

## Deaths associated with restraint use in health and social care in the UK. The results of a preliminary survey

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### Deaths associated with restraint use in health and social care in the UK. The results of a preliminary survey

Many aspects of the management of acutely disturbed behaviour have only relatively recently come under systematic scrutiny. Perhaps regrettably one of the last amongst the range of strategies that may be employed to be subjected to rigorous examination has been physical restraint. Considerable debate has recently taken place around what represents good practice in this sensitive and controversial area but the continuing dearth of research in some aspects of this area of practice has meant that this discussion has arguably been over reliant on 'expert' opinion. Questions continue regarding some fundamental issues of restraint, including the relative risks involved in alternative approaches, and anxieties have been expressed about the potential for injuries and death to result from restraint. This article outlines the results of a survey that sought to explore the incidence of deaths associated with restraint in health and social care settings in the UK. The outcome of an initial analysis of the cases identified is then discussed, with reference to the literature on restraint-related deaths, in order to identify the implications for practice.

**Keywords:** asphyxia, death, nursing, restraint, survey, violence

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### Introduction

In certain instances where other approaches are not practicable, restraint may represent the only intervention capable of protecting the client or others from serious harm (Royal College of Psychiatrists 1998). In the UK, in contrast with many other countries, such restraint tends largely to be 'physical'. That is, it involves the restriction of move-

ment by physical holding, as opposed to 'mechanical', where some device is employed to restrict movement (Paterson *et al.* 1998). Good practice guidance suggests that restraint should be subject to risk assessment such that the risks involved are considered against the risks of alternatives (Harris *et al.* 1996). Identified risks should be discussed with the client, carers, relatives and advocates where appropriate (Harris *et al.* 1996). This is in order that,

where possible, restraint is based on a consensus informed by the scrutiny and testing of alternative interventions based on the principle of 'the least restrictive environment' (Aitken & Tarbuck 1995) and the importance of primary prevention (Allan 2000). Where restraint is a foreseeable eventuality care staff in the UK, as in many other countries, are increasingly being trained in systematic methods of preventing violence and physical interventions, replacing previous 'ad hoc' procedures with the intention of improving safety (Paterson *et al.* 1992, Clinical Resource Audit Group. Scottish Health Service Management Executive 1996, Bowie 1998, British Institute of Learning Disabilities 1998).

Yet, as Sailas & Fenton (1999) concluded, few other interventions are so lacking in basic information about their proper use and efficacy. Case reports (Paterson & Leadbetter 1998, Siebert & Thogmartin 2000, Morrison & Sadler 2001) have suggested that restraint is not risk free, with both serious injuries and deaths reported in the UK and elsewhere (Miles & Irvine 1992, General Accounting Office of the United States 1999). There have been reviews of restraint-related deaths in police custody in the United States of America (USA) (Ross 1998) and England (Leigh *et al.* 1999) but no similar exercise appears to have been conducted in health or social care. This despite suggestions that restraint may be more common in such settings and that young people (Boyle 1999) and people with disabilities may be at increased risk (Allan 2000). In the absence of such research, recent good practice guidance regarding physical interventions (Harris *et al.* 1996, Department of Health 2000), including suggestions that certain restraint positions should be avoided, are, to some extent, based on speculation about the potential risks involved rather than evidence of any real quality (Sailas & Fenton 1999). This situation is clearly unacceptable and there have been recent calls for urgent research in this area (Allan 2000).

There is, however, currently no statutory requirement for service providers in either health or social care in Britain to report instances of restraint and no central database of either restraint-related injuries or deaths. Thus while a series of individual injuries or deaths may have been reported and investigated locally, there has been no systematic review of the phenomena in the UK. This review chose to focus only on deaths and to exclude injuries, in the assumption that deaths are more likely to be reported and are likely to be the focus of subsequent inquiries which themselves may attract comment.

The aims of the exercise undertaken were primarily:

- to establish preliminary figures for restraint-related deaths and a database of such deaths; and
- to carry out a preliminary analysis of such deaths.

## Survey

### Inclusion criteria

Restraint was operationally defined as being held against active resistance by physical or mechanical means. Deaths that had occurred in health or social care settings, i.e. hospitals or care homes (as opposed to police cells or prisons, where restraint was suggested to have been a causal or contributory factor to death) were included.

### Method

The case finding process had a number of elements. First, letters were written to the Mental Welfare Commission for Scotland and the Mental Health Act Commission in England asking for details of any cases they were aware of. Secondly a review of a series of nursing and healthcare databases (MEDLINE, CINAHL and PSYCHLIT) was conducted. Search terms employed were Restraint and Death, Restraint and Death and Mental, Restraint and Asphyxia. The research focus was: No.

Although a number of articles relevant to the broad topic of restraint-related deaths were initially identified, particularly regarding restraint and asphyxia, only two UK case accounts were identified (Paterson & Leadbetter 1998, Morrison & Sadler 2001). The relative failure of this search process led to considerable thought about the process of case identification and ultimately to the development of a third element to the case-finding process involving a newspaper database search. The rationale for accessing a newspaper database was that while cases might not have been discussed in the professional literature they were perhaps likely to have been the subject of newspaper reporting. *The Lexis-Nexis Executive News* plus is a collection of databases containing in total around 2300 UK and overseas newspapers, newswires and magazines. In the UK relevant coverage begins in approximately 1994, with the *Guardian* and *Times* beginning to be catalogued electronically, followed over time by the other main national and regional broad sheets and more recently a number of the 'tabloids'.

Three separate searches were therefore carried out on 10 March 2001.

A

Restricted: To UK Newspapers only

Restricted: To Major Stories. YES

Search terms: Restraint and Death

Articles identified and reviewed: 382

B

Restricted: To UK Newspapers only

Restricted: To Major Stories. NO  
 Search Terms: Restraint and Death and Mental  
 Articles identified and reviewed: 271  
 C

Restricted: To UK Newspapers only  
 Restricted: To Major Stories. NO  
 Search terms: Restraint and Asphyxia  
 Articles identified and reviewed: 112

The total number of articles reviewed, including multiple copies identified by search method, was 765.

Each article was screened for relevance by the author. A large number of false 'hits' were encountered. These involved, for example, accounts of violent conflict in areas such as the middle east or Northern Ireland, with reports of deaths often accompanied by demands for 'restraint' rather than retaliation from community leaders. In addition, a significant number of articles reported or discussed deaths associated with restraint in police custody, the prison service or other settings. These articles were excluded, in part because there has already been a survey into deaths in police custody (Leigh *et al.* 1999) but also because it is intended that the issue of restraint-related deaths involving people with mental illness in police custody will be the focus of a separate paper.

The inclusion criteria employed required that there was a report of or comment on a reported death that had occurred in a health and social care setting and that had been associated with restraint. From these various exercises and from cases otherwise known to the authors, including involvement as an expert witness, a total of 12 cases were identified. The key details known at present of each case are briefly summarized below.

- Mr Michael Martin, who died in 1979 in Broadmoor. Although he was initially restrained by a neck hold he was ultimately held face downwards and sedated. He was then left for 50 minutes, being periodically observed, before it was noted that he had not moved during this period. This case is of particular note because the subsequent inquiry called for the special hospitals to adopt 'non-violent' restraint methods and ultimately led to the adoption of control and restraint training from the prison service (Ritchie 1985).
- Orville Blackwood, a young black man who died in Broadmoor in 1991. He was restrained in a prone face down position by between five and seven staff while forcibly medicated. The cause of death was not, however, given as restraint but B(Pub)--PSR 1.1 cardiac failure associated with the administration of phenothiazine drugs (Prins 1994).
- Bryan Marsh, who died in Broadmoor in 1992. A second post-mortem suggested that he had been restrained about the neck at the time of a heart attack that caused his death.
- Shaun Martin, who died in Stratheden Hospital, Cupar, in October 1994, while being restrained while lying on a bed in what was effectively a side-lying position (see Morrison & Sadler 2001 for a very detailed description of this case).
- David Falconer, an inpatient at the Edith Morgan clinic in Devon, died in 1994 of a heart attack and traumatic asphyxia. He was reported as losing consciousness the day after he had been restrained in a face down prone position for 45 minutes with his arms and legs pinned behind his back. He failed to recover consciousness and was pronounced dead the next day.
- Freda Latham, a woman with learning disabilities who died in 1995 in Yorkshire after being 'mechanically' restrained by being tied to a toilet seat with her 'bib'. She was initially therefore in a seated position but appears to have slipped off the toilet seat and was then strangled by her bib, which acted as a ligature.
- Zoe Fairley, a 21-year-old woman with learning disabilities who died in 1995 in a care hostel run by North Yorkshire Council after being restrained in a prone face down position by first two and then four staff. The post-mortem concluded that her death was caused by asphyxia due to fixation of the chest during prone restraint.
- Roger Sylvester, a 30-year-old black man died in St Annes hospital, where he had been admitted as a place of safety after being restrained by eight police officers.
- Michael Craig, a man with learning disabilities who died in Glasgow in 1997. His death was not directly attributed to restraint but he suffered a myocardial infarction while restrained in a kneeling position by two staff with his knees on the floor and his torso lying face down across a bed.
- John Patterson, aged 39, who died in 1997 in Poole after being restrained face down on a lawn by three care staff. His wrists were held behind his back by one member of staff while another secured his left arm and a third secured his legs.
- David Bennet, a 38-year-old black man who died in the Norvik clinic in Norwich in October 1998. He was restrained by at least three staff after attacking a female member of staff and his heart stopped during the restraint.
- Michael Goldwater, a 35-year-old with schizophrenia who died after having a heart attack whilst being restrained face down on the floor by staff in Runwell hospital in April 2000.

## Discussion

As previously noted there is widespread anxiety about the potential for danger in prone restraint and this is reflected in the new guidance, which advises that it should be avoided (Department of Health 2000). This preliminary study has identified a number of deaths involving the use of variations of prone restraint. However, in some of the cases identified it appears the issue of prone restraint is either questionable or irrelevant.

### Neck holds

In at least two of the cases described, namely those of Bryan Marsh and Michael Martin, there is evidence that the restraint involved physical pressure to the neck. The dangers of neck holds used widely in the martial arts are manifest, pressure exerted on the carotid arteries can rapidly induce unconsciousness but carries a significant risk that death rather than unconsciousness will result (Reay & Eisle 1982). It has indeed been argued that the degree of risk in this procedure is such that it should be viewed as a form of lethal force, similar to the employment of a firearm, whose use should be restricted and judged accordingly (Reay & Eisle 1982).

### Mechanical restraint

A series of deaths in the USA involving the use 'mechanical restraint' have been reported by Miles & Irvine (1992). In the cases described, generally involving elderly people experiencing confusion, garments specifically designed for restraint purposes are often involved and when the patients attempt to escape they become entangled with lethal consequences (Corey *et al.* 1992, Frank *et al.* 1996). Such cases may not be uncommon, with Morrison (1997) recording that in the USA from 1987–96 the manufacturers of protective restraints reported 131 deaths to the Federal Drug Administration Agency. However, in some cases with similarities to that of Freda Latham an element of the individual's own clothing rather than a form of specialized restraint 'vest' or other garment can effectively become a ligature as they slip out of a bed or wheelchair. Calder & Kirby's (1990) analysis of 770 cases of wheelchair-related fatal accidents in the USA suggested that asphyxia occurred in 58 of such cases, with restraints involved in 44 out of the 58.

### Prone restraint

Prone restraints, however, appear to predominate in this series. It is extremely important, however, to stress that the

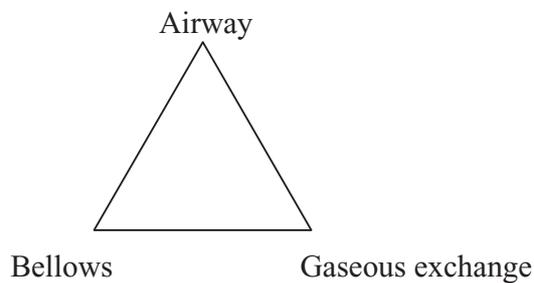
term 'prone restraint' does not describe in any way a homogenous procedure but a wide range of situations in which the person is held on the floor generally (unless otherwise described) 'face down'. A wide range of variations appear to have been used in the cases described. This is perhaps implied in the varying numbers of staff reportedly involved in the incidents, ranging from two to eight!

### Hobble tying

In the case of David Falconer both his arms and legs were pinned behind his back in a procedure which it has been suggested may mirror aspects of a technique allegedly associated with a number of restraint-related deaths known as 'hog-tying' (Paterson *et al.* 1998). This procedure is more correctly now referred to as hobble-tying because of racial sensitivities about the origins of the term (Stratton 1995). In this procedure the individual is placed in a prone position face down on the floor and his hands are secured behind him with handcuffs. His legs are then cuffed or otherwise secured by way of ties at the ankles. The ankles are then secured to the wrists with the client's legs bent and shoulders pulled back (Stratton *et al.* 1995). It was suggested by Reay *et al.* (1992) (Reay is a Seattle medical examiner) that use of this procedure could in certain circumstances lead to asphyxia. They proposed that the resultant deaths represented a variation of a phenomenon previously decided in the literature called 'postural or positional asphyxia' (Reay 1995). Bell *et al.* (1992) described a series of cases of accidental death. In these cases the posture adopted by the individual or in which the individual found themselves because of accident resulted in a significant impairment of respiration that proved fatal. The cases described occurred across a range of scenarios but did not include restraint. Typically they involved alcohol and drug intoxication or asphyxiation secondary to trauma. Bell *et al.* (1992) proposed that three criteria must be met before a death was ascribed to postural or positional asphyxia.

- The victim must be found in a position that interferes with pulmonary gas exchange or there must be a verifiable history of such a position.
- The person's inability to escape from the position must be explained, e.g. by reference to alcohol or drug intoxication.
- Other causes of death must be excluded by post-mortem and toxicological examination.

Respiratory function involves the so-called respiratory triad (See Fig. 1). This involves an unobstructed open airway, adequate gas exchange between alveoli and the pulmonary vascular system and a functional ventilatory pump or 'bellows' system to produce an airflow in and out of the lungs.



**Figure 1**  
The respiratory triad

If any part of the upper or lower airway becomes obstructed, respiration is impeded or completely prevented. If the surface of the lung is diseased or damaged as a result of injury, failure of the gaseous exchange element may occur. However, even with an unobstructed airway and perfectly healthy lungs, if a failure occurs with the mechanical component of respiration (the muscular pump or bellows system), effective respiration cannot be achieved. Failure of the ventilatory pump will result in alveolar hypoventilation and a reduced uptake of oxygen manifested primarily by hypercapnia (Chan *et al.* 1998).

The mechanical element of respiration requires:

- appropriate central nervous system control of respiratory muscle activity;
- the ability of the ribcage to be expanded and relaxed by action of the intercostal muscles and the diaphragm; and
- the ability of the diaphragm (the largest respiratory muscle) to contract in order to displace the abdominal viscera downwards and outwards.

When the respiratory muscles are appropriately activated by the central nervous system, the ribcage expands and the diaphragm descends, creating a negative intrathoracic pressure. The pressure gradient created 'draws' atmosphere into the lungs and produces inspiration. Relaxation of the ribcage's intercostal muscles and the diaphragm results in a positive intrathoracic pressure and the pressure gradient 'pushes' air back out of the lungs, producing expiration. If breathing becomes difficult (for whatever reason), the accessory muscles' and the diaphragm's role becomes more important in creating the negative intrathoracic pressure required for inspiration.

Reay *et al.* (1992) proposed that when placed in hobble restraints or similar positions the bellows aspect of the respiratory triad may be significantly compromised because:

- Pulling the shoulders up and back, done in order to secure the person's wrists to their legs, may force the chest wall into a hyper-expanded position, thereby seriously limiting chest wall relaxation and expansion.
- The face down position may prevent contraction of the diaphragm, particularly where the subject is obese and

excess adipose tissue is displaced upwards into the abdominal cavity. This may prevent the creation of the negative pressure gradient required for inspiration.

The subject restrained in this position may therefore be reliant on whatever restricted abdominal and chest wall movement they are able to obtain in order to achieve respiration at a time when their oxygen requirements may be high because of their exertions (Miller 1998a). The effects described may be exacerbated if pressure is applied downwards on the patients back by staff to ensure the subject remains face down or to hold them more securely, e.g. while administering medication (O'Halloran & Frank 2000). Even where the patient's legs are not involved, if the wrists are pushed behind the back against resistance and pressure is then exerted downwards on the chest from behind this may have the effect of severely limiting respiration (see the case of John Paterson).

### Experimental demonstrations

There remains, however, a fundamental weakness in the restraint asphyxia hypotheses; it has proved impossible to date to demonstrate clinically significant changes in respiration in controlled simulations as a result of hobble tying (Chan *et al.* 1997). This has led to suggestions that the phenomenon of restraint asphyxia is discredited (Chan *et al.* 1997). Reay and colleagues initial research (Reay *et al.* 1988) found significant decreases in heart rate and oxygen saturation level recovery rates in 10 adult volunteers restrained via hobble tying after moderate exercise to raise their pulse rate to 120 bpm. Similarly, Roeggla *et al.* (1997) reported that the experimental application of hobble restraint with non-struggling healthy volunteers dramatically altered cardio-pulmonary function within 3 min. Mean forced vital capacity (FVC) decreased by nearly 40% and forced expiratory volume (FEV) by 40%, with significant changes to both blood pressure and heart rate (Roeggla *et al.* 1997).

However, it has been argued that the theory that hobble tying may induce positional asphyxia has been invalidated by research carried out by Chan *et al.* (1997). They examined the impact of prone restraint on pulmonary function using 15 subjects, with more vigorous exercise, and obtained more accurate measurement of blood gases using arterial sampling. They found statistically significant differences in FVC and FEV between restraint and rest in a seated position but no clinically significant differences in blood gases. Research by Schmidt 1999) involving 18 subjects also failed to support Reay's initial observations, suggesting that although hobble-tying could impair respiration the degree of impairment was marginal and unlikely therefore to be clinically significant.

*Ecological validity*

However, a number of serious criticisms can be made of the ecological validity of both the original studies that initially supported the concept of restraint asphyxia and the later studies that have questioned it. Two main criticisms may be put forward in this respect. First, there is a lack of similarity between the subjects who participated in the experiments and those likely to be victims of restraint asphyxia. Obesity, a factor present in nearly all of the original series of deaths described by Bell *et al.* (1992), was used as an exclusion criteria by Reay *et al.* (1988). Positive testing for recreational drug use, a factor reported in the majority of cases of restraint-related deaths cited by Ross (1998), was used as an explicit exclusion criteria in the study by Chan *et al.* (1997) and not discussed by Roeggla *et al.* (1997).

Secondly, it is possible to suggest that aspects of the procedures used in the simulation did not accurately reflect those liable to be found in association with cases of restraint asphyxia. In the study by Chan *et al.* (1997) previously discussed, the subjects were not hobble tied in the conventional sense but via a modified procedure, which ensured that their arms were maintained in a straight rather than bent position by means of splints. However, it has been argued that this difference negated one aspect of hobble tying, the pulling of the shoulders up off the ground when the wrists are secured to the ankles and back, which may have a significant physiological impact (Miller 1998b). Schmidt & Snowden's (1999) research actually had two different elements; in the first stage in which the effects of hobble tying on recovery rates were examined students exercised on a cycle ergometer until their heart rates exceeded 120 bpm and were then allocated to a hobble tied or seated position. In the second phase subjects were involved in a simulated chase over 250 m followed by a 'struggle', resulting in a heart rate in the subjects ranging from 175 to 212 bpm. The effect of hobble tying on recovery from this scenario, perhaps much more akin to a real life restraint scenario than in stage 1, was not examined. The authors chose instead to examine the effects of a 'maximal restraint' position where the individual was handcuffed and his/her ankles secured. Rather than linking the legs to the wrists as in hobble tying, a cord was placed round the subject's waist, which was then connected to the foot restraint and the subject immobilized in a side-lying position. Subjects were then encouraged to actively struggle against the restraints but in a position expressly designed to minimize the factors suggested to contribute to reduced pulmonary function and for a maximum period of 30 seconds. Arguably therefore, although exercise as a variable was partially controlled for in the studies described, the

effects of severe exercise stress inducing bpm in excess of 175 have not been studied in relation to hobble tying.

The contribution of these studies to our understanding of UK restraint-related deaths is, however, hampered further by the infrequent association with death of hobble tying or procedures similar to it observed in this series. As noted, only in the case of David Falconer is it reasonably clear that that he was restrained in a manner that may have had similarities with hobble tying and even in this case there were marked differences. There has, however, been some research in the UK. Parkes (2000) investigated the effects of three restraint positions: a prone, i.e. face down 'C & R' restraint position, a supine, i.e. face up position, and a seated position, which was used as the control. He found no significant difference in recovery time between the seated position and the prone restraint position, although there was a difference between prone and supine. In the case of John Patterson it seems, however, clear that pressure was exerted downwards on his back in order to restrain him. In a Home Office-funded study (Cary *et al.* 2000) the effects on recovery rates after exercise of placing 75 kg in sandbags on the backs of 12 subjects placed in a prone face down position were studied. While the results indicated significant effects on ventilatory function, Cary *et al.* (2000) comment that there was no evidence of impaired cardio-respiratory function. Again, however, the ecological validity of the study is questionable; the subjects' exercise regime was controlled to ensure their heart rate was only 85% of the maximum measured in an exercise load test the previous day. Further, no rationale is given for fixing the load placed on the subjects' back at 75 kg. Where several staff are involved in a restraint it is easy to conceive of scenarios in which the weight placed on the subject's back could easily exceed this figure. In the case of Zoe Fairley it is estimated that the combined weights of the staff who employed body weight to effect her restraint exceeded 50 stones (York City Council 1997)!

In addition, as per the previous studies cited (with the limited exception of Schmidt & Snowden 1999 discussed previously), the subjects did not continue to struggle while restrained in the prone position but were instead acquiescent. This distinction may be crucial because it may be in some circumstances that it is a combination of prolonged struggle over several minutes or hours whilst pulmonary function is restricted that proves lethal (Hick *et al.* 1999). In all of the cases cited there is some evidence that the patients concerned continued to struggle vigorously against restraint over periods of time ranging from a few minutes (Michael Craig) to over 45 minutes (David Falconer).

*Acute/excited delirium/agitated delirium*

The focus of this paper thus far has been on the exploration on the potential role of restraint. However, the literature contains considerable debate about the potential contribution of a phenomenon variously described as acute or excited delirium, sometimes referred to as agitated delirium (Karch & Wetli 1995). This syndrome has been suggested as an alternative explanation for a number of recent deaths ascribed to 'restraint asphyxia' (Farnham & Kennedy 1997). In mental health, before effective treatment for the acute phases of mania or psychosis was available, death as a consequence of exhaustion in patients who exhibited prolonged agitation from mental disease was not uncommon (Bell 1859). The main causes of death recorded in one Scottish asylum over 28 years between 1908 and 1936 were recorded. Of 2444 deaths, 9.6% (or over 234) were ascribed to 'exhaustion from mental disease' (Easterbrook 1940, p. 592). It is of course possible that many of these deaths may have been the result of prolonged agitation over several months or even years or reflect a misattribution of the cause of death (Derby 1933). Similar figures are, however, available from a number of USA studies. Milling (1941, p. 297), discussing deaths at the South Carolina State Hospital between 1915 and 1937, records '360 cases in which the cause of death is given as Exhaustion due to mental excitement'. It is of course difficult to ascertain how many if any of such deaths were related to physical restraint. A number of management methods for acutely disturbed behaviour are reported as available, including medication 'protection sheets' and 'tepid packs' as described (Derby 1933, p. 445). In addition, other management strategies for acutely disturbed behaviour that were in use, such as tepid bathing, had the potential to be misused as restraint (Svedberg & Bjerén 2000). A number of deaths were, however, recorded either 'in pack' or shortly afterwards (Derby 1933).

Larson (1939), discussing 14 fatal cases of acute mania, notes that the mental symptoms included confusion, complete disorientation, rapidly changing hallucinations, irrationality and ideas totally devoid of sequence. Cardinal among the physical symptoms and present in every case were increased psychomotor activity, insomnia, dehydration, fatigue and elevation of temperature. Shulack (1946) described a phenomena he called 'sudden exhaustive death in excited manics' (Bellak *et al.* 1952, p. 191). Describing the onset and symptoms of this syndrome he observed:

- sustained motor and mental excitement with continued activity for a period;
- rapid thready pulse;
- rapid loss in body weight;
- profuse clammy perspiration;

- fall in blood pressure;
- hyperthermia; and
- delirium and death.

Bellak, discussing the cause of death in these cases, somewhat presciently goes on to speculate whether some form of a general toxæmia had been produced as a consequence of 'excessive and continuous muscle metabolism' (Bellak 1952, p. 191). Nearly 50 years later this hypothesis has recently received support in Hick *et al.*'s (1999) report of two series of collapse associated with restraint. In the first series, with one exception, all patients died despite efforts at treatment. On re-examination all of these patients were noted to have a severe acidosis and Hick *et al.* (1999) report the results of a second series of patients presenting in similar circumstances treated with intravenous sodium bicarbonate and hyperventilation who survived. Hick *et al.* (1999) comment that acute mental disturbance 'may alter pain sensation allowing exertion far beyond normal physiologic limits' without the patient experiencing subjective fatigue, resulting in a severe metabolic acidosis (Hick *et al.* 1999, p. 241). This condition might in certain circumstances clearly prove fatal, whether restraint was involved or not (Farnham & Kennedy 1997). However, in a case of agitated delirium, one physiological consequence of which may be acidosis, the effect of a restraint position on pulmonary function that would not normally be significant in a healthy adult, even post-exercise, could therefore prove critical. If the patient continues to struggle the potential effect is likely to be increased (Hick *et al.* 1999).

The hypotheses developed by Hick *et al.* (1999) allows us to imagine a scenario in which an individual experiencing mental illness perceives themselves to be in mortal danger. The resultant extreme fear may manifest itself physiologically in an acute stress reaction that constitutes a risk factor for death in its own right via the catecholamine stress on the heart (Howie 1968, Goodfriend & Wolpert 1976, Case 1986). Characteristic of agitated delirium they exhibit confusion, agitation, hyperthermia and hyperactivity, potentially involving extreme exertion (Miller 1998a). This may occur over minutes, hours or even days (Morrison & Sadler 2001). If they are restrained because of concerns over their safety or that of others they are likely to struggle vigorously against the restraint. However, if their pain perception is altered as a consequence of their illness there is the potential that they will continue to struggle until they collapse or die (Mohr & Mohr 2000). This situation and thus this effect may be difficult to simulate in the controlled situation of the laboratory. Farnham & Kennedy (1997) note that a number of other pre-existing medical conditions may increase risk during restraint. Obesity has already been remarked upon but the literature sug-

gests that a range of other physical disorders, particularly those that may impair respiratory or cardiovascular function, may increase risk. These include pre-existing cardiovascular disease, bronchitis or asthma and somewhat controversially in relation to a case that occurred in an English prison which is not discussed in this series, sickle cell anaemia (Williams 1998). Empirical support for these assertions is provided by Stratton *et al.* (2001), who compare a series of 18 cases of restraint-related deaths associated with hobble tying with a series of 196 cases of hobble tying in which death did not occur. Factors noted to be associated with death included associated obesity, prolonged struggle, pre-existing ill health and drug misuse.

### Cocaine-induced delirium

The role of cocaine intoxication merits separate discussion. Cocaine and other recreational drugs have been reported in association with agitated/excited delirium since the 1970s (Post 1975). The presenting features of the syndrome, i.e. agitated delirium, are similar but the aetiology is different, with cocaine or methamphetamine consumption the most common antecedents (Mirchandani *et al.* 1994). Cocaine-associated excited delirium deaths have been reported since at least 1985 (Wetli and Fishbain 1985). A substantial number of restraint-related deaths in the USA have involved cocaine-induced agitated delirium (Pollanen *et al.* 1998). Ross (1998), discussing a series of 61 case reports of excited delirium custody deaths, indicates that cocaine use was an issue in 69% but that in many instances this was combined with alcohol and sometimes other drugs. There is, however, no evidence from this preliminary examination of this series of deaths of cocaine intoxication.

### Neuroleptic therapy/neuroleptic malignant syndrome

In addition to recreational drugs, the role of prescribed medication, particularly the neuroleptics, has been discussed in relation to sudden deaths in psychiatry (Whyman 1976, Wendkos 1970).

Kumar (1997) has reviewed the potential adverse effects identified, including cardiac arrhythmia and respiratory failure, and case reports have linked neuroleptic therapy, particularly the phenothiazines, with deaths involving violent struggle (Laposata *et al.* 1988). Administration of neuroleptics may also increase the risk of death during restraint by impairing the client's ability to swallow or expectorate effectively, leading to an increased risk of the inhalation of vomit (Wendkos 1970, Jitsufuchi *et al.* 1995). Neuroleptic malignant syndrome (NMS) is a rare concomitant of neuroleptic therapy first described by Delay & Deniker (1968). It is a potentially lethal disorder

and its symptoms can partially mirror those of excited delirium, with hyperthermia and acutely agitated behaviour usually accompanied by raised blood pressure. Unlike agitated/excited delirium, however, it is normally associated with muscular rigidity (Ross 1998). It remains a source of concern because failure to recognize it could mean that it is inappropriately managed via restraint or even additional neuroleptic medication rather than urgent medical attention.

### Issues related to learning disabilities

Neuroleptics drugs are used frequently in the care of people with a learning disability, although their role remains controversial in the absence of an identifiable mental illness (Manchester 1993). Four out of the 12 cases described in this series have, however, involved people with a learning disability. The 1990s have been marked by an increasing awareness that people with a learning disability are likely to experience more health problems than the average person in the general population (Rodgers 1994). Further, they may have higher levels of unmet healthcare needs, experiencing unrecognized and thus untreated health problems (Kerr *et al.* 1996). Particular problems identified, which occur with increased frequency in association with learning disability, include obesity, which is the most commonly reported health problem (Bond *et al.* 1997), and heart disease (Department of Health 1994). Clearly both of these factors may increase the risk of adverse consequences during restraint. The increased prevalence of hearing and/or visual impairment (Vitiello & Behar 1979) may also effect the person's ability to communicate their distress or understand and respond to requests during restraint. This could perhaps increase the likelihood of a prolonged struggle, with its concomitant risks.

### Other dangers: seated and basket holds

While recognition of the potential problems that may arise from prone restraint appears to be growing (O'Halloran & Lewman 1993), other positions are not without foreseeable dangers. Seated restraint positions, often advocated as a more desirable and more dignified alternative to restraint on the ground, may involve significant risk if hyperflexion occurs. Case reports from the USA indicate that where the individual being restrained is in a position in which the upper torso is hyperflexed (that is leaning forward bent over at the waist whilst seated or kneeling) respiration may be severely compromised, particularly if the individual being restrained is obese (O'Halloran & Lewman 1993). Case reports in the American literature have also linked 'basket holds', a procedure in which the individual is

restrained by a member of staff standing or sitting behind him or her who then crosses the subject's own arms in front of him/her and secures them at the wrist or forearm, to instances of restraint related deaths (Hartford Courant 1999). A database of deaths associated with restraint established by the American newspaper lists some 142 from 1988 to date. However, it contains unfortunately rather limited information, with more than half the cases described containing no description of the restraint methods employed (Hartford Courant 1999). A substantial proportion of the cases cited relate to mechanical restraint, whose dangers have previously been noted, but around 30% appear to involve prone restraint, with 11% attributable to 'take downs', where the person has been literally 'taken down' to the floor, and some 3% to 'basket holds'. The National Alliance for the Mentally Ill (NAMI) has since the 1998 Hartford Courant campaign encouraged reporting of the misuse of seclusion or restraints and restraint-related deaths. A total of 12 deaths are cited, all since 1995, although again details are missing in many of the cases described. Of the eight cases described where details are available, it appears that face down restraint appears to have been a factor in five, with basket holds in two cases and a neck hold in one (NAMI 2001).

Two of the situations described in the present series do not previously appear to have been reported in association with restraint-related death: the deaths of Michael Craig, while restrained in a kneeling position by two members of staff with his knees on the floor and his torso lying face down across a bed, and that of Shaun Martin, who died whilst being restrained while lying on his side on a bed. There is no experimental literature on the physiological implications of such positions in respect of respiration. Such deaths should, however, serve to draw attention to the potential dangers of restraint in positions other than prone where respiration may be restricted.

The research presented represents the most comprehensive survey undertaken to date in the UK of this phenomenon. O'Halloran & Frank (2000) have stressed the necessity of establishing a temporal relationship between restraint, sudden loss of consciousness and death and in all of the cases reviewed such evidence exists even where the actual restraint was seen as a contributory factor rather than the cause of death. It must, however, be acknowledged that a number of deaths may not have been identified, and that this review is only a preliminary summary. An in-depth and multidisciplinary review of these cases is needed and might yield more information regarding the factors involved in such deaths. Interestingly, no deaths prior to 1980 were identified. This may reflect weaknesses in the methodology, particularly the electronic search of newspaper databases, which could not be extended further back

than 1985, but it may also indicate a growing awareness of the potential for adverse consequence as a result of restraint and perhaps an increased willingness to attribute the cause of death to restraint.

It is tempting to speculate with the wisdom of hindsight that alternative interventions such as seclusion or mechanical restraint might have avoided some of the deaths reported; however, getting a violent individual into seclusion against his/her will almost invariably involve some form of physical intervention and mechanical restraint as observed is clearly not without its own risks. Some parallels have been drawn between restraint and the phenomenon of capture stress observed in wild animals, which may result in fatality in the absence of obvious pathology (Morton *et al.* 1995). Animal studies suggest interestingly that 'chemical capture' achieved by rapid tranquilization may result in lower stress levels than physical restraint and these findings may have some implications for future research into the management of violent behaviour (Morton *et al.* 1995).

Hick *et al.*'s (1999) model of restraint-related deaths remains persuasive but still hypothetical given the problems with the experimental literature discussed. We can safely conclude only that the experimental research to date has failed to prove or disprove it, although the implications for the treatment of restraint-related collapse are significant. As Hick *et al.* (1999, p. 242) acknowledge, however, 'Continued Combativeness despite restraints... seems to be a marker for a patient at high risk of death, regardless of pathophysiology'. The available evidence suggests that a series of factors acting in combination may increase an individual's susceptibility to death during restraint including:

- obesity;
- prolonged struggle;
- physical ill health;
- acute mental disturbance;
- prescribed medication;
- illicit drug usage (although not in this series); and
- restraint procedures that impair respiration.

Restraint technique represents one, albeit highly significant, variable whose potential influence is mediated by a range of other factors (Chan *et al.* 1998, Milliken 1998). This does not imply that restraint position may not be fatal in itself where respiration is sufficiently compromised. Certain procedures, i.e. neck holds, unquestionably carry a high risk of fatality and should be proscribed in all care settings as should any form of physical obstruction of the nose and mouth. This carries the obvious possibility of suffocation and a number of cases have been reported in health-care settings in America (Observer 2000), leading in some settings for such procedures as covering the patient's mouth

to prevent spitting to be banned (General Accounting Office of the United States 1999). However, the role of a number of other positions, notably prone restraint, remains ambiguous and further research is needed to determine whether certain prone restraint positions may have greater or lesser physiological impact. However, the available evidence from this series shows that pressure exerted downwards on the chest in order to hold the person face down must be categorically avoided, as should positions mirroring aspects of 'hobble tying'. Similarly, given that there have been reported cases of deaths in the USA involving basket holds (Hartford Courant 1999) it would seem wise to avoid use of this technique. This, although the term 'basket hold' describes again not a single procedure but a range, unfortunately sharing the same terminology, but which may differ in their physiological implications and thus relative safety. Of considerable note in this series is that no cases of restraint-related deaths involving children are reported. This is in marked contrast to the situation in the United States where children appear dramatically over-represented in reports of deaths involving restraint (Hartford Courant 1999). In the light of such statistics it is, however, deeply worrying that many child care services in the UK appear to have opted to purchase aggression and violence management systems originally developed in the USA. Given the reported frequency of deaths involving children in the USA, the approval for use of systems that may have not been the subject of research regarding their physiological implications is highly questionable.

## Conclusion

The full combination of risk factors suggested to be associated with restraint-related deaths may prove difficult and indeed undesirable to simulate under controlled experimental conditions because of the ethical issues involved in potentially exposing participants to a very high level of risk, particularly with certain procedures such as hobble tying (Parkes 2002). Stratton *et al.*'s (2001) case series reports a total of 214 episodes of hobble tying in agitated delirium, in which death occurred in approximately 12% of cases. Exposing experimental subjects to such risks is clearly indefensible and we do not need to do research to investigate the potential risks involved in placing 50 stone on a subject's back to ascertain the likely consequences! However, this does not mean that research cannot or should not be carried out into the physiological impact of restraint using other procedures to determine their relative impact on respiration on healthy adult subjects. With the exception of the study reported by Parkes (2000) and Cary *et al.* (2000), there appears to have been no research on the potential negative effects on pulmonary function of a wide

range of procedures used commonly in the UK. This is of obvious concern given the potential for adverse consequences, including death, that may arise. Although hobble-tying or similar procedures do not appear to be routinely employed there is actually little UK data on restraint use. The absence of data on restraint use (including data on routine use as well as the frequency of untoward events) makes it extremely difficult to comment on: the relative risks involved in restraint; the comparative risks involved across a wide range of individual procedures; and the relative risks involved in alternative interventions, including seclusion, mechanical restraint or medication (Busch & Shore 2000).

There is an urgent need for standards for violence management training in a number of areas, including that of physical intervention (Smith 1999, National Control and Restraint General Services Association 2000, Paterson 2000). These standards must, however, be based on evidence rather than opinion (Wright 1999, Allan 2000). Violence poses a major threat to the welfare of many of the staff who work in health and social care settings and our attempts to reduce that risk may in certain circumstances involve the use of restraint. It remains of course ultimately desirable to avoid any form of physical intervention, as any such intervention risks the possibility not just of physical but also psychological trauma (Smith 1995). If, however, we accept the principle that restraint may be used where appropriate safeguards are in place to prevent its misuse, it is incumbent upon us to evaluate the potential risks involved so that potentially dangerous procedures can be eliminated from practice before, rather than after, tragedy. The bio-mechanical evaluation of risks in a carefully controlled environment may, however, never adequately simulate the dynamics of an actual violent incident, where recall and thus practice may only approximate to that originally taught (Bell & Stark 1998). This is of concern given that relatively minor variations in some procedures such as basket holds may greatly effect the risk involved (Paterson & Leadbetter 1998). We must therefore seek to learn about the risks involved in the application of procedures not just in the laboratory but in practice.

The published literature in this area is largely British or American and attempts to explore this issue with reference to other practice contexts, particularly Europe, have proved unproductive to date. Bowers *et al.* (1999) reported a wide variation in the content and duration of training in the management of violence across Europe. This inconsistency is echoed in terms of definition with terms such 'violence' and 'restraint' often defined very differently both in the literature and operationally. In the absence of consensual definitions on what constitutes restraint and enormous variations in restraint procedure both between and within countries, it is effectively impossible to draw any meaning-

ful comparisons given the absence of data on the frequency of restraints and restraint-related deaths in the published literature. Collaborative work is therefore necessary to produce consensual definitions and recording systems for restraint that would over time begin to enable us to identify the relative risks involved in differing management strategies and move towards safer practice.

It is perhaps important that this review concludes with a reminder that restraint is intrinsically an unsafe procedure, which, however, in some circumstances may be less dangerous than the alternatives available. The most obvious way of reducing the risk of restraint-related deaths is of course to avoid restraint by actively promoting alternative intervention and management strategies that focus on primary and secondary prevention. The debate around how this might best be accomplished in individual settings with differing client groups is complex and substantial investments in staff training in developing alternative ways of working may be necessary (Bowie 1998). There is, however, good evidence to suggest that some relatively simple regulatory measures, such as mandating the recording and reporting of restraint, may reduce the frequency of restraint use (1999).

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