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Mechanical restraint of adult psychiatric inpatients: a literature review

Report from the Conflict and Containment
Reduction Research Programme

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Background

Previous reviews have highlighted the ethical dilemmas faced by psychiatric nurses when deciding how to manage aggressive or violent behaviour among inpatients (Busch & Shore 2000; Fisher 1994). In some instances, maintaining the safety of the patient and others has been achieved by the use of mechanical restraint and/or seclusion. Increasingly regarded as emergency measures, patients can find the experience of restraint or seclusion traumatic. The reviews note, however, that the methods and rates of use for these interventions vary widely and are influenced by a number of non-clinical or cultural factors. This is perhaps exacerbated by a lack of research evidence to guide clinical practice.

The literature on restraint and seclusion is broad, incorporating a diverse range of treatment settings and patients groups. Interpretation of research findings is hindered by such diversity. For example, it is not clear how far evidence from adult inpatients is relevant to the experience of adolescents. It is also unsatisfactory that restraint and seclusion are so frequently combined into a single measure of physical control when the research demonstrates such marked differences in their application. The present review is limited to mechanical restraint, defined as the use of straps, belts or other equipment to restrict movement, as distinct from physical contact during the process of putting patients into mechanical restraints. As a consequence, no UK studies are included in the review since mechanical restraint is rarely used. The review only includes studies of adult psychiatric inpatients.

Literature search

This review was conducted in parallel with a review of manual restraint techniques. Electronic searches of the main databases were conducted to locate post-1960 empirical studies of restraint in English. The databases searched were: PsycInfo, Cochrane, Medline, EMBASE Psychiatry, CINAHL and the British Nursing Index. Key words utilised were restrain\$, psych\$ and mental\$. Consistent with the aims of the review, the following thesaurus terms were excluded: child, eating disorder, diet, dementia and elderly. Resulting titles and abstracts were then inspected for relevance. The type of restraint (manual or mechanical) was not always apparent from the abstracts: where there was any ambiguity, the original was obtained and inspected. Many studies combined measures of mechanical restraint and seclusion into a single indicator of physical control or restrictive measures. Such studies were excluded if it was not possible to identify data specifically on the use of mechanical restraint. As the literature accumulated, further references were obtained by following up citations. The final number of identified empirical studies of mechanical restraint was 69. The majority (n=50) were from the United States (US), but twelve were from Europe, three from Canada, two from Israel, one from Japan and one from Hong Kong.

Methodologies of the studies reviewed

In the absence of any controlled trials, the evidence included in this review is based upon descriptive or qualitative data as well as observational studies of

interventions. Twenty-nine of the studies were retrospective analyses of official incident records, although this was sometimes supplemented with descriptive data from other sources. Twenty-two studies used questionnaires or non-routine data collection methods to obtain information on mechanical restraint, and 12 used a qualitative methodology (including two single case studies) to describe staff and patient experiences of mechanical restraint. It was not possible to determine the method of data collection for six studies. Twenty studies concerned interventions to reduce the use of mechanical restraint and most employed a repeated measures design with rates and/or duration of restraint recorded before and after implementation. Four studies involved a control or comparison group.

The studies were conducted in various types of ward including: acute wards (n=19); forensic/maximum security units (n=6); and psychiatric emergency services (PES; n=5), which provide 24 hour emergency assessment, crisis intervention and referral to other mental health services patients. Sixteen studies specified a mix of wards types, and where possible results for some wards (e.g. adolescent) were excluded from the review. A further 16 were categorised as being conducted in psychiatric hospitals/units. Four studies did not specify the type of ward. One study surveyed staff from various settings in four countries.

Analytic procedure

The aim of the literature review was to establish existing evidence for and against the working model and assess commonality and links between different conflict and containment types such as patient profiles, chains of events, patient experiences, circumstances of use, etc. A structured data extraction tool was created with various headings including sample, methodology, admission status, age, gender, ethnicity, ward type, service setting, risk status, time spent on ward, rates of restraint, antecedents/causes, patients' views, staff views, etc. Where published papers provided empirical evidence, this was entered on the tool. The headings of the resultant matrix have then been summarised for the purposes of this review. A hierarchy of evidence was established to rate the weight of each study in relation to the project's aims. The most weight was given to studies on acute wards and/or PICUs, studies with large samples and to findings replicated across studies. Various types of hospitals are included, but treatment setting has been categorised as far as possible by ward type.

Incidence

Twenty-four studies reported the incidence of restraint, with such widely differing methods of presenting this information that only limited conclusions can be drawn from them. Studies reporting incidence rates following restraint reduction initiatives are described in a separate section below. The most consistently reported measure was the proportion of patients restrained, although the time period varied from one month to 15 years. However, it was not possible to calculate this for all 24 studies. Two were limited to violent patients/incidents with one reporting that almost half of a selected sample of violent patients was restrained over six months (Beck, White, &

Gage 1991), while the other found that 38% of assault incidents resulted in restraint over a six year period (Flannery, Rachlin, & Walker 2001). A comparison of German and Swiss hospitals was limited to schizophrenia patients and reported annual rates of restraint of 10% and 7% respectively (Martin et al. 2007). A further study reported 117 assault incidents during a year and that 73 patients had been restrained in this time, but the proportion of incidents resulting in restraint or the proportion of all patients restrained was not presented (Sheridan et al. 1990). Finally, a Canadian national survey of psychiatric facilities found that 86% of general hospital psychiatric units reported using mechanical restraint (Guirguis & Dufrost 1978).

Excluding these five studies, the proportion of psychiatric inpatients restrained is shown in Table 1. The lowest and highest percentages come from the same study which recorded conflict and containment events across 25 acute wards over a six month period, and is one of only three international comparison studies included in the review (Bowers et al. 2005). Rates ranged from 0% in London to 51% in Athens. A very low rate (1%) was recorded in a national Finnish survey of psychiatric hospitals measured restraint use in the same specific week over 15 years (Keski-Valkama et al. 2007). The number of patients restrained declined over time but so did the number of all inpatients during these weeks. Compared to the baseline year (1990), the risk of restraint declined for some but not all subsequent years. Only one study from a forensic setting reported the incidence of mechanical restraint (Price, David, & Otis 2004). This US forensic hospital was characterised by a very high rate of violent incidents, with around 50 per month recorded over a period of seven and a half years and a high proportion of patients subject to restraint (see also discussion of frequency of rate of restraint episodes below).

Using the available data, the average incidence of mechanical restraint for the US studies was 14%, with rates in psychiatric emergency services tending to be higher than those from other (non-forensic) settings. Among the European countries (excluding the UK), average rates were highest for Poland (22%) and lowest for Finland (3%). The US national average was similar to the average for the European samples combined (11%) and Japan (18%) and the same as the rate for Israel (14%).

The number of mechanical restraint episodes was reported less frequently. Again, data were presented inconsistently, making it difficult to compare rates across countries and settings or between individual studies. One US forensic hospital had an exceptionally high rate of restraint episodes (983 per 100 beds per month; Price et al. 2004). As noted above, violent incidents were common at this hospital, which also had a low admission rate (n=806 over 92 months) and a very high number of restraint episodes (n=7,925). Excluding this case, the highest number of restraint episodes per 100 admissions per month was found for patients from seven German psychiatric hospitals (37.0). The average number of restraint episodes was similar among studies from Finland, Switzerland and USA (7.3, 8.5 and 7.5 respectively).

The data presented by some studies allowed examination of the relationship between the risk of mechanical restraint and the frequency of restraint episodes. A survey of psychiatric facilities in New York State (Ray & Rappaport 1995) found a similar

proportion of patients secluded in state psychiatric hospitals and psychiatric units in general hospitals (both 4%), but the latter used restraints much more frequently (28 vs 10 episodes per 100 patients per month). These differing practices were not explained by differences in patient populations. A Canadian national survey (not shown in Table 1) found similarities in the proportion of psychiatric hospitals and general hospital psychiatric units which used mechanical restraint, but more frequent use in the latter category (not tested statistically; Guiguis & Durost, 1978). A study of 1,543 psychiatric admissions in Finland controlled for patient demographics, legal status, diagnosis and treatment history, and found psychiatric centre to be predictive of restraint use (Korkeila et al. 2002). Of the three centres, one had substantially higher rates of restraint than the others, but much lower rates of seclusion. This is consistent with a US national survey of 101 state psychiatric hospitals (Crenshaw & Francis 1995) which found that patients in larger hospitals were less likely to be restrained (or secluded), possibly because they tend to treat less acute patients - as indicated by longer lengths of stay and lower staff-patient ratios and later supported by (Crenshaw, Cain, & Francis 1997). In a Polish study, the proportion of patients subject to mechanical restraint on 11 acute wards reduced from 22% in 1989 to 16% in 1996 (Kostecka & Zardecka 1999). However, the number of restraint episodes per 100 patients significantly increased i.e. fewer patients were being restrained in 1996 but these patients were being restrained more frequently. Another study found the proportion of patients subject to restraint in German and Swiss hospitals to be similar (10% vs 7%), but the number of episodes per 100 admissions patient differed was substantially, indicating much more repeated use of restraint in Germany (Martin, Bernhardsgrutter, Goebel, & Steinert 2007). None of the studies in this review examined factors which might account for the repeated restraint of some patients.

Types of mechanical restraint

The type of mechanical restraints actually used with patients was specified less often than the range of devices available on wards. When restraint methods were described, however, four-point restraints were by far the most frequently reported. Other methods mentioned by two or more papers included two-point restraints, five-point restraints, belts, camisoles, vests, sheets and straight-jackets.

Duration

Wide variation in the duration of mechanical restraint episodes was reported between countries. For example, the mean duration of restraint in German psychiatric hospitals was found to be 10 hours compared to 49 hours in Switzerland (Martin et al. 2007). In Finland, one study reported a mean total time in restraints during admission of 19 hours (Kaltiala-Heino et al. 2003) while another paper using the same sample reported the maximum cumulative duration over all episodes of treatment to be 86 hours (Korkeila, Tuohimaki, Kaltiala-Heino, Lehtinen, & Joukamaa 2002). A recent national Finnish study reported a median duration of restraint episodes to be between 5 and 7 hours with no statistically significant change over 15 years (Keski-Valkama, Sailas, Eronen M, Koivisto, Lonnqvist, & Kaltiala-Heino R. 2007). In contrast, a Polish study did find a significant change in the duration of restraint over time, with a reduction over an eight year period from 13 to 8 hours (Kostecka &

Zardecka 1999), and that time in restraint was significantly higher on wards with more patients per staff member.

A survey of US Psychiatric Emergency Services reported an average duration of mechanical restraint (3 hours)(Allen & Currier 2004). The only other US non-intervention study to report the duration found an average of 8 hours across a range of psychiatric facilities in a single state (Chandler et al. 1998). This study examined compliance with state policy and found that duration of restraint episodes was unrelated to whether alternatives to restraint were tried, whether the restraint was deemed justified, gender, ethnicity and legal status. A study from Israel found that two thirds of restraint episodes lasted up to 4 hours, with more frequently restrained patients restrained for longer (Porat, Bornstein, & Shemesh 1997), while in Hong Kong a mean duration of 8 hours has been reported (Chien, Chan, & Lam 2005). The longest reported duration comes from a Japanese study of 241 restrained patients which found 16% to be restrained for under 24 hours, 24% for 2-3 days, 22% for 4-7 days, 18% for 15-30 days and 6% for over 30 days (Odawara et al. 2005).

Antecedents and circumstances

The most commonly cited reason for mechanical restraint was aggression or violent behaviour. For example, a study of PES patients found that violent patients were significantly more likely to be restrained than those who made threats or were some other concern to staff (Beck, White, & Gage 1991). A study of assault incidents found that restrained patients committed more assaults and fewer verbal threats than non-restrained patients (Flannery, Rachlin, & Walker 2001). One Polish study found an increase in the proportion of restraint episodes due to aggression between 1989 and 1996 (from 61% to 74%) which the authors attribute to less arbitrary use of restraint (Kostecka & Zardecka, 1999).

However, other reasons for restraint were also reported across countries and treatment settings. One of the older studies in the review found that events preceding restraint could not be classified in the majority of cases, but that refusal of patient request was cited in 19% of cases (Bornstein 1985). Behaviour preceding restraint involved physical or verbal aggression (40% and 18%), self-harm (13%) or attempted abscond (8%), and over a fifth of cases were classified as unknown. Other studies found restraint to be associated with agitation (Kaltiala-Heino, Tuohimaki, Korkeila, & Lehtinen 2003; Porat, Bornstein, & Shemesh 1997; Ross et al. 1988), disruption (Ross, Lewin, Gold, Ghuman, Rosenblum, Salzberg, & Brooks 1988), impulsive behaviour ((Soloff 1979), restless and confused (Gurguis & Durost 1978), not consenting to hospitalisation (Dabrowski, Frydman, & Zakowska-Dabrowska 1986)), and danger to self (Dabrowski, Frydman, & Zakowska-Dabrowska 1986). A small study of mechanical restraint episodes (n=73) distinguished between patient behaviours during the events leading up to restraint and the events themselves (Sheridan, Henrion, Robinson, & Baxter 1990). In terms of behaviours, physical aggression and verbal threats were recorded for the majority of restrained patients. Preceding events were more often rated as external to the patient than internal (i.e. specific psychiatric symptoms). Most frequently, this was some form of patient-staff conflict (38%), but conflict with other patients was also reported (19%).

Some studies described the use of restraint in terms of prevention, although it is not clear whether this means preventing violence, aggression or other behaviour or adverse outcomes following these behaviours. A Japanese study found that among 241 restrained patients the most common reason (47% cases) was 'prevention of excitement likely to culminate in assaults on other patients or staff' (Odawara, Narita, Yamada, Fujita, Yamada, & Hirayasu 2005). Preventing staff injury and disturbance to others, as well as maintaining safety in confusion state were reported as reasons for mechanical restraint by a study from Hong Kong (Chien, Chan, & Lam 2005). Qualitative interviews with nurses suggest they believe that restraint needs to be used in situations involving potential or imminent harm to the patient or others and that alternative methods are not as effective in protecting patients in some circumstances (Marangos, Frost & Wells 2000). Non-violent antecedents of restraint, especially breaking rules or non-specific rationale, have been found to be more common than violent ones among psychotic patients (Soloff 1978). A related paper on ten non-psychotic patients found that restraint was often preceded by 'micropsychotic' episodes or impulsive behaviour, and that restraint more often used to defend the social milieu than to prevent violence or self-harm (Soloff, 1979).

Two surveys of PES directors (both conducted in 1998) found disagreement as to whether restraint should be used for violent patients. In one (n= 51), 56% agreed that restraint was usually necessary for violent patients (Allen & Currier 2004). Danger to self or to staff were considered as appropriate reasons for restraining patients but there was disapproval of using restraint to prevent voluntary patients leaving before assessment or to maintain an orderly environment. Opinion was more divided on the use of restraint to prevent involuntary patients leaving before assessment or before transfer to a locked facility. In the second survey (n=20) 70% of directors said that acutely violent patients were usually put in restraints and medicated (the remainder did not restrain these patients) (Binder & McNiel 1999). One study describes the antecedents of mechanical restraint in relation to the use of other interventions (Maier, Van Rybroek, & Mays 1994). Four-fifths of secluded physically aggressive patients in a forensic intensive care unit came out of seclusion in two-point ambulatory restraints i.e. restraint used to prevent prolonged seclusion of patients. This figure reduced to 25% during a six and a half year period as the use of seclusion for new admissions declined. The study also reported that a different form of restraint (4/5 point restraints) was used to prevent self-harm. Another study found a common reason for restraint to be when patients' physical complications mean that sedative medication cannot be prescribed safely (Odawara, Narita, Yamada, Fujita, Yamada, & Hirayasu 2005).

Outcomes

Relatively few studies reported the outcomes of mechanical restraint. A case-comparison study of violent and non-violent PES patients found that restrained patients were significantly more likely to be hospitalised after admission than patients who were not restrained, and that the same effect was found for psychotic and non-psychotic patients (Beck, White, & Gage 1991).

Three studies reported injuries associated with the use of mechanical restraints (others reported injuries but did not distinguish whether these were the associated with

seclusion or restraint). One found a greater number of injuries to patients than staff associated with the use of two-point restraints (Maier, Van Rybroek, & Mays 1994). Only 11 of 412 staff injuries (3%) were caused by patients in restraints. Nearly half (43%) of patient injuries were associated with restraint. Another study found that most patients initially refused restraint (106/109 episodes), but that in 80% of cases there were no injuries to staff or patients, although violence did occur (Bornstein 1985). A study of 706 assault incidents found that restraint was involved in 38% of them (Flannery, Rachlin, & Walker 2001). No statistically significant differences between the restrained and non-restrained patients were found for demographic or clinical variables, but the former had committed more assaults.

Characteristics of restrained patients

Age

There was a tendency for restrained patients to be younger than non-restrained patients but the findings with regard to age were not consistent. Two studies found restrained patients to be in their twenties (Aschen 1995; Ross, Lewin, Gold, Ghuman, Rosenblum, Salzberg, & Brooks 1988). One study found that restrained patients were significantly younger than a randomly selected comparison group of non-restrained patients (mean age =33 vs 48; Bornstein 1985). A Norwegian study also found a statistically significant association between age and methods of containment, with patients in 18-39 and 40-59 age categories more likely to be subject to mechanical restraint than seclusion or pharmacological restraint (Wynn 2002). An intervention study found the highest rate of restraint among the youngest patients (aged 25 and under), while older patients tended to be restrained for longer (Smith et al. 2005). A Japanese study of a general hospital psychiatric unit found restrained patients to be significantly older than non-restrained patients (mean age=43 vs 39; Odawara et al. 2005). Three studies found no statistical associations between mechanical restraint and age (Kaltiala-heino et al. 2000; Kostecka & Zardecka, 1999; Flannery et al. 2001).

Gender

No clear conclusion about mechanical restraint and gender can be drawn from the literature. Three studies found restrained patients more likely to be male (Bornstein 1985; Odawara et al. 2005) or male patients to be restrained more frequently than females (Wynn 2002). Two found women more likely to be restrained (Porat et al. 1997; Ross et al. 1988). Five studies found no difference in mechanical restraint by gender (Flannery et al. 2001; Kaltiala-heino et al. 2000; Kostecka & Zardecka 1999; Smith et al. 2005; Soloff 1978). A study of 1,269 mechanical restraint episodes in Norway found interactions between restraint, gender and age (Wynn, 2002). Although less frequent for female patients, restraint episodes among women decreased with age whereas the pattern for males was less clear.

Ethnicity

Although less frequently analysed than other demographic variables, there is no clear evidence of the incidence of mechanical restraint differing by ethnicity (Price et al. 2004; Smith et al. 2005), nor of differences in the average time in restraints (Price et al. 2004). One study from Israel found Jewish patients to be restrained longer than

non-Jewish patients (Porat et al. 1997). A study of emergency psychiatric patients (Kuhlman et al. 1982) assigned subjects to 3 groups: not restrained (n=531), immediate restraint (n=96) and evolved restraint (during course of treatment, n=69). There was no difference in race (black vs white) between non-restrained and immediately restrained or evolved restrained groups. However, there were more black patients in evolved restraint group compared to immediate restraint patients. Race was not related to whether patients were released from restraints or admitted to a state psychiatric institution.

Legal

There appears to be some association between legal status and mechanical restraint. Two studies found restraint to be associated with involuntary admission to treatment (Korkeila et al. 2002; Odawara et al. 2005). A US national survey of state psychiatric hospitals found a correlation between the number of patients committed as 'criminally insane' and the rate and duration of mechanical restraint (Crenshaw et al. 1997). Patients brought into an emergency psychiatric service by the police have been found significantly more likely to be restrained by those brought in by others or self-referrals (Beck et al. 1991).

Diagnosis

Assessment of the relationship between mechanical restraint and diagnosis is made difficult by the use of differing terminology and diagnostic systems between studies and variations in the types of psychiatric services and their populations.

Descriptive data suggest that psychosis (mainly schizophrenia) is the most common diagnosis of patients who are mechanically restrained, followed by affective disorders and substance use/dependence (Kaplan et al. 1996; Kostecka & Zardecka 1999; Chien et al. 2005). These findings may reflect the prevalence of these diagnoses among inpatient populations. A comparison of restrained patients and randomly selected controls found differences in clinical profile with a much smaller proportion of restrained patients having a diagnosis of a depression affective disorder (Bornstein 1985). However, the results of this study are difficult to interpret because of the large number of diagnosis categories included in a single Chi-square analysis. One study found no significant difference between psychotic and non-psychotic patients in the frequency of mechanical restraint but the former group were restrained for significantly shorter periods of time (5.2 hours vs 6.3 hours). Similarly, an Israeli study of 224 violent patients subject to restraint found that those diagnosed with mood disorders were restrained significantly more frequently than schizophrenia/schizoaffective patients (Kaplan et al 1996). Another study found that the proportion of patients restrained was greater among those a non-psychotic disorder (Wynn, 2002).

A multivariate analysis of restraint among 1,543 admissions to three Finnish hospitals found the use of restraint to be predicted by having a substance use disorder (Korkeila et al. 2002). A study of restraint in psychiatric emergency services found diagnosis to be the only patient variable to predict restraint use, with increased restraint use associated with a higher proportion of psychotic patients (Allen et al. 2004).

A study of a small group of restrained patients (n=28) found a statistically higher proportion of these patients with a psychotic diagnosis than a randomly selected

control group (Soloff, 1978). Restraint of psychotic patients tended to be early on in treatment, but there was no clear pattern for non-psychotic restrained patients. Finally, a Japanese study found restrained patients significantly more likely than non-restrained patients to be diagnosed with organic mental disorders, substance use disorders and schizophrenia, but were less likely to be diagnosed with a mood disorder or neurotic disorder (Odawara et al. 2005). Two studies found no statistical association between mechanical restraint and diagnosis variables (Kostecka & Zardecka 1999; Flannery et al. 2001)

Length of stay

Contrasting results were found for length of stay. One study found that both psychotic and non-psychotic patients spent significantly longer in treatment if restrained (Soloff, 1978), while another reported no statistical association between length of stay and restraint (Odawara et al. 2005).

Other

Data from two US general hospital psychiatric units showed that compared to a control group restrained patients were significantly more likely to be married (Bornstein, 1985). A Finnish study (Kaltiala-heino et al. (2000) found no relationship between restraint and social class.

Interventions to reduce restraint

Twenty studies reported outcomes for programmes or interventions designed to reduce the incidence of mechanical restraint (Table 2). All were from the USA. The research designs used provides only weak evidence for the effects of interventions to reduce mechanical restraint. Most relied on descriptive analysis of restraints before and after implementation of the intervention with follow-up periods varying from one month to several years. This research design does not allow changes in the use of restraint to be attributed to the effect of the interventions. Comparisons are made more difficult by differences in outcomes used (patients, episodes or restraint hours), and the way these were measured (per month, admissions or patient days). These limitations mean that effectiveness of different interventions cannot be determined from the literature.

Only eight of these studies used statistical analyses to measure changes in restraint use. In many cases the reductions in restraint were considerable, which might explain the reliance on descriptive accounts of change over time. Sample sizes were on the whole modest, so some studies are likely to have lacked statistical power to detect significant changes (had this been measured). Two of the three largest studies, with sample sizes over 1,000, did use statistical analysis to measure the extent of change and both significant reductions in the rate of mechanical restraint use. Across all the intervention studies, there was virtually no consideration of mitigating factors which might also account for change (e.g. patient characteristics), although the absence of these measures in the analyses was often acknowledged in the discussion section of the papers. This was sometimes accompanied by statements that other elements of treatment (e.g. medication) did not change during the study, but no data was presented to support this.

There was only one case comparison study, which retrospectively examined the influence of occupational therapy (OT) on restraint use (Carlson and Holm, 1993). Two groups of 60 patients were identified, but only those in hospital for at least 90 days were eligible to participate (15% of total annual admissions). Patients were assigned to OT groups on the basis of contact during the 90 day period. OT patients were to have received OT at least once a month. However, subjects in the non-OT group had to have received no OT for at least one month, but presumably could have received some OT during the 90 days. The lack of a statistically significant difference in restraint outcome may have reflected the highly selective sample and poor group construction as much as the lack of effectiveness of OT.

Whilst the general picture is one of reduced levels of mechanical restraint, it is not so clear whether this was achieved by increasing the use of other methods of containment. On the whole, use of the full range of containment measures available to nurses was not reported. There were some exceptions, but these studies provide a mixed picture of the relationship between mechanical restraint and other measures to control patients. Hay and Cromwell (1980) report the outcome a programme which included a change in policy whereby patients were placed in seclusion before the use of mechanical restraints was considered. Unsurprisingly, the total hours which patients spent in restraints reduced dramatically, but data on the use of seclusion are not presented although the authors do state that high doses of medication were not required. Craig et al. (1989) found a large reduction in restraint hours after implementing a package of measures to reduce restraint, but hours of seclusion initially increased despite the explicit intention preventing this from happening (there was a subsequent decline to much lower levels). Changes in rules requiring face-to-face assessment of patients within one hour of restraint or seclusion initiation have led to a fall in the number and duration of restraint episodes (Currier and Farley-Toombs, 2002). This study also reported reduced use of seclusion but figures were not presented in the paper. A study of restraint and seclusion over a seven year period showed no reduction in restraint after a programme to reduce these methods of containment was introduced, but there was a statistically significant decline in seclusion (Hellerstein et al. 2007). As the authors note, however, the results is probably explained by the low rate of restraint use in the first place (seclusion was used much more frequently). One study assessed the role of staff training in least restrictive alternatives to restraint (Richmond et al., 1996). Despite large variations in restraint hours before the programme, all three units managed to reduce restraint hours by at least a quarter. Only one also reduced seclusion hours and overall seclusion hours approximately doubled. However, most disruptive incidents were managed using verbal interventions, decreasing stimulation and time-out, as well as PRN medication.

The contrasting findings might be explained by some programmes being designed to reduce restraint while others aimed to reduce both restraint and seclusion. There was no indication that the content of these approaches was systematically different and it is not possible to determine which is more likely to be successful. The complex relationship between restraint and seclusion is illustrated by a number of non-intervention studies. A US national sample of state psychiatric hospitals found statistically significant correlations between use of restraint and seclusion, particularly in terms of the hours spent in restraint and seclusion ($r=0.43$; Crenshaw et al 1995).

Conversely, a study of 125 psychiatric facilities in a single US state found no association between the use of restraint and seclusion (Ray & Rappaport, 1995). This is consistent with data from another state which reported that hospital policies tended to specify whether restraint or seclusion should be used, with hospitals tending to overwhelmingly use one but not the other (Way, 1986). A study of patients in a forensic intensive care unit reported the use of two-point ambulatory restraints as a method of reducing prolonged seclusion, although the need for this practice diminished over time (the reasons for this change is not properly examined; Maier et al. 1994).

Medication studies showed reductions in restraint for patients treated with Clozapine (Ratey et al., 1993; Chengappa et al., 2002; Mallya et al., 1992), but results were mixed for Risperidone (Chengappa et al., 2000) and there was no change in the number of patients restrained after the introduction of oral Olanzapine on a PRN basis (Simpson et al., 2006).

The majority of the interventions were multi-faceted. The largest study measured restraint three years before and two years after the introduction of a restraint reduction programme (McCue et al. 2004). The programme included:

- Revised assessment procedure to identify restraint prone patients
- Stress/anger management sessions for patients
- Staff crisis intervention training
- Crisis intervention team established (to assist in a show of force or non-mechanical restraint)
- Review of all restraint episodes with a view to using alternatives to prevent future episodes
- Rewards for units with the lowest restraint rate

Over 10,000 patients were discharged during the study period and there was a statistically significant reduction in the rate of restraint use after the programme was introduced, although this was accompanied by a rise in the number of patient-staff assaults shortly after implementation. Two further points from this study are worth noting. Rates of restraint were not especially high at the inpatient service before implementation (below average compared to a national survey), reducing the likelihood of a regression to the mean effect. Secondly, the authors suggest that, “the specific details of the initiatives may be less important than the elements they embody, which are the following: a multidisciplinary effort, education of alternatives to restraint use, continual feedback to the staff about their progress, and visible administration support both for the staff’s concerns about safety and the importance of the restraint reduction project” (p222).

As some authors acknowledge, the relative contribution of specific elements to such programmes has not been assessed. Whilst in theory it is reasonable to suggest that broad changes in practice and culture would be needed to affect meaningful and lasting change in the use of restraint (and possibly other containment measures), the evidence does not support the superiority of one combination of changes over another. However, some common elements of successful interventions to reduce mechanical restraint can be identified.

Training

The interventions described in seven studies involved some form of staff training. This was common in acute settings and was reported for both studies from general adult wards. None one of the intervention studies from forensic or unspecified psychiatric hospitals involved staff training. The training content tended to focus on aspects of crisis intervention or non-violent interventions as alternative to restraint (e.g. de-escalation techniques)(Craig et al., 1989; McCue et al., 2004; Jonikas et al., 2004; Richmond et al., 1986, Hellerstein et al., 2007; Forster et al., 1999) or aspects of violence awareness (Hay & Cromwell, 1980; Forster et al., 1999, Hellerstein et al., 2007). One study reported that requirements for staff training had been formalised but provided no details (Currier & Farley-Toombs, 2002).

Review

Another common element was a process of regularly reviewing progress. In some cases this could involve structural reviews of restraint and progress with the intervention programme through regular team meetings (Forster et al. 1999; Richmond et al. 1996), or a clinical director to evaluate frequent restraint cases (Hellerstein et al. 2007). Alternatively, reviews were patient specific and intended to reduce the chances of restraint episodes occurring again (McCue et al. 2004) and in one case this was the primary aim of the intervention i.e. it focused on repeated restraint only (Prescott et al. 2006). This raises the question of whether across the board or more targeted interventions/policies are likely to be most effective, or easier/harder to implement. In one programme, the review involved both staff and the patient discussing the events preceding restraint and possible changes to a personalised crisis management plan (Jonikas et al. 2004).

Patient involvement

Collaboration between nurses and patients in identifying strategies to reduce the need for restraint was also an aspect of some interventions. Hellerstein et al. (2007) describe a coping agreement questionnaire completed with all new patients. It asks patients what makes them upset and how they typically respond, as well as how they would prefer to be treated (including physical interventions, should they be required). A similar approach is reported by Jonikas et al. (2004) involving identifying personal stress triggers and methods of managing agitation or anger. As well as staff training, patient education has been incorporated into an intervention with the aim of improving patients' ability to control their own anger and emotions (McCue et al. 2004). An anger management assessment tool has also been developed to assist treatment planning (Visalli et al. 1997).

Staffing

Three programmes involved changes to staffing levels. Numbers were not presented, but Craig et al. (1989) report that the availability and numbers of registered nurses had to be changed in order to implement the restraint reduction programme (adopting a psychiatric intensive care model). Another study specifically employed a new nurse consultant to assist staff decrease violence on the wards and new nurse manager posts were established (Morrison et al., 2002). Smith et al. (2005) reported a decrease in hospital beds accompanied by an increase in staff numbers as one of several reasons for successful restraint reduction.

Three single case studies, not shown in Table 2, describe how changes in clinical approach seemed to reduce the need for restraint. In one, an aggressive patient placed in seclusion was allowed time out of restraints and visits from staff contingent upon achieving timed periods of non-aggressive behaviour (Edwards, 1974). Another describes time the application of limited, intermittent mechanical restraint on a particularly aggressive and difficult patient during initial contacts (Young, 1986). It is argued that the use of restraints in this instance established a safe environment for the development of a therapeutic alliance between therapist and patient. In the third study, the patient had not responded to therapy whilst in mechanical restraints, but replacing these with manual restraint techniques resulted in improved communication between patient and therapist (Lamberti & Cummings, 1992).

Staff and patient experiences

Relatively few studies addressed the views and feelings of patients and staff involved in mechanical restraint episodes. However, there was agreement among studies of patients' views of mechanical restraint that the experience was de-powering, de-humanising and frightening. Johnson (1998) describes how once patients are aware that restraint is going to take place they feel high levels of anxiety, fear and anger, sometimes resulting in a surge of energy which can escalate the situation. For some patients the experience of restraint is deeply traumatic. Two studies of female patients subject to mechanical restraint found evidence that the practice reawakened memories of previous distressing or abusive events. A study of ten women with a history of sexual abuse reported a range of traumatic emotional responses to restraint, including flashbacks to previous sexual assaults, coupled with a view that staff were unsympathetic to their history or distress (Gallop et al. 1999). A smaller study found that patients who had been raped previously found the experience of being restrained with leather straps as re-traumatising and reminiscent of their rape experiences (Brase Smith, 1995).

Not all patient feedback was negative. One study of 30 patients' first experience of mechanical restraint found that whilst negative feelings were expressed by many, two thirds expressed warm feelings towards staff who had shown concern for their needs (Chien et al. 2005). Negative effects were related to the inability of staff to satisfy patients' needs for concern, empathy, listening and information about restraint during and after its use. The study also found that patients with 'psychopathic personalities' tended to be more supportive of restraint as a means of controlling their violent behaviour, while some patients with schizophrenia indicated more negative aspects of restraint. Aschen (1995) found that patients restrained in the prone position reported the experience to be more tolerable, especially women who felt less vulnerable. Feelings of anger, fear and anxiety appeared to abate more quickly when restrained in the prone position. A survey of 71 hospitalised patients with schizophrenia in Croatia found that 86% reported mechanical restraint as sometimes necessary and 59% thought that restraining another aggressive patient reduced feelings of insecurity on the ward (Margetic et al. 2007). Among patients who had been mechanically restrained, half thought that it was necessary.

There were seven studies of staff perspectives. Ethnographic interviews with 6 registered psychiatric nurses described the difficult decisions they often face

(Marangos-Frost, 2000). In particular, the risk of imminent harm to self, others or property was identified as the main reason for using restraint. However, the decision to use restraint was also influenced by personal morals, values and emotions. Nurses described emotional conflict in deciding to use restraint and a feeling of failure as a nurse if they were unable to find an alternative to restraint. A study of 15 nurses' experiences of restraining patients (14 of whom worked in acute inpatient settings), identified 25 categories of emotional response encompassing the patient's aggressive behaviour, everyday stresses of nursing, conflicts of values, expectations and practice, the ward environment and conflicts about restraining (DiFabio, 1981). The study concluded that nurses find the practice disturbing because they have little help resolving these coping with these issues. An international comparison of staff attitudes to a range of containment methods found statistically significant differences between the UK, Netherlands and Finland in the approval of mechanical restraint (in order of increasing approval; Bowers et al. 2007). These were broadly in line with differences in national restraint practices. A survey of 190 nurses in Greece found that mechanical restraint was the most frequently reported method of containment used and was considered necessary by 80% (Lemonidou et al. 2002). Given the choice, a significant proportion of nurses seem to prefer seclusion over restraint as a means of calming aggressive patients, although medication would be the intervention of choice (Klinge, 1994; Terpestra et al. 2001; Lemonidou et al. 2002). A staff survey found that registered nurses identified fewer behaviours requiring physical interventions than nursing assistants, but there were no differences for the use of verbal or chemical interventions (Haber et al. 1997).

Evidence for and against the working model

The reviewed studies provide little evidence to support the working model. The apparent cultural differences underpinning restraint practices support the working model in the very broadest sense. In theory there is scope for nurses to change their approach to managing difficult patients and for this to impact on the use of restraint (and other forms of containment). Unfortunately, the role of nurses is well not explored in the literature. Interventions are implemented, but nurses' attitudes, skills and approach to patient care are not measured. For example, one study linked improved team working to staff attrition rates, staff attitudes, and willingness to address other problems that arise, but provided no direct evidence of this (Craig et al. 1989). Response teams to review restraint episodes was reported to improve supervision, communication between staff members at different levels and opportunities to discuss individual patient's treatment plans (Prescott et al. 2007). This provides anecdotal evidence of teamwork skill and apparent positive attitude and high therapy leading to lower containment, but again this was not explicitly examined by the research. One qualitative study reported that nurses consider their professional role in providing a safe environment for patients and are guided by a moral duty to protect. However, nurses experienced conflict with this duty when faced with a decision to restrain a patient, and the possible consequences of not doing so (Marangos-Frost & Wells, 2000). The attitudes of doctors and demand on resources (nurses observing restrained patients) contributed to this dilemma. Terpstra et al. (2001) surveyed 144 nurses and found that the choice of containment method was guided by how nurses would want to be treated if they were in the patient's situation. Preferences were for medication, seclusion and restraint in that order. It could be assumed that the positive appreciation of patients would impact on nurses' work with the patients. This was not examined, but despite the relative reluctance to use

restraint the majority of respondents thought that restraint was used appropriately. The only study to statistically model staff attitudes found that the decision to use containment (though not mechanical restraint specifically) is most influenced by whether it is considered to be safe (i.e. does not harm the patient) and effective (i.e. calming and preventing injury to others), rather than consideration of nurses' own safety (Bowers et al. 2007). There is also evidence that nurses believe that patient assessment (effective structure) and frequent communication (positive appreciation) are important practices in preventing violent behaviour (Lemonidou et al. 2002), but efforts to decrease restraint through staff education and training in understanding and managing aggressive behaviours may be mitigated by personal experience of assault (Haber et al. 1997).

Training in crisis intervention/de-escalation is concerned with technical mastery and is also relevant to the model because of its underlying value of equality/empathy. Other intervention elements have a loose connection to the model in the sense that restraint reduction is viewed positively and indicates an emphasis on the positive appreciation of patients. Overall, the weight of evidence suggests that the use of mechanical restraint can be reduced, but this conclusion is subject to a number of caveats:

- The research designs for the intervention studies were weak. There were no randomised trials, follow-up periods varied enormously and results were frequently limited to descriptive analyses. Changes in the use of mechanical restraint cannot be attributed directly to the intervention.
- Most of the interventions are best described as programmes, involving a package of measures to reduce to mechanical restraint (and sometimes seclusion also). Unfortunately, none of the studies examined which elements were most effective. This means it is unclear whether it is changes in national or local policy, organisational changes (i.e. review meetings, more nurses etc.) or direct nursing practice which might make a difference to levels of restraint.
- It is not clear if observed reductions in mechanical restraint reflect high initial baseline levels. The introduction of many of the programmes followed concern about perceived high levels of restraint use, although one of the more robust studies found initial rates of restraint to be below average compared to US national norms (McCue et al 2004).
- Reductions in mechanical restraint might be reduced while other forms of containment increase. Most studies did not measure other forms of containment, or at least provide no data to support claims that there were no changes.
- It is also not clear whether the interventions reduced conflict, the use of restraint in response to conflict or both. It is possible that restraint reduction programmes had a therapeutic influence on patient behaviour, thereby reducing the need for restraints. Alternatively, staff may have found other ways of managing patients' behaviour (e.g. de-escalation). For example, a programme of least restrictive alternatives to restraint resulted in verbal interventions, decreasing stimulation and time-out being used for almost two-

thirds of incidents of disruptive behaviour (Richmond et al. 1996). Few studies reported outcomes for violence or other behaviours and of those that did (n=5) the evidence was mixed. This makes it difficult to interpret the reductions in restraints reported by most of the intervention studies.

Points the model has missed

Rules

Introducing new policies to regulate the use of mechanical restraint might be a simple method of changing nursing practice, but it is unclear how effective such direct changes to practice really are. At a national level it may not have a consistent effect. For example, a Finnish study found no change in the risk of patients being restrained or secluded between 1990 and 2000 despite a number of legal changes to the delivery of psychiatric hospital services (Keski-Valkama et al. 2007). However, a US study found that a new rule requiring hospitals participating in Medicare and Medicaid to assess patients within one hour of initiation of restraint did appear to result in reduced restraint in one hospital (Currier and Farley-Toombs, 2002). Of course, this positive outcome may not be repeated in other US hospitals. Comparison of US national surveys of state psychiatric hospitals conducted in 1991 and 1994 showed little change in rates of restraint and continued variations in practices between hospitals (Crenshaw et al. 1997). Smith et al (2005) acknowledge that the nine US state hospitals in their study implemented a restraint reduction programme differently and at different times. They suggest that a non-restraint movement incorporating hospital and community advocates coupled with new state regulations on restraint were the reasons for changes in attitude, culture and environment within the hospitals. These contrasting findings illustrate the need for larger scale studies which examine implementation of changes over a longer period of time. Even if policy changes do impact on restraint practice, the research sheds no light on what the mechanism of change might be. Requiring more frequent assessments of restrained patients may simply represent a bureaucratic obstacle for staff who are subsequently deterred from initiating restraint, rather than representing a proactive endorsement of less restrictive practices. This requires further investigation.

Diurnal/seasonal variations

The two studies from Israel describe variations in the use of restraint by seasonal and shift. One found a correlation with shift patterns with a greater proportion of restraint episodes occurring during the morning shift (46%) compared to the evening (36%) and night (19%) shifts, although the mean duration of restraint was longer for the evening shift (Porat et al 1997). The other found that single restraint episodes peaked in the morning (08:00-12:00) but repeated restraints peaked in late evening (20:00-24:00; Kaplan et al 1996). This study also reported that the number of episodes was highest in winter (Jan-Mar) and lowest during May-June. In the US, Smith et al (2005) found that the duration of mechanical restraint was longer during night shifts (15 hours) compared to day & evening (both 8 hours), but there was no difference in duration between week days and weekends.

Involving patients

Perhaps the most important element missing from the working model is the role of the patient. Whilst the model implicitly concerns nurses' orientation to the needs and welfare of patients, some studies describe interventions which make this an explicit and formalised aspect of nursing practice. These interventions have already been summarised above, but they involve collaboration with patients in deciding how best to manage difficult situations should they occur and are subject to review. The assumption is that a consensual crisis management strategy may be key to reducing the need for containment. An entirely different type of study reported a broadly similar principle underlying the use of behaviour therapy for psychotic forensic patients (Becker et al. 1997). Using a case study approach, the study describes how technical mastery can be transferred to the patients. Patients were trained to master particular cognitive-behavioural skills to manage their own behaviours, with positive results. Involving patients in this way embodies equality, one of the prime values under moral commitments, and positive appreciation of patients. However this precise technique is not explicit in the working model.

Co-morbidity

The Japanese study reported a greater likelihood of restraint and longer duration of restraint for patients with physical health problems. This was the only study in the review to include the physical health of patients. It is not clear how prevalent medical complications are among psychiatric patients in other countries or how this affects treatment and care, but it seems it could have a bearing on conflict and containment in some cases. We know from the manual restraint literature review that the physical condition of patients has been identified as a contributory factor to patient deaths during restraint.

The classification of diagnosis may also hide psychiatric co-morbidities which could influence the use of restraint (e.g. a secondary diagnosis of substance misuse). One of the most robust analyses found that substance use was the only diagnosis variable to predict restraint (Korkeila et al. 2002). This study was from Finland, which apart from the UK had the lowest recorded rate of mechanical restraint so may be atypical. However, the findings from both these studies (and the total absence of data from the others) suggest that these issues deserve further investigation.

Variations in practice

Variations in use of mechanical restraint between regions and hospitals were frequently noted in the studies, but few examined the reasons for this. Where variation was examined, it appeared not to reflect patient characteristics. Two US surveys of state psychiatric hospitals found smaller hospitals providing acute care had higher rates of restraint and seclusion than their larger counterparts providing chronic care (Crenshaw & Francis, 1995; Crenshaw et al. 1997), but these studies did not explicitly examine patient variables: the implications are inferred. Overall, the evidence for the effects of patient characteristics is not strong, and perhaps better for diagnosis than for any other variable. The few studies which used predictive analyses of restraint found very little correlation between patient variables and restraint (Allen & Currier, 2004; Korkeila et al. 2002). This might suggest that cultural differences in nursing practice between hospitals may in part explain variations in the use of

mechanical restraint (and other containment methods), although this was not measured directly by any of the studies in the review.

Discussion

Summary

It is not possible to draw any conclusions about the use of restraint because relatively the small number of studies included are spread over a number of different countries and cover a wide range of services treating diverse populations. Methods of reporting the incidence and duration of mechanical restraint varied widely. Differences between countries/hospitals/wards are not well explained by patient variables, suggesting that national and local cultural factors play an important role. None of the studies in this review examined factors which might account for the repeated restraint of some patients. Four-point restraints were the most common type of restraint reported. Patients spend prolonged periods in restraints, typically between 3 and 10 hours per episode, but sometimes for much longer period. Preventing harm to the patient or others is the most frequently cited reason for using mechanical restraint, but it can also be used to in response to a range of other patient behaviours such as attempting to abscond and refusing requests. The outcome of restraint in terms of the consequences for patients and staff, as well as subsequent patient behaviour is rarely reported. There was a tendency for restrained patients to be younger than non-restrained patients, but no conclusions can be drawn about differences by gender or ethnicity. Some studies found restraint to be associated with involuntary admission to treatment. Whilst descriptive data suggest that psychosis is the most common diagnosis of patients who are mechanically restrained, multivariate analyses provide little evidence of strong relationships between restraint and diagnosis.

All the studies reporting outcomes for programmes or interventions designed to reduce the incidence of mechanical restraint were from the USA. The quality of the research design and reporting was often weak. Programmes often included some form of staff training, case review, patient involvement and increased staffing but specific programme elements were not assessed individually. On the whole, the research suggests that interventions can reduce the use of mechanical restraint, although in some cases this may have been achieved by increasing other forms of containment.

Lessons for future research

Many studies were excluded from the review because they combined seclusion and restraint, including some reporting outcomes for interventions to reduce these practices. Even among studies which were included, the distinction between mechanical restraint and seclusion was sometimes not made and limited the amount of information which could be included in the review. The result is that important information on practices specific to mechanical restraint has been lost. We would regard mechanical restraint and seclusion as very different procedures, and as this review has shown reductions in one could result in increases in the other. We therefore recommend that future studies provide data on seclusion and restraint separately. Where possible, a broad range of containment measures should be included which would allow a more considered understanding of programmes to reduce their use.

The research is characterised by too much inference and not enough evidence. Serious deficiencies in research design, approach to analysis and the way these are reported have been highlighted. It seems remarkable that for six studies it was not even possible to determine the method of data collection. Randomised trials of restraint techniques may not be an option on ethical grounds, but the standard of quasi-experimental outcome studies could be improved. In particular, the diverse factors found to be associated with restraint identified in the review suggest that future studies should use a broader range of measures and multivariate analysis wherever possible in order to avoid potentially misleading conclusions based upon simple counts of events or antecedents. These inadequacies may well reflect the availability of adequate data available to researchers, which could be ameliorated by development of national reporting systems and datasets.

Future evaluations should examine the relative effectiveness of the individual components of restraint reduction programmes in order to improve our understanding of how they work or might be improved. This information is essential if programmes are to be successfully implemented across different psychiatric settings and treatment populations. For example, there was relatively little research from forensic services which might be expected to have relatively high levels of containment. It is notable that all the intervention studies were from the USA, yet the rate of mechanical restraint in some European countries and other parts of the world is just as high. There would seem a need for evaluation of interventions from outside the USA where treatment systems and cultures are very different. There may be scope for action or mixed methods research to examine the process of programme implementation and development, before full scale evaluation is attempted.

The lack of sound evidence may well contribute to continued variation in practice. These variations were seen between countries, regions hospitals and wards and persisted over time. Care is needed when generalising from research findings from single site studies. Multi-site studies of restraint reduction are therefore required. There also needs to be more attention paid to staff perspectives. This does not simply mean views on mechanical restraint and other containment methods, but the broader cultural differences between wards and hospitals which may help explain observed variations in clinical practice.

Table 1: Incidence of restraint episodes by country and setting¹

Country	Study	Setting	Sample	% Patients	Rate of episodes			
					100 beds per month	100 admissions per month	100 patients per month	1000 patient days
USA	Allen & Currier (2004)	PES	51 PES directors	8.5				
	Beck et al. (1991)	PES	99 violent & 95 non-violent patients over 6 months	49				
	Khulman et al. (1982)/ Telintelo et al.(1983)	PES	697 patients over 1 month	24				
	Bornstein (1985)	A	1,457 patients over 9 months	7.5	12.1	7.5		
	Soloff (1978)	A	777 patients from 2 units over 6 & 16 months	4				Psychotic: 2.8 Non-psychotic:3.9
	Crenshaw & Francis (1995)	PH	101 hospitals					9.3
	Flannery et al. (2001)	PH	706 assault incidents over 6 years	38				
	Price et al. (2004)	F	806 patients over 7.5 years	36		983.34		
	Ray & Rappaport (1995)	Mix	125 psychiatric facilities	State: 4 Gen hosp: 4			State: 10 Gen hosp: 28	
	Finland	Kaltiala-Heino et al. (2000/2003)	Mix	1,543 patients over 6 months	4		7.26	
Keski-Valkama et al. (2007)		PH	28,064 patients in a specific week, repeated over 15 years	1 (range: 0.7-1.2)				
Norway	Wynn (2002)	Mix	797 restraint episodes over 5.5 years		12.1			
Poland	Dabrowski et al. (1986)	PH	1,564 patients over 7 months	27				
	Kostecka & Zardecka (1999)	A	866 patients over 2 months/years	1989: 22 1996: 16			1989: 41.8 1996: 58.0	
Germany & Switzerland	Martin et al. (2007)	PH	8737 schizophrenia patients over 1 year	Ger: 10 Swi: 7		Ger: 37.0 Swi: 8.5		
UK, Italy & Greece	Bowers et a. (2005)	A	838 patients admitted for 2 weeks or more	UK: 0% I: 10% G: 51%				
Japan	Odawara et al. (2005)	PH	1,334 patients over 4 years	18				

Israel	Porat et al (1997)	Mix	1,419 patients over 1 month	14			49.5	
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Notes: ¹Excludes 'before and after' studies of interventions to reduce restraint. A=acute wards; F=forensic wards; Mix=acute and non-acute wards; PES=psychiatric emergency service; PH=unspecified psychiatric hospital(s).

Table 2: Interventions to reduce restraint

Study	Setting	Sample	Methodology	Intervention	Outcomes
Craig et al. (1989)	A	Restraint hours	Year before & after	<ol style="list-style-type: none"> 1) Restraint and seclusion specific rooms 2) Increased staffing 3) Crisis intervention training 4) Multidisciplinary input 	Restraint hours reduced from 1,030 per month to 408.
Forster et al. (1999)	A	5,570 patients	Year before & after	<ol style="list-style-type: none"> 1) Improved staff training 2) Weekly staff discussions 3) Progress charts. 	Restraint episodes reduced from 92.9 per 100 admissions per month to 79.1
Hay & Cromwell (1980)	A	Restraint hours	One month before & 2 months after	<ol style="list-style-type: none"> 1) Staff education 2) Adequate medication 3) Multi-purpose seclusion/restraint room 4) Seclusion first policy 	360 restraint hours in month before programme to 60 and 30 hours in subsequent two months
Hellerstein et al. (2007).	A	Restraint episodes	Twenty months before and 67 months after	<ol style="list-style-type: none"> 1) Reduced re-assessment time 2) Staff training 3) Review of frequent restraints 3) Patient preferences 	No reduction: 0.35 patients per month to 0.32 & 1.7 hours to 1.0 ¹
McCue et al. (2004).	A	10,753 patients	Three years before & 2 years after	<ol style="list-style-type: none"> 1) Identify restraint prone patients 2) Patient anger management group 3) Crisis intervention training 4) Crisis response team 5) Daily review of restraints 6) Staff incentives 	Reduction from mean of 7.99 episodes per 1000 patient days to 3.70. ¹
Simpson et al. (2006)	A	352 patients	Admissions 6 months before & after	Replacement of haloperidol with oral olanzapine as p.r.n.	No difference: 13 patients restrained in before group & 12 in after group. ¹
Becker et al. (1997)	F	Four violent patients	Case studies, variable follow-up	Behavioural therapeutic approach, tailored to individual patients	From extensive restraint to no violence and restraint free
Morrison et al. (2002)	F	503 restraint episodes	Retrospective analysis over 1 year	<ol style="list-style-type: none"> 1) Re-define 'emergency' restraint 2) New restraint products 3) Security management team 4) Aggression management plans 	Number and duration of episodes increased initially but then declined. Higher at end of study than beginning.

				5) New nurse consultant & managers	
Ratey et al. (1993)	F	Five severely aggressive patients	Twelve month review	Clozapine	Time in restraints reduced by 79% for 3 restrained patients
Currier & Farley-Toombs (2002)	Gen	23 restraint episodes	Three months before & after	New rules on restraint assessment, staff training & documentation	Restraint episodes reduced from 20 to 3. Mean duration reduced from 8.6 to 2.4 hours
Jonikas et al. (2004)	Gen	1,602 patients	Year before & after	1) Personalised crisis management plans & review 2) De-escalation and non-violent intervention training	1.36 per 1000 patient days in quarter before programme to 0.2 in quarter after. Rates remained low thereafter ¹
Prescott et al. (2007)	Mix	126 restraint episodes	Action research, over 6 weeks	Rapid response teams to review incidents of restraint	Episodes reduced from 77 in 6 weeks before to 49 in 6 weeks after
Richmond et al. (1996)	Mix	873 disruptive incidents	Year before & after	1) Training in least restrictive alternatives to restraint (and seclusion) 2) Staff meetings to review implementation	Total restraint hours reduced from 3388 to 1812.
Carlson & Holm (1993)	PH	120 longer stay patients	Case control analysis, over 90 days	Occupational therapy (60 received OT, 60 did not)	No difference for time in restraints: 9.5 hours vs 24.1 respectively ¹
Chengappa et al. (2000)	PH	74 patients	Up to 1 year before & after	Risperidone treatment	Mean restraint hours reduced from 1.2 per person per month to 0.36, but no reduction restraint episodes. ¹
Chengappa et al. (2002)	PH	42 patients	Up to 1 year before and after	Clozapine	Mean episodes reduced from 0.34 per patient month to 0.08. ¹
Mallya et al. (1992).	PH	111 patients	Six months before & 7 months after	Clozapine	Fewer patients restrained: 34% to 13%. Restraints pre restrained patient reduced from 0.938 to 0.083. Mean duration reduced from 15.7 hours to 5.38. ¹
Smith et al. (2005)	PH	Restraint episodes	Retrospective analysis, over 11 years	1) Leadership 2) Management support 3) State policy change 4) Improved patient-staff ratio 4) Emergency response teams 5) Incident management system 6) New anti-psychotics	Episodes reduced from 3.5 episodes per 1000 pt days to 1.2. Mean duration reduced from 11.9 hours to 1.9.

Snellgrove & Flaherty (1975)	PH	50 restraint episodes	One month before & 7 months after	Attitude therapy (consistent attitudes to patients)	Episodes reduced from 28 in month before to 10, 1, 7, 2, 0, 1 and 0 in subsequent months
Visalli et al. (1997)	PH	Restraint episodes	Ten month review	1) Anger management assessment tool 2) Promotion of anger management strategies for patients	Unspecified reduction in episodes & and duration of restraint

Notes: A=acute wards; F=forensic wards; Gen=General adult; Mix=acute and non-acute wards; PES=psychiatric emergency service; PH=unspecified psychiatric hospital/unit(s). ¹ Confirmed by statistical tests.

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