

2011

Review of the Medical Theories and Research Relating to Restraint Related Deaths



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Acknowledgements

The authors wish to thank the following for their contributions and advice:

Professor Richard Shepherd; Matt Leng (Ministerial Council on Deaths in Custody), Deborah Coles and Victoria McNally (INQUEST), Prof Richard Whittington, Malcolm Rae, Dr Brodie Patterson, Prof Ian Wall.

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Executive Summary

The Independent Advisory Panel (IAP) which forms the second tier of the Ministerial Council on Deaths in Custody, commissioned this review of the medical theories and research relating to restraint related deaths. This report seeks to clarify research from national and international literature to ascertain any common findings in order to provide guidance for staff on safe and effective restraint techniques where there is no other resort in the management of violent and aggressive individuals.

The methodology used was a literature review, a gap analysis and gathering expert opinion. There were 21 relevant international studies identified and 7 UK studies. There were 38 UK restraint-related deaths identified through NEXIS, INQUEST and a previous survey (which covered the period of 1979 to 2000). Of these 38, 7 were individuals detained under the Mental Health Act and 4 were informal patients in mental health care settings.

Throughout the literature there is evidence that certain groups are more vulnerable to risks when being restrained, whether because of biophysiological, interpersonal or situational factors or attitudinal factors. These groups are those with serious mental illness or learning disabilities, those from Black and Minority Ethnic communities, those with a high body mass index; men age 30-40 years and young people (under the age of 20).

The physiology of deaths under restraint in any setting where there is a duty of care on the state, is difficult to investigate as internationally the numbers of restraint-related deaths are small and classification by pathologists varies in different countries. Findings from experimental studies are not completely valid as there is limited generalisability to the real situation. The studies in this review which have increased validity are those with large numbers of retrospective case histories and autopsies but these are mostly published in literature from the USA. The frequency and acceptance of excited delirium syndrome as a cause of death in restraint incidents in this body of literature, and the use of 'hobble' restraint methods as the most common technique in these cases, make inferences and associations with UK deaths in custody more problematic.

Simply restraining an individual in a prone position may be seen as restricting the ability to breathe, so lessening the supply of oxygen to meet the body's demands. Restriction of the neck, chest wall or diaphragm can also occur when the head is forced downwards towards the knees. Laboured breathing and cessation of resistance may demonstrate collapse and

indicate a medical emergency rather than cooperation from the individual. Other theories, besides positional asphyxia, were examined. These included acute behavioural disturbance and excited delirium, stress-related cardiomyopathy and the role of alcohol and drug abuse.

Six of the thirty eight deaths noted in this report involved individuals with pre-existing conditions that may have increased the risk of cardiac arrest: e.g. ischaemic heart disease, diabetes and four people suffered from epilepsy. Sixteen cases had a history of mental illness, specifically psychosis. Positional asphyxia appears to be implicated in at least twenty six deaths (whether or not given as a verdict) because of struggle/physical stressors prior to restraint, number of staff involved and, in particular, because of the length of time of the restraint and position of the individual.

Expert opinion and reviews were sought. There was consensus that there was a gap in reporting restraint-related deaths. Overall concerns were raised as to whether direct cause and effect can be determined in deaths as they often involve a mixture of complex factors and situations. The general view was that it should be assumed that everyone is at a potential risk rather than try to profile individuals only medically at risk. This is a class of death not fully understood and is multifactorial. Finally, a gap analysis was developed, including training and risk assessment issues, and implications for practice were discussed as a result of the expert opinion.

1. Introduction

There is considerable controversy surrounding deaths that occur in custody and healthcare, especially in this era of instant media coverage and communications. These cases immeasurably distress the victims' family and community; they also exhaust the resources and staff in all parts of the medical–legal community. Law enforcement, healthcare staff or prison personnel, who are centrally involved with the death, are often stigmatised and subsequently experience considerable professional pressure and personal stress. Service reputations and community relationships may be compromised. Further complicating the situation is the fact that there are often minimal physical findings at autopsy, accompanied by sparsely detailed case information.

Where these deaths have involved the use of restraint they can be among the most controversial because they have occurred as a result of the actions of representatives of the state. The death of David 'Rocky' Bennett in 1998¹ in a healthcare setting is an example of restraint-related deaths that demonstrate the need for clarity on methods of physical restraint that are safe and humane in the management of aggressive or violent individuals. With effect from 17 July 2008 the Coroners (Amendment) Rules 2008 amended Rule 43 of the Coroners' Rules 1984² so that coroners have a wider remit to make reports to prevent future deaths as a result of restraint such as in the case of Adam Rickwood³.

The demand for transparency in investigating restraint-related deaths in custody or healthcare has been recognised by the Independent Police Complaints Commission's reviews of deaths in police custody (Hannan 2010) and by the Joint Parliamentary Committee on Human Rights' report into 'Deaths in Custody' in 2004. In order to aid any public scrutiny data collection must be rigorous. However, autopsies, investigations and public scrutiny of restraint-related deaths have not always provided the exact physiological causes of these tragic and unexpected deaths. Guidelines such as that provided by the

¹ 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

² There has been a long history of Rule 43 reports on restraint deaths in the late 1990's, early 2000's; e.g. Roger Sylvester.

³ 14-year-old Adam Rickwood became the youngest child to die in custody in Britain in modern times. He hanged himself after being restrained by four adult carers at Hassockfield secure training centre

National Institute for Clinical Excellence (NICE 2005) on safe and effective techniques for physical interventions for management of violent and aggressive individuals are therefore based on scant research and much speculation on the physiology of restraint-related deaths. This report seeks to clarify research from national and international literature to ascertain any common findings in order to provide guidance for staff on safe and effective restraint techniques where there is no other resort in the management of violent and aggressive individuals.

The terminology used throughout the report will try to be as broad as possible to encompass and reflect all services/agencies while being cognisant that specific services, such as mental health services, use terms, such as 'physical interventions' or 'prevention and management of violence and aggression' instead of 'control' and 'restraint' which have perceived negative connotations. A broad definition of restraint is also necessary. ***Physical restraint is defined here as the lawful use of force involving the restriction of movement by physical holding.***

2. Background to the Review

The work of the Independent Advisory Panel on Deaths in Custody (IAP) which forms the second tier of the Ministerial Council on Deaths in Custody is primarily being taken forward via working groups, each led by a member of the Panel. One group is working on the use of physical restraint in state custody. The full terms of reference for this group are to:

1. Review the statistics on the number of restraint related deaths that have occurred within state custody over the last ten years and the circumstances of these to gain an understanding of the scale of the issue and identify any common themes;
2. Review the policies and guidance governing the use of restraint across the different custody sectors and the training provided to staff. Attempt to identify the points of correlation and discrepancy between sectors in relation to restraint and highlight the reasons why different approaches are adopted;
3. Undertake a short analysis of current medical theories and concepts about restraint related deaths;
4. Identify good practice and learning in relation to the actual use of restraint techniques and the training provided to staff and explore how this might best be shared across the different custody sectors, and;

5. Consider whether cross sector guidance on the principles of the use of restraint would be useful and if so use the findings of this work to feed into the development of this document, which will be taken forward as part of the IAP's longer-term work programme.

At the Ministerial Board on Deaths in Custody on 4th March 2010, this working group presented a series of recommendations, which were supported by Board members. One of the recommendations was for the IAP to commission a review of the medical theories and research relating to restraint related deaths.

3. Aims and objectives

The findings from this review will enable IAP to identify whether the restraint training packages used by each of the custodial sectors adequately mitigate the medical risks related to restraint and provide the IAP with a definitive understanding of the physiological causes of death.

The specific objectives are:

- 3.1 A review of the medical theories and research to encompass any idea, experiment, reasoning or explanation that has a medical basis (in the broadest sense) so including basic medical sciences (physiology, biochemistry, anatomy etc) as well as the clinical aspects (cardiology etc) relating to restraint related deaths focussing upon those that occurred in the UK from 1st January 1999 to 31st December 2009 with particular reference to positional asphyxia.
- 3.2 Reference to relevant international research on these deaths.
- 3.3 Discussion of other aspects of restraint related deaths including excited delirium, pre-existing congenital conditions e.g. Sickle Cell Disease (SCD) and acquired conditions e.g. Chronic Obstructive Pulmonary Disease (COPD).
- 3.4 Discussion of the role of drugs and alcohol in restraint related deaths.
- 3.5 Identification of any trends particularly in relation to Black and Minority Ethnic (BME) communities and those individuals with mental health issues.
- 3.6 Relevant research that has been undertaken in relation to the use of de-escalation techniques in order to avoid the use of physical restraint.

4 Methodology

4.1 Establishing baseline dataset from the literature review

The first task was to establish a search matrix and subsequent data set. Search terms formed the tender specification and knowledge of the subject area was used to cover the range of literature and research published between the dates of 1992 to date. The data set informed the project in relation to:

- Statistics on restraint incidents
- The scale of the issue
- Medical theories and concepts
- Reporting mechanisms
- Outcomes
- The reasons given for the use of restraint
- Perspectives from a range of stakeholders on restraint including clinical staff and service users
- National and international variations

The project team accessed any relevant literature held by the key organisations (Ministry of Justice; Department of Health) for information to inform some of the discussion and expert opinion scheduled for later parts of the review.

4.2 Gap analysis/expert review

Gap analysis determines the steps to be taken in moving from the current position to a desired future state. Having scoped, recorded, reviewed and mapped medical theories against the range and extent of literature on physical restraint practices a further stage of data collection to identify gaps was conducted. This involved a mapping of met and unmet

recommendations against findings and recognised guidelines in the use of physical restraint. This will be tested with experts both nationally and internationally to explore the way forward in this area of practice.

4.3 Expert seminars

Two expert seminars were conducted. One, to take advantage of an already scheduled two day meeting of the European Violence in Psychiatry Research Group (EViPRiG)⁴, the second drew upon national expert opinion at a specially scheduled event in London. This involved the format of a world café⁵. The approach mirrors aspects of the Delphi Technique which was originally designed to gather input from participants without requiring them to work face-to-face. Often, the process is used to find consensus among experts who have differing views and perspectives. The Delphi Technique enables group problem-solving using an iterative process of problem definition and discussion, feedback, and revisions. These processes are intended to collate feedback and commentary from the experts.

The second expert seminar was an invited group in order to initiate the interim dissemination strategy as well as providing opportunities to consider approaches to restraint and to reflect on the demands of practice and education governance in developing the workforce to provide quality and safe techniques.

5 Results of literature search

UK sources were the primary focus for accessing research on restraint-related deaths using the hierarchy of evidence levels 1- 6. However, anticipating that there would be scant or unreliable evidence, the strategy included international published papers and professional text. Each article was screened for relevance by the researchers. The start date for published reports was 1992 when the first research on restraint-related deaths was published in the USA. Current research projects led by UK university based researchers were also accessed; acknowledgments are made to these sources.

⁴ An active network of mental health researchers, educators and practitioners with over 60 members in 20 European countries.

⁵ A participative process which enables people to have creative conversations while sitting cafe-style around small tables

In order to establish preliminary figures for restraint-related deaths, and to carry out a preliminary analysis of such deaths, reports from the Independent Advisory Panel on Deaths in Custody were accessed. INQUEST reports and statistics were also accessed for the time period 1st Jan 1999 to 1st Jan 2010. Finally, the NEXIS database was used. The rationale for accessing a UK newspaper database was that while cases of restraint-related deaths might not have been discussed in the professional literature they may have been the subject of newspaper reporting.

Inclusion criteria:

Studies were included in the systematic review if they met the following inclusion criteria:

- Medical sciences (physiology, biochemistry, anatomy etc) as well as the clinical aspects (cardiology etc) relating to restraint related deaths with particular reference to positional asphyxia.
- Studies were published between 1st January 1992 and 1st June 2010 (one more recent study has also been included)

Cases were included in the analysis if:

- The case involved people, from age 14 years upwards, in mental health settings, custodial settings, or whilst the individual was being arrested by officers in the course of their duty, Secure Young People's Estates and Immigration removal services
- There was a report of, or comment on, the reported death relating to physical restraint
- Death occurred during, or immediately afterwards, physical restraint/physical interventions used by those with statutory powers and a duty of care⁶
- Of the 38 cases, 7 were individuals detained under the Mental Health Act (MHA) and 4 were informal patients in mental health care settings. We have included those individuals who are not detained under the MHA as we believe there is learning to be gleaned from these cases.

Exclusion criteria:

- Psychogeriatric
- intensive care (in general hospitals)

⁶ Physical restraint is defined here as the lawful use of force involving the restriction of movement by physical holding

- military
- use of Tasers (this was excluded as their use does not fit within the category of “hands on restraint”, as detailed elsewhere in this report)
- The cut off for the time frame for cases was June 2010 as inquests may not yet have been carried out.

Databases:

1. BNI
2. EMBASE
3. HMIC
4. MEDLINE
5. PsycINFO
6. CINAHL
7. PubMed

Resources:

1. Bandolier, Evidence Based Reviews, Images, For Patients, NHS Evidence Specialist Collections, AMED, National Library of Guidelines (includes NICE Guidance), NICE Guidance (only), Clinical Knowledge Summaries, The Royal Society of Medicine, Black's Medical Dictionary, 41st Edition
2. INQUEST (a charity that provides a free advice service to bereaved people on contentious deaths and their investigation with a particular focus on deaths in custody)
3. Independent Police Complaints Commission
4. Expert opinion, e.g. The European Violence in Psychiatry Research Group (EViPRG)
5. Nexis: A full-text database of news and business intelligence drawn from over 29,000 sources. These sources include local, regional and national newspapers, newsletters, magazines and trade journals, newswires, broadcast transcripts, company news databases, government documents, legislation and legal journals
6. National Heart and Lung Institute, Imperial College London.
7. School of Health and Rehabilitation, Keele University.

Search terms:

(positional AND asphyxia). Ti,ab [Limit to: Publication Year 1992- 2010]

(postural AND asphyxia). Ti,ab [Limit to: Publication Year 1992- 2010]

(Sudden AND death AND custody). Ti, ab [Limit to: Publication Year 1992- 2010]

(Sudden AND death AND restraint). Ti, ab [Limit to: Publication Year 1992-2010]

(Excited delirium OR acute behavioural disorder). Ti, ab [Limit to: Publication Year 1992-2010]

(Physiological AND restraint AND death). Ti, ab [Limit to: Publication Year 1992-2010]

(Prone position AND adverse effects). Ti, ab [Limit to: Publication Year 1992-2010]

Results:

Studies were excluded for the following reasons: physical restraint of the elderly; pepper spray; qualitative surveys on physical restraint; and accidental asphyxiation as not relevant to the topic.

There were 21 relevant international studies identified and 7 UK studies. These are listed in Appendix 1. The findings will be discussed in Chapters 15 and 16.

There were 38 cases identified through NEXIS, INQUEST and a previous survey (Paterson 2003). These will be analysed and compared with research findings in Chapter 18.

6 Rationales for restraint

Healthcare best practice in managing aggression and violence is guided by the Code of Practice and NICE guidelines. The Mental Health Act Code of Practice states:

Interventions such as physical restraint, seclusion or rapid tranquillisation should be considered only if de-escalation and other strategies have failed to

calm the patient... Managing aggressive behaviour by using physical restraint should be done only as a last resort and never as a matter of course. It should be used in an emergency when there seems to be a real possibility that harm would occur if no intervention is made

However, effectiveness in managing aggression or violence is in doubt: a Cochrane review in 2001 (Salias) found that in the absence of any controlled trials in those with serious mental illness, no advice can be made about the efficacy, advantages or harmfulness of restraint. Recent update to the review (Muralidharan, Fenton 2008) found that the types of physical restraint currently used vary and no explicit methodology exists.

7 De-escalation

The use of de-escalation, defined as “a complex range of skills designed to abort the assault cycle during the escalation phase; [which] include both verbal and non-verbal communication skills” (NICE, 2005), is widely acknowledged and recommended as an intervention in both the prevention, management and reduction of violence and aggression within institutional settings and wider society as a whole (Miller, 2003), (National Institute for Mental Health in England [NIMHE] 2004), (NHS Education for Scotland, 2005) (Nursing and Midwifery Council [NMC], 2001) . The concept of de-escalation is firmly espoused within the Public Health approach (World Health Organisation [WHO], 2002) to violence reduction, sitting firmly within the secondary and tertiary prevention frameworks whilst being linked to the elements of primary prevention interventions (WHO, 2002). However, although it is widely recognised that the concept of de-escalation involves the use of both verbal and non-verbal communication styles and strategies (Paterson, Leadbetter, McCormish 1997), what is less apparent when considering the literature and evidence base surrounding this concept is whether there is a standardised approach to the process that could be used in the wide array of settings whereby this intervention will be required to be implemented (Paterson and Leadbetter 1996).

The literature review conducted by Wright, Gray, Parkes and Gournay (2002) for the United Kingdom Central Council for Nursing Midwifery and Health Visiting (UKCC) paper on ‘The Recognition, Prevention and Therapeutic Management of Violence in Acute In-Patient Psychiatry’ (UKCC 2002), perhaps provided the most comprehensive review of the available

evidence surrounding the concept of de-escalation within recent times. As Wright et al (2002) established, there is very little by way of relevant research as to the effectiveness of any of the models promoted for the process of de-escalation, or for the effectiveness of training models and packages within this area. As Wright et al (2002) clearly state

“While there is considerable overlap in the skills and practices that are described in the literature [around the subject of de-escalation], there is also contradictory and mutually contradictory advice”.

A more recent review of the available evidence for de-escalation is found within the National Institute for Clinical Excellence (NICE) 2004 Clinical Guidelines 25 ‘Violence: The short-term management of disturbed/violent behaviour in in-patient psychiatric settings and emergency departments’. However, as Wright et al (2002) established, there is a lack of empirical evidence around the subject and as such, NICE (2004) found that the evidence surrounding the concept of de-escalation is limited to recommendations for best practice based on expert opinion and general consensus, as opposed to evidence found through meta analysis, systematic review or randomised control trials (NICE, 2004).

More recently, within mental health and other settings, Conflict Resolution Training in its’ various manifestations, has attempted to provide a more standardised approach to the issue of de-escalation (Miller, 2003), (Security Management Service (SMS) 2004 & 2005), although there remains little by way of rationale for the models of de-escalation chosen within such training.

However, although there appears to be a lack of high level evidence for the process of de-escalation, as NICE (2004) rightly ascertain, there are indeed a number of general principles that appear to be universally agreed as opposed to an overarching agreement and consensus over a preferred model for de-escalation.

What is clear from the literature is that the concept and process of de-escalation is part of many interventions available for the prevention, management and reduction of violence and aggression that sit within an overall organisational framework of violence reduction (Colton, 2004).

8 Physical restraint training and techniques

The original model for physical restraint used within the UK, called Control and Restraint, abbreviated to C&R, was developed by the prison service in 1981 in response to the growing number of violent incidents within prisons and the often poor outcome for both prison staff and those detained in prisons (Wright, Gray, Parkes, Gournay 2002) (Rogers, Miller, Paterson, Bonnett, Turner, Brett, Flynn, Noak 2007).

Following recommendations made in the Ritchie Report (1986), the prison service Control & Restraint model of violence management and prevention was introduced to the 3 high secure 'special' hospitals in England, with specific amendments made to the model to ensure relevance with the client group detained within the special hospital settings (Wright et al 2002). This expansion into the special hospital setting was firmly regulated by the prison service, with all instructors training and other such standards remaining under the control and remit of the prison service (Paterson, 2006). However, after the adoption of physical restraint training by more mainstream mental health services, a distinct differing of directions has occurred between the prison service and mental health services (Rogers et al 2007).

The original model of Control and Restraint remains the same in the prison service, with all staff, irrespective of which prison they work in, being taught the same suite of techniques and manoeuvres, with instructor training taking the same standardised approach (Smallridge, Williamson 2008).

However, within Mental Health Services a different picture emerges. With the adoption of restraint training within mainstream services, adaptation of techniques has occurred resulting in no clear standardised approach across the mental health estate (Butterworth, Harbison 2010). This has been compounded by the ending in the early 2000's of the English National Board for Nursing (and its' UK wide equivalents) and the subsequent dissolution of what was previously recognised as the Control & Restraint Instructors course – namely ENB 956 Coping with Violence and Aggression Stage 1, ENB Coping with Violence and Aggression Stage 2, ENB A74 Training the Trainers – Control and Restraint, ENB 998 Teaching and Assessing in Clinical Practice (Butterworth et al 2010). Although this course offered no standardised approach to restraint techniques it did offer a standardised approach to the professional education of instructors (Butterworth et al 2010). Within mental health services there is now an unregulated restraint industry. Equally though, the lack of accreditation within the Prison Service and in particular the young person's prison estate has given rise to concern following recent inquiry reports (Smallridge et al 2008). Thus the national picture

within both settings is currently one of pockets of good practice, lacking in a firm evidence base, with an unregulated piecemeal approach prevailing within mental health services.

In the police service all trainers follow the ACPO (The Association of Chief Police Officers) manuals of guidance used in police training. Training for Detention Custody Officers and Detention Escorting Officers is subject to the same stringent accreditation policy as prison officers, which are accredited to specifications set by the National Offender Management Service.

9 Reporting mechanisms on restraint

- Prison establishments are required to submit monthly returns to the Security Policy Unit (SPU) within National Offender Management Service (NOMS) on the frequency and type of force⁷ used on prisoners.
- Data on use of force by police officers is not mandatory recorded nationally.
- The Detention Services Intelligence Team within United Kingdom Border Agency (UKBA) has overall responsibility for collating and analysing the statistics on the use of force within the Immigration Removal Centres (IRC). In addition, each IRC is responsible for collating statistics locally for monitoring and analysis purposes. Any use of force used by enforcement officers is recorded and sent to the National Arrest Training Centre for monitoring and learning.
- The Youth Justice Board requires every Youth Offender Institute, Secure Training Centre (STC), Local Authority Secure Children's Home (LASCH) and commissioned STC escort provider to send monthly returns on the use of restrictive physical interventions (RPI), which is defined as any occasion when force is used on a young person.
- In the National Health Service mental health services record incidents of serious injury in secure settings through the National Reporting and Learning System (NRLS) which has been a role of the National Patient Safety Agency (NPSA). However, in the future, the NRLS will be transferred to the NHS Commissioning Board as a Patient Safety sub-committee of the Board as proposed in the 2010 report "*Liberating the NHS: Report of the arms-length bodies review*".

⁷ The term 'use of force' here denotes any and all types of force that may be used against individuals detained in state custody, including the use of handcuffs and batons and the use of planned and unplanned Control and Restraint (C&R).

Unexpected or avoidable deaths must be investigated in NHS funded services and care via the NPSA to the Care Quality Commission (NPSA 2010) but specific restraint-related deaths have not been collated nationally:

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

(Paterson 2003)

10 Incidents of restraint

The “Count me in” census from the Care Quality Commission (CQC) is a one-day snapshot of patients detained under the Mental Health Act (1983) carried out on 31 March each year. Amongst other things, the census provides information on the number of times in-patients had been subject to physical restraint by staff. In the 2010 survey about 12% of in-patients had experienced one or more episodes of hands-on restraint. No ethnic differences were observed. A UK national survey by Wright *et al.* (2005) gave a mean frequency of restraint of 3.13 incidents per month (range 0.1–100). Statistics from the NHS Security Management Service (NHS SMS) show that in 2008/09, 54,758 incidents of physical assault against staff were reported in the NHS in England. Of these around 11,000 occurred within the acute (general hospitals) sector and 39,000 in mental health and learning disability services. The remainder were in primary care and the ambulance sector (Skills for Security 2010).

The Care Quality Commission in their Mental Health Act annual report (2010) found some hospitals could have been doing more to resolve situations before using seclusion or restraint. Where seclusion or time-out is not an alternative, restraint incidents may occur more frequently or for longer periods as Bowers (2010) found:

The absence of seclusion as an option might mean that in rare instances very disturbed patients are manually restrained for longer periods while rapid tranquillisation takes effect, and lengthy restraint carries the risk of positional asphyxia

Since April 2011 the NHS Mental Health Minimum Data Set version 4.0 now includes the collection of:

The duration in minutes of a reported incident of physical restraint of a PATIENT by one or more members of staff in response to aggressive behaviour or resistance to treatment. Any incident of restraint resulting in the Trust Restraint Policy being invoked should be recorded. DATE OF PHYSICAL RESTRAINT records the date that this incident took place

NHS Connect for Health. Information Standards
Board for Health and Social Care

The Mental Health Minimum Data Set data is collected from NHS funded providers of specialist mental health services and submitted via the Bureau Services Portal provided by the Systems and Services Delivery (SSD) team at NHS Connecting for Health. The Mental Health Minimum Data Set Version 4.0 will be used to facilitate national reporting and analysis of key information and should support the development of mental health policy, commissioning, service improvement and also address a variety of data quality issues. An overview of restraint incidents nationally will then be possible.

11 Sequelae of restraint incidents

Psychological distress to the community, the staff involved in a restraint incident (Whittington 2006) and the individual restrained will be a probable result of not just preceding violence or aggression but also the method of restraint and how post incident debriefing is managed. Many participants in a study by Strout (2010) reported that the experience of being restrained brought back memories of previous violent attacks against them.

Non-fatal physical trauma can also occur as a result of restraint. However, there is little information on the prevalence of restraint-related injury (Evans 2003). The types of physical injury reported include dehydration, choking, circulatory and skin problems, loss of strength and mobility, and incontinence (Mohr 2003, Reay 1999). Injury during restraint was reported as 3.25% of restraint incidents in a study by Uppal (2009). In a study of staff and patient injuries in an acute mental health care trust Lancaster (2008) found that reported injury rates

across incidents were overall higher for staff (17%) than for patients (4%). This difference applied in all three restraint positions (supine, prone and vertical).

In a study by Hatta (2007) rate of drug-induced liver injury was significantly higher in restrained patients than in non-restrained patients in a psychiatric intensive care unit. No significant differences were seen between groups in mean number of drugs given or rates of patients who received benzodiazepines or mood stabilizers. Thus, differences in medication factor were not apparent between groups. However, the researchers hypothesised that stress might have resulted in stimulation of the hypothalamic-pituitary-adrenal axis, followed by adrenergic stimulation. Stress-induced stimulation of the hypothalamic- pituitary-adrenal axis may follow enhancement of immune responses. Exposure on this unit to the stressor, i.e. restraint, was prolonged and repeated. Consequently, immune responses to psychotropic drugs might have been enhanced in patients with drug induced liver injury.

12 National and international variations

In a survey of psychiatric professionals in the United Kingdom, the Netherlands, Finland, and Australia, staff in Finland expressed the highest level of approval of containment including restraint; staff in the UK the least, with those in the Netherlands in between. Individuals' preferences for different containment measures were largely determined by whether they considered it (i) safe for the patients undergoing it, (ii) prevented them from injuring others, and (iii) quickly calmed them (Bowers et al 2007). In a European survey of managing violence (Lepping 2009) 100% of German wards used mechanical restraint by fixing patients to their bed compared with 60% of Swiss wards and 0% of British wards.

Considerable differences therefore have been found across Europe on involvement of control and police, application of involuntary medication, need to transfer to forensic psychiatry, and use of coercive measures. Physical restraint, seclusion, and mechanical restraint each are common in some countries and forbidden or definitely not used in others. (Steinert, 2010). For example, the incidence of coercive measures to manage violence or aggression in the Netherlands is higher than the UK because their mental health legislation and professional opinion sees involuntary medication as being more invasive than restraint or seclusion.

13 Stakeholders' perspectives

13.1 Victims' families

In one study (Bilanakis 2008) 89% of families interviewed after their family member had been restrained or secluded believed that the decision to restrain or seclude the patient was justified. They agreed that coercion in these cases was the last resort for the prevention of potentially dangerous behaviour and stated that the coercion had not been used for medical or punitive reasons.

13.2 Learning disabilities

In a study by Cunningham et al (2003) restraint was rated negatively by all nursing students, staff and service users. Service users rated restraint more negatively than other groups. The chair method was rated the 'least - worst' restraint method.

Actual service user experience was more negative than the staff had believed in another study (Hawkins et al 2004) while the primary similarity between service user and staff accounts was the parallel production of negative emotional reactions during a physical intervention.

Jones's study in 2006 found that mechanistic definitions given by patients were suggestive of restraint being a functional, non-communicative practice

13.3 Healthcare settings

Care and responsibility in managing aggressive behaviour, rather than physical restraint or control, is seen as the critical role of the nurse in in-patient mental health settings. However, staff still report difficult feelings in this function as a study in New Zealand found (Bigwood, 2008):

The findings suggest that mental health nurses are very uncomfortable with physical restraint despite it being taken-for-granted as integral to their role. The nurses experienced conflict and fear associated with the procedure and would prefer to utilise other de-escalation skills if it was possible.

This dissonance is also evident in a study in Canada (Marangos-Frost 2000) when the nurses experienced conflict in relation to the restraint situation when they had to choose from equally unwelcome options — the risk of imminent harm or restraint. Uncertainty was also seen in Lee's study (2003) of staff's views of restraint:

Despite the positive view that incidents were brought under control, concerns and ambivalence in the use of physical restraint still remains.

Specific techniques used in restraint may be seen by staff as contentious; while many nurses appear to hold positive views of physical intervention, some have concerns about the potential for abuse and misuse of the techniques mainly joint locks and flexion to induce pain (Lee, 2003).

Patients and staff in Duxbury's research (2002) believed that service user aggression could be handled more effectively on the mental health wards. In addition, the need for change, the examination of alternatives and the development of proactive methods are recognised by both the service user and nursing staff population. Bigwood (2008) concluded that staffing, skill mix, and the nature of the practice environment all need to be addressed to support nurses in safe practice.

Service users in Bower's review (2003) of research on seclusion and restraint had very negative feelings about both, whether they were restrained or secluded or observed by others who were not restrained. They saw restraint as punishment for their actions and felt panic, fear, hopelessness, anger and frustration, and a sense of injustice which could lead to further aggression and resistance (Stubbs 2009). These fears and anxieties may also be experienced by staff, as a result of inadequate skill mix, support and confidence.

In two small studies a total of 20 service users (Bonner *et al.* 2002, Sequeira & Halstead 2002) found mainly negative experiences including feelings of anger, fear and panic. They said they felt ignored prior to the incident and that their behaviour had not justified the use of restraint.

In Accident and Emergency settings a study (Winstanley 2002) noted that cognitive impairment as a result of confusion, psychosis or the effects of prescribed or illegal drugs (intoxication or withdrawal) and aversive stimulation (where an assaulted staff member was seen as frustrating the patient, enforcing personal care or enforcing treatment immediately prior to the assault) occurred together, suggesting that cognitively impaired patients tend to receive more aversive care and treatment than others.

13.4 Custodial settings

Police officers have expressed compassion and understanding of people with mental disorders and reported that they have an appropriate and sometimes positive role with them and in working with mental health services (McClean, 2010). However, a study of police officer's attitudes on training course in 2003 (Pinfold et al) found that they perceived people with mental health problems who are violent were the most difficult to deal with.

The Metropolitan Police Service report (2004) that front line officers are asked to recognise, in restraint situations, excited delirium as a syndrome whose existence has been disputed in healthcare. It would be of value to determine if training and placement of police officers in mental health settings enabled a greater understanding and impacted on the way they responded to people in mental distress

13.5 Youth services

Penal custody for young people in the UK is for those 17 yrs and under. Safety was seen by patients in a young people's in-patient secure service in the USA as the main reason for physical restraint; staff saw this as well as the main reason for restraint rather than aggressive or assaultive behaviours (Petti, 2001)

However, children often reported feeling traumatised by bad restraint memories and, consequently, being afraid of the restraint procedure and believed that the staff members had not listened to them and could have helped them avoid being restrained (Smith 2009). The Children's Commissioner sought young people's views of restraint (2011). They reported that the young people expressed anger about how and why they were restrained:

They reported that the use of restraint seemed heavy handed and could lead to them feeling traumatised.

14 Incidents of restraint-related deaths

There are statistics held by the Independent Advisory Panel on Deaths in Custody from the custody sectors on restraint-related deaths. The Independent Police Complaints Commission also record deaths in police custody; these statistics include those who died under restraint (Grace, 2011). In the period of 2010-2011 seven people fell ill or were identified as being unwell at the point of arrest. Of these seven cases, four of these were pronounced dead at the scene of arrest and three were taken to hospital and died within an hour of arrival. Four involved some form of restraint by the arresting officers. There were also two restraint-related deaths reported for this period where the death was in or following custody. There were also two restraint-related deaths where police had contact with the individual⁸; in both these cases the police were called to a mental health hospital to assist staff with a patient.

The IAP reported that between the 1st January 1999 and the 31st December 2009, there were 6,151 deaths in state custody⁹ in all services. In 22 of these cases, restraint was identified as a cause of death at the coroner's inquest (IAP 2010).

Table 1 Deaths by age range

Setting	No of restraint related deaths	Age range 11-20	21-30	31-40	41-50	51-60	61-70	71-80
Prisons	1	0	1	0	0	0	0	0
Secure Young People's Estates	1	1	0	0	0	0	0	0
Immigration Removal Centres	0	0	0	0	0	0	0	0
Police	15 ¹⁰	0	1	6	3	2	1	1

⁸ Deaths following police contact that are subject to an IPCC independent investigation

⁹ When the state takes away the individual's liberty and places him in custody or under the mental health act in care.

In-pt mental health setting	5	0	2	3	0	0	0	0
TOTAL	22	1	4	9	3	2	1	1

Between April 1998 and March 2003 there were four (Home Office Category 3¹¹) deaths in police custody where excited delirium was given as the cause of death. This covers the deaths of persons who have been arrested or otherwise detained by the police. It also includes deaths occurring whilst a person is being arrested or taken into detention. The death may have taken place on police, private or medical premises, in a public place or in a police or other vehicle (Metropolitan Police Service, 2004). Between April 1998 and March 2003 there were five Home Office Category 3 deaths in police custody where positional asphyxia was given as the cause of death.

This figure of 22 restraint-related deaths over 11 years is in comparison with the 16 deaths in police custody where restraint was a factor between January 1990 and December 1996 (Leigh 1998). However, differences may be accounted for by the shorter period covered and by the focus on police custody only in the earlier study.

15. Vulnerable populations

Throughout the literature, research studies and debates there is evidence that certain groups are more vulnerable to risks when being restrained, whether because of biophysiological, interpersonal or situational factors or attitudinal factors. These groups may be vulnerable because they are over-represented in the detained population in any case or through attitudes and situations they encounter whilst being detained and consequently restrained. There are also others who are susceptible to medical harm because of biophysiological features such as pre-existing conditions.

¹⁰ One unknown

¹¹ deaths in, or following, custody

15.1 Individuals with serious mental illness

People with serious mental illness have much higher mortality rates from all causes, for example, respiratory disease, cardiovascular disease and infectious disease (National Mental Health Development Unit, 2011). The risk of sudden deaths due to cardiac arrhythmias related to antipsychotic drugs is thought to increase in people with pre-existing cardiac disease, those taking multiple QT-acting drugs, and those taking antipsychotics at high dose for long periods (Appleby, 2000). Compared with the general population, rates of sudden death are reported to be higher among mental health service users for several reasons, including general neglect of health and increased rates of damaging personal habits, for example, smoking, alcohol and other substance abuse, and poor diet (Mohr, 2003).

In the community where police are at the scene of an incident, the arresting officer has to make a rapid assessment of the individual and this requires basic mental health awareness, knowledge of local mental health services and an awareness of their legal powers. Watson and Angell (2007) and Cooper et al (2004) suggest police officers routinely decide if the mentally disordered person they are managing would be admissible or not to hospital or other care facility. Even if they assess them as needing medical care, the person is likely to be arrested as this is the only way in which public order can be restored at this time. In custody, the custody officer is responsible for the detainee from the time they arrive at the police station, and will make decisions on subsequent actions such as requesting a mental health assessment. This requires the police to be an informed gate-keeper, and have good partnership and inter-agency working relationships (Bradley Report, DoH, 2009). However, in reality, the custody suite can be chaotic and the custody officer may have to make difficult decisions, in particular, whether the individual has a severe psychotic illness or is under the effects of drugs or alcohol. An appropriate place of safety under S.136 where permanent, full-time qualified staff can prevent aggression or manage someone with serious mental illness may not always be available. If the individual is drunk they may refuse to admit them:

Even when Section 136 units are operating successfully many will refuse to take detainees who are violent or intoxicated as an assessment cannot be conducted unless a detainee is relatively calm and sober

(Police Foundation, 2009)

The Royal College of Psychiatrists standards on the use of S.136 (2008) note that success criteria for police officers should include having assessment facilities that are able to deal

with any risk and will provide appropriate health facilities for individuals including persons who are extremely agitated and in need of restraint for their own or another's safety.

In England, the number of mentally ill remanded prisoners is on the increase and psychiatric morbidity is prevalent among prisoners (Sugarman, 2000). Singleton (1998) found that 90% of prisoners have common mental health problems. These may not have been treated in the community:

Their mental health needs often fall below the threshold required to access treatment in the community; and their offending is less of a serious risk to society and more of a persistent nuisance.

(Edgar, 2009)

As conditions in prison are not conducive to good mental health, prisoners with mental illness are at risk of experiencing a worsening of their mental state (Earthrowl, 2003). Birmingham (2003) found that:

Mentally disordered offenders are not popular as patients and they often fail to meet the criteria required for acceptance by community mental health teams.

Patients with dual diagnosis (mental illness and substance misuse) in a study by Wright et al (2002) were more likely to report a lifetime history of both offending and violence than patients with psychosis only. Schizophrenia and other psychoses have been associated with violence and violent offending with increased risk linked with substance abuse comorbidity (Fazel, 2009). Violence and aggression in prison as a result of untreated or deteriorating mental health, and/or substance misuse, may increase the likelihood of being restrained¹².

Collapse can also occur in acute excited states such as mania, a mental state in which agitation is a central feature regardless of context, leading to physiological exhaustion without subjective fatigue. The collapse should be regarded as a medical emergency with a serious mortality (Farnham, 1997).

¹² For example a previous death in 1995 of Zoe Fairley, a young woman with Intellectual disabilities suffocated and died when restrained face down for 50 min

15.2 Individuals with learning disabilities

There is increasing awareness that people with a learning disability are likely to experience more health problems than the average person in the general population. Further, they may have higher levels of unmet healthcare needs, experiencing unrecognised and thus untreated health problems including hypertension (Kerr, 2004). Particular problems identified, which occur with increased frequency in association with learning disability, include obesity, which is the most commonly reported health problem, and heart disease (Disability Rights Commission, 2004; Emerson, 2010). These health problems could adversely affect the individual in any restraint situation.

The increased prevalence of hearing and/or visual impairment (Vitiello & Behar, 1979) may also affect 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. When individuals with severe atypical autism are restrained they may be unable to calm down as the physical restrictions will continuously trigger the fight/flight response leading to prolonged restraint with possible adverse reactions.

15.3 Black and Minority Ethnic groups

Since David Bennett's death after being restrained in 1998 there are still complaints of racism in healthcare: the Mental Health Act Commission's 12th Biennial report (2008) found that:

Patients complained that nurses relied upon restraint, medication, and confinement to manage them. All this is occurring disproportionately to African-Caribbean's who, as the Commission's Count Me In Census 2007 indicates, are over-represented in acute settings as a proportion of the population as a whole.

The National Mental Health Development Unit (NMHDU) found no consistent evidence that people from BME communities are subject to greater use of seclusion or physical restraint although patients in the hospitals with higher number of patients from BME communities do generally report feeling more coerced (NMHDU, 2011). Out of 32,799 patients surveyed as part of the 2010 'Count Me In' census, no ethnic differences were observed regarding hands on restraint. In fact, very few ethnic differences have been observed in the previous

censuses also and they have not shown a consistent pattern over the last five censuses Care Quality Commission (2010).

However, African Caribbean service users are more likely to be misdiagnosed and diagnosed with psychotic conditions and treated using medication, which is often of a higher dosage (Sainsbury Centre, 2002). INQUEST state that:

People from BME groups were significantly more likely to be restrained than white people. The study suggests restraint was directly related to death in 16 cases – a quarter of which were people from BME communities

1998/99 – 2008/09 Inquest

Keating (2004) in a study of treatment of Afro-Caribbean people with mental illness found that when service users were seen as dangerous, aggressive or difficult to manage, staff were said to employ control and restraint but culturally appropriate and acceptable behaviour has been wrongly interpreted as symptoms of abnormality or aggression (Inquiry into the death of David 'Rocky' Bennet, 2003).

Fear of mental illness also leads to a fear of rejection by others, and therefore, people who experience mental health problems will make considerable efforts to hide this aspect of their lives (Keating, 2004). Keating stated:

If these different layers of fear are combined – fear of black people, fear of mental illness and fear of MH services – a pernicious circle of fear can be identified: a circle that impacts negatively on the engagement of black people with services

Seeking help may be delayed until conditions deteriorate causing a public emergency in which police and compulsory procedures are eventually involved (Sathyamoorthy, 2001).

According to IAP (2010) since 1999 there have been 8 out of the 22 restraint-related deaths involving individuals from Black and Minority Ethnic (BME) groups, with 5 classified as Black, 2 as Asian and 1 as Mixed Ethnicity.

15.4 Individuals with high body mass index

Obesity is known to increase the work of breathing (Hough, 2001) and reduce diaphragm movement in the prone position (Hollins, 2010). Atypical anti-psychotic drugs¹³ can increase the risk of obesity so making those with serious mental illness more vulnerable.

Obesity was also one of the predisposing risk factors to police custody deaths in studies by Hick (1999), O'Halloran (1993) and Southall (2008). In Stratton's study (2001) of deaths from excited delirium, where obesity was defined as having a BMI greater than 29, 56% of the cases were obese. In O'Halloran's study (2002) the cases of obesity (BMI greater than 25) was 75%.

"A large, bulbous abdomen (a beer belly) presents significant risks because it forces the contents of the abdomen upward within the abdominal cavity when the body is in a prone position. This puts pressure on the diaphragm, a critical muscle responsible for respiration, and restricts its movement. If the diaphragm cannot move properly, the person cannot breathe."

(Reay 1996)

15.5 Men 30-40yrs

Although females in acute mental health settings are restrained, for example, Whittington (2006) found that 46% of the incidents involved female patients, men are more likely to be violent or aggressive and then restrained. In research in an acute mental health care trust the mean age for men involved in restraint incidents was 35.0 yrs (Lancaster, 2008).

Sex differences are much larger for serious violence in the 'real world', where men are the great majority of perpetrators (Soothill, 2008). In the Home Office report on crime (2010) 31% of violent incidents involved an offender aged 25-39.

In statistics for restraint related deaths, Stratton (2001) gives the mean age as 31yrs old, Grant (2007) as 38.5yrs. In the literature review by the Task Force on excited delirium in the

¹³ Atypical (second generation) antipsychotics are used in the acute phase of schizophrenia and related psychoses and for long term maintenance and prevention of relapse.

USA (2009) more than 95% of all published fatal cases were males with a mean age of 36. In O'Halloran's study of 21 cases of restraint asphyxia, all were males with a median age of early 30's.

15.6 Young people

Young people (under the age of 20) are vulnerable to harm when restrained because of physiological immaturity as Hollins (2010) stated:

Within the developing child a bio-mechanical disadvantage, a higher ventilatory requirement, an altered perception of exertion, an ineffective anaerobic warning system and poor thermoregulation may all conspire to increase their vulnerability during a physical restraint where exertion levels can be extremely high and prolonged

The independent review of the use of restraint in juvenile secure settings (Smallbridge, 2008) found widespread acceptance that it was sometimes necessary to use force to restrain children in the secure estate (for those 17yrs and under), where their behaviour posed a high degree of risk to themselves or others. However, on the evidence available, they did not feel able to state that any one restraint technique would be completely safe to use on everyone in the juvenile secure estate. Since then, in the second inquest on Adam Rickwood in January 2011, the jury found that he had been subjected to an unlawful restraint technique (face down) and hurt in a way (nose distraction technique) that contributed to his taking his own life. This inquest came after three judicial reviews challenging the first inquest; a high court judge then ruled the first verdict unlawful and ordered a second examination of the circumstances of his death.

The two restraint techniques that rely on the application of pain authorised in the 2010 Ministry of Justice manual are the rib distraction and the thumb distraction. They are supposed only be used in potentially volatile or violent situations where the safety of young people, staff or others is at risk. Previously, the circumstances in which staff could use physical restraint on children included the maintenance of 'good order and discipline'. The Court of Appeal in 2008 ordered that these Amendment Rules for Secure Training Centres should be quashed because they violated Articles 3 (right to be protected against torture or

to inhuman or degrading treatment or punishment) and the right to private life under Article 8 of the European Convention on Human Rights (The Children's Commissioner, 2008).

The Royal College of Nursing's guidelines (2010) state that restrictive physical intervention (direct physical contact between persons where reasonable force is positively applied against resistance to either restrict movement or mobility or to disengage from harmful behaviour displayed by an individual) should only be used to prevent serious harm.

16. Medical theories and concepts

There is much rhetoric and advice given in the press and professional journals on preventing restraint-related deaths but much of this is based on opinion and less on valid studies. Clinical or professional guidance is therefore mostly tentative as Paterson stated (2003):

recent good practice guidance on physical interventions (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

The physiology of deaths under restraint in any setting where there is a duty of care, is difficult to investigate as internationally the numbers of restraint-related deaths are small and classification by pathologists varies in different countries. Findings from experimental studies are not completely valid as there is limited generalisability to the real physical restraint situation, they are run in a laboratory setting in controlled conditions and there is a subject selection bias as most subjects are healthy volunteers. Retrospective studies have been carried out, the largest being 202 cases in Maryland in the USA (Grant, 2007), but the demographics of the population may be dissimilar to UK populations. Single case studies, e.g. Channa (2007), lack validity. Reviews of published research, e.g. DeBard (2009), found that that not all of the publications were observational studies and there was a significant overlap of publications that reference each other to obtain the most common clinical presentation. The published literature in this area is largely British or American.

This systematic review of the small amount of national and international published research since 1999 on restraint-related deaths must therefore have the same caveat; until further

sound and relevant research is carried out, guidelines on safe restraint for those who have to intervene in the last resort, are based on limited information. The diagram below illustrates the medical theories which have predominated in the scientific and professional literature but are not arranged in any significant order.

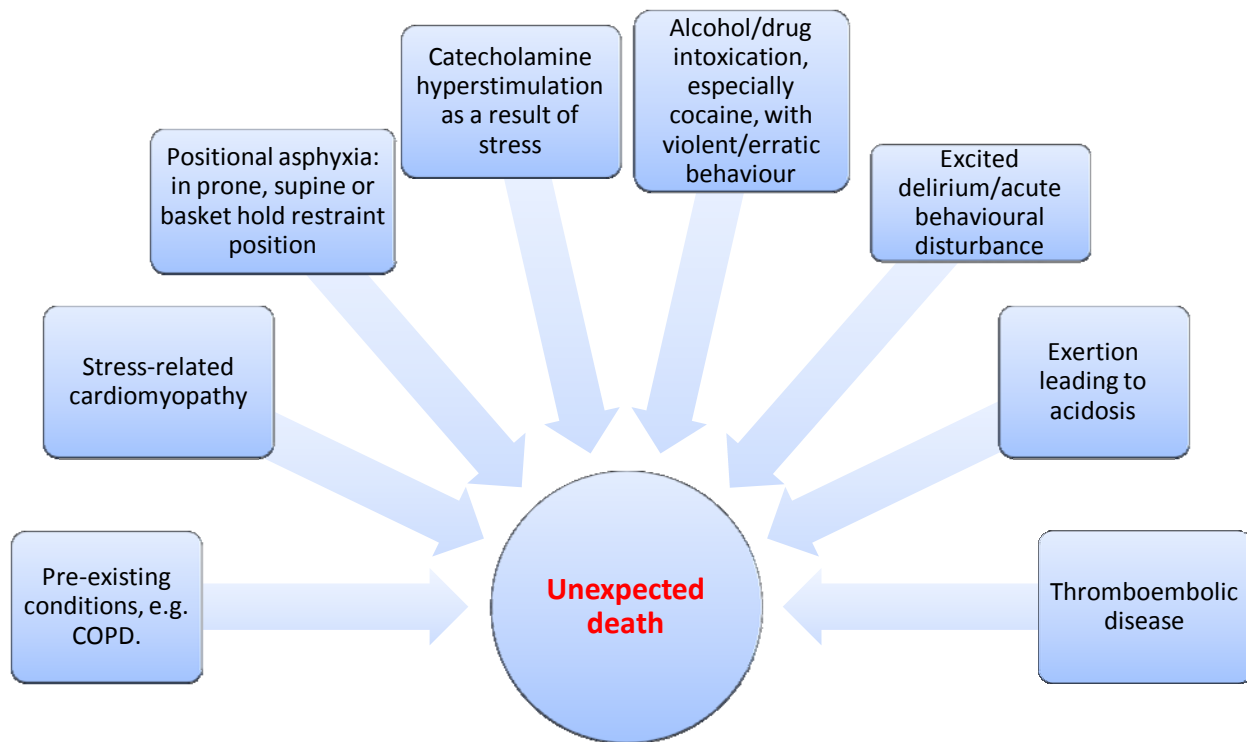


Figure 1 Multifactorial causes of restraint-related death

These theories will now be discussed and explanations given.

16.1 Positional asphyxia

Ventilation in a healthy human involves two key factors: movement of the ribs by the intercostal muscles and movement of the diaphragm (Parkes, 2000; Reay, 1992). The chest expands and the diaphragm contracts, drawing air into the lungs (inhaling). The ribs and diaphragm then relax, releasing air from the lungs (exhaling). When an individual is restrained or contained in a prone position, three things happen that compromise the body's ability to breathe:

1. There is possible occlusion of the respiratory orifices (Belviso, 2003)
2. There is a compression by weights or restriction to movement of the ribs limiting their ability to expand the chest cavity and breathe (Parkes, 2000; Stratton, et al., 2001);

3. The abdominal organs may be pushed up, restricting movement of the diaphragm and further limiting the available space for the lungs to expand (Parkes, 2000; Reay, 1992).

Consequently, even without any other contributing factors, simply restraining an individual in a prone position may be seen as restricting the ability to breathe, so lessening the supply of oxygen to meet the body's demands. Restriction of the neck, chest wall or diaphragm can also occur when the head is forced downwards towards the knees. Asphyxia as a result of restriction under restraint has also been called "restraint asphyxia".

In the prone maximal restraint position, used in the USA, also referred to as the hogtie or hobble restraint, the individual is placed in a prone position face down on the floor, the client's hands are then secured behind him or her with handcuffs and his or her legs are cuffed or otherwise secured by way of ties at the ankles and the ankles are then secured to the wrists with the clients legs bent and shoulders pulled back in order to accomplish this. It has been suggested that this prevents adequate chest wall, abdominal, and diaphragmatic movement, leading to hypoventilatory respiratory compromise and risk of death from positional asphyxia (Stratton, 2001). Significant changes were found after restraint in a prone position: vital capacity was reduced, expiratory volume decreased, heart rate decreased, BP decreased and cardiac output decreased (Roeggia, 1999). This form of restraint is not recommended in any UK guidelines for healthcare, prisons or police restraint.

The 'forceful prone' position is particularly hazardous: pressure is applied to the back, abdomen or hips rather than, or in addition to, the holding of the limbs (Miller, 2004). This is a procedure of extremely high risk for any individual; the use of force in the circumstances of drawn out resistance entails lethal risks. Where prone restraint positions have been part of policy and procedure there is an inherent danger that in the heat of the moment such procedures can mutate into the dangerous forceful prone position.

Other restraint positions, besides the prone position, have been implicated in deaths: Gareth Myatt was held in a seated position and bent forward at the waist causing hyperflexion and severely restricted his breathing. The most recent research (Parkes 2011) found that seated restraint positions with the person leant forward may increase the risk of harm or death during prolonged restraint and the risk will be further increased where the person exhibits higher body mass index.

A further problematic restraint is a 'basket hold' 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. An unofficial variant of this technique has been noted as very risky:

..The basket hold is continued after the individual has fallen to the floor face down resulting in a situation where the member of staff ends up lying on top of the person being restrained may be particularly dangerous

(Paterson 2010).

In Gareth's case staff modified restraint procedures without supervision but also as the organisation had made a policy decision not to use prone restraint as it was perceived as dangerous. This procedure has in the past been used in youth offender institutions but the double basket hold has been banned by the Ministry of Justice since Gareth Myatt's inquest.

If the person is held in a supine position there is an added risk of choking or inhalation of vomit (Morrison, 2002). As Hollins (2010) stated:

While asphyxia can occur in a variety of positions, to focus too closely on the risk of restraint asphyxia is also to lose sight of the fact that any forced movement places soft tissues under potentially damaging levels of tension.

Parkes (2002) postulated that breathing can be reduced by 15% in a face down position and by 23% if the person is bent in a face down position. Paterson (2010) states that the prone position is actually a range of procedures incurring possible risks:

These multiple versions of prone actually share only one variable, which is that the individual is held against resistance face down either by being physically held, via control of the limbs, the approach most commonly used in the UK

Signs of asphyxia are cyanosis, congestion and petechial haemorrhages; on autopsy, in O'Halloran's study (2002) more than half had petechial haemorrhages. However, in cases of restraint-related deaths, these have not always been noted on autopsy (Shepherd, 2005). Petechiae found on autopsy are simply markers of increased cephalic venous pressure such as found in chest crushing injuries or status epilepticus. In and of themselves, they should not be regarded as supportive evidence of asphyxia (Ely, 2000).

Researchers measured hypoventilatory respiratory function in prone healthy subjects when weights were placed on them and after they were exercising (Michalewicz, 2007) found that results were within normal range and function concluded that –

Factors other than ventilatory failure associated with the restraining process may be responsible for the sudden unexpected deaths of restrained individuals.

Studies on healthy volunteers (Chan, 1997) found that there was a small statistically significant decline in lung volume in restraint positions after exercise but no clinically relevant changes in oxygenation or ventilation. However, there is limited relevance in this study to the real physical restraint situation (Day, 2002) as healthy volunteers are not representative of restraint subjects. The objectivity of these findings may also be questionable as the research grant was in relation to a civil court case and the findings were used by the defence (Parkes, 2002).

Others (Gulino, 2000; Glatter, 2004; Ross, 2010) have also argued that restraint alone cannot account for sudden death and there must be underlying conditions. Glatter (2004) stated that the mere act of restraining an agitated individual could not possibly lead to considerable hypoxia and death unless there was some pre-existing problem with central cardiac output, peripheral oxygen extraction, or oxygen utilisation. Reay (1992) had previously postulated that post mortem changes could not differentiate between sudden cardiac death as a result of respiratory restriction as in restraint, or as a result of psychological events, e.g. bio - behavioural stress, causing malignant ventricular arrhythmias unrelated to the position of the individual.

NICE guidelines (2005) on the management of violence and aggression state that the evidence base surrounding the dangers of positional restraint is weak and it is not possible to give a specific time frame for keeping someone restrained. The Metropolitan Police Service Review on restraint (2004) concluded that it was neither safe nor practicable to set a time limit for the restraint of a person in the prone position. This should be used for the minimum time necessary to achieve control and that the person should then be turned into another position preferably kneeling or standing as soon as possible.

O'Halloran (2000) in analysis of 21 case reports found that the time held prone before collapse ranged from 2 to 12 minutes. It has been claimed that the average time between first application of forceful prone restraint and when full cardiopulmonary arrest was noticed

is only 5.6 minutes (Miller, 2004) while Parkes (2002) found in case reports that immediate death did not occur after positional restraint but there was more likely to be prolonged, severe struggle before collapse under restraint. Laboured breathing and cessation of resistance may demonstrate this collapse and indicate a medical emergency rather than cooperation from the individual.

16.2 Excited delirium and acute behavioural disturbance

The state of excited delirium has been described as an agitated, aggressive, paranoid behavioural disturbance where the individual also has great strength and numbness to pain (Paquette, 2003). It is a form of acute behavioural disturbance (ABD).

Of all the forms of acute behavioural disturbance, excited delirium is the most extreme and potentially life threatening.

(Faculty of Forensic and Legal Medicine 2010)

Fatal excited delirium was first described in seven cocaine users between April 1983 and May 1984 in the USA (Sztajnkrycer, 2005). Incidence of increased drug-related deaths along with violent behaviour and use of restraints has coincided with increased cocaine use in the USA (Grant, 2007). However, the exact incidence of excited delirium (ED) is impossible to determine as there is no current standardised case definition to identify this state (deBard et al, 2009). It is currently not a recognised medical or psychiatric diagnosis according to either the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IVTR) of the American Psychiatric Association or the International Classification of Diseases (ICD-9) of the World Health Organization (Samuel, 2009). The syndrome of delirium itself may be manifested by symptoms of agitation or combativeness and is caused by an underlying disease such as brain injury, infection or drug effects, particularly anticholinergics or other CNS depressants (Clegg, 2010) or by withdrawal from alcohol or benzodiazepines. Delirium is managed by treating the underlying cause. However, the highest prevalence of delirium is in older men often in ICU and in elderly care. Excited delirium can therefore be distinguished by age and setting where it may occur.

There are relevant research findings which have been published, mostly from the USA. In a review of excited delirium deaths during custody, victims were predominantly male (97%), had an average weight of 220 lbs. and a mean body temperature of 104°F (Ross, 1998). Mash (2009) found that victims were young (mean age 34.2), males, with a high body mass.

Mean body temperature was 40.7 °C, seizures were observed in 13% of cases. Many of the deaths occurred one hour after initial police contact, cardiac arrest occurred shortly after use of restraints.

The most striking feature of the excited delirium syndrome is the extreme hyperthermia (Bunai, 2008). Struggling while being restrained will also raise body temperature:

Being placed in police custody prior to death can also raise body temperature through increased psychomotor activity if the victim struggles in the process

(Mash, 2007)

The cocaine delirium syndrome comprises four components that appear in sequence: hyperthermia, delirium with agitation, respiratory arrest, and death (Mash, 2007). Restraint is a common feature of deaths from excited delirium and acute behavioural disturbance as the behaviours displayed will come to the attention of police. There are however, reports of deaths due to excited delirium that did not occur in custody or with restraint and therefore elevated stress from excited delirium alone can be fatal (Gill, 2008). O'Halloran (2000) also hypothesised that excited delirium, whether or not drug-related, could reasonably be considered contributing to death.

DeBard (2009) in a literature review of 18 studies described the features of excited delirium as:

Features in History

Males

Mean age 30's

Sudden onset

History of mental illness

History of psychostimulant abuse

Features evident at scene

Call for disturbance/psychomotor agitation/excitation

Violent/combative/belligerent/assault call

Not responding to authorities/verbal commands

Psychosis/delusional/paranoid/fearful

Yelling/shouting/guttural sounds
Disrobing/inappropriate clothing
Violence toward/destruction of inanimate
objects
Walking/running in traffic
Subject obese

Features evident on contact

Significant resistance to physical restraint
Superhuman strength
Impervious to pain
Continued struggle despite restraint
Profuse sweating/clammy skin

Features with clinical assessment

Tachypnoea (rapid breathing)
Tachycardia
Hyperthermia
Hypertension
Acidosis
Rhabdomyolysis (the breakdown of skeletal muscle due to damage to muscle tissue)

Although the majority of reported drug associated fatal excited delirium cases have involved the use of cocaine, other stimulant agents, including LSD, phencyclidine (PCP) and methamphetamine, have been implicated in excited delirium deaths. Cocaine causes epinephrine (also known as adrenaline) release from the adrenal glands, and blocks the reuptake of norepinephrine, thereby resulting in a state of increased physical stimulation.

The pathology of this condition may include genetic susceptibility and chronic stimulant-induced abnormalities of dopamine transporter pathways, along with elevation of heat shock proteins in fatal cases (deBard 2009). The genetic fault impairs the brain's ability to increase the number of drug receptors which helps pump dopamine and other excess hormones out of the brain (Paquette, 2003). The result then of drug use is dangerously high level of hormones in the amygdala (associated with feelings of fear and aggression), leading to delirium and aggression.

Gill (2008) stated that there were no distinct autopsy findings and therefore witness statements, documentation of any petichea, any injuries/bruising, as well as toxicology screening, are necessary in order to reach a conclusion of fatal excited delirium. He goes on to consider that the difference on autopsy between excited delirium and drug intoxication may be difficult to ascertain and is therefore not usually answered by autopsy alone.

However, Stevens et al (2004) found on autopsy that while the dopamine receptor D2 in the hypothalamus of nonpsychotic cocaine abusers were unchanged, in the psychotic and violent cocaine abusers, a marked reduction in the numbers of receptors was found within the temperature regulatory centres of the hypothalamus. They concluded that cocaine induced disorders of ion channels¹⁴ were significant factors in the induction of sudden cardiac death.

16.3 Pre-existing conditions

In one UK study volunteers with stable chronic obstructive pulmonary diseases (Meredith, 2005) were randomly allocated to five positions. The response to the prone position with or without wrist restraint appeared highly individual, with some individuals tolerating the prone position with no measurable clinical effects and others suffering a clinical worsening of symptoms. The reasons for this individual variation remained unclear. The small number of subjects in this study and the difficulty in applying it to mental health or custodial settings decrease its validity and relevance.

Exercise-related collapse in individuals with sickle cell anaemia is a rare but serious complication. Local hypoxia causes intravascular sickling, in turn causing vascular occlusion and organ and tissue damage. This can result in rhabdomyolysis (the breakdown of muscle fibres resulting in the release of muscle fibre contents into the bloodstream), myocardial ischemia, arrhythmias and sudden death (Scheinen, 2009). Incidence of restraint-related deaths of individuals with sickle cell anaemia is extremely rare but Dyson (2006) found that:

Statistically, sickle cell could not possibly explain the highly raised overrepresentation of deaths of African-Caribbean males in custody

¹⁴ Ion channels regulate the flow of ions across the membrane in all cells

This over-representation of Afro-Caribbean males is also evident in mental health settings. The Mental Health Act Commission (2005, 2006) one day census found that Afro-Caribbean males are three times more likely to be admitted to hospital and 44% more likely to be sectioned under mental health legislation.

Dyson (2006) argues that citing sickle cell disease as a cause of death in custody avoids organisations having to deal with institutional racism. He states that claiming sickle cell anaemia is a cause of restraint-related deaths is out of proportion to the issue as sickle cell anaemia only affects 1 in 300 people of Afro-Caribbean descent in the UK.

An abnormally enlarged heart has been reported as one of the predisposing factors that can lead to restraint-related death (Laposata, 2006; Southall, 2008). This abnormality has been linked to chronic stimulant drug abuse (Schmidt, 1999). In O'Halloran's study (2000) of 21 cases of restraint-related deaths, on autopsy, 15 had heart disease including an enlarged heart. Byard (2008) stipulates that:

There may certain cases where underlying organic illness, such as cardiovascular or respiratory disease is present that may be either unrelated to the terminal episode or, alternatively, may have predisposed to positional asphyxia.

Chronic cocaine misuse has been found in a recent study (Aquaro, 2011) to lead to cardiac structural involvement which could lead to cardiac damage and become evident later in life. The researchers found that 83 per cent of people using cocaine over long periods have suffered major structural damage to their hearts.

Post ictal aggression in epilepsy can occur when physical restraint is applied to a delirious or confused patient. In particular, this can lead to a vicious circle of attempts to restrain and resulting resistive violence with fatal results (Devinsky, 2003).

Sudden unexpected deaths in epilepsy (SUDEP) may be caused by respiratory events, including airway obstruction. In addition, cardiac arrhythmia, during both the ictal and interictal periods, leading to arrest and acute cardiac failure, play an important role (Harrison, 2007). The additional factor of extreme exercise as in struggling in restraint is therefore still unknown although in the UK one patient (Godfrey Mayo) died after being restrained during a seizure.

It is currently unknown whether or not epileptics are more vulnerable to SUDEP if they choose to engage in vigorous physical activity. However, one could postulate that as physical exertion can lead to dehydration, electrolyte imbalances, hyperventilation secondary to increased oxygen demand, and hyperthermia— all of which are well known to decrease the seizure threshold in an epileptic

Harrison (2007)

In diabetes low blood sugar may precipitate sudden mood swings that could appear as sudden anger or crying, sweating, nervousness, rapid heartbeat, confusion, and seizures. Aggressive behaviour may appear similar to acute behavioural disturbance (Padder, Udyawar, Azhar, & Jaghab, 2005)

16.4 Stress-related cardiomyopathy

Otahbachi (2010) found that the pathogenesis of excited delirium deaths was multifactorial and included positional asphyxia, hyperthermia, drug toxicity, and/or catecholamine-induced fatal arrhythmias. These deaths, he concluded, were secondary to stress cardiomyopathy.

Sudden death in adults, particularly young adults who are asymptomatic, may occur from the onset of ventricular tachycardia (a type of rapid heart rate) or other dangerous arrhythmias. A genetic factor appears to influence which people with hypertrophic cardiomyopathy are more prone to sudden death. In restraint-related deaths, extreme physiological stress and sudden exercise, e.g. violence and struggling, in an individual with genetic predisposing factors, may result in fatal hypertrophic cardiomyopathy as has been seen in the sudden death of young athletes (Maron, 1996; Frenneaux, 2004).

Shepherd (2005) suggests that there is a sub-group of healthy individuals who are vulnerable to the effects of stress and die suddenly without signs of asphyxiation; it is possibly the effects of stress-related catecholamines producing stress cardiomyopathy which lead to these fatalities.

16.5 Thromboembolic disease

Immobilisation is a well-known risk factor for deep venous thrombosis (DVT) and pulmonary embolism (Lensing, 1999). It has been speculated that physical restraint inhibits venous blood flow, and also that antipsychotic drugs can facilitate blood clotting (Nishio, 2007).

Antipsychotic drugs may also cause venous thromboembolism due to immobility (Tapson, 2000)

A Canadian study (Dickson, 2008) in a retrospective review of deaths occurring in physically restrained psychiatric patients over 6 years, found three deaths where the patients had been restrained by 4 point, 3-to-5 point and waist physical restraints. The immobilisation periods ranged from 3 to 5 days. On autopsy, occlusive pulmonary thromboemboli were identified in each patient. None of the patients had previously recognized clotting disorders or significant risk factors for deep vein thrombosis.

Five other cases have been published (Laursen, 2005) presenting an association between thrombosis and restraints; however, the patients had several predisposing risk factors, these included being overweight. The above findings may form an underestimation as emboli can be clinically silent but the small numbers found make the studies unreliable. Clinically silent/asymptomatic pulmonary embolisms are unlikely to be fatal.

16.6 Catecholamine hyperstimulation

Recent research (Ho, 2009) indicates that physical struggle is a much greater contributor to catecholamine surge and metabolic acidosis than other causes of exertion or stimuli. Michalewicz (2007) saw catecholamine hyperstimulation as one of the risk factors of restraint-related deaths. DiMaio (2001, ch.22) found that:

During high intensity exercise, e.g., a struggle, there is release of catecholamines (norepinephrine and epinephrine) from the adrenals into the circulation. The effects of these substances are to increase the rate and force of contraction of the heart, the conduction velocity and the blood pressure. This results in an increase in demand for oxygen by the heart. The highest levels of catecholamines occur not during physical activity (a struggle in this case) but approximately 3 min after cessation of the activity.

16.7 Acidosis

Hick (1999) found in five cases of sudden death that there may have been exacerbation of exercise-induced lactic acidosis by sympathetic-induced vasoconstriction, enhanced by the

actions of cocaine in at least some cases. He added that regarding respiratory function being impeded in hobble restraint position:

The controversy continues over whether this positional decrease in ventilatory ability has any clinical effect. A healthy patient model who does not continue to struggle against restraints apparently suffers no ill effects from moderate reductions in ventilatory capacity. The detriment to a struggling, profoundly acidotic patient whose life may depend on the ability to develop a respiratory alkalosis has not been studied.

Alshayeb (2010) also noted that people exercising intensely, who are highly aggressive and then restrained, and have taken cocaine, may develop lactic acidosis and subsequently suffer cardiac arrest. In this process, cocaine toxicity prevents the reuptake of noradrenaline, serotonin, and dopamine at presynaptic nerve terminals and increases the release of calcium from the cerebral vascular smooth muscle cells, resulting in accumulation of neurotransmitters at postsynaptic sites and generalised vasoconstriction (Farooq 2009). This will lead to increasingly impaired tissue perfusion resulting in impaired cardiac contractility, cardiac arrhythmias, and cardiac arrest,

This process (see figure 5) is typically not responsive to advanced cardiac life support.

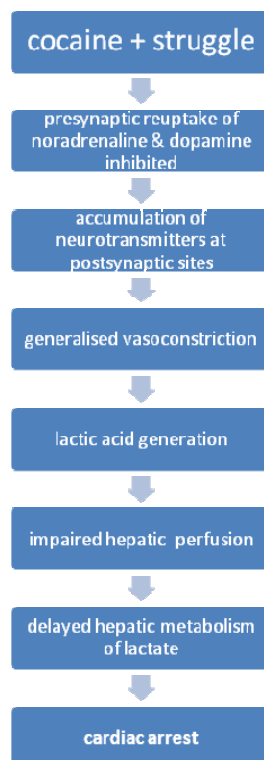


Figure 2 Process of profound lactic acidosis

However, Chan (1999) argued that these findings were incorrect as a good portion of the metabolic acidosis may have simply been due to cardiopulmonary arrest. Also, generation of a portion of the observed metabolic acidosis was from high oxygen consumption and anaerobic metabolism due to physical exertion from fighting or fleeing immediately prior to being physically restrained rather than restraint itself.

16.8 Alcohol abuse

Alcohol abuse is a predisposing factor for violence and aggression. There is limited evidence to suggest that heightened arousal, depressive symptoms and alcohol intoxication are antecedents of disturbed/violent behaviour in emergency departments (NICE, 2005). In a study of patients diagnosed as having behavioural disturbances in an emergency department, overall, at least 85% of presentations could be linked to intoxication with alcohol or illicit drugs (Spain, 2008). Most of this patient group (82%) were considered disturbed enough to require transport to hospital by police or ambulance and treatment at an emergency department.

Sudden death of an individual with a history of alcohol abuse, and under the influence of alcohol, may occur during a struggle. Alcohol is a recognised cause of a variety of atrial and ventricular arrhythmias. A prolonged QT interval, a problem associated with sudden death, as well as increased levels of norepinephrine may be present in prolonged alcohol abuse. These predispositions to arrhythmias can be exaggerated by catecholamines released during a violent struggle. Therefore, if the heart is already predisposed to arrhythmias by the action of alcohol, under conditions such as a violent struggle the released catecholamines can produce a fatal arrhythmia (diMaio, 2001). In a study (Bell, 1992) of 30 cases of positional asphyxia, chronic alcoholism or acute alcohol intoxication was found in 75% of cases with average post-mortem blood alcohol concentrations of 0.24%.

Restraint was found to be least likely to be required for those being arrested for alcohol-related offences in a research paper by the Police Research Group (Leigh, 1998). However, the report adds:

It is likely that in the arrest population as a whole, many of those arrested for drink-related offences may be more capable of being violent. It is likely, therefore, that for such people arrested, many more will need restraining than is suggested here.

When alcohol is taken in conjunction with cocaine the risk of violence and aggression is increased; there is also a new compound produced, cocaethylene, which lasts longer in the body and has even more powerful toxic effects (Sztajnkrycer, 2005). Cocaethylene is toxic in the liver and has also been blamed for heart attacks in the under-40s. The combination of alcohol and cocaine has been associated with a significant increase in the incidence of neurological and cardiac emergencies including cerebral infarction, intracranial hemorrhage, myocardial infarction, cardiomyopathy, and cardiac arrhythmias (Farooq, 2009).

16.9 Neuroleptic medication

Many psychoactive agents with anticholinergic properties that are used in psychiatric settings are also potentially toxic. Children in particular are more susceptible to the adverse effects of anticholinergic drugs (Waternberg, 1999). These medications systemically reduce normal body cooling mechanisms. In children experiencing extreme agitation while struggling with staff and against restriction, the ability to discharge or release the heat created by this increased activity is weakened (Mohr, 2003).

Paterson (2003) found that administration of neuroleptics increased the risk of death during restraint by weakening the individual's ability to swallow or expel leading to an increased risk of the inhalation of vomit. Other life-threatening adverse effects of neuroleptics include hyperthermia, neuroleptic malignant syndrome (see below), respiratory and laryngeal-pharyngeal dyskinesias, anti-adrenergic-mediated vasodilation with hypotension and lowered seizure threshold (Kumar, 1997). In large well-conducted population studies the risk conferred by QT prolongation when taking antipsychotics, particularly thioridazine, droperidol, sertindole and ziprasidone, appears to be a modest increase in mortality and sudden death. Co-morbid physical illness, especially cardiovascular disease, is a further risk factor (Abdelmawla, 2006). Some antipsychotic medications have also been reported to be associated with an increased risk of diabetes and could indirectly play a part in the increased cardiac risk seen in patients with schizophrenia (Jindal, 2005)

Psychotropic medication given p.r.n (pro re nata or as required) has been noted as frequently given for agitation or aggression in addition to prescribed antipsychotics with

further risks of side effects and long-term implications to health (Joukamma et al., 2006). Baker (2008) found that p.r.n medication was an under-researched intervention and side-effects were not closely monitored:

Typical antipsychotic PRN undoubtedly contributes to antipsychotic polypharmacy and high doses that individuals may receive

Medication effects may therefore be connected in the sudden death of psychiatric service users. However, it is important to guard against an arbitrary diagnosis of sudden cardiac death in psychiatric service users with negative autopsies, particularly when restraint and other mechanisms are involved.

16.10 Neuroleptic malignant syndrome

Neuroleptic malignant syndrome (NMS) is a rare but potentially lethal side-effect of atypical antipsychotics. Between 20 and 30 percent of service users who develop severe NMS may die. Risk factors include the use of high-potency typical antipsychotics, being young and male, and organic brain syndromes (Daley, 2001), agitation and recent use of restraint (Troller, 2009).

Samuel (2009) noted that survivors of cocaine intoxication with excited delirium have also been reported to develop rhabdomyolysis which results in skeletal muscle breakdown and leakage of muscle substance into the circulatory system that has clinical similarities to NMS.

The principal clinical features of NMS are hyperthermia, muscle rigidity, autonomic dysfunction, and mental status changes (including agitation) (Factor, 2008). The symptoms therefore may be mistaken as excited delirium/acute behavioural disturbance.

16.11. Serotonin syndrome

Serotonin syndrome (SS) is associated with an excess of serotonin usually resulting from increasing the dose of a single serotonergic agonist drug, polypharmacy of serotonic agents, or a drug interaction of a monoamine oxidase inhibitor (MAOI) with a serotonin reuptake inhibitor (SRI). Serotonin syndrome can be fatal. At least three of the following signs or symptoms must be present: agitation, diarrhoea, heavy sweating not due to activity, fever,

mental status changes such as confusion or hypomania, muscle spasms (myoclonus), overactive reflexes, shivering, tremor, uncoordinated movements (ataxia). Some symptoms of serotonin syndrome can mimic those due to an overdose of cocaine. It should be noted that in service users experiencing medical complications, presence of SS was associated with a substantial mortality risk (Perry, 2002)

17. Current UK research projects

The National Heart and Lung Institute have commissioned research led by Dr Mary Sheppard at the Royal Brompton Hospital¹⁵. The research covered 1996-2009. The researchers retrospectively investigated forty cases of sudden cardiac death (SCD) in relation to an emotionally stressful event such as physical restraint: There were twelve cases of restraint-related sudden death; five were in police custody, seven in mental health institutions. The aim of this study was to highlight deaths during emotional stress and the fact that the diagnoses were mainly of non-atherosclerotic origin: of the total number 82% were non-atherosclerotic. There were other factors in the histories such as history of alcohol/substance misuse and obesity.

18. Characteristics of individuals in UK restraint-related deaths 1999-2010

The IAP has undertaken an analysis, for the time period of 1998/99 to 2008/09, of 22 Independent Police Complaints Commission cases, and 7 reports from the Prison and Probation Ombudsman, HM Coroners Rule 43 Reports and narrative verdicts and Mental Health Act Commission Post Inquest Reports to which the IAP had access. Some of the information was validated against press reports. The 29 deaths were related to restraint being identified as either a direct cause or a contributory factor (IAP 2011). Issues raised were:

- In three of the cases, there were concerns that the restraint techniques were not always carried out in accordance with those taught on training courses. In two of those cases, the

¹⁵ Dr. Mary Sheppard is Reader in Cardiovascular Pathology, National Heart and Lung Institute and Consultant Cardiac Pathologist at the Department of Histopathology, Royal Brompton Hospital

restraint was being administered by staff that were not appropriately trained to administer such techniques.

- In seven of the cases, the reports contained concerns around the lack of staff awareness concerning the dangers associated with positional asphyxia and to a lesser extent, acute behavioural disorder, during the restraint incident.
- In three of the cases, concerns were highlighted at the delays between the incident of restraint and the arrival of an emergency ambulance or doctor.
- In three of the cases, serious concerns were raised about the use of the prone position as a restraint technique and the prolonged period of time this was used.
- Of particular concern to the IAP is that inquests held in 2008 into the deaths of Kurt Howard who died in 2002 and Azrar Ayub and Geoffrey Hodgkin who both died in 2004 highlighted that the lack of restraint training and staff knowledge was a contributory factor

On analysis of the reports found through NEXIS and INQUEST databases for this study there are obvious similarities with the IAP's investigation and with Paterson's 2003 survey of deaths in health and social care settings between 1994 and 2001 where restraint was a factor.

- Sixteen out of the thirty eight cases found that died between 1999 and 2010 had a history of mental illness, specifically psychosis.
- Three had a learning disability or pervasive developmental disorder such as autism.
- Fifteen were of Black or Minority Ethnic origin.
- Fifteen were males in the 30-40 yrs age group (only one was female). Twelve were males in the 40-50 yrs age group. One was a young male.
- Two were noted as being overweight.
- The deceased who had a history of mental illness may have been receiving neuroleptic medication which can have life-threatening adverse effects.
- Six of the thirty eight had pre-existing conditions that may have increased the risk of cardiac arrest: one had ischemic heart disease, one had diabetes and four had epilepsy.
- Five swallowed a drug package whilst being restrained, leading to leakage and a fatal overdose.

- Positional asphyxia appears to be implicated for at least 26 of the 38 deaths (whether or not given as a verdict) because of struggle/physical stressors prior to restraint, number of staff involved and, in particular, because of the length of time of the restraint and position of the individual.

Verdicts of fatal excited delirium were given for five deaths. Accounts describe the individual as being restrained in a prone position, either flat or over a mattress/chair. The number of staff involved in the restraint was between two and fifteen staff; the length of restraint was between 10 mins and 1 hr 40 minutes. Police were involved in the restraint incident for twenty nine of the deaths, hospital staff for seven and Secure Training Centre staff for one of the deaths. Location of death is not always specified in reports.

It is unclear from the accounts whether exhaustion due to prolonged struggle was a factor as the length of time of the disturbed behaviour before the restraint incident has not been given.

19. Expert opinion

Experts (see Appendix for names) were invited to review the findings of this study in light of their own research and clinical practice. The report has been adjusted in accordance with their input. Three experts independently reviewed the findings. The report was then presented at the European Violence in Psychiatry Research Group conference. Pre existing conditions were raised as factors in restraint-related deaths, including diabetes. Other issues were highlighted. These included concerns about training disparities across mental health settings and also concerns about trying to biomedicalise restraint-related deaths by focussing on medical theories rather than contextualising deaths individually and taking into account social factors.

Concerns were raised that security guards with little training may be used in Accident and Emergency units or general wards where someone is disturbed. Examples in the literature include:

For instance, consideration might be given to potential roles for psychiatrically trained nurses or security guards

(Carson, 2010)

Another study found that although only 4% of patients on general wards were disturbed, they needed a great deal of resources, therefore trained security staff may be needed (Kannibaran, 2008). The expert's anxieties were about their training and capacity to undertake Prevention and Management of Violence and Aggression techniques and supervision.

The second event was at a seminar organised by the Independent Advisory Panel. The objectives for this seminar were to test out the findings of the review to date and to gain insights and raise any further issues around the already identified medical theories. The interim report had already been distributed; on the day, after a brief presentation on findings to date, participants were given the opportunity to discuss issues raised in sub-groups. The points raised are summarised below.

There was consensus amongst the participants that there was a discrepancy in the reporting and recording of the significance of restraint in deaths in custody in verdicts in courts. In the NHS it was believed that the 'Shipman effect' had resulted in risk factors such as physical conditions at the time of death being suppressed in death certificates leading to a potential lack of scrutiny. Attendees believed there would be value in strengthening mechanisms to capture information on these deaths, which the IAP will explore as part of its longer term work plan.

There was also consensus that environmental and interpersonal factors need to be taken into account, e.g. how certain occupational groups behave; attitudes/behaviours, such as depersonalising, stereotyping and institutional cultures, and how these can be altered.

There was consensus opinion that the time factor in the management of medical emergencies as a result of acute behavioural disturbances was critical. There was a lack of consensus in whether the term 'forceful' prone position to indicate the most hazardous restraint position was useful as all restraint positions carried risks.

Post mortem evidence is critical to increase learning. "Sudden death in restraint syndrome" should be used to describe inquest verdicts rather than any euphemism in order to enhance clarity as this is a class of death we don't fully understand and is multifactorial. Other experts opposed the term as not only is knowledge of this area far too limited to posit such a 'syndrome', but the label also diverted attention away from the fact that deaths do occur because restraint is used inappropriately

The jury, rather than medical experts, will make the decision. Inquests should be investigative rather than adversarial.

There were six themes discussed in sub-groups.

1. Pre-existing conditions

It was felt that the small numbers of deaths recorded restricts making real judgement about these issues. It was also felt that consideration should be given to how near misses or non-restraint deaths can be captured in the future. There needs to be better 'tagging' of and signposting to restraint related deaths so that they can be picked up more effectively and reported correctly.

It was also felt that pre-existing conditions needed to be considered not only as congenital conditions but also acquired. For example, conditions including long term alcoholism (leading to enlarged heart), poor physical health commonly associated with enduring mental illness and medication related problems.

There was an extensive debate concerning whether mental illness could be classed as a pre-existing condition. There was no real consensus reached but it warrants consideration nonetheless.

Early warning predictors and markers should be noted by staff for those who are becoming unwell with a pre existing condition before potential collapse. Steroid abuse in men was also mentioned as a problem but is often not detected as specific blood tests can be too expensive.

Stress-related cardiomyopathy is a big problem as stress leads to hypoxia. Autopsies have uncovered restraint-related deaths where stress cardiomyopathy was a factor. Serotonin syndrome was mentioned again.

Additional issues discussed were:

- The need for expert medical evidence during investigations and trials
- Consideration of patient's socioeconomic circumstances which may make them vulnerable to certain poor physical health factors.

Overall concerns were raised as to whether direct cause and effect can be determined in deaths as they often involve a mixture of complex factors and situations. This perspective was also emphasised by participants in the EViPRG seminar. The general view was that it

should be assumed that everyone is at a potential risk rather than try to profile individuals only medically at risk.

2. Alcohol/drug abuse

Disinhibition as a result of alcohol or drug abuse can lead to people being more susceptible to restraint due to the nature of their behaviour. A vicious circle of unpredictability then ensues.

With regards to cocaine use, this can also lead to release of noradrenaline and stress on the heart. The use of medication can also compound the situation if someone has taken drugs and is then restrained.

3. Psychoactive Medications

It was stated that medication used in psychiatry has a good safety record. It is the cocktail of variants that are significant rather than just the medication. Additionally it was suggested that benzodiazepines are relatively safe. However, there is a paucity of evidence relating to potential adverse impacts in this particular context.

There was a suggestion that the identification of repeat offenders/or those who are repeatedly aggressive and have died could be backtracked through the coroners courts. There may be something with regards to the extent of repeat PRN use on a regular basis with these individuals that could be significant.

4. Positional asphyxia

Positional asphyxia can occur in other positions besides the prone position. The recovery position may be the only recommended position with a lower risk. There are no absolute safe restraint interventions. The term 'forceful' prone position was seen by some as unhelpful. The physiological impact of restraint is more important.

There are relevant research papers by Parkes to demonstrate how lung function is impaired (Parkes, 2008). Some prone positions cause significant restriction of lung function. Even in a seated restraint position where the individual is bent forward it can be affected by 50%; in the worst case by 80%. These experiments were carried out without the use of force.

The end point of restraining an individual is returning them to normative behaviours. There should be a range of options to achieve this; e.g. time out, medication. There should be a timeline from initial restraint and control to reviewing the intervention but this timeline depends on the context, for example, the police may be reactive in managing the incident and may act inappropriately. This may be because they don't understand or appreciate the parameters especially any mental health issues. Responses to violence and aggression depend on training, e.g. how to reduce stereotyping due to the fear factor. The culture also affects staff's behaviour when the individual is violent or aggressive. The decision-making process is not just about restraining the individual but also about what happens after.

However, rational decision-making in stressful situations can be reduced, e.g. by fear. The supervisor/second responder should facilitate rational decision-making. Front-line staff still have responsibilities, e.g. in training. Lack of supervision in the police causes problems. Police services are understaffed and exhausted: it not always possible to have a controller/supervisor. The 'rookie' has minimal training and experience and fear is their obvious reaction in stressful situations temporarily clouding judgment. Training especially for the police does not deal with real-life situations. Effective training is about this cycle of decision-making. Training should be about de-escalation and also about mental health issues. There needs to be realistic training including how to assess risk versus non-compliance.

There are inherent dangers from only focussing on medical aetiology and vulnerable populations but staff need to be aware of risks. There therefore needs to be dissemination of medical theories into practice, e.g. dangers of restraint in a seating position. It is also about managing those risks. How 'hazardous' a restraint position is may be quite individualised, depending on characteristics of the person held, the length of time, the forcefulness of the hold and a range of other factors including relatively intangible factors such as the levels of stress and the extent of aggressive attitudes projected by all concerned. This makes any classification of how 'risky' a restraint position is difficult to apply objectively

The culture in the UK which appears to militate against the use of mechanical restraints or safe rooms or solitary confinement, (which were believed to be used effectively in other countries) meant alternatives to restraint were not considered.

5. Excited delirium and acute behavioural disturbance

There is a lack of valid research. Excited delirium (ED) is terminology used mostly by police where there is a spectrum of symptomology. These are mainly behavioural, e.g. sweating profusely, hyperthermia. Also symptoms are common with cocaine intoxication. Stephens et al (2004) stated that dopamine receptors change because of cocaine: *Cocaine is able to block the reuptake pump by which dopamine is recycled back to the nerve terminal*

Other syndromes may be more likely to cause acute behavioural disturbance:

- Serotonin syndrome can be fatal with toxicity of selective serotonin reuptake inhibitors (SSRIs) or selective serotonin/norepinephrine reuptake inhibitors (SSNRIs). At least three of the following signs or symptoms must be present: agitation, diarrhoea, heavy sweating not due to activity, fever, mental status changes such as confusion or hypomania, muscle spasms (myoclonus), overactive reflexes, shivering, tremor, uncoordinated movements (ataxia). Some symptoms of serotonin syndrome can mimic those due to an overdose of cocaine
- Neuroleptic malignant syndrome

These are more likely to cause acute behavioural disturbance but have common pathways to ED. There needs to be greater medical and psychiatric care for all these conditions. The management is more important than aetiology. In acute behavioural disturbances it should not be about labelling or blaming the individual. Restraint with these behaviours will always be difficult with possible risks of fatalities. It may be about leaving the individual alone in a safe space rather than restraining them.

There is research to demonstrate that there is a defect in the regulation of the dopamine transporter in the victims. The failure to upregulate¹⁶ the dopamine transporter with chronic cocaine abuse leads to a hyperdopaminergic state and this in turn, leads to the psychotic symptoms and hyperthermia.

Police need to manage ED through a custody unit with instant access to Accident and Emergency departments where the individual will be treated as an acute medical emergency with sedation and intubation as necessary. Such units need economic analyses but would save in costs through local responses to all medical emergencies e.g. alcohol or drug intoxication, via integrated and cohesive services. However, this would need a fundamental

¹⁶ The process of increasing the response to a stimulus

change in service provision as persons who are “drunk and incapable” would be managed in an Emergency Department rather than a police cell.

6. Acidosis

There is poor quality of evidence for deaths due to acidosis which is treatable. There are common pathways with ABD: increased activity will increase the need to breathe more leading to cardiomyopathy. There may be a tipping point in restraint where acidosis will lead to unstable cardiac rhythm. Stopping restraint and reducing exertion will reduce risk. However, certain individuals cannot buffer acidosis. Emergency treatment is resuscitation and sodium bicarbonate. Individuals with positional asphyxia may be difficult to resuscitate because of hypoxia. Staff training needs to include advanced life support skills.

Hypoventilation was also discussed. It was seen as possible that a prone restraint position, combined with the subject’s prolonged struggle could cause a hyperventilation state which could become a restraint induced hypoventilation state, rather than asphyxiation. This could then lead to acute hypercapnia (an unusually high level of carbon dioxide in the blood), which could then lead to a dangerous lowering of pH levels, which would then lead to ventricular fibrillation, and death.

20. Gap Analysis

It is essential to consider met and unmet objectives in relation to the findings of this review. The following gap analysis attempts to consider the strategic implications where principles of strategic directions and best practice have not been met and there are implications for agencies and authorities.

Table 2 Gap analysis

Principles	The Gap	Rationale	Commissioning Implications
To identify any future restraint-related deaths in the UK across sectors	While the IPCC record deaths in police custody and the IAP now hold records of restraint-related deaths across sectors, there appears to be under-reporting of restraint-related deaths in the NHS	Consistency in reporting relevant deaths locally and nationally is necessary to facilitate analysis of key information and prevent deaths in the future	Mandatory reporting of restraint-related deaths through information technology; collation of quality information; analysis and audit of this information; feedback at national and local levels.
To educate and train professionals who have a duty of care to make sound risk assessments on the safety of those they are restraining	Prison Service Order 1600 issued guidance on monitoring the individual's condition with particular regard to any medical warning signs. Other sectors of custodial services are not as specific.	Having a basic working knowledge of functional anatomy and physiology as well as a simple yet robust risk assessment model should enable staff to make rapid safety critical decisions in a dynamically evolving situation	NHS Counter Fraud and Security Management Service to issue guidance to trainers; NOMS standards to include this on the syllabus; police personal safety training to include basic working knowledge of anatomy and physiology.
To ensure standards of training and trainers of physical interventions in the management of violence and aggression are consistent across NHS services	While prison and police training follows one curriculum, adaptation of techniques has occurred in the NHS resulting in no clear standardised approach across mental health.	Expert opinion and research finds the national picture in the NHS is currently one of pockets of good practice, but lacking in a firm evidence base, with an unregulated piecemeal approach prevailing within mental health services	A Restraint Accreditation Board for regulation and accreditation of NHS training has been outlined and promoted nationally ¹⁷ ; further work must ensure this is carried out.
To identify retrospectively risk factors of restraint-related deaths in the UK 1999-2010	Cases only identifiable on IAP reports by date, age and ethnicity. Cases identified on Nexis database unreliable	Drawing inferences from a series of infrequent events subject to individual investigations and	An in-depth and multidisciplinary review across autopsy cases is needed.

¹⁷ This does not refer to the Restraint Accreditation Board currently in operation at the Ministry of Justice, which is accrediting techniques in the secure youth estate.

	because of lack of objectivity.	reporting is problematic	
To identify occurrence and physiological mechanisms of restraint incidents and risks of various restraint techniques.	There is currently little information on restraint incidents, particularly where the individual nearly dies. As a consequence, it is impossible to determine the magnitude of the problem.	Observational studies of restraint incidents, methods/techniques used and post-incident follow-ups needed to establish biophysiological mechanisms. An investigation into restraint incidents resulting in the near death of individual would benefit from specific focus on physiology, given the possibilities for learning that could be gained from these incidents.	Observational studies of 'near misses' restraint incidents needed. This was one of the recommendations of the IPCC Near Misses study in Police custody (2008) and consideration should be given to refereeing to this.

21. Implications for practice

Strategic objectives, like those above, must drive safe practice in the prevention and management of violent individuals. However, all staff have a duty of care, no matter what service, and therefore must consider the connotations of the findings of this review for their own practice. The reviewers would therefore invite all managers, supervisors and staff groups to draw up guidelines for physical interventions in their own area based on the following points, as well as existing national guidelines, for example, NICE (2005). These points have been gathered from research findings, the literature review, analysis of the UK restraint-related deaths in the time period and expert opinion.

21.1. Alternatives to restraint

There are no absolute safe restraint positions; even the recovery position has been associated with a restraint-related death in Scotland. Morrison and Saddler (2001) reported that staff were unable to secure the individual in the recovery position so then opted to lie on top of the individual. Mechanical restraints, fixation, confining the limbs to bed or a chair (as

used in parts of Europe) all have risks such as deep venous thrombosis (de Hert, 2010). Seclusion may be seen as the least harmful method of managing a violent individual. However, this will be likely to mean the individual has to be restrained first with the concomitant risks:

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

Patterson (2010)

There is also no safe time limit for duration of any restraint; staff must be aware during any physical intervention of the signs of a medical emergency (see Appendix 5) and have life support skills and equipment to respond to any emergency. They also need to bear in mind that cessation of aggression may indicate collapse rather than the individual's co-operation.

21.2 Reporting

The under-reporting of restraint-related deaths, particularly in the NHS, was evident in the experts' narratives, and in the report by the Joint Committee on Human Rights presented to Parliament (2004):

A reliable, comprehensive assessment of the number of deaths attributable to control and restraint in custody is difficult, in particular in relation to psychiatric detention. The MHAC [Mental Health Act Commission] estimates that one patient per annum over the last seven years died whilst control and restraint was being administered. However, there is no national database of figures for patient deaths connected to the use of restraint, and the cause of death of detained patients is often unclear

Consistency in reporting relevant deaths locally and nationally is necessary to facilitate analysis of key information and prevent deaths in the future. NHS reporting systems (Mental Health Minimum Data Set Version 4.0) now include recording restraint incidents; restraint-related deaths should also be a mandatory category.

A single national agency should collate all reports across sectors in order to analyse trends, such as ethnicity, and provide analysis nationally and locally.

21.3 Training

- 1) Staff training in all services needs to include immediate life support skills as a minimum certification level and advanced skills as a maximum level (for those working in emergency departments and acute medical admissions and paramedics). These skills and course provided to develop them are laid out by the Resuscitation Council (UK)¹⁸.
- 2) There needs to be dissemination of medical theories into practice, e.g. dangers of restraint in a seating position. It is also about managing those risks.
- 3) Effective training is about the cycle of decision-making. Training should be about de-escalation and also about mental health issues. There needs to be realistic training including how to assess risk versus non-compliance.
- 4) It would be of value to determine if training and placement of police officers in mental health settings enabled a greater understanding and impacted on the way they responded to people in mental distress. Where reciprocal training and joint working initiatives have taken place, e.g. Leeds Partnerships NHS Foundation Trust and West Yorkshire Police (Wharton 2008), participants have found it beneficial. It has increased understanding of each other's role as well as a greater understanding of the challenges of dealing with mental illness from both staff groups' perspectives. The Sainsbury Centre (Bather 2008) also recommended collaboration in training for police:

They can best be acquired through joint agency training, for example training delivered to a group that spans the criminal justice care pathway – from police to probation and from court staff to prison officers, etc. It is also essential that service user input is incorporated and that voluntary groups are engaged.

- 5) NHS Counter Fraud and Security Management Service should issue guidance to trainers on functional anatomy and physiology as well as a simple yet robust risk assessment model. This will set some minimum standards that services could be audited against. National Offender Management Strategy standards should include this on the syllabus and police personal safety training should also include basic working knowledge of functional anatomy and physiology.

¹⁸ <http://www.resus.org.uk/siteindx.htm>

- 6) As recommended by the Police Foundation (2009) and the Sainsbury Centre (Bather 2008) mental health first aid training, including de-escalation skills, should be rolled out across police services in order to decrease risks of restraining the individual with mental health problems:

The Metropolitan Police Authority has identified that de-escalation techniques should be part of police training.

21.4 Risk assessment and management

Risks of each restraint method/technique used should be evaluated by trainers. There are no absolute safe restraint interventions. How 'hazardous' a restraint position is may be quite individualised, depending on characteristics of the person held, the length of time, the forcefulness of the hold and a range of other factors including factors such as the levels of stress and the extent of aggressive attitudes projected by all concerned. The end point of physical interventions is to return the individual to normative behaviours. There should be use of a range of options to achieve this; e.g. time out, medication, with ongoing evaluation of effectiveness. This could be an education and training issue for staff, or a local policy/procedure issue which fails to utilise the options as part of a repertoire of responses, or a combination of the two. More could be done to ensure that the full repertoire of interventions needs to be available and utilised by front-line staff.

Service users who are identified to be at risk of disturbed/violent behaviour could be given the chance to have their needs and wishes recorded in the form of an advance directive as promoted in NICE guidance (2005):

This should fit within the context of their overall care and should clearly state what intervention(s) they would and would not wish to receive. This document should be subject to periodic review.

Families need to be better engaged in discussions prior to incidents and in anticipating risk scenarios and planning for these. They may have something to offer in terms of understanding triggers of violence.

Police need to ascertain if drug packages have been swallowed before restraining the individual. If this is the case, they need to take a hands-off approach and the prisoner should be taken to hospital immediately in case of absorption of the drug into the gastro-intestinal tract which is likely to be fatal. A risk assessment in the custody suite must ascertain if the individual has a history of drug swallowing and observed as stipulated in PACE (2008). The Code of Practice Code C¹⁹ states that those suspected of being intoxicated through drugs or having swallowed drugs must be visited and roused at least every half an hour.

21.5 Management of acute behavioural disturbance and excited delirium

The supervisor/2nd responder should facilitate interventions, where the individual displays acute behavioural disturbance, that are based on accurate assessment and clear communication strategies, so that decisions are made proactively in the best interests of the individual.

Police need to manage ABD through a custody unit with immediate access to Accident and Emergency units where the individual will be treated as an acute medical emergency with potential ED with sedation and intubation as necessary but also staffed by professionals skilled both in mental health as well as physical acute care

21.6 Polypharmacy

Psychotropic medication given p.r.n (pro re nata – i.e. as required) must be used sparingly and dosage and frequency recorded and monitored carefully in case of side effects. Psychiatrists should consider the pharmacokinetic²⁰ implications of drugs prescribed for use 'as needed', because of the potential for unpredictable interactions.

¹⁹ The requirements for the detention, treatment and questioning of suspects not related to terrorism in police custody

²⁰ The mechanisms of absorption and distribution of an administered drug, the rate at which a drug action begins and the duration of the effect, the chemical changes of the substance in the body and the effects and routes of excretion of the metabolites of the drug

21.7 Pre-existing conditions

Early warning predictors and markers should be noted by staff for those who are becoming unwell with a pre-existing condition before potential collapse. Consideration of patient's socioeconomic circumstances which may make them vulnerable to certain poor physical health factors should also be taken into account in planning care and prevention and management of violence and aggression.

22. Conclusions

Experimental research on humans to ascertain risks of physical restraint will always be ethically fraught. The condition of real-life situations where restraint is the last resort is impossible to recreate in experimental situations. The studies in this review which are therefore more valid are those with large numbers of retrospective case histories and autopsies. These however are mostly published in literature from the USA. The frequency and acceptance of excited delirium syndrome as a cause of death in restraint incidents in this body of literature, and the use of hobble restraint methods as the most common technique in these cases, make inferences and associations with UK deaths in custody more problematic. There are also difficulties around identifying and studying excited delirium syndrome because of the lack of well-defined, consistent epidemiological case definition and overlap with other established diseases (deBard, 2009) such as neuroleptic malignant syndrome. Stress-related cardiomyopathy may be a factor in restraint-related deaths but more analysis is needed of timelines before and during the restraint to confirm this.

However, reviewing the comparisons of restraint-related deaths in the UK from 1999 to 2010 with the literature available, it can be seen that those in vulnerable groups when restrained in a prone position, or in a basket hold, for a prolonged period and who are agitated and resistive, are most at risk. The fatality may occur during restraint, immediately after, or, as in the case of Roger Sylvester, some considerable time after.

The risk of fatalities could be viewed as present in any restraint position in physical interventions, with forceful restraint (in the UK) being the most risky, and de-escalation being the intervention of choice in managing violence and aggression. This can be seen as a continuum (see Fig.3) However, de-escalation may not always be effective and, in order to prevent harm to others, restraint or seclusion may be necessary as a last resort.

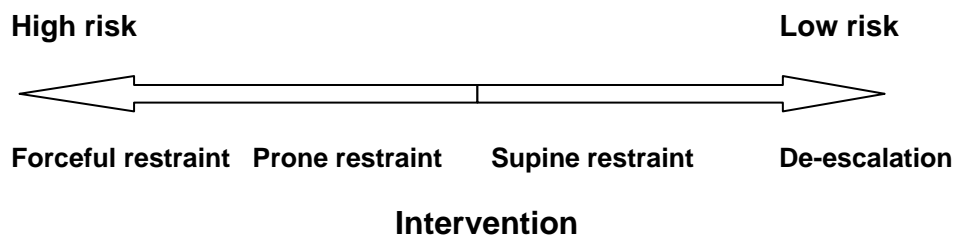


Figure 3 Continuum of risk in managing violence or aggression

In deaths in custody, there will always be the additional difficulty of separating any potential contribution of control measures from the underlying pathology. For example, was death due to the police control method, or to positional asphyxia, or from excited delirium syndrome/ABD or from the interplay of all these factors? As well as further research, a consistent case definition should be developed and applied in a large epidemiologic study or from a national or international database of all suspected cases, including those who survive.

The causes of these tragic deaths described in this case analysis and literature review, can be seen to be multifactorial as seen in the diagram below.

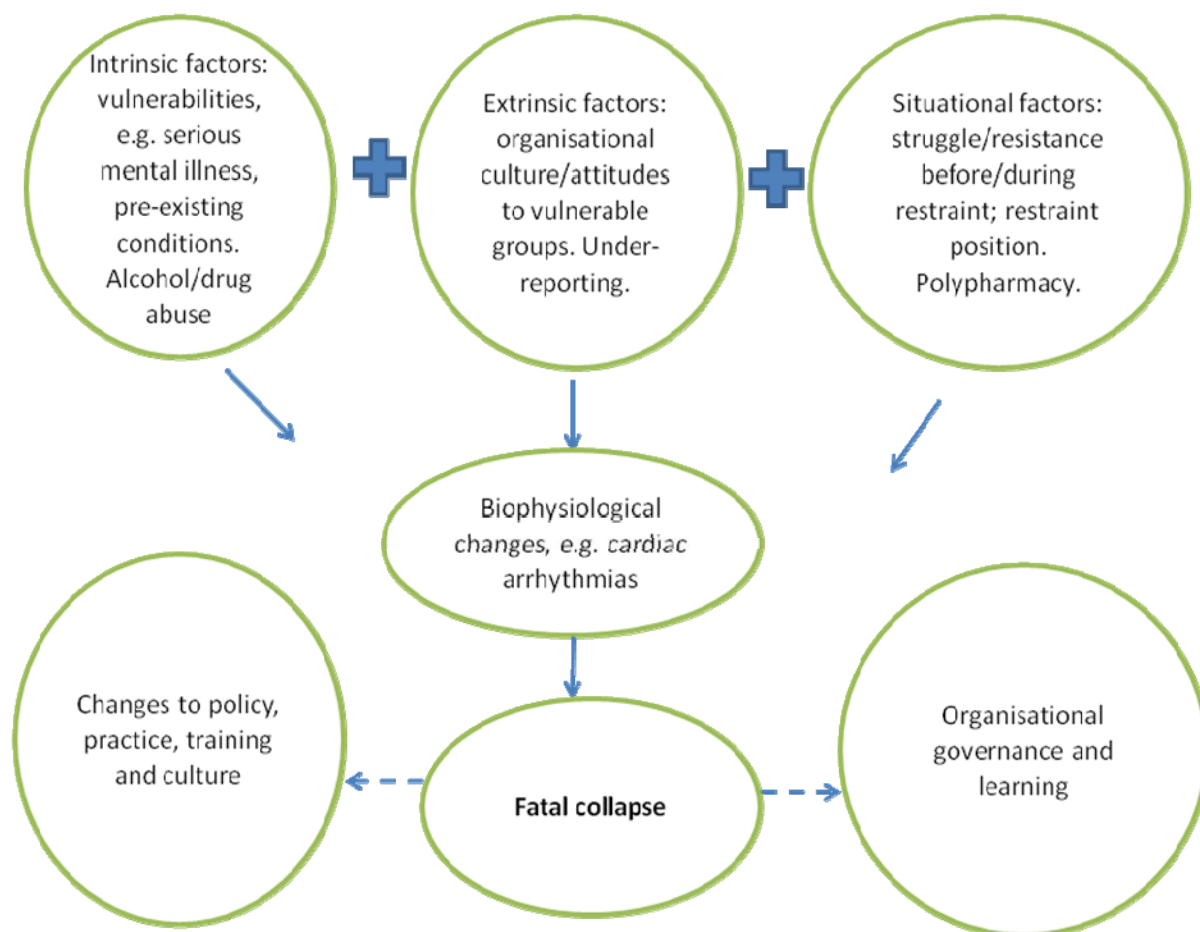


Figure 4. Multifactorial model of restraint-related deaths

Focussing on biophysiological causation alone ignores the narrative of each individual death and the complex factors leading up to the death. We also need to be mindful that organisational accountability and learning from these deaths are unfortunately not always a given. Recent cases highlight an issue INQUEST has extensively documented:

Concerted action across sectors needs to be taken to avert the ever-present risk of death associated with dangerous restraints. A series of coroners' recommendations warning of these dangers have resulted in some changes to policy and practice. However, there are still concerns about the adequacy of mechanisms to ensure learning from previous deaths

This review of medical theories relating to restraint-related deaths sought to enable the Independent Advisory Panel, which forms the second tier of the Ministerial Council on

Deaths in Custody, to identify whether the restraint training packages used by each of the custodial sectors adequately mitigate the medical risks related to restraint and to provide the IAP with a definitive understanding of the physiological causes of death. In order to achieve this, the authors have reviewed the medical theories and research relating to restraint related deaths. They have analysed and focussed upon those that occurred in the UK from 1st January 1999 to 31st December 2009 with particular reference to positional asphyxia. The review has also included discussion of other aspects of restraint related deaths such as the role of drugs and alcohol in restraint related deaths and any trends particularly in relation to Black and Minority Ethnic communities and those individuals with mental health issues. The research and analysis has been re-examined at different stages by peer reviewers and expert opinion in order to reach consensus. Finally a gap analysis and implications for practice have been outlined in order to consider the outcomes for policy makers, agencies, training bodies, researchers, physicians, managers, supervisors and staff groups.

Glossary

Positional asphyxia: insufficient intake of oxygen as a result of body position that interferes with one's ability to breathe

Restraint asphyxia: a form of positional asphyxia that occurs during the process of subduing and restraining an individual in a manner causing ventilation compromise

Forceful prone position: pressure is applied to the back, abdomen or hips rather than, or in addition to, the holding of the limbs

Physical intervention: a skilled hands-on method of physical restraint involving trained designated healthcare professionals to prevent individuals from harming themselves, endangering others or seriously compromising the therapeutic environment. Its purpose is to safely immobilise the individual concerned.

Rhabdomyolysis : the breakdown of skeletal muscle due to damage to muscle tissue

Rib distraction technique: approaching the young person in a protective stance from the rear, take hold of the young person's clothing around the rib cage area with both hands. The member of staff will give a clear verbal instruction that a technique involving the use of pain will be applied. With an inverted knuckle drive sharply inward and upward to distract the young person and effect a separation by turning the young person away from the incident. At the same time clear instructions must be given to the young person on what actions they must stop doing i.e. let go, release etc.

Thumb distraction technique:

- Block the base of the thumb.
- 'Cock' the thumb.
- Apply pressure between the base and tip of the thumb.
- To be used only when necessary.
- Report reasons for use.
- Use in short sharp bursts.
- Use in conjunction with verbal commands

Basket hold:

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. An unauthorised variation of this procedure in which, the basket hold is continued after the individual has fallen to the floor face down resulting in a situation where the member of staff ends up lying on top of the person being restrained may be particularly dangerous (Paterson 2010).

Appendix 1 Relevant studies

UK

Authors Country Evidence Grading	Sample and Interventions	Methods	Results	Limitations
Parkes J(2000) Leicester, UK. Sudden death during restraint: a study to measure the effect of restraint positions on the rate of recovery from exercise. <i>Medicine, Science, Law.</i> 40,1, 39-44 Grade: Level III	Study setting: medium-secure mental health hospital. Participants 16 nurse volunteers, valid data for 13. Mean age 35 years (range 25-49), mean Body Mass Index (BMI) 27 (range 21-34.5), 9/13 smokers, 4/13 no exercise, 9/13 at least weekly aerobic exercise. Intervention Bike exercise until pulse rate 120 beats/min then randomly placed in each of a seated (control) position, supine restraint or prone restraint position on floor. Comparator: Subject in each other position.	Study design: quasi-experimental study with before and after design. Inclusion criteria: good health, nursing staff that had completed a control and restraint course. Exclusion criteria: readings in three subjects, changed to ear-located probe. Outcome measures: repeated measures of rates of recovery from exercise using pulse oximetry and oxygen saturation levels in each position. Follow-up interval: none.	No significant difference in recovery time between supine restraint, prone restraint and seated control positions. Significantly longer recovery time for prone restraint compared with supine restraint position. The supine restraint position recorded shorter recovery time than seated control position, but no significant difference. No significant or consistent lowering of oxygenation levels during exercise found; recovery rate for oxygen saturation could not be calculated. A highly resistive subject in prone restraint position may have greater difficulty breathing than in supine position and that position may be a contributing factor to death during a restraint situation.	Experimental study evaluating post-exercise recovery times of healthy volunteers in supine, prone restraint and seated positions. Limited generalisability to real physical restraint situation, laboratory setting and controlled conditions. Subject selection bias, healthy volunteer nurses working in mental health not representative of restraint subjects in mental health settings. Possible measurement bias from ear-oximeter readings cited from literature, investigators forced to use this due to difficulties with finger probe oximetry. Also possible residual metabolic and respiratory effects from each set of exercise and rest position. Small sample size and method of randomisation to restraint position not described. Conclusion: due to limitations study does not clearly demonstrate a relationship between prone/supine restraint body position and greater recovery time from exercise. Therefore, no strong inference can be made that

				this translates into real risk of death
Morrison A, Sadler D. 2001. Death of a psychiatric patient during physical restraint. Excited delirium – a case report. <i>Medicine, Science, Law.</i> 41,1, 46-50 Level VI	Single case study of young man with autopsy findings.	5 staff restrained 25yr old man (diagnosis of paranoid schizophrenia) for 90 mins mostly in semi-prone position following threatening and agitated behaviour. Hyperthermic?	On autopsy no significant acute natural disease, no substance misuse. Cause of death given as 'positional and restraint asphyxiation in acute psychotic state'	Single case study lacks validity
Evans D., Wood J. & Lambert T L. (2003) Patient injury and physical restraint devices: a systematic review. <i>Journal of Advanced Nursing</i> 41(3), 274–282 Systematic review. Level V	Acute or residential care settings. Use of physical restraint, and reported outcomes related to direct or indirect injury	Systematic review. To compare outcomes between restrained and unrestrained people all randomized controlled trials (RCT) and observational studies that met the inclusion criteria were considered. To determine the prevalence of restraint-related injury, descriptive and observational studies were considered. To investigate the specific nature of injuries, descriptive studies and case reports were considered	While there are a number of papers addressing different aspects of restraint-related injury, there is currently little information on its prevalence. As a consequence, it is impossible to determine the magnitude of the problem	The magnitude of the problem is not known and warrants further investigation. Population described were elderly.
Paterson B., et al (2003) Deaths associated with restraint use in health and social care in the UK. The results of a preliminary survey. <i>Journal of Psychiatric and Mental Health Nursing</i> 10, 3–15 Survey and review Level VI	Health or social care settings	Survey. Inclusion criteria: 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.	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.	Collaborative work is necessary to produce consensual definitions and recording systems for restraint
Meredith C et al. (2005) The cardiopulmonary effects of physical restraint in subjects with chronic obstructive pulmonary disease <i>Journal of Forensic Clinical Medicine</i> 12, 3, 133-136. Experimental study Level IV	Eight patients with stable COPD Subjects were randomly allocated to five positions.	The outcomes measures studied were pulmonary function at 10 mins. The difference in FEV1 between the seated position and seated position with wrists restrained behind the back were also compared.	The response to the prone position with or without wrist restraint appears highly individual, with some individuals tolerating the prone position with no measurable clinical effects and others suffering a clinical deterioration in symptoms. The reasons for this individual variation remain unclear.	Small number of subjects. Lack of applicability to mental health or custodial settings

<p>Parkes, J (2002) A review of the literature on positional asphyxia as a possible cause of sudden death during restraint. <i>British Journal of Forensic Practice</i>.4, 1, 24-30. Literature review and expert opinion. Level V</p>	<p>Review of case reports and laboratory studies</p>	<p>Critical analysis of evidence on positional asphyxia</p>	<p>Evidence on position asphyxia as a cause of deaths in custody remains unclear</p>	<p>Case reports from UK not included; only USA hobble restraint positions discussed.</p>
<p>Parkes J, Thake D, Price M (2011) Effect of seated restraint and body size on lung function <i>Med Sci Law</i> 51:177-181</p>	<p>40 healthy volunteers</p>	<p>Lung function in a standing control position was compared with lung function in seated positions</p>	<p>Seated restraint positions with the person leant forward may increase the risk of harm or death during prolonged restraint. The risk will be further increased where the person exhibits higher BMI</p>	<p>Limited generalisability to real physical restraint situation, laboratory setting and controlled conditions</p>
International				
<p>Authors Country Evidence Grading</p>	<p>Sample and Interventions</p>	<p>Methods</p>	<p>Results</p>	<p>Limitations</p>
<p>Reay D et al 1992 USA Positional asphyxia during law enforcement transport. <i>Am Jour Forensic Med & Pathol</i> 13,2,90-97</p>	<p>Autopsies of 3 case studies</p>	<p>History and post mortem findings discussed</p>	<p>Limited findings under autopsy; restraints and positioning led to respiratory compromise; i.e. positional asphyxia</p>	<p>Small number of case studies lacks validity</p>
<p>Chan T Vilke GM, Neuman T, Clausen JL: 1997 Restraint position and positional asphyxia. <i>Ann Emerg Med</i> November 1997;30:578-586.Level II</p>	<p>Experimental, crossover controlled trial with 15 healthy male subjects</p>	<p>Exclusion criteria: positive toxicology screening, abnormal pulmonary function or BMI above 30 kg/m2. Subjects were tested in sitting, supine, prone and restraint positions; after 4 mins exercise, re-tested, then exercise repeated.</p>	<p>There was a small statistically significant decline in lung volume in the restraint position but no clinically relevant changes in oxygenation or ventilation.</p>	<p>Limited generalisability to real physical restraint situation. Healthy volunteers not representative of restraint subjects in mental health settings.</p>
<p>Roeggia M, Wagner A et al 1999. Cardiorespiratory consequences to hobble restraint. <i>Wein Klein Wochenschr.</i> 109;359-361 Level II</p>	<p>6 male volunteers in a randomised crossover trial</p>	<p>Haemodynamics and respiratory function measured after restraints used in 1) upright position 2) prone position.</p>	<p>Significant changes after restraint in prone position: vital capacity reduced, expiratory volume decreased, heart rate decreased, BP decreased and cardiac output decreased.</p>	<p>Small number of subjects; volunteers not representative of restraint subjects</p>
<p>Hick J et al. 1999. USA. Metabolic Acidosis in Restraint-associated Cardiac Arrest: A Case Series. <i>Academic Emergency Medicine.</i> 1999. 5,3,239-243 Case studies Level IV</p>	<p>5 patients in emergency departments with restraint-associated cardiac arrest and profound metabolic acidosis.</p>	<p>Serum toxicology; lactate levels</p>	<p>A profound metabolic acidosis is associated with cardiovascular collapse following exertion in a restrained position</p>	<p>More study is needed both on the physiological changes of restraint positioning and on the mechanisms of death in these cases</p>
<p>Schmidt P, Snowden T. 1999. USA The effects of positional restraint on heart rate and oxygen saturation. <i>Journal of emergency medicine.</i> 17,5,777-782 Level II</p>	<p>18 healthy volunteers</p>	<p>Phase 1: random allocation to unrestrained or 'hogtie' groups. Both exercised until heart rate</p>	<p>Phase 1: no significant differences in heart rate recoveries between subjects Phase 2: small and</p>	<p>Small cohort of only healthy subjects. The quasi-experimental studies also had limited</p>

		<p>was more than 120 beats per sec. Heart rate and O2 saturation measured</p> <p>Phase 2: paired volunteers exercised, then wrestled for 1 min. 1 of pair seated while other was in restraints on one side and struggled for 30 secs. O2 saturations of both measured immediately</p>	<p>statistically insignificant differences in O2 saturation.</p>	<p>generalisability to real physical restraint situations because they were conducted under laboratory conditions</p>
<p>O'Halloran and Frank (2000) Restraint Asphyxiation in Excited Delirium <i>American Journal of Forensic Medicine & Pathology</i>. 14(4):289-295 California, USA Retrospective case series review Level IV</p>	<p>Study setting Ventura County, California Medical Examiners' Office records, case histories and autopsies, police and witness interviews. Participants: 21 cases of sudden death while being restrained in a prone position, during the years 1992 to 1996. Age range 17 to 45 years. Intervention of interest: Physical restraint in prone position. Comparison group: none</p>	<p>Inclusion criteria None specified.</p> <p>Exclusion criteria None specified.</p> <p>Outcome measures Method of restraint, behaviour, cause of behaviour, cause of death, manner of death</p>	<p>All cases were acutely disturbed exhibiting delirium or aggressive behaviour, 15 cases involved police and two involved security personnel. One or more risk factors (drug toxicity, obesity, excited delirium, blunt force head injury, pepper spray, underlying heart condition) for sudden death was present in all 21 cases reviewed. All cases were restrained in a prone position, 14 were restrained by body weight and handcuffs, four were hog-tied (All 18 were handcuffed behind the back) and three restrained with just upper body weight to restrain arms, 11 had ankle or lower leg restraints. Pepper spray was used in seven cases prior to restraint, witnesses reported no significant effects of the spray and no cases were identified at autopsy. All cases except one were held involuntarily in prone position until unconscious. Certified cause of death was asphyxia or similar in 13 cases. Asphyxial deaths can occur in subjects who are held in a prone position with arms</p>	<p>Limitations: Non-specific research objectives and no description of case selection methods, other than "except for the 4 deaths. No inclusion and exclusion criteria. Convenience sample with selection bias. No description of case assessment and outcome measure criteria. Reliance upon autopsy findings where there are difficulties in diagnosing positional asphyxiation. Cases are mostly from US law enforcement settings. Case material from autopsy reports and coroners findings show that it is difficult to establish the cause of death related to positional asphyxia with the presence of many other risk factors contributing to these deaths.</p>

			and legs restrained and weight applied to the back. Persons with drug or psychotic induced excited delirium are at greater risk of asphyxial death. Pre-existing heart conditions, obesity, and physical exhaustion also increase risk. No direct causal inference can be made that physical restraint contributes to sudden death.	
Sailas and Fenton (2000) Helsinki, Finland Seclusion and restraint for people with serious mental illnesses (Cochrane review) in: <i>The Cochrane Library</i> , issue 1, 2002. Chichester, UK: John Wiley & Sons Ltd. RCT. Level 1	Persons with serious or chronic mental illness. Intervention Restraint defined as restricting patients' ability to move by using different design purpose devices or holding down by physical force. Other interventions not relevant to this appraisal include seclusion and prevention of seclusion and restraint use. Comparator Standard care or other alternative interventions.	Inclusion criteria Randomised Controlled Trials (RCTs) with focus on use of physical restraint (or seclusion) or strategies designed to reduce use of physical restraint (or seclusion) in treatment of serious mental illness. Exclusion criteria People with dementia, illness related cognitive impairment other than psychotic disorders, trials focusing on restraining the elderly from wandering. Outcome measures Relevant measures including physical adverse effects, death, and suicide or by other causes, psychological adverse effects.	Most studies focused on restraining elderly confused people to prevent wandering or falls. Author's conclusions There is a complete lack of any controlled trials and no recommendation can be made as to the potential harms or benefits of physical restraint of those with a serious mental illness. Reports of serious adverse effects from restraint (and seclusion) have been reported in qualitative reviews. Alternatives need to be developed.	Extensive and adequate search strategy and search terms, use of two independent reviewers, and consistent application of inclusion and exclusion criteria, study quality assessment, detailed review methodology and summary of findings. Conclusion Comprehensive and rigorous systematic review highlighting the lack of controlled trials addressing the risks and benefits of physical restraint, although adverse effects have been reported in qualitative literature.
Stratton S et al. USA. 2001 Factors Associated With Sudden Death of Individuals Requiring Restraint for Excited Delirium. <i>American Journal of Emergency Medicine.</i> 2001. 19,3, 187-191 Case studies. Level IV	Consecutive case series of 18 excited delirium sudden deaths after struggle and physical restraint.	Data collected from Coroner's investigation reports included age, gender, and taser, or capsiicum spray, evidence of injury, vitreous fluid glucose, and comprehensive toxicological tests for both legal and illegal drugs. Evidence of other disease states or past injuries was also collected from Coroner's autopsy reports.	All sudden death victims in the series had been hobble restrained. The total number of persons with excited delirium who were restrained during the study period is not known. The data presented does not support or refute the prone position while hobble restrained as independently associated with sudden death in the setting of excited delirium.	Because this report is descriptive, causal inference cannot be made for the associated factors identified.

<p>Day P. 2002 New Zealand. What evidence exists about the safety of physical restraint when used by law enforcement and medical staff to control individuals with acute behavioural disturbance? <i>NZHTA TECH BRIEF SERIES</i> September 2002 Vol. 1 No. 3 Literature review. Level V</p>	<p>Persons with acute behavioural disturbance requiring urgent physical restraint. Healthy volunteers used in experimental studies</p>	<p>Review what evidence exists about the safety of physical restraint when used by law enforcement, mental health and emergency department staff to control individuals with acute behavioural disturbance requiring immediate response. Outcomes: Mortality such as death caused by strangulation, asphyxiation or trauma. Morbidity such as pressure ulcers, thrombosis, neuropathy, fractures, bruising, and adverse effects such as psychological distress</p>	<p>The reviewed literature documents serious complications, particularly sudden death, as being associated with physical restraint use on acutely behaviourally disturbed individuals. The exact casual mechanisms that lead to these complications are complex as many risk factors are seen as being contributory to death and remain a challenge to medical examiners in determining the cause of death. From the evidence reviewed it was difficult to assign an independent association of physical restraint use and method to these deaths.</p>	<p>Almost all of the included studies were set in North America, where restraint use and methods may not necessarily reflect those used elsewhere. The quasi-experimental studies also had limited generalisability to real physical restraint situations because they were conducted under laboratory conditions, focused upon post-exercise recovery while under restraint, and involved healthy non-behaviourally disturbed subjects.</p>
<p>Mohr W, et al. 2003 Canada Adverse effects associated with physical restraint. <i>Can J Psychiatry.</i> 2003;48,330-337 Literature review. Level V</p>	<p>Forensic, geriatric, emergency and psychiatric literature</p>	<p>Searching databases</p>	<p>The causes of mortality are complex and multifactorial.</p>	<p>Research is needed to provide clinicians with data on the risk factors and adverse effects associated with restraint use.</p>
<p>Chan T et al. 2004 USA. Weight Force During Prone Restraint and Respiratory Function. <i>American Journal of Forensic Medicine & Pathology.</i> September 2004. Vol 25 - Issue 3 - pp 185-189 RCT. Level II</p>	<p>Human subject volunteers placed in the prone maximal restraint position</p>	<p>Randomized, cross-over, controlled trial on 10 subjects placed in 4 positions for 5 minutes each</p>	<p>Prone maximal restraint position with and without 25 and 50 lbs of weight force resulted in a restrictive pulmonary function pattern but no evidence of hypoxia or hypoventilation.</p>	<p>The quasi-experimental studies also had limited generalisability to real physical restraint situations because they were conducted under laboratory conditions</p>
<p>Channa Perera SD, Pollanen MS. 2007 USA. Sudden death due to sickle cell crisis during law enforcement restraint. <i>Journal of Forensic & Legal Medicine,</i> Jul 2007, vol. /is. 14/5(297-300) Case study. Level VI</p>	<p>Sickle-cell anaemia</p>	<p>A case of vaso-occlusive sickle cell crisis in a young schizophrenic man with undiagnosed sickle cell trait who was restrained and died while restrained</p>	<p>At autopsy, there was acute vaso-occlusive sickle cell crisis associated with hypernatremic dehydration</p>	<p>Single case study lacks validity</p>
<p>Michalewicz B, Chan T et al USA. 2007 Ventilatory and metabolic demands during aggressive physical restraint in healthy adults <i>Journal of Forensic Science.</i> 52, 1,171-75. Experimental study. Level II</p>	<p>30 healthy male and female subjects placed in 'hogtie' restraints in prone position with weights, then struggling for 60 secs.</p>	<p>Exclusion criteria: substance use. Ventilation and cardiopulmonary measurements taken.</p>	<p>Results showed no clinical importance therefore factors other than ventilator failure associated with restraint may be responsible for death.</p>	<p>Subjects may not reflect restrained individuals. Physical and psychological stressors could not be reproduced.</p>
<p>Grant J et al 2007. USA Death in</p>	<p>202 cases of</p>	<p>Autopsy reports,</p>	<p>Substantive change</p>	<p>Sampling strategy</p>

<p>custody: a historical analysis. <i>Journal of Forensic Science</i>.52, 5, 1177-1181. Retrospective case series Level IV</p>	<p>deaths in custody identified over 34 years sampling of law enforcement, correctional and mental health settings</p>	<p>police reports, investigations and medical reports reviewed. Length of time in custody not studied.</p>	<p>in deaths identified from '80's onwards: younger age group, males; drug intoxication, violent/erratic behaviour and use of restraints increased. Correctional facilities main agency</p>	<p>may introduce bias; drug testing better; forensic training better</p>
<p>Bunai Y. Japan. 2008. Fatal hyperthermia associated with excited delirium during an arrest. <i>Legal Medicine</i>. Volume 10, Issue 6, Pages 306-309. Case study. Level VI</p>	<p>Autopsy case of 39yr old man</p>	<p>After a 20-min struggle he was ultimately forced into a prone position on the ground with his arms and legs restrained by police officers</p>	<p>His rectal temperature measured 2.5 h after death was 40 °C. Autopsy revealed abrasions and subcutaneous haemorrhages of the head, face, arms, and legs. The heart was dilated and exhibited subendocardial haemorrhages in the left ventricle. The brain and both lungs were congested. Microscopic examination of the lungs revealed intraalveolar oedema and haemorrhages. The skeletal muscles showed contraction band necrosis and hyaline degeneration. The liver showed diffuse coarse-droplet fatty infiltration of hepatocytes. Neither addictive drugs nor alcohol were detected from blood or urine</p>	<p>Unreliability of single case study</p>
<p>Byard R et al 2008. Australia. Conditions and circumstances predisposing to death from positional asphyxia in adults. <i>Journal of Forensic and Legal Medicine</i>. 15,415-419. Retrospective case series Level IV</p>	<p>Retrospective study of autopsy cases over an 18yr period for cases attributed to positional asphyxia</p>	<p>No attempt made to collate overall numbers of cases. 6 examples were given under 3 categories</p>	<p>A variety of situations may predispose to positional asphyxia: Intoxication/sedation Organic disease Chronic injury</p>	<p>Reliability of methods; lack of numbers</p>
<p>Southall P, et al. 2008. USA Police custody deaths in Maryland, UA: an examination of 45 cases. <i>Journal of Forensic and Legal Medicine</i>. 15,227-230. Retrospective case series review Level IV</p>	<p>Retrospective analysis of police custodial deaths</p>	<p>Exclusion criteria: suicides, shootings, police-related motor vehicle incidents. Comparators: decedent characteristics, incident information, autopsy/toxicology reports and cause and manner of death.</p>	<p>Relatively static number of factors: behavioural (e.g. erratic, violent behaviour) and physical (e.g. stimulant abuse, natural disease and obesity)</p>	<p>Lack of uniform case documentation and use of small sample size prevented a statistically powerful analysis.</p>
<p>Laursen S et al 2005. Denmark Deep venous thrombosis and pulmonary embolism following physical</p>	<p>The use of physical restraint in a</p>	<p>A case report of DVT and Pulmonary</p>	<p>Four other case studies found. Risk of DVT and PE in</p>	<p>Lack of recognition of DVT as a complication during</p>

<p>restraint. <i>Acta Psychiatr Scand</i> 111: 324–327 Case study. Level VI</p>	<p>patient with a diagnosis of acute delusional psychotic disorder</p>	<p>embolism associated with prolonged physical restraint. The literature on physical restraint, DVT, and PE was reviewed</p>	<p>association with immobilization during physical restraint may occur in spite of no pre-existing risk factors.</p>	<p>physical restraint may contribute to the reported low incidence</p>
<p>Mash D et al 2009. USA. Brain biomarkers for identifying excited delirium as a cause of sudden death. <i>Forensic science international</i>. 190, e30-e19. Retrospective case series review. Level IV</p>	<p>Mortality review of 90 excited delirium deaths</p>	<p>Quantitative analyses of the dopamine transporter, toxicology, incident circumstances, force used.</p>	<p>Majority tested positive for cocaine, heat shock protein was elevated, and dopamine transporter levels low. Victims were young (mean age 34.2), males, with a high body mass. Mean body temperature was 40.7, seizures observed in 13% of cases. Many of the deaths occurred 1hr after initial police contact, cardiac arrest occurred shortly after use of restraints. If resuscitated, death occurred within 2 days from multisystem failure.</p>	
<p>Dickson B, Pollanen M.2008. Canada. Fatal thromboembolic disease: a risk in physically restrained patients. <i>Journal of Forensic and Legal Medicine</i>. 16,284-286 Case studies. Level VI</p>	<p>Physically restrained patients in psychiatric hospitals.</p>	<p>3 cases identified: autopsies reviewed.</p>	<p>Occlusive thromboemboli identified in each patient. None had previous history or risk factors. All had received prolonged physical or mechanical restraint.</p>	<p>This may form an underestimation as emboli can be clinically silent. Unreliability of small numbers.</p>
<p>Gill JR. 2008 USA. The medicolegal evaluation of excited delirium. In Forensic Pathology Reviews. Vol 5. Tsokos M (ed). Humana Press. Level VII</p>	<p>Forensic pathology of excited delirium cases.</p>	<p>3 cases identified; autopsies reviewed. Expert opinion given by author (chief medical examiner. New York)</p>	<p>Cocaine and amphetamine are 2 of the many substances that can cause the syndrome. There is no sign on autopsy that is so characteristic of the disease that it makes the diagnosis</p>	<p>There is no current standardized case definition to identify this. It is currently not a recognized medical or psychiatric diagnosis according to either the <i>Diagnostic and Statistical Manual of Mental Disorders (DSM-IVTR)</i> of the American Psychiatric Association or the International Classification of Diseases (ICD-9) of the World Health Organization</p>
<p>DeBard et al. 2009. USA. White Paper Report on Excited Delirium Syndrome. <i>American College of Emergency Physicians. American College of Emergency Physicians Excited Delirium Task Force.</i> Consensus Opinion. Level VII</p>	<p>19 experts in the Task Force. 18 of these experts are emergency physician members and 1 is a PhD researcher.</p>	<p>The Task Force was charged to examine the available literature and existing data and use their expert experience and consensus to determine: if the entity commonly referred to as</p>	<p>Pathophysiology may include genetic susceptibility and chronic stimulant-induced abnormalities of dopamine transporter pathways, along with elevation of heat shock proteins</p>	<p>The exact incidence of excited delirium is impossible to determine as there is no current standardized case definition</p>

		"excited delirium" exists, and if so, whether it could be treated	in fatal cases.	
Scheinin L, Wetli C. 2009 USA. Sudden death and sickle cell trait. <i>American Journal of Forensic Medicine & Pathology</i> .30; 204-208. Case studies. Level VI	7 exercise-related sudden death	Autopsy reports reviewed.	In exercise-related death inc. restraint, local hypoxia causes intravascular sickling, vascular occlusion and organ and tissue damage. This results in rhabdomyolysis, myocardial ischemia, arrhythmias.	Small number of case studies lacks validity
Ross D. 2010. USA. Science, liability, use of force, and restraint asphyxia Legal Issues and Concepts. http://www.policeone.com/police-products/less-lethal/TASER/articles/1996241-Science-liability-use-of-force-and-restraint-asphyxia/ Literature review. Level V	Databases of Medline and ProMed published studies on the subject of a sudden death in police custody during a violent confrontation and restraint were assessed from 1985 through 2008.	A total of 75 publications addressing sudden deaths in police or detention custody in which restraint of the person (positional asphyxia) was the primary issue assessed were reviewed	The physiological science of restraint not only clarifies that the restraint position or restraint procedures fail to support a sudden death from ventilatory compromise but also reveal that other more significant factors are more likely to contribute to a sudden violent restraint death. Other factors such as excited delirium, drug intoxication, mental illness, stress, trauma, and catecholamine hyperstimulation	Reliability of author and source
Otabhachi M et al 2010 USA Excited Delirium, Restraints, and Unexpected Death: A Review of Pathogenesis. <i>American Journal of Forensic Medicine & Pathology</i> . 31, 2; 107-112. Expert opinion. Level VII	Review of research on excited delirium.	Hypothesis: death after use of restraints, drug intoxication, violent behaviour and production of severe stress produces stress cardiomyopathy and vascular collapse. These cases may die immediately or in a period of 1-2 days after.	Patients with stress cardiomyopathy have unique ventricular morphology on echocardiograms and left ventricular angiography and have had normal coronary angiograms. People who die under unusual circumstances associated with high catecholamine levels have contraction bands in their myocardium	Limited cardiac biopsy information is available in patients with stress cardiomyopathy.
Alshayeb H et al 2010 USA Lactic Acidosis in Restrained Cocaine Intoxicated Patients. <i>Tennessee Medicine</i> . Nov-Dec. 37-39. Case study. Level VI	A case of restraint associated severe lactic acidosis in a cocaine intoxicated patient	Successful medical interventions are described	Compensatory hyperventilation in response to metabolic acidosis may be limited by the restrained prone or hobble positions	Unreliability of single case study

Appendix 2 Hierarchy of evidence

Level I: Evidence of a systematic review or meta analysis of all relevant randomized controlled trials (RCT), or evidence-based clinical practice guidelines based on the above.

Level II: Evidence from at least 1 RCT.

Level III: Evidence from controlled trials without randomization.

Level IV: Evidence from case-control and cohort studies.

Level V: Evidence from systematic reviews of descriptive and qualitative studies.

Level VI: Evidence from a single descriptive or qualitative study.

Level VII: Evidence from the opinion of authorities and/or reports of expert committees.

http://www.spu.edu/depts/library/reference/health_science/ebp.htm

Appendix 3 Expert opinion

European Violence in Psychiatry
Research Group

Malcolm Rae

Dr Brodie Patterson

Dr Nick Lessof

John Crawley

Chris Sterling

Dr Meng Aw-Yong

Dr Peter Dean

Dr Mary Sheppard

Dr Jason Payne-James

Dr Anthony Bleetman

Prof Richard Whittington

Dr John Parkes

Richard Barnett

Maria Lietner

Deborah Coles

Victoria McNally

Professor Richard Williams

Professor Bob Flanagan

Eric Baskind

Lord Toby Harris

Appendix 4 Signs and symptoms of medical conditions

Cardiac arrhythmias	Palpitations, dizziness or feeling light-headed. Fainting. Shortness of breath. Chest discomfort. Weakness or fatigue. Tachycardia often accompanied by chest discomfort, diaphoresis (excessive sweating), nausea. Loss of consciousness.
Enlarged heart	Fatigue, mild chest pains, dizziness, sharp pains and shortness of breath
Excited delirium/acute behavioural disturbance	Tachycardia, rapid breathing, hypertension, acidosis, hyperthermia, rhabdomyolysis
Lactic acidosis	Nausea, vomiting, hyperventilation. Abdominal pain, lethargy, shock, hypotension, tachycardia
Neuroleptic malignant syndrome	Hyperthermia, muscle rigidity, autonomic dysfunction, and mental status changes (including agitation)
Positional asphyxia	Cyanosis, congestion and petechial haemorrhages. Struggling to breathe. Evidence or report of an individual feeling sick or vomiting. Swelling, redness or bloodspots to the face or neck. Marked expansion of the veins in the neck. Individual becoming limp or unresponsive. Changes in behaviour. Loss of, or reduced levels of, consciousness. Respiratory or cardiac arrest.
Rhabdomyolysis	Muscle stiffness, weakness and tenderness, nausea followed by vomiting, decrease or absence of urine production, confusion, coma, cardiac arrhythmias.
Vomit inhalation	Bluish discoloration of the skin caused by lack of oxygen. Chest pain. Cough. Fatigue. Shortness of breath. Wheezing. Excessive sweating. Swallowing difficulty

Appendix 5 Useful links

<http://www.bild.org.uk/>

BILD is the British Institute of Learning Disabilities. *“We work to improve the lives of people with learning disabilities and family carers. To do this our work focuses on human rights, positive behaviour support, developing the workforce that provides support, and working for greater community involvement”*. The BILD Physical Interventions Accreditation scheme was launched in April 2002. Developed over 3 years with project funding from the Department for Education and Skills and Department of Health it is underpinned by joint guidance entitled *Guidance on the Use of Restrictive Physical Interventions; how to provide safe services for people with learning disabilities and autism*. The assessment criteria for accreditation are drawn from the BILD publication entitled *BILD Code of Practice for the use and reduction of restrictive physical interventions*, third edition (2010).

<http://www.inquest.org.uk/>

INQUEST is a charity that provides a free advice service to bereaved people on contentious deaths and their investigation with a particular focus on deaths in custody

<http://www.nice.org.uk/CG25>

National Institute for Clinical Excellence (2005) *Violence: The Short-term Management of Disturbed/ Violent Behaviour in Psychiatric In-patient Settings and Emergency Departments*

<http://eviprg.eu/index.php>

An active network of mental health researchers, educators and practitioners with over 60 members in 20 European countries. The group aims to enhance the understanding, prevention and management of violence in psychiatric settings by conducting research and disseminating good practice.

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