the intervention is shown to be effective or not, workers have to like the intervention, believe that it works and that it will protect them for them to use it; if workers do not use the intervention then it's continuation is also unnecessary. For example, current focus group results suggest that even though the Alert System may not be associated with a decreased risk for violence, many workers related that they think this is a valuable tool for patient risk communication.

4. The broader nature of workplace health and safety:

With interventions in real world settings, there are factors that impact the intervention that the researcher cannot control. This study encountered the problem of inconsistent implementation of the intervention, which limited the method in which the intervention could be evaluated. This intervention was intended to be used for, but not limited to, all admissions to high-risk departments. However, previous work indicated this was not the case and nursing staff were pre-selecting who should be assessed among those admitted to high-risk departments. Other problems this study encountered including having to exclude cases due to the inability to assess the temporality of Alert assessment relative to the violent incident.

Workplace interventions are also multifactorial and do not exist in isolation; implementation requires training then behavior changes from workers plus work environment changes in order to be effective. Intervention studies, the current one included, often does not or cannot assess for behavior changes from the worker after the intervention is put in place.

Summary

This highlights only a few of the multitude of challenges in doing occupational intervention research. Many of these challenges are difficult to overcome, but as they are increasingly documented future researchers can learn from these issues and try to overcome them.

Conclusions

In 1983, Lehmann et al (1983) concluded that more research in needed about the causes of violence in specific settings, that interviews with workers should be included in studies, and that centralized reporting and review of incidents is necessary. After over 20 years of added research and evidence suggesting that violence is on the rise, the same conclusion can still be drawn. Now we are beginning to fully understand the prevalence of violence and are gaining a sufficient body of knowledge on the risk factors. To add to this knowledge base, the minimum necessary next step is to continue to add evidence-based interventions at all levels of the hierarchy of controls to the literature so that they can be incorporated into violence prevention programs, as well as improving our understanding of the multifaceted nature of violence in healthcare.

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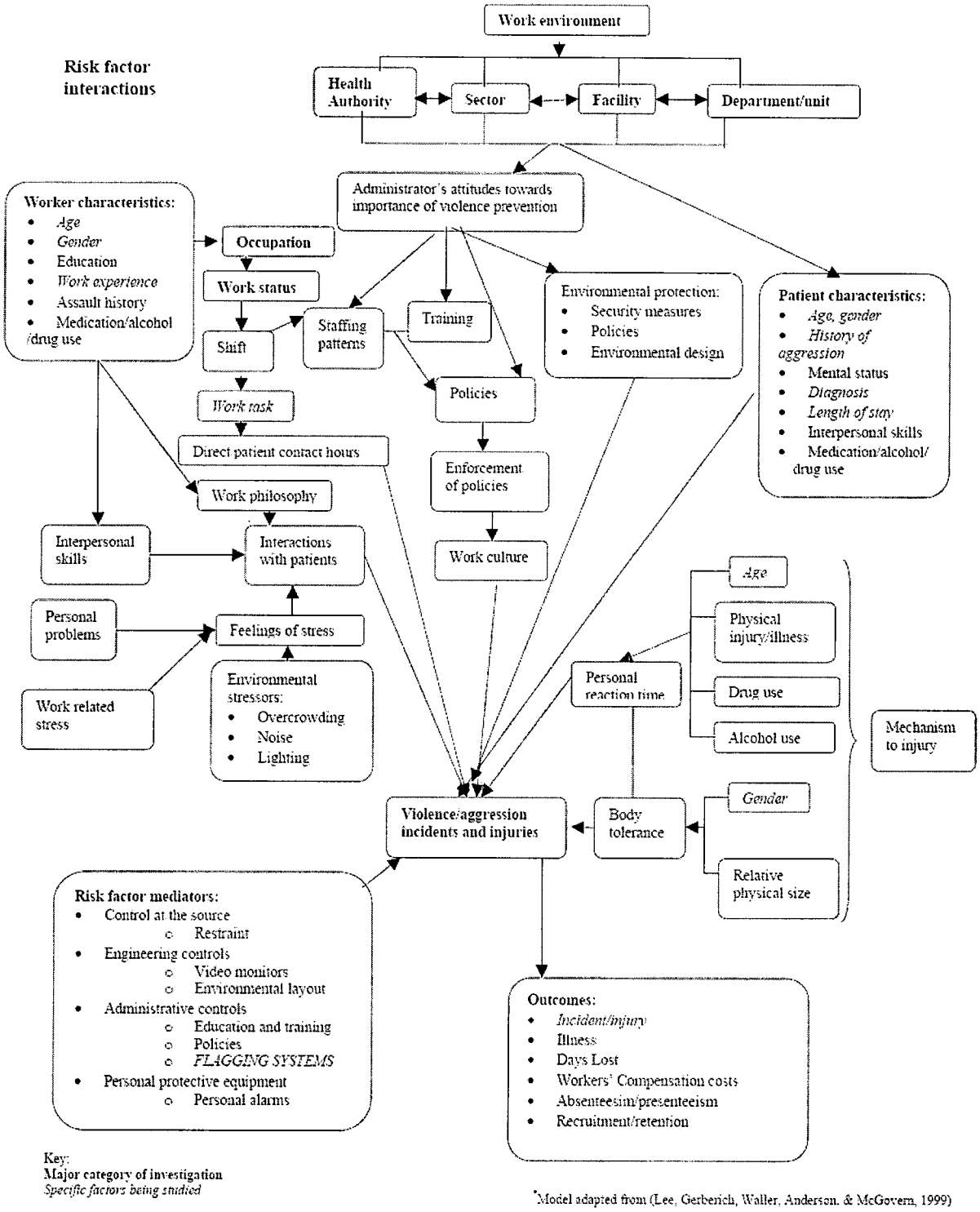
Appendix I



*Model adapted from (Lee, Gerberich, Waller, Anderson, & McGovern, 1999)

Figure 2: Conceptual Model for Violence in Healthcare

Appendix II: Nature and Contributing Factors to Violence

The majority of the injuries resulting from a violent/aggressive incident were musculoskeletal injuries (29.3%) and bruises/contusions (28.7%) with a significant amount of incidents resulting in a near miss/no injury (22.7%) and psychological trauma (14.7%).

Type of Injury (total N=2495):

Type of Injury	N(%)
Near miss- no injury/unsafe condition	565 (22.65)
MSI	731 (29.30)
Bruise /contusion	717 (28.74)
Burn	4 (0.16)
Cuts/scratch/abrasion/laceration	354(14.19)
Puncture	25(1.00)
Skin/mucous membrane exposure	47(1.88)
Skin irritation	48 (1.92)
Allergic response	1 (0.04)
Respiratory irritation	1 (0.04)
Psychological trauma	366(14.67)
Eye irritation	16 (0.64)

Patient related factors were most often cited as contributing to the violent/aggressive incident at 76% of the time. The patient related contributing factors most often noted included the patient being aggressive (61.7%), patient being resistive (36.1%) and the patient making an unexpected movement (29.9%).

Contributing factors:

Contributing factors	Frequency (%)
Equipment/device	26 (1.04)
Environment	101 (4.05)
Work Practices	126 (5.05)
Patient related	1899 (76.11)*
Organizational/administrative	177 (7.09)
Worker related	125 (5.01)

***Contributing factors- patient related**

Patient related contributing factors	Frequency (%)
Unable to follow directions	261 (10.46)
Inconsistent weight bearing	28 (1.12)
Patient aggressive	1539 (61.68)
Patient resistive	901 (36.11)
Made unexpected movement	747 (29.94)
Confused/ dementia	502 (20.12)
Under influence of drugs/alcohol	89 (3.57)
Language barrier	51 (2.04)
Other	207 (8.30)

The activity being done at the time of the incident involved patient handling (29.5%) and patient care (21.9%). The patient handling activity cited most often was holding or assisting during a procedure (11.7%) and the patient care activity noted most often was washing or bathing (9.5%).

Activity

Activity	Frequency (%)
No injury	433 (17.35)
Patient handling^	736 (29.50)
Patient care^^	548 (21.96)
Sharps handling	9 (0.36)
Materials/equipment	37 (1.48)
Natural activity	68 (2.73)
Box A	169(6.77)

^Patient Handling - activity

Activity	Frequency (%)
Repositioning	153 (6.13)
Transferring	199 (7.98)
Assisted walking	76 (3.05)
Preventing a fall	63 (2.53)
Holding/assisting during a procedure	293 (11.74)
Toileting	58 (2.32)

^^Patient Care - activity

Activity	Frequency (%)
Washing/bathing	236 (9.46)
Dressing	123 (4.93)
Changing	163 (6.53)
Feeding	48 (1.92)
Preparing/dispensing medications	82 (3.29)
Dressing changes	9 (0.36)

Physical assault was reported most often and hitting/kicking/or beating was the most common form of physical aggression. Verbal threats or assault were reported as 20% of all violence/aggression. The incident involved a patient 73.7% of the time and another worker 18.7% of the time.

Type of Aggressive Incident

Type of Incident	Frequency (%)
Verbal threats/verbal assault	502 (20.12)
Biting	96 (3.85)
Hitting/kicking/beating	889 (35.63)
Squeezing/pinching/scratching/twisting	687 (27.54)
Sexual assault	7 (0.28)
Other physical violence	295 (11.82)
Other	115 (4.61)

Incident Involved

Incident involved	Frequency (%)
Patient	1840(73.75)
Family member	44 (1.76)
Other member of the public	48 (1.92)
Worker	466(18.68)
Other	145(5.81)

Appendix III: Logic Model for the Alert System

Program component of intervention:

The Alert System –a risk assessment for the identification of violent patients

The Alert System assessment is done using a list of risk indicators for aggressive behaviour and the practitioners' clinical judgment.

Forms used for the Alert System risk assessment:

- Aggressive Behaviour Risk Assessment: M-55
- Review of Aggressive Behaviour Alert: M-55A

Indicators of risk on the M55 form:

- History of physical aggression: Physically aggressive or threatening
- Verbally hostile/threatening
- Shouting / demanding
- Confusion / cognitive impairment
- Drug/alcohol intoxication/potential for withdrawal
- Suspicious
- Suffering auditory or visual hallucinations
- Withdrawn
- Agitation
- Threatening to leave

The Alert System is one piece of the violence prevention program at the Vancouver Coastal Health Authority, which also includes:

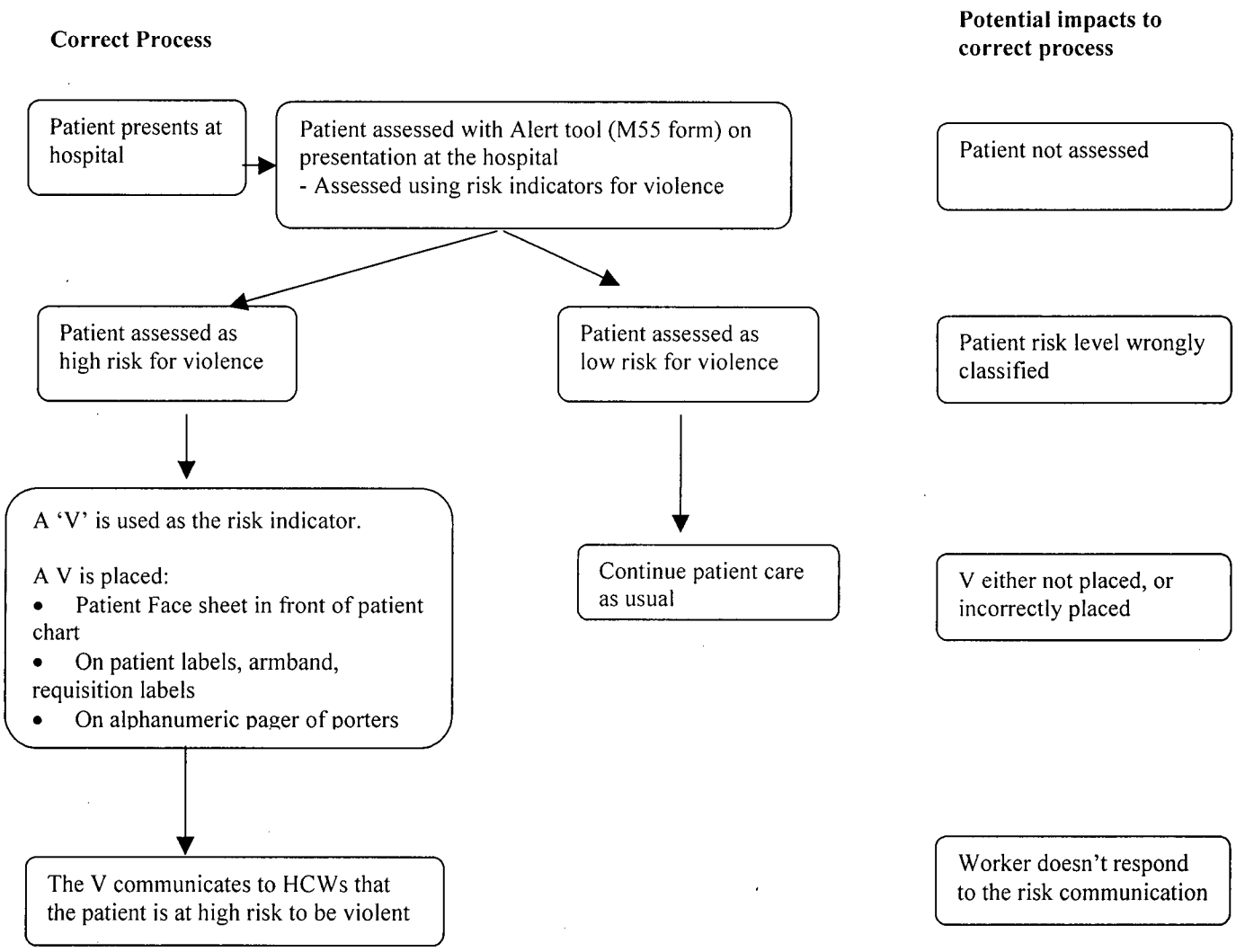
- Education
    - Recognize risks

    - Responses to violence
    - Violence prevention policies and programs
- Risk assessments
- **Communication of risk – The Alert System**
- Assessing stages of aggressive behavior
- Interventions
- Code White
- Reporting and documenting the incident
- Incident follow up with client
- Incident de-briefing with staff
- Investigation, documentation and follow up

Program resources/input:

- Training staff on the Alert System and process
- Continued staff training on violence prevention techniques
- Alert System program coordinator
- Alert System research –assessment of validity of tool and effect of the tool for violence prevention

Program activities:



Program output/outcome:

Desired outcome

Alert System correctly identifies patients who are at high risk to be violent

↓

Health care worker warned of patient risk for aggression through the V placed on the patient's chart and wristband, as well as the Alert form clipboard

↓

Health care worker has the option of taking precautions to prevent an aggressive or violence incident from occurring including:

- Removal of sharp objects from patient's room
- Have the Code White team nearby
- Wearing a personal alarm
- Not entering an at risk patient's room alone
- Use of restraints
- Prevention and Management of Aggressive Behavior (PMOAB) interventions
- Put patient in quiet environment

Roadblocks to desired outcome

Alert System misclassifies the risk of the patient:

- High risk patients assessed as low risk
- Low risk patients assessed as high risk

- If misclassification occurs, worker is incorrectly warned, and may be treating a high risk patient
- V not placed, or incorrectly placed, thus not communicating the risk to workers
- Worker does not listen to the risk

- HCW doesn't use violence prevention measures when treating at risk patients
- HCW takes precautions and uses prevention techniques, but violent incident still occurs
- Organizational culture- management may not support the Alert System or encourage prevention techniques used for high risk patients

Program Impacts:

Desired impacts

- Potential prevention or attenuation of aggressive or violent incident
- Decrease in violent incident rates
- Decrease in violent incident costs
  - WorkSafeBC
  - Injury
  - Productivity
  - Retention and recruitment

Alternate impacts

- The Alert System has no impact on violent incidents or costs
- The Alert System does have an impact on violence- either on incidents or costs – but none can be measured due to true rise in violence in the community
- Statistical significance vs. clinical significance: The Alert System may or may not have a preventative effect, however:

➔ Workers like the warning given by the system

➔ Workers may feel the warning helps to give better patient care