Frequency of Client and Staff Injury During Physical Restraint Episodes: A Comparison of 2 Child Restraint Systems

Lorrie Henderson, PhD, Kevin Siddons, EdD, Thomas Wasser, PhD, Steve Gunn, MA, LCSW, and Edward Spisszak, BA

Abstract

- *Objective:* To compare the frequency of injury to clients and staff with use of 2 restraint systems.
- *Design:* Retrospective database review.
- *Setting and participants:* Youth admitted under both voluntary and involuntary commitments to residential behavioral and mental health programs in Pennsylvania and New York and staff from these institutions.
- *Methods:* Restraint events that occurred during 2003 were reviewed and stratified by method of restraint: Therapeutic Crisis Intervention (TCI) and Professional Crisis Management (PCM). Injuries caused during restraint applications were coded as serious (required in-house treatment) or critical (required transportation to medical center). Age, race, and sex of clients and restraint duration were determined. Group *t* tests and chi-square tests with restraint method as the independent variable were used to compare injury frequency and restraint duration between methods. Chi-square tests were used to compare the frequency of injury by hold method within each restraint system.
- *Results:* There were 5580 restraint applications in the PCM group (*n* = 813) and 1274 in the TCI group (*n* = 194). The mean (SD) hold duration was significantly shorter for the PCM method (8.5 min [14.4] versus 15.1 min [13.7]; *P* < 0.001). TCI was associated with significantly more critical and serious client injuries (both, *P* < 0.001). No difference between PCM and TCI was noted for critical staff injuries (*P* = 0.404), although a trend toward significance was seen in serious staff injuries (*P* = 0.094). More injuries occurred at higher restraint levels with TCI than with PCM.
- *Conclusion:* The PCM method was associated with a lower frequency of client injuries compared with the TCI method. We recommend the PCM method over TCI for use in children.

Physical restraint of clients demonstrating or about to demonstrate aggressive or self-harmful behavior has been used for decades in both psychiatric and medical settings. It is well understood that clients need to be held on occasions when they are demonstrating behaviors that are thought to be of danger to themselves or others. A review article by Fisher found that restraint and seclusion use is effective in preventing injury and reducing agitation and that it is very difficult for organizations to run programs for youth without the use of physical/mechanical restraint or seclusion [1]. Further research is needed on the adverse effects associated with restraint use [2].

Previous studies have examined legal and ethical issues of restraint use in both the adult and child/youth populations [3–5], variables associated with restraint use [6–10], the incidence of restraint-related injuries in small versus large hospitals [9], and strategies to reduce the use of restraints and seclusion [11–17]. However, no studies have examined the relationship between the restraint method employed and client and staff injury. This study examines the occurrence of injury associated with 2 personal restraint systems.

Methods

Setting

KidsPeace conducts therapeutic behavioral and mental health programs for children and adolescents in 10 states, including inpatient services, residential treatment and education, foster care, and other community-based help programs. These programs include outreach to children in need as well as children in crisis. This study included children in residential treatment receiving education, counseling, and other therapy. KidsPeace seeks to avoid restraint use and only initiates these procedures in order to protect the client or others from harm.

Table 1. Restraint Holds Used in the PCM and TCI Systems

Hold	PCM	TCI
1	Wrist triceps (staff members steady client while standing or walking)	Breaking up a fight technique (2 staff intervene to separate 2 people involved in a fight)
2	Sunday stroll (staff members interlace arm around client upper arm)	Standing hold technique (2 staff approach from both sides, grasp the client's arms, pivot, and hold client from behind)
3	One arm wrap (staff member wraps arm around the client at the waist)	Team restraint front initiated (Involves 2 staff and begins from a standing position facing the client. The client is lowered to the floor onto his back and the arms and legs are secured.)
4	Vertical immobilization (standing hold immobilizing client arms)	Team restraint rear initiated (Involves 2 staff and begins from a standing position behind the client. The client is lowered to the floor on his back, is turned to a prone position, and arms and legs are secured.)
5	Brief assisted required relaxation (BARR— staff hold at the wrists, triceps, and feet to completely immobilize client)	

PCI = Professional Crisis Management; TCI = Therapeutic Crisis Intervention.

Restraint Methods

Professional Crisis Management (PCM) is a system of restraint designed to de-escalate violent behavior by use of a 5-point series of holds (**Table 1**). The PCM method is used by KidsPeace as the preferred method in all inpatient and residential settings in Pennsylvania, Maine, Minnesota, and Georgia. More detailed information regarding the hold methodology, applications, and training can be found at www.pcma.com.

Therapeutic Crisis Intervention (TCI) is a restraint method that was developed at Cornell University in 1980 with federal funding from the National Center on Child Abuse and Neglect. Similar to PCM, this system is based on a de-escalation model where holds are used to address aggressive or violent behavior. It involves a 4-point system of holds (Table 1). Currently, TCI is the state-mandated system for hospitals and residential settings treating children/adolescents in New York state. Staff at the KidsPeace New York residential center receive training in TCI and execute this method in crisis situations. Detailed information regarding applications and the 5-day training program can be found at http://rccp.cornell.edu/TCIpage1.htm.

Proper use of either restraint method requires staff training in the use of the method and recognition of when holds may be needed. Both methods have their own training and certification systems. All staff members are fully trained in the restraint method that is used in the location where they are employed.

Data Gathering

All restraint events occurring in Pennsylvania and New York in the calendar year 2003 were recorded onto incident reports at the time of the restraint event by the staff involved in the incident. Once these data were collected, it was entered into the KidsPeace database. Data from these incident reports were retrieved from the quality assurance database and stratified into TCI and PCM groups based on an internal identifier and converted into an SPSS data file to facilitate analysis. For each restraint method (PCM and TCI), the holds that were being used at the time of injury were recorded. Data regarding age, race, gender, number of holds used during each admission, and injury to client or staff were tabulated and reported as frequencies with percentages for each category. Injuries to client and staff were coded as critical or serious. Critical injuries were defined as any injury requiring transportation to a medical center for additional treatment and/or treatment for the injury by a physician. Serious injuries were defined as any injury requiring in-house (staff or nursing) treatment.

Analysis

The data were analyzed with restraint method (PCM and TCI) as the independent variable using parametric methods, including group t tests on the continuous duration of holds. The samples were also compared using nonparametric chi-square test of association for age, race, gender, and type of injury (critical or serious) received by staff or client. Significant differences or associations were indicated by P values less than 0.05.

For restraint episodes involving only 1 hold being used at the time of a single injury, we used chi-square test of association to determine which holds in the restraint systems were associated with injury. Significant chi-square tests would indicate that the hold level that leads to injury could be identified. These data were compared using chi-square tests within each category of injury (staff or client; critical injury or serious injury). Individual P values are reported for each level of hold within each restraint method for each of the 4 categories of injury.

Table 2. Client Characteristics in Restraint System Groups

Variable	PCM (*n* = 813)	TCI (*n* = 194)	*P* Value
Race, *n* (%)			
Black/African American	143 (18)	45 (23)	
Caucasian	386 (47)	109 (56)	
Hispanic/ Latino	116 (14)	7 (4)	< 0.001
Biracial	48 (6)	10 (5)	
Other	120 (15)	23 (12)	
Sex, *n* (%)			0.716
Male	559 (69)	136 (70)	
Female	254 (31)	58 (30)	
Age, yr, *n* (%)			
12 and under	267 (32.8)	24 (12.4)	
13	103 (12.7)	25 (12.9)	
14	120 (14.8)	42 (21.6)	
15	119 (14.6)	56 (28.9)	< 0.001
16	109 (13.4)	30 (15.5)	
17	64 (7.9)	14 (7.2)	
18 and over	31 (3.8)	3 (1.5)	
Mean length of hold (SD), min	8.50 (14.36)	15.13 (13.75)	< 0.001

Note: Chi-square test of association was used for race and sex. Group *t* test was used for age and length of hold.

PCM = Professional Crisis Management; TCI = Therapeutic Crisis Intervention.

Results

In the PCM group (*n* = 813), there were 5580 restraint applications across 61 treatment sites, and in the TCI group (*n* = 194) there were 1274 holds across 12 treatment sites. The mean (SD) duration for which a restraint was applied for the PCM group was 8.5 minutes (14.36) versus 15.13 minutes (13.75) for the TCI group (*P* < 0.001) (**Table 2**). The 2 groups also differed in regard to race and age (both, *P* < 0.001).

There were 5 critical injuries to clients in the PCM group (0.1% of all PCM restraints) compared with 10 critical injuries in the TCI group (0.8% of all TCI restraints) (**Table 3**). Although the incidence of critical injury was low, this difference was found to be statistically significant by chi-square test of association (*P* < 0.001). The same relationship was found for serious client injury. There were 189 (3.4%) serious injuries in the PCM group and 85 (6.7%) in the TCI group (*P* < 0.001). Staff injuries occurred more frequently than client injuries, and the same relationship between injury and restraint method was observed. Critical injuries occurred more frequently in the TCI group (12 [0.9%]) than in the PCM group (40 [0.7%]), but this difference was not signifi-

Table 3. Injuries to Client and Staff by Restraint System

Injury Type	Injuries, *n* (%)		*P* Value
	PCM (*n* = 5580)	TCI (*n* = 1274)	
Critical client	5 (0.1)	10 (0.8)	< 0.001
Serious client	189 (3.4)	85 (6.7)	< 0.001
Critical staff	40 (0.7)	12 (0.9)	0.404
Serious staff	305 (5.5)	85 (6.7)	0.094

Note: Statistic used is the chi-square test of association.

PCM = Professional Crisis Management; TCI = Therapeutic Crisis Intervention.

cant (*P* = 0.404). There were 305 (5.5%) serious injuries in the PCM group and 85 (6.7%) in the TCI group. This difference was trend significant (*P* = 0.094).

In the PCM group, 480 events required the lowest level of restraint (wrist triceps) (**Table 4**). The one arm wrap level resulted in the highest percentage of both critical and serious injuries to the client (0.40 and 5.14, respectively). Staff injuries were more evenly distributed across all hold levels, and there was a significant association for critical and serious injuries (*P* = 0.008). More injuries occurred at higher hold levels, although these patterns did not increase in a linear fashion as hold level increased.

The pattern of injury for clients in the TCI group was somewhat different from that in the PCM group (**Table 5**). Higher percentages were still seen at the entry level of hold, but there were also high percentages observed at the team restraint front initiated level. While these percentages were high for both critical and serious injuries in clients, they were not statistically significant (0.905 and 0.198, respectively). The same relationship was seen for critical and serious injuries in staff for team restraint rear initiated, but this pattern was not statistically significant (0.921 and 0.445, respectively).

Discussion

The TCI restraint method was associated with a higher frequency of injuries compared with the PCM method. There were statistically significant associations between hold method and both critical and serious injuries to clients in the TCI group (both, *P* < 0.001). The TCI method was also associated with a higher incidence of serious staff injuries, but this association was only trend significant (*P* = 0.094). This study found no association of hold method with critical staff injuries (*P* = 0.404). While these injuries occurred in less than 1% of both PCM and TCI holds, they were more prevalent in TCI holds.

We suspect that injuries are occurring during the initiation of hands-on contact at the beginning of the hold process, but we do not have any data to examine this further. While the

Table 4. Hold Level and Client and Staff Injury Using the PCM System

	Wrist Triceps	Sunday Stroll	One Arm Wrap	Vertical Immobilization	BARR	P Value
No. of hold applications	480	711	253	371	3765	
Injury type, n (%)						
Critical client	1 (0.21)	1 (0.14)	1 (0.40)	1 (0.27)	1 (0.03)	0.158
Serious client	14 (2.92)	20 (2.81)	13 (5.14)	12 (3.23)	130 (3.45)	0.479
Critical staff	2 (0.42)	3 (0.42)	1 (0.40)	5 (1.35)	29 (0.77)	0.397
Serious staff	15 (3.13)	38 (5.34)	12 (4.74)	10 (2.70)	230 (6.11)	0.008

Note: Statistic used was the chi-square test of association.

same pattern of injury was observed for both PCM and TCI, the larger sample size in the PCM group led to the observed significant difference. We are unsure what role age played in the finding that more client injuries occurred in the TCI group. Certainly, older age relates to increased size and strength, and it would seem that older age would be a factor associated with increased injury in staff. This was not the case. It could be that older, larger, and stronger children could cause staff to intervene more quickly and aggressively. This study cannot answer this question, and we suggest this as an area for further research.

One of the strengths of this study is the large sample size, which enabled us to find significant differences between restraint methods with a relatively small number of client injuries. The low incidence of client injuries is not an indicator that injuries to staff and clients are not worth further study or further intervention. We found the high number of staff injuries in both restraint systems to be surprising. One explanation for this observation is that at times clients make a purposeful attempt to harm the holder, while there is no similar intention to hurt or injure directed from the holder to the client.

This study adds important information to the literature on restraint use in children, but further research is necessary. Only the National Survey on Seclusion and Restraint in State Psychiatric Hospitals [9] examined injuries to staff and client populations as an outcome of restraint use. This survey did not examine the type of restraint methods used but rather compared small hospitals (daily census < 260 clients) with larger hospitals (daily census > 275 clients). The findings were notable in that smaller hospitals had a higher incidence of both staff and client injuries than did larger hospitals.

Other studies have looked at variables associated with restraint use. Several have shown that sex and age are associated with restraint use, with younger males significantly more likely to need restraints [6–8,10]. Also, it has been shown that the application of restraints varies widely based on institution size, staffing, and a lack of practice standards or policies regarding restraint use [9,10,18]. Few studies have

examined the impact of restraint on the continuing mental health of the client [19–21]. There is strong evidence that the use of restraint is a stop-gap method to de-escalate a violent situation and that restraint use can increase or at least prolong the psychiatric condition [5,22]. Those who have been restrained can view the act as a punishment and may not always understand why the application of restraints was used [23].

Reports of successful efforts to reduce restraint use have been published. One pretest-posttest intervention study implemented a protocol that classified disruptive behavior into 4 stages and used verbal and behavioral interventions for behavior control at each stage. Following implementation of the protocol, seclusion and restraint episodes decreased by 64% and the number of persons requiring restraint or seclusion decreased by 39% [11]. Another study found that switching from a seclusion-based environment to a therapeutic holding environment led to decreases in staff and client stress [12]. Finally, a number of studies have examined aspects of the organization and staff members' attitudes and beliefs regarding seclusion and restraints and ways to reduce aggressive behaviors in institutions, including seclusion and restraint [13–15]. These organization-based strategies included practice-based nursing, seeking feedback from staff, establishing a staff restraint task force, rage reduction, and anger management for both clients and staff. Petti and colleagues [16,17] have recommended debriefing of staff and clients following restraint incidents as a tool for identifying problems and gathering information that can be used to develop measures aimed at reducing the use of restraint and seclusion.

Several limitations of our study should be noted. The use of secondary data is problematic in any retrospective review of data. As a result, we do not have any information on what happened to the client after a hold that led or did not lead to injury. Also, there is no way to determine what injuries could occur to clients and staff if restraints were not used. Second, while all staff are trained in the use of the physical restraints (PCM and TCI) appropriate for where they are employed, it

Table 5. Hold Level and Client and Staff Injury Using the TCI System

	Breaking Up a Fight Technique	Standing Hold Technique	Team Restraint Front Initiated	Team Restraint Rear Initiated	*P* Value
No. of hold applications	148	21	898	207	
Injury type, *n* (%)					
Critical client	1 (0.68)	0 (0.00)	8 (0.89)	1 (0.48)	0.905
Serious client	12 (8.11)	2 (9.52)	64 (7.13)	7 (3.38)	0.198
Critical staff	2 (1.35)	0 (0.00)	8 (0.89)	2 (0.97)	0.921
Serious staff	8 (5.41)	0 (0.00)	60 (6.68)	17 (8.21)	0.445

Note: Statistic used was the chi-square test of association.

is impossible to tell whether the physical restraints were applied in a "textbook" fashion. For the purpose of this analysis, we would argue that the situations where physical restraints are used are equally chaotic across both PCM and TCI methods. Third, there were statistical differences in the race, age, and duration of the holds and sample size between PCM and TCI groups. The impact of these differences on use of physical restraints is difficult to determine. We do know that the use of chi-square analysis on the frequency of injuries adjusts for sample size differences (by the use of expected frequencies within group). Last, the data present a paradox in that the injuries occur early in the escalation of the process of physical restraint, yet the TCI group, which has higher percentages of client injury, has a statistically significant longer duration of hold. It could be that the injury early in the hold process causes more aggressive behavior and this leads to the longer hold. We do not have any data to test this hypothesis and suggest additional research to examine this relationship. It is possible that chemical restraints may lead to fewer injuries; however, other unquantified psychological issues may result following the use of chemical restraints, such as tendency for additional aggression, rule breaking behavior, or fear of staff or other clients.

We suspect that one reason why PCM may lead to fewer injuries is because this method has clear, behaviorally defined criteria for release. The TCI method does not have such criteria. Based on the data presented here and utilizing the strengths of epidemiologic, population-based samples, we find evidence to support the use of PCM hold methods over TCI methods in centers where physical restraints are used.

Corresponding author: Thomas E. Wasser, PhD, 5754 Loyola St., Macungie, PA 18062, Thomas.Wasser@lvh.com.

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