

Analysis: Restraint in Mental Health Settings; Is it Time to Declare a Position?

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Declarations of Interest

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Summary

The emergence of a drive to reduce restrictive interventions has been accompanied particularly in the UK by a debate focussing on restraint positions. Any restraint intervention delivered poorly can potentially lead to serious negative outcomes. More research is required to reliably state the risk attached to a particular position in a particular clinical circumstance.

Introduction

There is broad international consensus that where any form of coercion is used, preference should be given to the least restrictive and least dangerous measure.¹ Physical restraint is sometimes used as a discrete intervention, separate to the use of other coercive interventions such as mechanical restraint, enforced medication and seclusion, but where such options are available restraint will almost invariably be used to facilitate. Coercive interventions exist in a dynamic clinical context, where the availability of one intervention may have an impact on the frequency and nature of another.

The use of coercive interventions has historically been driven by an interaction between local and national cultures rather than being evidence-based; and internationally a number of countries are working towards reducing such interventions². Practice in the UK is comparatively unusual in that mechanical restraint³ and seclusion are used infrequently; arguably a legacy of the restraint reduction movement of the 1800s which has also been an emergent policy theme tied into high profile fatalities in the UK. The focus on decreasing the number of restraints has been accompanied by a focus on reducing specific types of physical restraint, especially those in which the patient is held in the prone position; similar concerns have been expressed in Australia and New Zealand.⁴

In 2013, the UK charity Mind published a report calling for an end to the 'life-threatening' practice of facedown restraint.⁵ According to Mind's analysis, at least 3,439 patients were restrained in a face down position in 2011–12. This report was published in the context of wider public concerns after highly publicised deaths in both police custody and mental health settings of patients post-restraint and the scandal of the abuse of people with learning disabilities at Winterbourne View.⁶ The authors suggested that restrictive interventions were being used for too long, not as a last resort, and sometimes to 'inflict pain, humiliate or punish'.

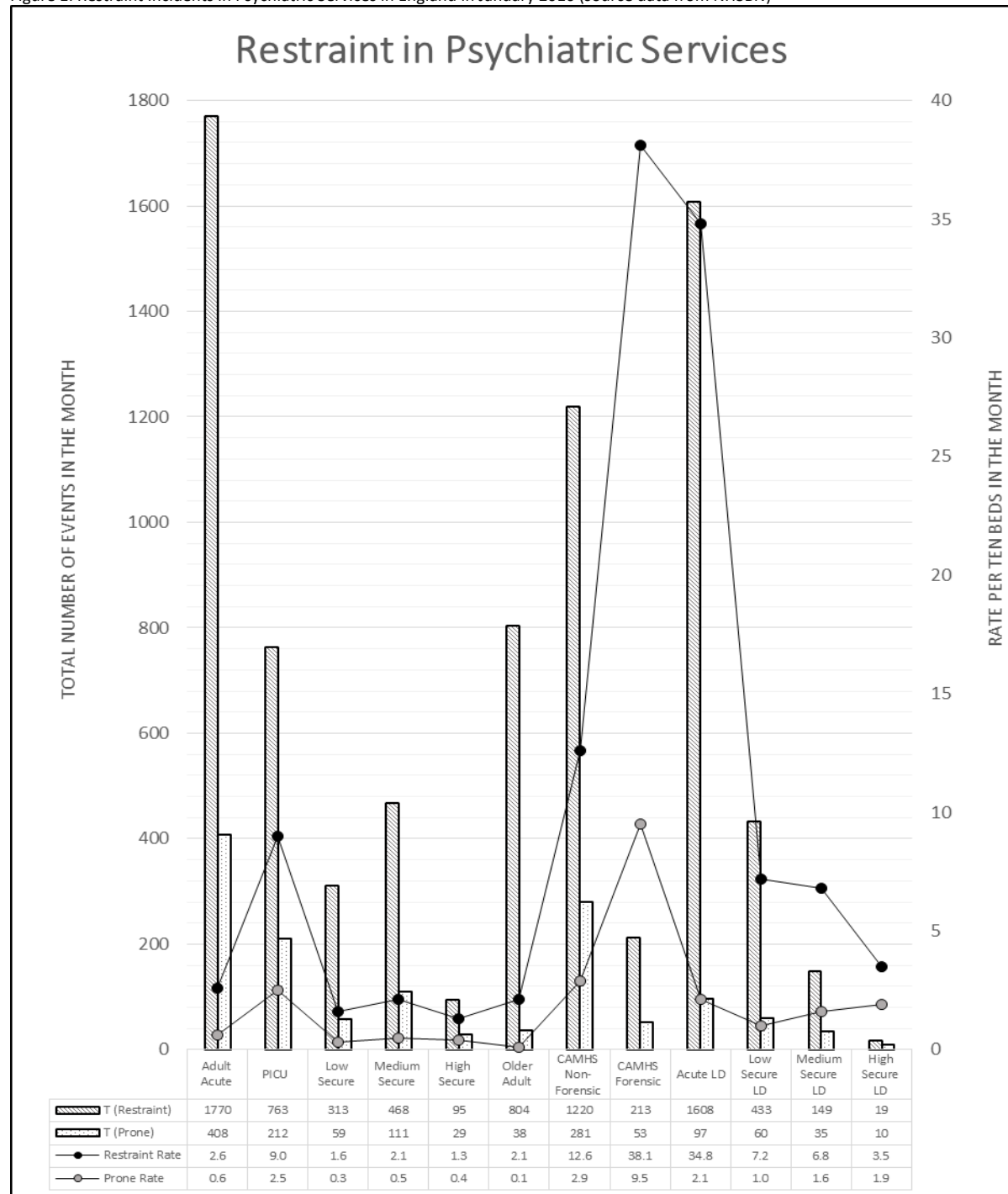
In 2014 the 'Positive and Safe' programme launched by the UK Department of Health, sought to transform policy, practice, reporting and accountability around the use of restrictive interventions in mental health and learning disability services.⁷ This was closely followed by the 2015 NICE guidelines which suggested an avoidance of taking a patient to the floor and a preference for supine over prone restraint. The guidance also suggested considering the use of seclusion or rapid tranquillisation if the restraint lasts for more than ten minutes.⁸

The revised Code of Practice of the UK Mental Health Act 1983 (MHA) states that unless there are cogent reasons for doing so, there must be no planned restraint of a person whereby they are forcibly laid on their front.⁹ The Care Quality Commission produced a guide in 2015 focusing on the importance of training, individual care plans and debriefing.¹⁰ Concerns about physical risk during restraint have also led to patient safety alerts for both England and Wales stressing the importance of vital signs' monitoring.^{11,12}

The NHS Benchmarking Network (NHSBN) has collected recent data on the use of restraint in England. Figure 1 summarises the totals/rates for (prone) restraint in over 90 per cent of the beds in England in January 2016.

The figure summarises the results from the NHSBN Restraint Audit (2016)¹³ and displays a striking variation in practice in different clinical specialties across the security spectrum.

Figure 1: Restraint Incidents in Psychiatric Services in England in January 2016 (source data from NHSBN)



A prerequisite to the NHSBN's work was definitional clarity over what constituted (prone) restraint. This led to definitions for restrictive interventions, defined as 'planned or reactive acts on the part of other person(s) that restrict an individual's movement, liberty and/or freedom to act independently in order to take immediate

control of a dangerous situation where there is a real possibility of harm to the person or others'. Restraint was defined as 'any restrictive intervention involving direct physical contact where the intervener's intention is to prevent, restrict, or subdue movement of the body, or part of the body of another person'. Prone restraint was defined as 'the use of restraint in a face down or chest down position for any period of time'.

The Legal Perspective

The use of force to restrain a person may be legally and ethically justifiable in certain situations, for example to prevent a crime. Cases brought under the European Convention on Human Rights frequently engage one or more of the following provisions: the right to life (Art 2); the right not to suffer torture, inhuman or degrading treatment or punishment (Art 3); the right to liberty and security (Art 5) and the right to respect for private and family life (Art 8). In healthcare, the ethical justification becomes more complex not least because of the wide range of circumstances in which force might be used, ranging for example from a confused patient wandering towards a busy road to preventing assaults on staff. Although the reasons may differ, the requirement for any response to be necessary, reasonable and proportionate remains.^{14, 15} Practically, this means that the least possible restrictive intervention should be used with the minimum amount of force necessary to achieve the objective; any intervention beyond this is legally and ethically unjustifiable.

Where a person has been detained in hospital under the UK MHA, decisions regarding treatment may be taken without consent under Part IV of the Act, and this includes the use of reasonable, least restrictive force. The use of force against a person who lacks capacity may be justified under the UK Mental Capacity Act 2005 provided it is necessary and proportionate to the likelihood and seriousness of harm occurring, and is in the person's best interests.

Our understanding of the prevention and management of violence and aggression (PMVA) and the safer use of restraint has improved, but the notion of anything approaching an entirely safe method is still unrealistic. In 1998, it was noted that: 'restraint is not itself harmless; some proportion of those who are restrained may die. We do not know what this proportion is, or how many others will come near death and be revived. As clinicians, we need to accept that restraint procedures are potentially lethal and to be judicious in their use'.¹⁶ This is as true today as it was two decades ago.

Internationally, restraint fatalities are often associated with mechanical restraint but are typically the result of the use of physical force to immobilise. The more time it takes to complete the restraint procedure, the higher the risk of serious complications.¹ Current initiatives have concentrated on measures to reduce aggression and thereby minimise the need for physical interventions. De-escalation training is now a standard ingredient in most physical intervention training programmes, with the emphasis on bringing restraint to the earliest possible conclusion.

Combining best practice with legal and ethical principles produces a model in which restraint should be considered an emergency intervention and avoided if possible, adapting prevailing conditions to deal with acute situations. Where restraint proves necessary, it must be properly recorded and investigated to see what

lessons can be learned to prevent reoccurrence. Lessons learned can have local and national impact. Following the restraint-related death of Jimmy Mubenga in 2010, the Home Office Manual for Escorting Safely (HOMES) was introduced as the sole approved training programme for Detention Custody Officers.¹⁷ Furthermore, a new system for use with minors (MMPR)¹⁸ was introduced following concerns about the harm caused by restraint in juveniles.

Until recently, there has been considerable resistance to the standardisation of approaches to PMVA in healthcare settings. A unifying example has recently been developed by the UK's High Secure Services and endorsed by the National Institute for Health and Care Excellent (NICE).¹⁹ The 'Positive & Safe Violence Reduction and Management Programme' (PSVR) has been produced to ensure that a standard skills programme is delivered by approved trainers. Although written specifically for high secure settings, because of its modular approach much of the material is applicable to other settings. It covers the prediction, prevention and management of aggression and violence, organised into a three level interventional framework.

Safety of Restraint Positions

Substantial controversy has arisen regarding the safety of restraint practices, particularly prone restraint, culminating in one set of official guidance proposing a ban of the use of this position.⁷ The published literature does not support such a simplistic view.

Although deaths have occurred during prone restraints, it is not clearly demonstrated that death is associated specifically with this position and the number of deaths directly associated is small. Hall et al²⁰ studied 3.25 million police/public interactions which resulted in 2,015 restraints in a prone position and 2,358 in a non-prone position. One fatality following restraint occurred, a rate of 0.02%; this was in a non-prone position. There is no randomised controlled trial examining this issue and the challenges associated with such a trial are self-evident.

Table 1: Physiological studies of restraint

Source	n	Subjects	Design/Interventions	Results
Chan et al (1997) ²¹	15	Male BMI < 30	Exercised 4 min. Lung function tested. Compared seated-control position with hobble-prone.	Mean reduction in FVC: 8% in prone position, 14% in hobble prone position ($p < 0.001$) No significant change in O ₂ saturation.
Chan et al (2004) ²²	10	Male (exclusion: unable to be restrained)	Compared seated-control with hobble-prone or hobble-prone + max 50 lb weight.	Mean reduction in FVC: 16% in hobble prone position with 50 lb weight. No significant change in O ₂ saturation.
Meredith et al (2005) ²³	8	Male/Female +COPD Mean age = 66	Lung function tested. Seated and prone positions, each with hands in front or behind back.	No significant change in lung function between positions. Three participants could not tolerate prone position and could not be tested.
Micalewicz et al (2007) ²⁴	30	Male/Female Healthy	MVV-seated compared with hobble-prone + max 100 kg weight. Hobble-prone + 60 s struggle. Restraint/struggle VO ₂ compared versus max running VO ₂ .	Mean MVV, hobble prone position with weight, showed 70% of seated MVV. VO ₂ during restraint/struggle 40% of treadmill VO ₂ . Concludes adequate ventilatory reserve during hobble restraint. Prolonged struggle in restraint difficult and participants 'waning' by 60 s.
Parkes & Carson (2008) ²⁵	15	Male BMI < 35	Lung function tested. Standing control with 4 restraint positions.	Restraint lying flat, supine or prone, resulted in non-significant reductions in lung function (< 10%). Prone restraint with weight and/or flexing of body caused reductions of up to 27% ($p < 0.001$).
Vilke et al (2011) ²⁶	10	Male/Female BMI < 30	Seated control versus exercise followed by normal seated and exercise followed by seated in restraint chair. MVV and O ₂ saturation measured.	Non-significant reduction in MVV in restraint chair. No change in O ₂ saturation.
Ho et al (2011) ²⁷	23	Male/Female BMI < 30	USS measurement of diameter of IVC before/after max 147 lb weight. Prone.	Significant reductions IVC. Increasing magnitude: prone, prone + 100 lb, prone+ 147 lb ($p < 0.0001$).
Parkes et al (2011) ²⁸	40	Male/Female BMI < 35	Lung function tested. Standing control versus seated leant forward and seated leant forward + restraint.	Leaning forward while seated showed significant reductions in lung function. Mean reduction in FVC 44% (leaning forward, restrained, BMI > 25)
Barnett et al (2013) ²⁹	25	Male/Female BMI < 30	Lung function tested. Seated control versus 3 prone positions.	All prone positions resulted in significant reductions in lung function ($P < 0.001$). A prone position with the arms allowing support under the participants caused least reduction (11% reduction).

BMI: body mass index; COPD: chronic obstructive pulmonary disease; FVC: forced vital capacity; IVC: inferior vena cava; MVV: maximal voluntary ventilation; USS: ultrasound scan; VO₂: volume of oxygen consumption; O₂: oxygen.

Laboratory research has been conducted into the physiological effects of restraint positions, examining variables such as lung function. A review by Barnett et al found that the studies reported reduced lung function in specific restraint positions but this was commonly at a level considered clinically insignificant.³⁰ The authors concluded that 'restraint position negatively effects ventilatory and other physiological functions, but to what extent in real world restraint situations is unknown.'

Many of the reviewed studies examined restraint positions associated with law enforcement, utilising handcuffs. These are of interest but have limited direct relevance to healthcare. Parkes & Carson conducted laboratory lung function testing of manual restraint techniques, finding that some prone restraint positions caused significant reductions in lung function.²⁵ Barnett et al conducted a similar study; demonstrating small reductions in lung function in the prone position could be ameliorated by modified arms placement.²⁹

Although attention in the UK has focused on the prone position, fatalities have occurred in other positions.³¹ Laboratory testing of seated positions has demonstrated reductions of lung function substantially greater than those in prone restraint.²⁸

Some authors have emphasised the role of other causal factors. Vilke et al highlighted the role of 'excited delirium', which may contribute to death due to acute behavioural disturbance, cardiovascular effects of

autonomic arousal and hyperthermia.³² Karch discussed the role of sudden cardiac death, the causation of which is not fully understood in the context of death following restraint.³³

We know that death can occur during or following restraint; the infrequency and complex circumstances of these events hampers scientific investigation in the real world. Laboratory simulations point to some, but not all, positions inhibiting lung function. Ethical constraints prevent the full recreation of fatal events in laboratory studies using human participants, yet front-line clinicians require guidance. Such guidance needs to be balanced, practical and reflect the complexity and the uncertainty of the current state of knowledge.

Reducing the risks also requires that organisations acknowledge and actively manage the processes that may be associated with its misuse, which may be indicative of the development of pathological cultures. Approaches to reduce the use of restrictive interventions now exist targeting the prevention of such cultural influences on practice and promoting the development of safer therapeutic cultures; an example of such an approach is the Safewards Model.³⁴

Medical, Psychiatric and Psychological Perspectives

Medical complications associated with physical restraint encompass two groups: exacerbations of underlying physical disease and those arising de novo due to the act of physical restraint. Psychiatric patients are more likely to experience comorbid physical health disorders. Pre-existing respiratory, cardiovascular or neurological system disorders can increase the risk of complications associated with restraint. Examples include chronic obstructive pulmonary disease, cardiomyopathy and epilepsy. Restraint itself has been associated with complications across all systems, including muscle, bone, biochemistry, breathing/respiration and circulation. Examples of complications include muscle trauma, fractures/dislocations, metabolic acidosis, thromboembolism and arrhythmia.

In physical restraint, a confluence of factors can lead to medical emergencies. Consider the scenario where physical restraint position may restrict ribcage movement and uplift the abdominal organs. Clinicians leaning into the patient's back may limit lung expansion, the patient's agitation will increase oxygen demand, and medical risk factors such as obesity, sedative medications and respiratory disorders may reduce respiratory effectiveness. It is not inconceivable that such a clinical scenario may lead to restraint asphyxia, a form of positional asphyxia in which body position results in insufficient oxygen intake. The risk of fatal asphyxia may be reduced by monitoring during restraint, and pulse oximetry has been utilised to supplement visual observation.³⁵ That said, pulse oximetry primarily detects hypoxia, and may not detect hypercapnia, the latter having been associated with restraint asphyxia and acidosis.^{36, 37}

In comparison with physical complications, mental disorders receive little coverage as a complication in physical restraint. Psychotropic medications cause several side-effects (e.g. extrapyramidal side-effects, pro-arrhythmic states, sedation) which can seriously compromise safety.

Negative psychological complications of physical restraint and the compound effect of enforced medication can lead to powerful experiences which evoke shame, humiliation, rage and fear. Patients in the acute mental

health system commonly have significant trauma histories and physical restraint even by well-meaning clinicians may be re-traumatising, replicating the unconscious dynamics of past abuse. Such scenarios can lead to a violent and vicious circle. Proposed strategies to mitigate the potential negative psychological effects of restrictive interventions on patients and staff include the practice of debriefing.⁸ Although the concept of debriefing has an intuitive appeal, its effectiveness has yet to be fully established and requires further research.

Summary and Conclusions

Physical restraint is part of a hierarchy of responses employed in the management of acute disturbance. The central therapeutic objective with most restrictive interventions is that of regaining a sense of control. Legal and ethical justifications for restraint, binding the concepts of necessity, reasonableness and proportionality, support clinical decision making which often requires complex risk-benefit analyses in the context of urgent and immediate response.

One cannot underestimate the counter-therapeutic impact on patients and clinicians of physical restraint. Restraint done poorly can lead to malignant shifts in the sense of hope, opportunity and control. It should be used when absolutely necessary in an emergency, for the shortest time possible and by clinicians who are trained in an approved restraint method.

Much of the debate around restraint guidance is dominated by clinicians, academics, regulators and policy makers. Other areas of mental health have been more successful in developing a co-productive relationship with the patient, and this may be required to change the prevalent culture around restraint and restrictive interventions in general.

There is variation in the use of restraint across the UK. Confounding stems from heterogeneity of service profiles, organisational reporting bias and definitional confusion. The most recent data capture by the NHSBN evidences considerable variation, but also provides the opportunity to look for root causes.

Much has been made in the UK of a perceived association between prone restraint and increased risk of negative outcomes. Restraint (prone or otherwise) rarely occurs in isolation; almost always part of a potentially lethal set of dynamic factors which in confluence can lead to serious negative outcomes for both patients and clinicians. In our opinion, the focus on positions may be an unhelpful and confusing distraction. As it stands today, the limited evidence base does not support the effectively 'banning' of any position. Any restraint intervention delivered poorly has the potential to lead to serious negative outcomes. More research is required before we can reliably state the level of risk attached to a particular position in a particular clinical circumstance.

The real challenge for service providers is to ensure that while a focus on reducing restriction is required, when restrictive interventions (including restraint) are unavoidable, the full range are available in clinical settings to provide a safe and effective crisis response. A clinical setting with a multidisciplinary team trained in de-escalation, with expertise and skills in the use of rapid tranquilisation and therapeutic restraint, access to an

extra-care-area, access to a seclusion room, and the ability to access differing levels of security will operate with a distinctly different philosophy of care to one which has limited options.

- ¹ Høyer, G. *The Use of Restraints in Psychiatric Institutions*. European Committee for the Prevention of Torture and Inhuman or Degrading Treatment or Punishment. Strasbourg. 2012. <http://www.cpt.coe.int/en/working-documents/CPT-2012-28-eng.pdf>
- ² Bernhardsgrutter R, Conca A, Hatling T, Janssen W, Keski-Valkama A, Lepping P, Mayoral F, Steinert T, Whittington R. Incidence of seclusion and restraint in psychiatric hospitals: a literature review and survey of international trends. *Social Psychiatry and Psychiatric Epidemiology* 2010; **45**(9): 889-97.
- ³ Whittington RE, Baskind E, Paterson B. Coercive measures in the management of imminent violence: restraint, seclusion and enhanced observation. In: *Violence in Mental Health Settings: Causes, Consequences, Management* (editors: Richter D, Whittington R). 2006. Pp145-172. Springer Verlag, New York.
- ⁴ Royal Australian & New Zealand College of Psychiatrists. *Minimising the Use of Seclusion and Restraint in People with Mental Illness*. PS61 PPP. 2016. https://www.ranzcp.org/Files/Resources/College_Statements/Position_Statements/PS-61-Minimising-the-use-of-seclusion-and-restrain.aspx
- ⁵ Mind. *Mental Health Crisis Care: Physical Restraint in Crisis*. 2013. https://www.mind.org.uk/media/197120/physical_restraint_final_web_version.pdf
- ⁶ Department of Health. *Winterbourne View Hospital: Department of Health Review and Response*. 2012. <https://www.gov.uk/government/publications/winterbourne-view-hospital-department-of-health-review-and-response>
- ⁷ Department of Health. *Positive and Proactive Care: Reducing the Need for Restrictive Interventions*. 2014. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/300291/JRA_DoH_Guidance_on_RH_Summary_web_accessible.pdf
- ⁸ NICE. *Violence and Aggression: Short-term Management in Mental Health, Health and Community Settings*. 2015. <http://www.nice.org.uk/guidance/NG10>
- ⁹ Department of Health. *Code of Practice: Mental Health Act 1983*. The Stationery Office, 2015.
- ¹⁰ Care Quality Commission. *Brief Guide for Inspection Teams: Restraint (Physical and Mechanical)*. 2015. https://www.cqc.org.uk/sites/default/files/20160422_briefguide-Restraint_physical_mechanical.pdf.pdf
- ¹¹ NHS England. *The Importance of Vital Signs During and After Restrictive Interventions/Manual Restraint*. NHS/PSA/W/2015/011. 2015. <https://www.england.nhs.uk/wp-content/uploads/2015/12/psa-vital-signs-restrictive-interventions-031115.pdf>
- ¹² NHS Wales. *The Importance of Vital Signs During and After Restrictive Interventions/Manual Restraint*. PSN 023. 2016. <http://www.patientsafety.wales.nhs.uk/sitesplus/documents/1104/PSN023%20The%20importance%20of%20vital%20signs%20during%20and%20after%20restrictive%20interventions.pdf>
- ¹³ <http://www.nhsbenchmarking.nhs.uk/news/view-article.php?id=139>
- ¹⁴ UK Criminal Justice and Immigration Act 2008, s.76.
- ¹⁵ UK Mental Capacity Act 2005, ss 5, 6.
- ¹⁶ Milliken D. Death by restraint. *Canadian Medical Association Journal* 1998; **158**: 1611–12.
- ¹⁷ Home Office & Immigration Enforcement. *Use of Restraint(s) for Escorted Moves*. Detention Services Order 07/2016. <https://www.gov.uk/government/publications/use-of-restraints-for-escorted-moves>
- ¹⁸ Ministry of Justice. *Minimising and Managing Physical Restraint*. 2012. <https://www.gov.uk/government/publications/minimising-and-managing-physical-restraint>
- ¹⁹ NHS. *Positive and Safe: Violence Reduction and Management Programme*. <http://www.wlmht.nhs.uk/pmva-manual>
- ²⁰ Hall C, Votova K, Heyd C, Walker M, MacDonald S, Eramian D et al. Restraint in police use of force events: examining sudden in custody death for prone and not-prone positions. *J Forensic Leg Med* 2015; **31**: 29–35.
- ²¹ Chan TC, Vilke GM, Neuman T, Clausen JL. Restraint position and positional asphyxia. *Ann Emerg Med* 1997; **30** (5): 578–86.
- ²² Chan TC, Neuman T, Clausen J, Eisele J, Vilke GM. Weight force during prone restraint and respiratory function. *Am J Forensic Med Pathol* 2004; **25** (3): 185–9.
- ²³ Meredith C, Taslaq S, Min Kon O, Henry J. The cardiopulmonary effects of physical restraint in subjects with chronic obstructive pulmonary disease. *J Clin Forensic Med* 2005; **12**: 133–6.
- ²⁴ Michalewicz BA, Chan TC, Vilke GM, Levy SS, Neuman TS, Kolkhorst FW. Ventilatory and metabolic demands during aggressive physical restraint in healthy adults. *J Forensic Sci* 2007; **52** (1): 171–5.
- ²⁵ Parkes J, Carson R. Sudden death during restraint: do some positions affect lung function. *Med Sci Law* 2008; **48** (2): 137–41.
- ²⁶ Vilke GM, Sloane C, Castillo EM, Kolkhorst FW, Neuman TS, Chan TC. Evaluation of the ventilatory effects of a restraint chair on human subjects. *J Emerg Med* 2011; **40** (6): 714–18.
- ²⁷ Ho JD, Dawes DM, Moore JC, Caroon LV, Miner JR. Effect of position and weight force on inferior vena cava diameter – implications for arrest-related death. *Forensic Sci Int* 2011; **212**: 256–9.
- ²⁸ Parkes J, Thake D, Price M. Effect of seated restraint and body size on lung function. *Med Sci Law* 2011; **51** (3): 177–81.
- ²⁹ Barnett R, Hanson P, Stirling C, Pandyan AD. The physiological impact of upper limb position in prone restraint. *Med Sci Law* 2013; **53** (3): 161–5.
- ³⁰ Barnett R, Stirling C, Pandyan D. A review of the scientific literature related to the adverse impact of physical restraint: gaining a clearer understanding of the physiological factors involved in cases of restraint-related death. *Med Sci Law* 2012; **52**: 137–142.

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- ³¹ Park KS, Corn CS, Henderson SO. Agitated delirium and sudden death: two case reports. *Prehosp Emerg Care* 2001; **5**: 214–6.
- ³² Vilke GM, Payne-James J, Karch SB. Excited delirium syndrome: redefining an old diagnosis. *J Forensic Leg Med* 2012; **19**: 7–11.
- ³³ Karch SB. The problem of police-related cardiac arrest. *J Forensic Leg Med* 2016; **41**: 36–41.
- ³⁴ <http://www.safewards.net/>
- ³⁵ Sheldon M. The use of pulse oximetry in response to violence. *Mental Health Practice* 2006; **9**(8): 32-5.
- ³⁶ Hick JL, Smith SW, Lynch MT. Metabolic acidosis in restraint associated cardiac arrest: a case series. *Acad Emerg Med* 1999; **6**: 239-43.
- ³⁷ Alshayeb H. Lactic acidosis in restrained cocaine intoxicated patients. *Tennessee Medicine* 2010; Nov-Dec: 37-39.