

## **Using interventions to reduce seclusion and mechanical restraint use in adult psychiatric units: an integrative review**

Väkiparta, Laura; Suominen, Tarja; Paavilainen, Eija; Kylmä, Jari

### **Abstract**

The aim of this integrative review was to describe interventions aimed at reducing seclusion and mechanical restraint use in adult psychiatric inpatient units and their possible outcomes. CINAHL-, Medline-, PsycINFO- and Medic -databases were searched for studies published between 2008 and 2017. Based on electronic and manual searches, 28 studies were included, and quality appraisal was carried out. Data was analyzed using inductive content analysis. Interventions to proactively address seclusion were environmental interventions, staff training, treatment planning, use of information and risk assessment. Interventions to respond to seclusion risk were patient involvement, family involvement, meaningful activities, sensory modulation and interventions to manage patient agitation.

Interventions to proactively address mechanical restraint were mechanical restraint regulations, a therapeutic atmosphere, staff training, treatment planning and review of mechanical restraint risks. Interventions to respond to mechanical restraint risks included patient involvement, therapeutic activities, sensory modulation and interventions to manage agitation.

Outcomes related to both seclusion and mechanical restraint reduction interventions were varied, with several interventions resulting in both reduced and unchanged or increased use. Outcomes were also reported for combinations of several interventions in the form of reduction programs for both seclusion and mechanical restraint.

Much of the research focused on implementing several interventions simultaneously, making it difficult to distinguish outcomes. Further research is suggested on the effectiveness of interventions and the contexts they are implemented in.

(4,880 words)

Key words: seclusion; mechanical restraint; psychiatric nursing; psychiatric units; literature review

### **Introduction**

The use of coercive measures such as seclusion and mechanical restraint in adult psychiatric inpatient units may be problematic for patients and staff. In this review, seclusion is defined as the involuntary confinement of a patient in a locked room. Restraint in psychiatric care can also refer to chemical or physical restraint, but this review only includes mechanical restraint, defined as using belts or other devices to restrict a patient's movement. (1) Patients have described negative experiences (2–4), feeling punished (3, 5) and powerless (3, 4), a lack of information (2, 4) and problems in communication (2, 5), inappropriate use of force (5), problems related to dignity (3, 5), resentment towards staff (4) and problems with care and activity (2) related to seclusion or mechanical restraint. Some patients have also considered seclusion helpful (4–6). Nurses view patients' reactions to seclusion or mechanical restraint as primarily negative and their use may bring up negative feelings for staff. Use may also be viewed as potentially useful or calming to the patient and increase feelings of safety for staff. (7, 8) Seclusion and mechanical restraint may also be viewed as being part of psychiatric treatment (8, 9).

Nurses have acknowledged the need for alternatives for coercive measures (8) and descriptions of de-escalation techniques used prior to coercive measures include measures to help, such as support, and restrictions, such as verbal direction (10). Research on seclusion and mechanical restraint reduction has focused on numerous areas, such as factors and programs in addition to interventions.

A review of mechanical restraint reduction interventions identified factors such as staff attitudes, staff experience and patients' responses to rules related to mechanical restraint use in addition to various preventative interventions (11). Seclusion and restraint reduction programs, such as the Safewards Model, identify factors affecting the use of coercive measures and suggests possible interventions to address them. While the model is based on extensive literature searches, there are acknowledged issues related to distinguishing the most influential factors and the level of evidence related to different interventions. (12) Recent literature reviews focused on the effectiveness of seclusion and mechanical restraint programs but described difficulties related to the assessment of effectiveness due to the diversity in the available research (13, 14). This review focused on describing seclusion and mechanical restraint reduction interventions in more depth, in order to provide a broader view of current research related to seclusion and mechanical restraint reduction. The aim of this review was to identify and describe interventions aimed at reducing seclusion and mechanical restraint use in adult psychiatric inpatient units and their possible outcomes.

### **Research questions**

The research questions were:

1. What interventions have been developed to reduce seclusion on adult psychiatric inpatient units?
2. What interventions have been developed to reduce mechanical restraint on adult psychiatric inpatient units?
3. What possible outcomes have interventions aimed at reducing seclusion on adult psychiatric inpatient units had on seclusion use?
4. What possible outcomes have interventions aimed at reducing mechanical restraint on adult psychiatric inpatient units had on mechanical restraint use?

### **Methods**

An integrative literature review design was used to allow for the inclusion of data from various methodologies. The search strategy was based on the research questions and an informatics technician aided in planning. The search strategy was formed by combining search terms related to seclusion and mechanical restraint with search terms related to psychiatric services and mental health (figure 1). (15) As mechanical restraint may be referred to by various terms, the search terms were not limited to mechanical restraint. Searches were carried out in CINAHL-, Medline-, PsycINFO- and Medic -databases for studies published between 2008 and 2017 (figure 1). According to the inclusion criteria, peer-reviewed, English or Finnish language studies focusing on seclusion or mechanical restraint reduction interventions and reporting any possible outcomes related to the use of seclusion or mechanical restraint were included. Studies could focus on a single intervention or include several interventions as part of a reduction program. Study participants included were patients or nursing staff of any adult psychiatric inpatient setting. All other settings, such as child and adolescent psychiatry or learning disabilities, were excluded as well as studies that included both child or youth psychiatric and adult psychiatric units. Interventions under research could aim to reduce seclusion, mechanical restraint or both simultaneously, but studies, which had evaluated effects on seclusion and mechanical restraint as a single outcome statistic were excluded. The initial database search result was 1,839 articles. One researcher read and evaluated the inclusion of the titles, abstracts and full texts, which resulted in the inclusion of 27 articles. A manual search of the reference lists of selected articles was carried out and one study was included, resulting in 28 studies. (Figure 1) Information on the research aim, research design, setting,

participants, data, analysis, intervention and outcomes related to seclusion and mechanical restraint were extracted. Seventeen of the studies focused only on seclusion, six on both seclusion and mechanical restraint and five on mechanical restraint only (table 1). The detail of description related to study settings, participants and methodology varied, with only nine studies having a detailed description of both the setting and participants. Various forms of quantitative methods were used in twenty-six of the studies. Quality appraisal was first carried out by two authors independently, after which the results of the appraisals were discussed by all four authors. Quality appraisal was carried out using suitable Critical Appraisal Tools developed by The Joanna Briggs Institute (16). One of the articles was evaluated using a scoring system for mixed methods research constructed by Pluye et al. (17) as no Critical Appraisal Tool for mixed methods research was available from The Joanne Briggs Institute. (Table 1)

### **Data analysis**

Data analysis was carried out using inductive content analysis, which can be used for combining qualitative and quantitative data. Analysis was guided by the research questions. The unit of analysis was 1–3 sentences which answered the research question, which were coded into reduced expressions. Reduced expressions from studies, in which interventions aimed to affect both seclusion and mechanical restraint, were included in categories for both interventions related to seclusion and mechanical restraint to answer all research questions. Sub-categories were created based on common features and were further abstracted into general categories. In the case of the analysis related to interventions related to seclusion and interventions related to mechanical restraint, general categories were further abstracted into main categories. (18)

### **Findings**

#### **Interventions to reduce seclusion**

Interventions to reduce seclusion proactively addressed seclusion and responded to seclusion risks. Interventions to proactively address seclusion were interventions which attempted to affect seclusion use through preventative measures, such as environmental interventions, staff training, treatment planning, use of information and risk assessment. (Table 2)

Environmental interventions attempted to reduce seclusion use by affecting the organization or unit environment, for example by using seclusion related regulations (19–21). Organization-level changes were made by permanently opening closed psychiatric units (22) or introducing a psychiatric intensive care unit (23). Changes on the unit-level were made by incorporating recovery principles into clinical practice to create a focus on recovery or by making cultural services available (24). Units also incorporated interventions such as high staff to patient ratio, availability of single rooms for patients or the use of a personal alarm system for staff (23). (Table 2)

Various forms of staff training were described in relation to seclusion reduction efforts, which targeted challenging patient behavior such as aggression (25, 26), preventative measures such as de-escalation (19, 24, 26–28) or seclusion (21, 28). Training was also focused on the implementation of evidence-based practice (26, 29) or therapeutic interventions such as sensory modulation (24, 26, 27, 30, 31). (Table 2)

Treatment planning, such as using individualized care plans or safety plans (19, 24, 25, 27, 28, 32, 33) was also used to reduce seclusion. Planning included utilizing information from various sources (19, 27, 29, 32, 34, 35), identifying a patient's triggers or warning signs (24, 28, 32, 33, 35, 36) or a patient's helpful interventions, such as preventative actions (25, 27, 28, 32, 33, 37, 38). Factors such

as patient involvement in treatment planning (19, 24, 27, 29), the adjustment of treatment plans as needed (29, 35, 36) and the involvement of all staff (27) were used to complement treatment planning. (Table 2)

Information, for example utilizing seclusion information, such as a patient's seclusion history (28, 32, 33, 35, 36, 38), was used to plan changes, for example seclusion prevention (28, 32, 34, 35, 38), or to identify seclusion alternatives (20, 35). Risk assessment interventions were carried out by assessing a patients' behavioral changes, such as aggression (20, 25, 27, 32, 34, 35, 37) or by using a specific risk assessment tool, such as the Brøset Violence Checklist (28, 34, 37), and scores were reviewed in planning or multidisciplinary meetings (34). Risks were also assessed during specified safety meetings (32), seclusion review meetings or through an analysis of events (19, 24, 28, 32, 35). (Table 2)

Interventions to respond to seclusion risks were interventions, which attempted to reduce seclusion use by providing therapeutic activities and respond to patient behavior with alternative means and included patient involvement, family involvement, meaningful activities, sensory modulation and interventions to manage patient agitation. (Table 2)

Patient involvement to reduce seclusion was carried out through unit-patient collaboration, such as the engagement of peer specialists (19, 24, 28) and also on the individual level, through orientation of the patient to the unit (24), including the patient as an active agent in their daily care by making care related decisions (24, 36) and using support to debrief all patients after seclusion (24, 28, 32, 35, 37, 38). Families were involved by utilizing information from the patient's family for safety plans (27, 32) and consulting the family in treatment planning (27, 29). Units offered patients meaningful activities such as exercise facilities, handicrafts (24) or group interventions (24, 36). (Table 2)

Sensory modulation was introduced using a sensory modulation trolley (24, 32, 33), a sensory modulation room (21, 24, 30, 31, 39, 40) or specified sensory modulation techniques (24, 33). Available sensory modulation supplies varied widely from music to puzzles (21, 24, 28, 30, 36, 39, 40). Patient education on sensory modulation was offered (30, 31) and a sensory modulation agreement form was introduced (21). Sensory assessment of patients (31, 36) was completed as a separate activity or as part of individual sensory modulation planning (31, 36). Staff supported sensory modulation use through assistance or encouragement (30–32, 39). (Table 2)

Patient agitation was managed through interventions such as focusing on communication by allowing the patient to express themselves (24, 27, 32, 36, 37) or offering an agitated patient support so they can remain in control (32, 36). To enhance close observation of patients, staff were active in the patient environment (23, 32). Medication was offered in the form of as-needed medication (37) or involuntary medication (41). In some cases, it was helpful for the patient to move to a separate area (28, 37). Staff focused on less restrictive alternatives if a patient was unable to participate in their care or as prompted by a specialized form (20, 32). (Table 2)

### **Interventions to reduce mechanical restraint**

Interventions to reduce the use of mechanical restraint also proactively addressed mechanical restraint and responded to mechanical restraint risks. Interventions to proactively address mechanical restraint attempted to affect mechanical restraint use by focusing on mechanical restraint regulations, therapeutic atmosphere, staff training, treatment planning and review of mechanical restraint risks. (Table 3)

Mechanical restraint regulations attempted to standardize mechanical restraint application and use, for example by introducing new regulations, which can prohibit staffs' routine use of mechanical restraint (21, 42, 43). Regulations were related to initial mechanical restraint application, for example obtaining permission for use (42, 43) or mechanical restraint use, for example mechanical restraint duration (43). Mechanical restraint protocols were also revised (44). (Table 3)

A therapeutic atmosphere was introduced through a therapeutic care environment, for example using cognitive milieu therapy or patient-centered care (45) or ensuring a sense of no crowding on the unit (45). Staff training in connection to mechanical restraint reduction focused on challenging patient behavior, such as aggression or escalating behavior (26, 42, 45), mechanical restraint and its application (44, 45) or preventative measures such as de-escalation methods (42, 44, 45). Training was also offered focusing on staff related factors such as self-awareness, legislation or teamwork (26, 45) and therapeutic interventions such as patient-centered care (26, 45, 46). (Table 3)

Treatment planning was carried out using safety plans or other forms of individualized treatment planning (32, 35, 44). Planning involved the identification of patient's triggers such as responses to distress (32, 36, 44, 45) or the identification of patient's helpful interventions such as calming activities or techniques (32, 36, 44, 46). Patients were actively involved in treatment planning through needs assessment and goal development (35, 36, 44). (Table 3)

Review of mechanical restraint risks utilized information on mechanical restraint through data analysis (32, 35, 36, 43, 44), and information was used to identify mechanical restraint alternatives (32, 35). Patient related risks were evaluated by assessing agitation or violence with specific tools (32, 44–46). Risk assessment documentation included documentation of aggressive or suicidal behavior (45). Risks were also reviewed during safety meetings (32) or by evaluating each episode through mechanical restraint review (32, 35, 44, 45). (Table 3)

As with seclusion, interventions to respond to mechanical restraint risks were active measures and responses to potential mechanical restraint use through patient involvement, therapeutic activities, sensory modulation and interventions to manage agitation. (Table 3)

Patient involvement included patients influencing unit rules, documentation and rounds in unit-patient collaboration (45) and offering debriefing after every mechanical restraint episode (32, 45). Therapeutic activities were offered and included providing group interventions, such as a psychoeducation groups (36), or patient's participating in activities, which can be individualized (36, 45). (Table 3)

Sensory modulation was carried out using sensory modulation trolleys (32), sensory modulation rooms with a carefully planned design (21, 39, 46) or by introducing sensory modulation supplies on the unit, such as a weighted blanket or therapy balls (36, 46). The availability of sensory modulation supplies was highly varied, for example music or aromatherapy (21, 32, 39). Sensory modulation use was supported by staff through encouragement or feedback (32, 39) and patient acknowledgement was enhanced by using a sensory modulation agreement form (21). Use was individualized through sensory assessment of patients (36, 46) and individual planning (36, 46). (Table 3)

Interventions to manage agitation included support for agitated patients through care actions or discussion (32, 36, 44, 45). High staff to patient ratio increased staff availability in the patient environment (32, 45). Disturbed patients were separated as a form of limit-setting (45). Units offered the use of an alarm system (45) and responses to crisis situations were enhanced by using a

response team (42). Staff were described as attempting to use less restrictive alternatives to mechanical restraint (32, 35, 36). (Table 3)

### **Outcomes of interventions aimed at reducing seclusion on seclusion use**

Outcomes of interventions aimed at reducing seclusion were related to interventions to proactively address seclusion, interventions to respond to seclusion risks and combined interventions.

Studies reported outcomes of environmental interventions, staff training, treatment planning, use of information and risk assessment, which made up interventions to proactively address seclusion.

Lowered seclusion use was reported after the implementation of environmental interventions (22), treatment planning (25, 29, 35), use of information (33) and risk assessment (20) as well as shorter seclusion duration related to environmental interventions (23), treatment planning (29, 35), use of information (38) and risk assessment (34). No change was found in incidents of seclusion related to use of information (38). Incidents and duration were also unaffected by environmental interventions (22), staff training (26), or treatment planning (37). One study found an association between treatment planning and seclusion use (35), while another did not (37). (Table 4)

Interventions to respond to seclusion risks were reported in relation to sensory modulation and interventions to manage patient agitation. Some studies reported lower incidents of seclusion after implementation of sensory modulation (31) or interventions to manage patient agitation (41), as well as reduced duration related to sensory modulation (40) and a lower risk of seclusion use related to interventions to manage patient agitation (41). However, no changes in incidents (21, 30, 39, 40) or duration (31, 40) of seclusion after implementation of sensory modulation, or in seclusion duration (41) related to interventions to manage patient agitation were also reported. (Table 4)

Combined interventions in the form of reduction programs reported fewer incidents (19, 24, 27, 28, 32, 36), reduced duration (28, 32) and reduced risk (27) of seclusion, but also duration (27) of seclusion remaining unchanged. (Table 4)

### **Outcomes of interventions aimed at reducing mechanical restraint on mechanical restraint use**

Interventions aimed at reducing mechanical restraint reported outcomes related to interventions to proactively address mechanical restraint, interventions to respond to mechanical restraint risks and combined interventions.

Outcomes of interventions to proactively address mechanical restraint were reported in relation to mechanical restraint regulations, therapeutic atmosphere, staff training and review of mechanical restraint risks. Mechanical restraint regulations (43), a therapeutic atmosphere (45) and review of mechanical restraint risks (35, 45) were all associated with fewer incidents of mechanical restraint and mechanical restraint regulations (43) and staff training (26) with shorter duration of mechanical restraint. However, an increase in mechanical restraint use was also found in conjunction with mechanical restraint regulations (43) and staff training (26). Implementing review of mechanical restraint risks (35) also resulted in no change in mechanical restraint duration and there was no association between the intervention and mechanical restraint use. (Table 5)

Outcomes related to interventions to respond to mechanical restraint risks were associated with patient involvement (45) and sensory modulation (46), both of which resulted in lowered mechanical restraint use. Sensory modulation was however also linked to mechanical restraint use remaining unchanged (21, 39). (Table 5)

Combined interventions in the form of reduction programs led to reduced incidents (36, 42, 44), reduced duration (32, 44) and reduced risk (44) of mechanical restraint, but also to increased duration of mechanical restraint episodes (44). (Table 5)

## **Discussion**

Interventions identified in this review focused on risk assessment, treatment planning and sensory modulation for both seclusion and mechanical restraint reduction, all of which were also identified in earlier reviews (13, 47). The findings of this review were in line with findings of earlier reviews in relation to regulations (47), training (14, 47), data use (47), review (14, 47), patient involvement (14, 47), family involvement (47) and prevention tools (14, 47). Outcomes of interventions for both seclusion and mechanical restraint were mainly mixed, with several interventions showing both reductions in incidents, duration or both but also with incidents, duration or both remaining unchanged. Regarding mechanical restraint, a few studies reported some increase in incidents (26, 43) or duration (44) after implementation. Since many of the interventions were implemented as part of a reduction program, there are no separate outcomes related to several identified interventions and several interventions only had one or two studies reporting outcomes.

Implementation of a reduction program was the only intervention to result in mainly positive outcomes in several studies for both seclusion and mechanical restraint use. Nursing staff carried out or were active participants in the implementation of reduction interventions in most of the review studies and although the results are inconclusive, there is some evidence that certain interventions may be useful in nursing practice.

Risk assessment or review of mechanical restraint risks was often implemented but resulted in mixed outcomes in four studies. Nurses have voiced support for risk assessment in other studies (48). Clinical judgement may be considered to work as well (49), or even better (48), than structured risk assessment tools and may be the most common form used (49). Clinical assessment of patient behavior was used on its own or in addition to specific tools in many of the studies in this review. It may be important for nurses to be actively aware of patient status and behavior. Viewing risk assessment as an informal process, instead of as a structured event (49), could potentially lead to unsystematic responses to high risk assessments. As needed medication, reassurance, distraction, limit setting, one-to-one nursing, increased observations and de-escalation were identified as the most common nursing intervention documented by nurses following a high risk-assessment score (50). As needed medication, seclusion, and discussion with a nurse, as opposed to any other professional, were identified in another study (51). However, risk assessment on the following day did not result in lower scores following these interventions (51) and in some cases, the use of medication, reassurance and limit setting increased later patient aggression (50). This suggests that while risk assessment may be useful in reducing coercion, responses to high risk-assessment scores should also be well planned and nurses should be aware of the potential for adverse effects.

Treatment planning was included as part of reduction programs but also had positive outcomes on its own. Treatment planning was somewhat focused on safety in this review, but also included personalized care plans and involving patients and significant others. Service users have reported feeling that care plans are tools for professional communication and may be insignificant in their daily lives. Service users may even feel care plans are coercive, if unwanted by the service user and felt there is no control over them. (52) Tensions between patient empowerment and traditional focuses on safety and containment, concerns over professional accountability, time and workload

pressures have all been identified as possibly limiting the implementation of patient involvement in psychiatric care planning (53). Community mental health nurses and service users have expressed valuing informal discussion over planning, with service users emphasizing connection and understanding (52). To avoid the risk of increasing feelings of coercion while attempting to reduce seclusion or mechanical restraint, it seems especially important for nurses to support patient involvement in treatment planning.

Sensory modulation also appeared frequently both as the sole focus of a study and as part of a program. The outcomes were however mixed for both seclusion and mechanical restraint. While sensory modulation may not result in clear changes in seclusion or mechanical restraint use, they can result in other positive changes such as lowered patient distress or improved staff-patient communication and may be a beneficial addition to psychiatric inpatient units seeking to improve care.

Due to exclusion criteria, identified research on programs such as Safewards and Six Core Strategies were not included in this review. Earlier reviews by Gaynes et al. (13) and Goulet et al. (14) focused on the effectiveness of reduction programs and noted that while the evidence suggests benefits of implementing programs, there is insufficient evidence to draw firm conclusions.

Research has linked both to decreases in containment, including seclusion, physical restraint and coerced medication (54), and combined seclusion and restraint (55). A recent follow up of one of the programs included in this review suggests that changes in seclusion use are possible to maintain for several years (56). Reactions of nurses to the implementation of the Safewards model have ranged from negative to somewhat positive. Certain elements, such as communication, were viewed as useful interventions and a potential for ward culture change was reported. To ensure successful implementation, support from senior staff and management was viewed as important. (57)

Most studies provided little information on the setting and there were variations in baseline seclusion or mechanical restraint use as well as local regulations related to use. Four studies acknowledged the difficulty of isolating the effectiveness of interventions (19, 27, 28, 44). Ten studies acknowledged difficulties related to interpreting outcomes, such as outcomes may have been affected by staff expectations (30, 34), other factors (21, 25, 31, 35), or uncertainty was voiced about what ultimately caused reduction (22, 24, 26, 43). Due to these factors, as well as the lack of in-depth information on the settings and other care processes involved, it is difficult to differentiate between the effect of the various interventions implemented and outcomes.

Many of the studies did find reductions in seclusion or mechanical restraint use and certain interventions may be beneficial in reducing seclusion or mechanical restraint use on adult psychiatric units. Nurses have expressed concerns over the complete elimination of seclusion and mechanical restraint and that elimination should be a gradual, consultative process with clear information on alternatives being provided (58). While many national organizations are pushing for the reduction of seclusion and mechanical restraint, considering the available evidence and nurses' views on reduction, perhaps change should focus on changing work place culture and ensuring staff are able to carefully evaluate the suitability of different interventions to their unit.

### **Limitations**

Electronic databases and manual searches were used in this review, but due to limitations, relevant studies may have been overlooked. Only one researcher conducted the review process, grey literature was excluded, and publication and language bias risks cannot be ruled out. Consulting



additional databases, such as the Cochrane Library, may have yielded more results. The entire search process was carefully documented to enhance reliability and quality evaluation was strengthened by the participation of four researchers and use of structured data evaluation tools. (59)

There were six studies (21, 26, 32, 35, 36, 39), which attempted to reduce both seclusion and mechanical restraint using the same interventions yet documented the outcomes separately. These studies were included, though it affected the level of overlap in this reviews' analysis. However, including these studies was important in order to provide a fuller description of interventions implemented. However, due to variety in the acceptability and use of seclusion and mechanical restraint, studies which combined seclusion and mechanical restraint outcome statistics were excluded (n=17) in order to describe the possible effects of the interventions on each measure individually. Nurses have reported variation in the acceptability of different coercive measures, often considering mechanical restraint less acceptable than seclusion (60, 61). A study comparing the perceived coerciveness of seclusion and mechanical restraint found no difference between patients perceived coercion (62), yet in another study patients have described mechanical restraint as a larger violation of human rights (5). Differences have also been found in the prevalence and legal status of both measures internationally (63, 64).

Data analysis was also influenced by difficulties in distinguishing interventions from other measures taken in studies. Descriptions of study protocols ranged in detail from a few sentences to several pages, affecting the descriptiveness of units of analysis. The content analysis process was continuously reviewed using the checklist compiled by Elo et al. (18).

## **Conclusion**

The research included in this review focused on nursing practice and identified interventions aimed at reducing both seclusion and mechanical restraint on adult psychiatric units. While the findings suggest that certain interventions may affect seclusion or mechanical restraint use, outcomes related to others are mixed. With careful planning, some interventions may be useful at reducing seclusion or mechanical restraint or have other benefits, such as lowered patient distress or improved communication, for nursing practice on adult psychiatric wards. The variety in interventions aimed at addressing seclusion and mechanical restraint and the limited information available on settings and factors related to implementation may explain the variation in outcomes. Further research is needed on the effectiveness of interventions included in programs and the contexts in which seclusion and mechanical restraint reduction interventions are implemented in.

## **Author contribution**

All authors were involved in the conception and design of the study, quality analysis of the included studies, interpretation of the data and drafting, revision and final approval of the manuscript. The first author carried out the literature search and the content analysis.

## **Ethical approval**

Ethical approval was not sought as empirical research was not conducted.

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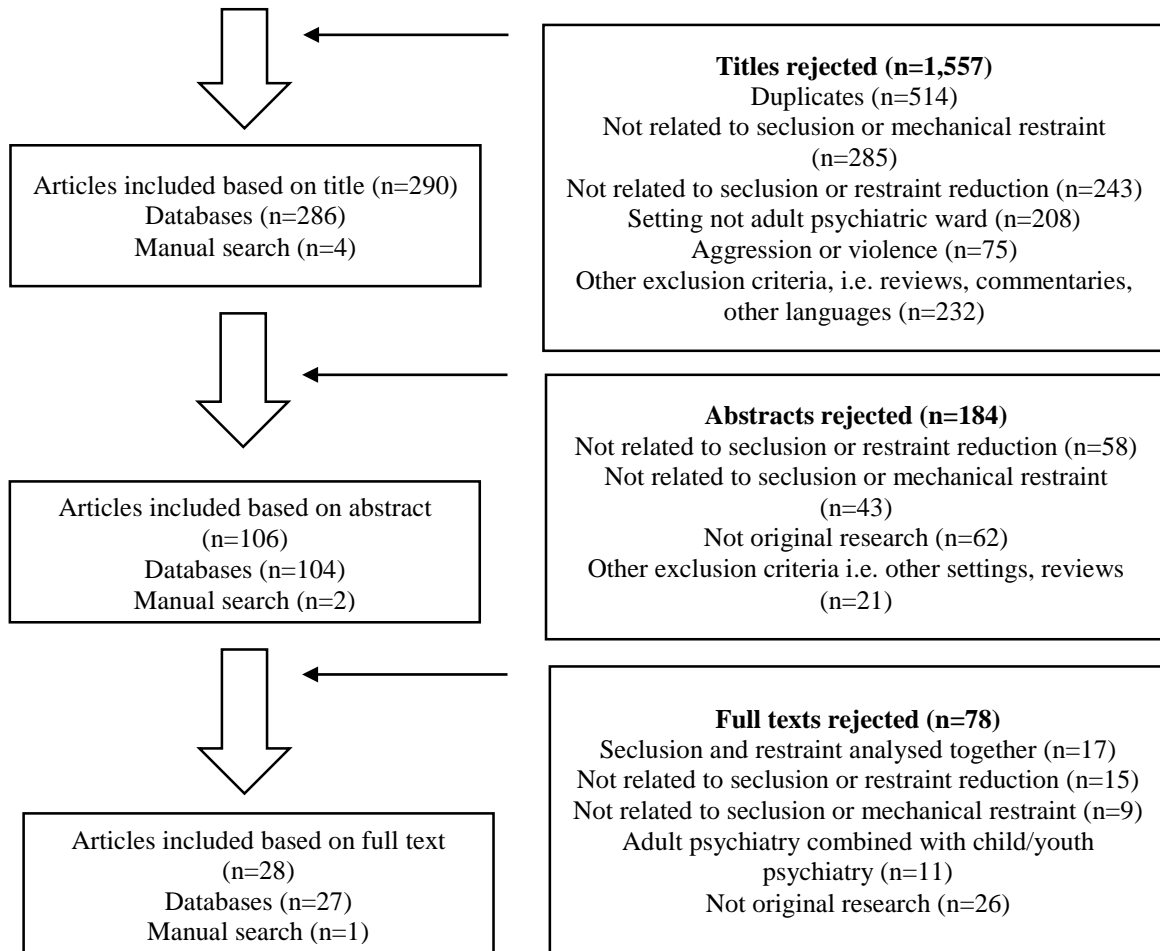
**Search terms:** Patient isolation or patient seclusion or seclusion\* or seclud\* or restraint, physical or immobilization or restrain\* AND psychiatry or psychiatric nursing (PsycINFO "psychiatric nurses") or emergency services, psychiatric or psychiatric units or psychiatric patients or psychiatric service or hospitals, psychiatric or psychiatric care or mental disorders or mental health or mental health services or mentally ill persons or mental disorders, chronic or mental health personnel or mental disorders treatment

**Search results** (n=1,847)

**Databases** (n=1,839)

Medic (n=30), Medline (n=743), CINAHL (n=456), PsycINFO (n=610)

**Manual search** (n=8)



**Figure 1** Literature review process



**Table 1** Interventions to reduce seclusion or mechanical restraint and their outcomes

<b>Study details</b>	<b>Study design</b>	<b>Psychiatric setting; SR* data related to implementation</b>	<b>Intervention</b>	<b>Results related to seclusion</b>	<b>Results related to mechanical restraint</b>	<b>Quality rating</b>
Goulet et al. 2017. Canada.	Case study	Acute unit; 6 mos. before and after	Post-seclusion and/or restraint review	Reduction in rate. Significant change in duration and association between intervention and seclusion.	Reduction in rate. No changes in duration or association between intervention and restraint.	5/8
Andersen et al. 2017. Denmark.	Case-control	Two open units; 1 yr. study period (descriptive)	Sensory modulation		Less use changes not significant.	6/10
Guzman-Parra et al. 2016. Spain.	Retrospective analysis	Acute unit; 1 yr. before and after	Multimodal intervention program based on the Six Core Strategies		Decrease in monthly rate. Significant decrease in probability. Significant increase in duration.	10/10
Guzman-Parra et al. 2015. Spain.	Retrospective analysis	Acute unit; 1 yr. before and 1 yr. 6 yr. later	Mandatory regulatory protocol		Reduction in use. Significant reduction in duration. Significant increase in rate per patient.	10/10
Ash et al. 2015. Australia.	Participatory action approach	Psychiatric intensive care unit; 1 yr. during and after	Recovery-based services	Significant reduction in use.		5/10
Smith & Jones. 2014. United Kingdom.	Mixed methods	Psychiatric intensive care unit; 3 mos. before and after (descriptive)	Sensory room	No significant changes.		67%
Lloyd et al. 2014. Australia.	Quasi experimental	Two acute units; 6 mos. before and after	Sensory modulation	Significant change in rate. No changes in duration.		7/9
Kontio et al. 2014. Finland.	Cluster-randomized trial	10 acute units; 2 yr. before and after	eLearning course	No significant changes.	No changes in rate. Significant reduction in duration.	9/12
Jungfer et al. 2014. Switzerland.	Longitudinal observational	Six general units; 1 yr. before and after	Change from closed to open wards	Significant reduction in frequency.		10/10

Godfrey et al. 2014. United States.	Before and after	Acute unit and rehabilitation unit; 1 yr. before and 23 mos. after	Staff training; formation of a response team and policy change		Significant reduction in use.	8/10
Boumans et al. 2014. Netherlands.	Quasi experimental	Four acute units; 29 mos. (4/2008-6/2010)	Methodical work approach	Significant reduction in incidents and duration.		7/8
Bak et al. 2014. Denmark and Norway.	Retrospective association	Adult units in Denmark and Norway; 1 yr. period	Association between potential mechanical restraint preventive factors and use		Significantly associated with low rates: mandatory review, patient involvement, no crowding	5/10
Whitecross et al. 2013. Australia.	Cohort study	Two acute wards; 1 yr. period	Post-seclusion counselling nursing intervention	No significant difference in episodes. Significant difference in duration.		10/10
Georgieva et al. 2013. Netherlands.	Randomized clinical trial	Acute units; 33 mos. study period	Involuntary medication	Significantly lower risk in intervention group. No other differences.		8/13
Sivak 2012. United States.	Before and after	Two admission units; 4 mos. before and after (graph)	Comfort room	Rate of use before and after implementation 0 per 1,000 patients.	Rate of use 0 per 1,000 patient beginning two months before implementation.	2/10
Novak et al. 2012. Australia.	Before and after	Acute unit; 1 yr. before and after	Sensory room	No significant changes.		6/10
Jayaram et al. 2012. United States.	Case series	Psychiatric service; 2 yr. period	Early screening and seclusion documentation	Low rate maintained.		5/10
Chandler 2012. United States.	Qualitative case study	Locked unit; 1 yr. before and 6 yr. after (graph)	Trauma-informed care	Reduction in events.	Reduction in events.	9/10

van de Sande et al. 2011. Netherlands.	Cluster randomized controlled trial	Four acute units; 10 wks. before and 30 wks. after	Short-term risk assessment	Significant reduction in duration. No changes in events.		8/13
Trauer et al. 2010. Australia.	Before and after	Two units; 6 mos. before and after	Management of Acute Arousal Programme	No significant changes.		10/10
Qurashi et al. 2010. England.	Before and after	High secure hospital; 5 yr. period (descriptive)	Multidisciplinary seclusion reduction programme	Decrease in use.		7/10
Lee et al. 2010. Australia.	Before and after	Acute unit	Sensory modulation and assessment tool (Safety Tool)	Less previously secluded patients secluded after use		8/10
Georgieva et al. 2010. Netherlands.	Retrospective study	Psychiatric intensive care unit; 28 mos. follow-up (descriptive)	Psychiatric intensive care unit	Less previously secluded patients secluded after admission		5/10
Fluttert et al. 2010. Netherlands.	Quasi experimental	16 units in forensic hospital; 30 mos. study period	Early Recognition Method	Significant reduction in use and rate.		8/9
Cummings et al. 2010. United States.	Case study	Acute unit; 9 mos. period, includes before and after	Comfort room	No significant changes.	No significant changes.	6/10
Ching et al. 2010. Australia.	Before and after	Forensic hospital; 14 mos. before and after	Beacon Project (evidence-based strategies)	Significant reduction in events and duration.		10/10
Lewis et al. 2009. United States.	Before and after	Five units; 4 yr. (graph)	Crisis Prevention Management (evidence-based program)	Reduction in events and duration.	Reduction in events and duration.	4/10
Noorthoorn et al. 2008. Netherlands.	Prospective cohort study	Two units; 28 mos. period	Several preventive measures	Significant difference in risk. No difference in duration.		7/10

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\*Seclusion or mechanical restraint

**Table 2** Interventions to reduce seclusion use

GENERAL CATEGORY	SUB-CATEGORY
<i>Interventions to proactively address seclusion</i>	
Environmental interventions	Use of regulations Closed units opened Introduction of psychiatric intensive care unit Focus on recovery Availability of cultural services High staff to patient ratio Availability of single rooms Use of personal alarm system
Staff training	Staff training related to challenging patient behavior Staff training related to preventative measures Staff training related to seclusion Staff training related to evidence-based practice Staff training related to therapeutic interventions
Treatment planning	Use of individualized care plans Information utilized in care planning Identification of patient's triggers Identification of patient's helpful interventions Patient involvement in treatment planning Adjustment of treatment plans All staff involved in treatment planning
Use of information	Information on seclusion utilized Information utilized in planning changes Identification of seclusion alternatives
Risk assessment	Assessment of patients' behavioral changes Use of specific risk assessment tool Review of risk assessment Introduction of safety meetings Use of seclusion review
<i>Interventions to respond to seclusion risks</i>	
Patient involvement	Unit-patient collaboration Patient orientation to unit Patient active in daily care Debriefing after seclusion
Family involvement	Information from patient's family utilized Family involvement in treatment planning
Meaningful activities	Availability of exercise facilities Availability of handicrafts Availability of group interventions
Sensory modulation	Introduction of sensory modulation trolley Introduction of sensory modulation room Introduction of sensory modulation techniques Availability of sensory modulation supplies Patient education on sensory modulation Use of sensory modulation agreement form Sensory assessment of patients Sensory modulation planned individually

Interventions to manage patient agitation	Sensory modulation use supported by staff
	Focus on communication
	Support for agitated patient
	Close observation of patients
	Use of as needed medication
	Use of involuntary medication
	Patient moves to separate area
	Focus on less restrictive alternatives

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**Table 3** Interventions to reduce mechanical restraint use

GENERAL CATEGORY	SUB-CATEGORY
<i>Interventions to proactively address mechanical restraint</i>	
Mechanical restraint regulations	Introduction of new regulations Regulations related to mechanical restraint application Regulations related to mechanical restraint use Revision of mechanical restraint protocols
Therapeutic atmosphere	Therapeutic care environment No crowding
Staff training	Staff training related to challenging patient behavior Staff training related to mechanical restraint Staff training related to preventative measures Staff training related to staff factors Staff training related to therapeutic interventions
Treatment planning	Use of individualized treatment planning Identification of patient's triggers Identification of patient's helpful interventions Patient involvement in treatment planning
Review of mechanical restraint risks	Information on mechanical restraint utilized Identification of mechanical restraint alternatives Assessment of patient related risks Documentation of risk assessment Introduction of safety meetings Use of mechanical restraint review
<i>Interventions to respond to mechanical restraint risks</i>	
Patient involvement	Unit-patient collaboration Debriefing after mechanical restraint
Therapeutic activities	Availability of group interventions Participation in activities
Sensory modulation	Introduction of sensory modulation trolley Introduction of sensory modulation room Introduction of sensory modulation supplies on unit Availability of sensory modulation supplies Sensory modulation use supported by staff Use of sensory modulation agreement form Sensory assessment of patients Sensory modulation planned individually
Interventions to manage agitation	Support for agitated patient Staff availability in patient environment Limit-setting Use of alarm system Use of response team Use of less restrictive alternatives

**Table 4** Outcomes of interventions aimed at reducing seclusion on seclusion use

<b>INTERVENTIONS</b>	<b>OUTCOMES</b>
<b><i>Interventions to proactively address seclusion</i></b>	
Environmental interventions	Reduced incidents of seclusion Reduced duration of seclusion Incidents of seclusion unchanged Duration of seclusion unchanged
Staff training	Incidents of seclusion unchanged Duration of seclusion unchanged
Treatment planning	Reduced incidents of seclusion Reduced duration of seclusion Association between intervention and seclusion Incidents of seclusion unchanged Duration of seclusion unchanged No association between intervention and seclusion
Use of information	Reduced incidents of seclusion Reduced duration of seclusion
Risk assessment	Incidents of seclusion unchanged Reduced incidents of seclusion Reduced duration of seclusion
<b><i>Interventions to respond to seclusion risks</i></b>	
Sensory modulation	Reduced incidents of seclusion Reduced duration of seclusion Incidents of seclusion unchanged Duration of seclusion unchanged
Interventions to manage patient agitation	Reduced incidents of seclusion Duration of seclusion unchanged Reduced risk of seclusion
<b><i>Combined interventions</i></b>	
Reduction program	Reduced incidents of seclusion Reduced duration of seclusion Reduced risk of seclusion Duration of seclusion unchanged



**Table 5** Outcomes of interventions aimed at reducing mechanical restraint on mechanical restraint use

INTERVENTIONS	OUTCOMES
<i><b>Interventions to proactively address mechanical restraint</b></i>	
Mechanical restraint regulations	Reduced incidents of mechanical restraint Reduced duration of mechanical restraint Increased incidents of mechanical restraint
Therapeutic atmosphere	Reduced incidents of mechanical restraint
Staff training	Reduced duration of mechanical restraint Increased incidents of mechanical restraint
Review of mechanical restraint risks	Reduced incidents of mechanical restraint Duration of mechanical restraint unchanged No association between intervention and mechanical restraint
<i><b>Interventions to respond to mechanical restraint risks</b></i>	
Patient involvement	Reduced incidents of mechanical restraint
Sensory modulation	Reduced incidents of mechanical restraint Incidents of mechanical restraint unchanged
<i><b>Combined interventions</b></i>	
Reduction program	Reduced incidents of mechanical restraint Reduced duration of mechanical restraint Reduced risk of mechanical restraint Increased duration of mechanical restraint